The Integrated Energy and Communication Systems Architecture

Volume II:
Functional Requirements

Appendix F:
Task 1 Enterprise Activities

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Appendix F – Task 1 Enterprise Activities

This appendix contains a collection of brief narratives that describe plausible future power system scenarios. The team considered these "Enterprise Activities" during the Task 1 scoping effort on the project. The team selected a subset of these for closer examination during the later stages of the project. They are organized here by power system domain as follows:

C - Consumer Services Domain

- C-1 Automatic meter reading (AMR)
  - C-1.1 Meter Data Management Agent (MDMA) reads meters with handheld/mobile technologies
  - C-1.2 MDMA reads industrial and/or commercial meters with fixed AMR technology
  - C-1.3 MDMA reads residential meters with fixed AMR technology
  - C-1.4 MDMA provides individual and aggregated meter readings to market settlements, DisCos, and/or TransCos
  - C-1.5 MDMA or DisCo provides individual energy usage and billing to customers
  - C-1.6 Prepay metering
  - C-1.7 Non-electric metering -- subcontracted submetering for non-electric utilities -- Note: focus on aspects of shared infrastructure and not the actual metering
  - C-1.8 Sub-metering -- customer bill disaggregation and rental space allocations
  - C-1.9 Non-intrusive load monitoring -- deducing load contributions by monitoring aggregate consumption changes
  - C-1.10 Outage detection
- C-2 Customer Management
  - C-2.1 ESP interfaces with customers to provide tamper detection, load profiles, etc. services to DisCos
  - C-2.2 ESP provides connect, disconnect, energy usage and billing information, etc. to customers
  - C-2.3 ESP provides DisCo with information for updating relevant databases
- C-3 Customer trouble call management
  - C-3.1 Customer reports trouble and trouble ticket is generated (see Call Center Management and Support under Information Management Domain)
  - C-3.2 Trouble ticket is used by outage management function (see Distribution Operations)
  - C-3.3 Trouble ticket is used for statistical analysis (see Distribution Operations)
- C-4 Real-time Pricing (RTP)
  - C-4.1 ESP issues updated RTP schedules for subscribing customers
    - C-4.1.1 ESP receives base RTP schedule from Market Operations
    - C-4.1.2 ESP calculates customer-specific RTP schedules
    - C-4.1.3 ESP multicasts RTP schedules to customers
  - C-4.2 Customer EMS manages energy usage based on RTP
    - C-4.2.1 Customer EMS determines optimal mix of current load, deferred load, and DR generation, based on RTP schedule

C-1 Automatic meter reading (AMR)

The Purpose of *Automatic meter reading (AMR)* ***function is described below...***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.6	1.3	2.7	1.4	1.6	1.7

COMMENTS:
The following comments were collected during the peer review:

0 - for multicast / broadcast messages, that recipient can be permitted to miss

How does this rating for "AMR" differ or relate to MDMA and others below?
-- Joe Hughes - 28 Apr 2003

While the architecture for AMR is fairly straightforward for fulfilling the meter functions, the architecture for tying AMR-enhanced meter information to other functions of electricity markets is largely unspecified, especially for competitive electricity markets. This especially true where multiple members of the electricity value chain (generator to end use) simultaneously need access to the information in real time. There are also PID control theory applications to restoring electricity markets (e.g., reliability crisis) to the desired "set point." These applications not only need real-time data, they also need speedy access and analysis of the meter data history. So configuration, quality of service, and data management all should be 2.5 or higher.
-- William Smith - 27 Jun 2003

C-1.1 Meter Data Management Agent (MDMA) reads meters with handheld/mobile technologies

The Purpose of *Meter Data Management Agent (MDMA) reads meters with handheld/mobile technologies* ***function is to***

permit company to improve the billing process, make it more cost effective, faster, more comfortable to the clients, reduce probability of error in the reading process and the estimations in the billing

To eliminate problems related to reading meters in difficult or dangerous locations (or in most locations) and can also help to reduce utility company operating costs

directly involving

MDMAs (DisCos
Energy Services Provider-ESPs
GenCos
Scheduling Coordinators
Etc)
Customers
Meters

performing

Retrieve meter data traveling around meters locations

with key interfaces between

MDMAs and meters
MDMAs and Settlement System

with communication configuration requirements of

One* to many between MDMAs and meters over WAN
One* to one between MDMAs and Settlement system over WAN
*One in case on one MDMA
Many in case of many MDMAs

with quality of service requirements of

Medium availability (can be read later)
Data accuracy high (billing purposes)
Data frequency is low

with security requirements of

High security level and confidentiality to keep safe this data (that have financial implications)
To keep private individual energy consumption
And also to avoid tampering and other acts, that put in risk the financial process

with data management requirements of

Large metering database with infrequent updates

with constraints of

No special constrains

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	1.0	3.0	1.0	2.0	1.4

COMMENTS:
The following comments were collected during the team rating review:

Security=3 this it cash register data
Constraints=2 large legacy interface
Data Mgmt=1 smaller volume of data and existing system if functioning

The following comments were collected during the peer review:

1 - guaranteed delivery
No timeliness requirements

0 looks too low for configuration here since the vision includes migration to fixed.
-- Joe Hughes - 28 Apr 2003

Agree with the comments here, and think this item is ancillary. CEIDS is trying to address the Digital Society, isn't it? This item is for basic customers as they now exist.
-- William Smith - 27 Jun 2003

C-1.2 MDMA reads industrial and/or commercial meters with fixed AMR technology

The Purpose of *MDMA reads industrial and/or commercial meters with fixed AMR technology* ***function***

is to

permit company to improve the billing process, make it more cost effective, more comfortable to the clients, reduce probability of error in the reading
To reduce utility company operating
It also permits to stream line the settlement system, making it faster and more transparent

directly involving

MDMAs (DisCos
Energy Services Provider-ESPs
GenCos
Scheduling Coordinators
Etc)
Customers
Meters

performing

Retrieve meter data

with key interfaces between

MDMAs and meters
MDMAs and Settlement System

with communication configuration requirements of

One* to many between MDMAs and meters over WAN

One* to one between MDMAs and Settlement system over WAN
*One in case on one MDMA
Many in case of many MDMAs

with quality of service requirements of

Medium availability
Data accuracy high (billing purposes)
Data frequency is low

with security requirements of

High security level and confidentiality to keep safe this data (that have financial implications)
To keep private individual energy consumption
And also to avoid tampering and other acts, that put in risk the financial process

with data management requirements of

Large metering database with infrequent updates

with constraints of

No special constrains

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	2.0	3.0	2.0	3.0	2.6

COMMENTS:
The following comments were collected during the team rating review:

Config=3 still large but not as large as residential but dispersed locations
QoS = 2 because need for timeliness and accuracy of cost-sensitive data
Data Mgmt=2 high volume of data Constraint=3 high cost of some media/interfaces/transports Security=3 this is the cash
Non repudiation of meter configration changes

The following comments were collected during the peer review:

---

2 - higher performance -- sub second delays

I'm surprised that the time dimension isn't stressed here. Just like Fedex, speedier availability of the data and the settlement process has tremendous value that the digital society will be able to tap into. In particular, add "deliver" and "provide access to" under Performing; change "medium" to "high" regarding availability, and "low" to "high" regarding data frequency, under Quality of Service. Also change "infrequent" to "frequent" under Data Management. Quality of Service &

Data Management should be ranked at least 2.5. Otherwise it will be a slow, garbage-in/garbage out middleman at best. The lightspeed interactions of the Digital Society will need trustworty data available on a moment's notice.
-- William Smith - 27 Jun 2003

C-1.3 MDMA reads residential meters with fixed AMR technology

The Purpose of *MDMA reads residential meters with fixed AMR technology* ***function***

is to

permit company to improve the billing process, make it more cost effective, more comfortable to the clients, reduce probability of error in the reading

To reduce utility company operating

It also permits to stream line the settlement system, making it faster and more transparent

directly involving

MDMAs (DisCos

Energy Services Provider-ESPs

GenCos

Scheduling Coordinators

Etc)

Customers

Meters

performing

Retrieve meter data

with key interfaces between

MDMAs and meters

MDMAs and Settlement System

with communication configuration requirements of

One* to many between MDMAs and meters over WAN

One* to one between MDMAs and Settlement system over WAN

*One in case on one MDMA

Many in case of many MDMAs

with quality of service requirements of

Medium availability

Data accuracy high (billing purposes)

Data frequency is low

with security requirements of

High security level and confidentiality to keep safe data with financial implications

To keep private individual energy consumption

And also to avoid tampering and other acts, that put in risk the financial process

with data management requirements of

Large metering database with infrequent updates

with constraints of

No special constrains

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	1.0	3.0	2.0	3.0	2.4

COMMENTS:
The following comments were collected during the team rating review:

Config=3 large quantity of connections;
QoS=1 need for "last gasp" communications from meter on loss of power Data Mgmt=2 high volume of data Constraint=3 high cost of some media/interfaces/transports Security=3 this is the cash

Non repudiation of meter configration changes

The following comments were collected during the peer review:

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3 - Ultra high performance -- guaranteed bandwidth determinacy

---

Similar comments to those in 1.2. This portrayal completely overlooks the opportunity for AMR to interoperate with digitally-enhanced residences (e.g., home automation). Add "data presentment" to Purpose, change things to reflect needs for High Data Availability, High Frequency Data/Updates.
-- William Smith - 27 Jun 2003

C-1.4 MDMA provides individual and aggregated meter readings to market settlements, DisCos, and/or TransCos

The Purpose of** MDMA provides individual and aggregated meter readings to market settlements, DisCos, and/or TransCos **function is to

permit to stream line the settlement system, making it faster and more

It permit customers to know accurately their load profile, helping then to select the most suited tariff

It permit DisCos and TransCos to perform energy and power balances to use for billing purposes, planning

To reduce risk when signing settlements to both parties (now the load profile is more certain)

directly involving

MDMAs (DisCos, Energy Services Provider-ESPs, GenCos, Scheduling Coordinators (if they exist), etc), Customers

ISO/RTOs, TransCos, Settlement System, Historical Records, , Meters, Billing System, Accounting System, ESP-SCADA/EMS

performing

Provide final energy data and reporting to support billing and settlement processes

with key interfaces between

MDMAs and Settlement System
ESP SCADA/EMS and Settlement System
ESP SCADA/EMS and Historical Records

with communication configuration requirements of

One* to one between MDMAs and Settlement system over WAN
One to one between ESP SCADA/EMS and Settlement System over WAN
One to one between ESP SCADA/EMS and Historical Records System
*One in case on one MDMA
Many in case of many MDMAs

with quality of service requirements of

Medium availability, data accuracy high (billing purposes), data frequency is
High volume of data between MDMA and settlement system

with security requirements of

Confidentiality (normal) and high security level to allow proper settlement and market processes

with data management requirements of

Large metering database with infrequent updates
Data is exchanged with other units inside and outside of the organization

with constraints of

No special constrains

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	3.0	1.0	1.0	1.4

COMMENTS:
The following comments were collected during the team rating review:

Security=3 this it cash register data
Data Mgmt= 1 additional use of existing data, which is alread acquired

---

If this is not AMR supported, then it probably doesn't need changing, because it will be inadequate to meet Digital Society needs. The aggregation function is critical to freeing the bounds of current metering/settlement approaches so customers can take advantage of new services and relationships with their energy providers. The more automated (and the more the feedback timescale shrinks), the better.
-- William Smith - 27 Jun 2003

C-1.5 MDMA or DisCo provides individual energy usage and billing to customers

The Purpose of *MDMA or DisCo provides individual energy usage and billing to customers* ***function***

is to

permit to make more transparent the billing

It permit customers to know accurately their load profile, helping then to select the most suited tariff

In market where small customer chose Energy provider it helps to reduce risk when signing settlements (now the load profile is more certain)

directly involving

MDMAs (DisCos

Energy Services Provider-ESPs

GenCos

Scheduling Coordinators (if they exist)

Etc)

Customers

Meters

Settlement System

Historical Records

Meters

Billing System

Accounting System

ESP-SCADA/EMS

Web page

performing

Provide final energy data and reporting to support billing processes

with key interfaces between

MDMAs and Settlement System

ESP SCADA/EMS and Settlement System

ESP SCADA/EMS and Historical Records

with communication configuration requirements of

One* to one between MDMAs and Settlement system over WAN

One to one between ESP SCADA/EMS and Settlement System over WAN

One to one between ESP SCADA/EMS and Historical Records System

*One in case on one MDMA

Many in case of many MDMAs

with quality of service requirements of

Medium availability
Data accuracy high (billing purposes)
Data frequency is low

with security requirements of

Confidentiality (normal) and high security level to allow proper billing process

with data management requirements of

Large metering and billing databases with infrequent updates

with constraints of

No special constrains

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	3.0	1.0	1.0	1.4

COMMENTS:
This function has similar interfaces (and ratings) to function (C-1.4) MDMA provides individual and aggregated meter readings to market settlements, DisCos, and/or TransCos above.

Ditto (see C1.4). Also there are a number of missing word/odd wordings/typos in C1.4 and C1.5.
-- William Smith - 27 Jun 2003

C-1.6 Prepay metering

The Purpose of *Prepay metering* ***function is to***

Allow clients a better control of their energy costs
Eliminate the reading process and its costs
And reduce working capital of the energy provider

directly involving

MDMAs (DisCos
Energy Services Provider-ESPs
GenCos
Scheduling Coordinators (if they exist)
Etc)
Customers
Meters
Settlement System
Historical Records

Meters
Billing System
Accounting System
ESP-SCADA/EMS

performing

meters provide energy already paid (through cards for example),
MDMA compute energy
* Here I assuming a prepaid scheme that require connection with
MDMA or ESP

with key interfaces between

ESP SCADA/EMS and Settlement System

with communication configuration requirements of

One to one between ESP SCADA/EMS and Settlement System over
WAN

with quality of service requirements of

Medium availability
Data accuracy high
Low data frequency

with security requirements of

High security level and confidentiality to keep private individual
energy consumption and also to avoid tampering u other source of
error

with data management requirements of

Large metering database with infrequent updates

with constraints of

No special constrains

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	3.0	1.0	1.0	1.4

COMMENTS:
This function has similar interfaces (and ratings) to function (C-1.4) MDMA provides individual and aggregated meter readings to market settlements, DisCos, and/or TransCos above.

Low value item. May be good for electricity provider for managing customers whose accounts tend to be delinquent regarding payment.
-- William Smith - 27 Jun 2003

C-1.7 Non-electric metering -- subcontracted submetering for non-electric utilities -- Note: focus on aspects of shared infrastructure and not the actual metering

The Purpose of *Non-electric metering -- subcontracted submetering for non-electric utilities -- Note: focus on aspects of shared infrastructure and not the actual metering* ***function***

is to

use the economies and cost reductions that bring the common (or shared) use of one metering system with other services (water telephone, etc)

directly involving

MDMAs (DisCos, Energy Services Provider-ESPs, GenCos, Scheduling Coordinators (if they exist), etc), Customers, Meters, Gas Companies, Water Companies, Billing System, Accounting System, Other services

In a aggregate way it involves also ISO/RTOs, TransCos, Settlement System, Historical Records, ESP-SCADA/EMS

performing

Retrieve meter data from different services (electricity

Gas

Etc)

with key interfaces between

Electric meters and gas meters

Electric meters and water meters

MDMAs and meters

MDMAs and Electric Billing/Accounting/Settlement Systems

MDMAs and Gas Companies

MDMAs and Water Companies

with communication configuration requirements of

One to one between different types of meters

One* to many between MDMAs and meters over WAN

One* to one between MDMAs and Settlement system over WAN

*One in case on one MDMA

Many in case of many MDMAs

with quality of service requirements of

Medium availability

Data accuracy high

Data frequency is low because it is not frequently read

with security requirements of

High security level and confidentiality to keep safe this data (that have financial implications)

To keep private individual energy/gas/water consumption

And also to avoid tampering and other acts, that put in risk the financial process

with data management requirements of

Large metering database with infrequent updates

Exchange of information across organizational boundaries

with constraints of

Interfaces between electric
Gas
And water meters are media-constrained
Compute-constrained
And power-constrained

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	2.0	3.0	2.0	3.0	2.6

COMMENTS:
The following comments were collected during the team rating review:

Config =3 due to communications of gas and water meters to electric meter-reading system
QoS = 2 due to need by some (larger) customers for high availability of information in real-time
Security =3 different issues where different clients have rights to subsets of information from a single device
Data Mgmt =2 due to cross-organizational data flows and large amounts of data
Constraints = 3 due to media-constrained
Compute-constrained
And power-constrained interfaces between electric
Gas
And water meters to the meter-reading system

Agree with the ratings. Not sure why this hasn't caught on; we've talked about it for 20 years that I know of. Might be facilitated in areas where the metering function is outsourced by all utilities; then a 3rd party can invest in the multifunction metering interface.
-- William Smith - 27 Jun 2003

C-1.8 Sub-metering -- customer bill disaggregation and rental space allocations

The Purpose of *Sub-metering -- customer bill disaggregation and rental space allocations* ***function***
is to provide customers options of disaggregation of their bills allowing them to distribute the energy cost properly among their users
directly involving
MDMAs
Customers
Meters
Billing System

performing

Provide final energy data and reporting to support disaggregated billing process

with key interfaces between

MDMAs and meters

ESP-Billing system

with communication configuration requirements of

One* to many between MDMAs and meters over WAN

One to one between ESP and Billing system

*One in case on one MDMA

Many in case of many MDMAs

with quality of service requirements of

Medium availability

Data accuracy medium

Low data frequency

with security requirements of

High security level and confidentiality

with data management requirements of

Large metering database (each consumer could be consider with more fields) with infrequent updates

with constraints of

No special constrains

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	3.0	1.0	1.0	1.4

COMMENTS:

This function has similar interfaces (and ratings) to function (C-1.4) MDMA provides individual and aggregated meter readings to market settlements, DisCos, and/or TransCos above.

This will probably be most helpful to the customer for controlling energy costs at the end use level, and to energy companies looking to promote end-use oriented programs and services.
-- William Smith - 27 Jun 2003

C-1.9 Non-intrusive load monitoring -- deducing load contributions by monitoring aggregate consumption changes

The Purpose of *Non-intrusive load monitoring -- deducing load contributions by monitoring aggregate consumption changes* ***function is to***

Prevent customer emergencies, faults, etc by notifying them when they face no-normal raises in their loads (possible fail)
Estimate load profile of unknown loads by aggregate estimation

directly involving
MDMAs
Customers
Meters
Load Monitoring Software and Equipment
performing
Monitor load
Diagnostic faults and estimate unknown loads
with key interfaces between
ESP SCADA/EMS and Settlement System
ESP SCADA/EMS and Historical Records
with communication configuration requirements of
One to one between ESP SCADA/EMS and Settlement System over WAN
One to one between ESP SCADA/EMS and Historical Records System
*One in case on one MDMA
Many in case of many MDMAs
with quality of service requirements of
High availability
Data accuracy medium
High data frequency
with security requirements of
Medium security level and confidentiality
with data management requirements of
Large metering database with more frequent updates
with constraints of
No special constrains

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	2.0	1.0	1.2

COMMENTS:
This function has similar interfaces (and ratings) to function (C-9.4) Improve power quality through data acquistion and supervisory control above.

The following comments were collected during the team rating review:

Data Mgmt=2 implementation needs to be tuned to the customer installation

EPRI has a long history (we were a pioneer) with this technology. It has potential cost advantages over "wired" approaches. What's the tradeoff against today's wireless configurations? Quality of Service and Data Management seem low, and their interaction with Configuration seems understated/underrated. Config 1.5 to 2.0 seems more reasonable, as does Quality of Service 2.0.
-- William Smith - 27 Jun 2003

C-1.10 Outage detection

The Purpose of *Outage detection* ***function***
is to Narrow down location of broken/misoperating power system infrastructure
directly involving
MDMAs
Customers
Meters
Historical Records
ESP-SCADA/EMS
performing
Identify meters without power or non-responsive to infer affected equipment location
with key interfaces between
ESP SCADA/EMS and Settlement System
ESP SCADA/EMS and Historical Records
with communication configuration requirements of
One to one between ESP SCADA/EMS and Settlement System over WAN
One to one between ESP SCADA/EMS and Historical Records System
*One in case on one MDMA
Many in case of many MDMAs
with quality of service requirements of
High availability
Data accuracy medium
High data frequency
with security requirements of
Medium security level
with data management requirements of
Large metering database with frequent updates
with constraints of
No special constrains

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3***

(highly likely to involve architectural challenges) ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	1.0	0.0	1.4

COMMENTS:
The following comments were collected during the team rating review:

Config=2 coordination with dist sys protection
QoS=2 performance
Security=2 reaches into home

The following comments were collected during the peer review:

Essentially same, as item 15B

This can be a high value item for both the energy company and the customer. I'd suggest trying to piggyback some of the AMR-enabled items above to provide higher value based on the higher requirements for Quality of Service and Data Management. Data Management should be rated 2.0.
-- William Smith - 27 Jun 2003

C-2 Customer Management

The Purpose of *Customer Management* ***function is described below...***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.3	1.0	1.7	1.5	1.0	1.3

COMMENTS:

See comments below. Given the number of involved parties these activities try to connect, the ratings should be substantially higher. This issue is a fundamental impediment to functioning competitive electricity markets. Also, I wonder if some of the myriad involved parties noted below shouldn't also be included in items 1.1 to 1.10.
-- William Smith - 27 Jun 2003

C-2.1 ESP interfaces with customers to provide tamper detection, load profiles, etc. services to DisCos

The Purpose of *ESP interfaces with customers to provide tamper detection, load profiles, etc. services to DisCos* ***function is to***

Provide ESP/DisCo with necessary tamper protection
Load profile
And other basic customer management services

directly involving

MDMAs (DisCos
Energy Services Provider-ESPs
GenCos
Scheduling Coordinators (if they exist)
Etc)
Customers
Meters
Settlement System
Historical Records
Meters
Billing System
Accounting System
ESP-SCADA/EMS
Web page

performing

Basic management of customer meter
Connection point

with key interfaces between

MDMAs and meters
MDMAs and Settlement System

with communication configuration requirements of

One* to many between MDMAs and meters over WAN
One* to one between MDMAs and Settlement system over WAN
*One in case on one MDMA
Many in case of many MDMAs

with quality of service requirements of

Medium availability
Data accuracy high
Data frequency is low because it is not frequently read

with security requirements of

High security level and confidentiality to keep private individual energy consumption and also to avoid tampering u other source of error

with data management requirements of

Large metering database with infrequent updates

with constraints of

No special constrains

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	2.0	2.0	1.0	1.6

COMMENTS:
The following comments were collected during the team rating review:

Config=2 large number of devices
Data Mgmt=2 5 minute profile data to manage

Please add definitions for acronyms like ESP, EMS, etc
-- Philip Jacobs - 17 Apr 2003

I see that these in particular are listed at first use but others are not, Dis Co. Maybe link each acronym to a definition in a glossary?
-- Philip Jacobs - 17 Apr 2003

This function would be a prime candidate for AMR enabling. That would up the rating for Quality of Service.
-- William Smith - 27 Jun 2003

C-2.2 ESP provides connect, disconnect, energy usage and billing information, etc. to customers

The Purpose of** ESP provides connect, disconnect, energy usage and billing information, etc. to customers **function
is to

Provide ESP/DisCo with necessary tamper protection
Load profile
And other basic customer management services

directly involving

MDMAs (DisCos
Energy Services Provider-ESPs
GenCos
Scheduling Coordinators (if they exist)
Etc)
Customers
Meters
Settlement System
Historical Records
Meters
Billing System

Accounting System
ESP-SCADA/EMS
Web page

performing

Basic management of customer meter
Connection point

with key interfaces between

MDMAs and meters
MDMAs and Settlement System

with communication configuration requirements of

One* to many between MDMAs and meters over WAN
One* to one between MDMAs and Settlement system over WAN
*One in case on one MDMA
Many in case of many MDMAs

with quality of service requirements of

Medium availability
Data accuracy high
Data frequency is low because it is not frequently read

with security requirements of

High security level and confidentiality to keep private individual energy consumption and also to avoid tampering u other source of
Higher security due to connect/disconnect capability - life safety issue

with data management requirements of

Large metering database with infrequent updates

with constraints of

No special constrains

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	3.0	2.0	1.0	1.8

COMMENTS:
The following comments were collected during the team rating review:

Config=2 large number of devices
Data Mgmt=2 5 minute profile data to manage
Security=3 control

This function would be a prime candidate for AMR enabling. That would up the rating for Quality of Service.
-- William Smith - 27 Jun 2003

C-2.3 ESP provides DisCo with information for updating relevant databases

The Purpose of *ESP provides DisCo with information for updating relevant databases* ***function***

is to

permit to stream line the settlement system, making it faster and more

It permit customers to know accurately their load profile, helping then to select the most suited tariff

It permit DisCos and TransCos to perform energy and power balances to use for billing purposes, planning

To reduce risk when signing settlements to both parties (now the load profile is more certain)

directly involving

MDMAs (DisCos, Energy Services Provider-ESPs, GenCos, Scheduling Coordinators (if they exist), etc), Customers

ISO/RTOs, TransCos, Settlement System, Historical Records, , Meters, Billing System, Accounting System, ESP-SCADA/EMS

performing

Provide final energy data and reporting to support billing and settlement processes

with key interfaces between

MDMAs and Settlement System

ESP SCADA/EMS and Settlement System

ESP SCADA/EMS and Historical Records

with communication configuration requirements of

One* to one between MDMAs and Settlement system over WAN

One to one between ESP SCADA/EMS and Settlement System over WAN

One to one between ESP SCADA/EMS and Historical Records System

*One in case on one MDMA

Many in case of many MDMAs

with quality of service requirements of

Medium availability, data accuracy high (billing purposes), data frequency is

High volume of data between MDMA and settlement system

with security requirements of

Confidentiality (normal) and high security level to allow proper settlement and market processes

with data management requirements of

Large metering database with infrequent updates

Data is exchanged with other units inside and outside of the organization

with constraints of

No special constrains

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	2.0	1.0	1.4

COMMENTS:
This function has similar interfaces (and ratings) to function [(C-1.4) MDMA provides individual and aggregated meter readings to market settlements, DisCos, and/or TransCos] above.

The following comments were collected during the peer review:

ESP to DisCo Link

I'm surprised that the ratings are so low. We're talking about interoperability between multiple parties of an extremely high value item. That's pretty complex. I'd up the Configuration and Quality of Service items to at least 2.0. I'd also change the bullets above to reflect the need for high availability and frequent updates. Also, a major constraint is the potential incompatibility of between the involved parties' data management systems and data requirements. I'd up constraints to 2.0.
-- William Smith - 27 Jun 2003

C-3 Customer trouble call management

The Purpose of** Customer trouble call management **function is to

Permit to shorten the out time due to faults in the distribution networks
Allowing the distribution companies to better use their repair crews and minimize the down time for customers (without increasing the level of redundancy of the distribution systems)

directly involving

Energy Services Providers ESPs
Customers
Distribution Operations and Distributed Resources
Historical Records

performing

ESPs / DisCos
Receive trouble calls
ESPs / DisCos generate trouble ticket
ESPs / DisCos check SCADA-EMS
ESPs send a crew*

Crew communicate via radio (internet-notebook-handheld also)
Crew perform manual or request switching operations*
ESPs / DisCos update statistics
* if necessary

with key interfaces between

Customer and ESPs / DisCos
ESPs / DisCos and Quality of Service Management Program

with communication configuration requirements of

One* to many between ESPs/DisCos and Customers over Phone, Internet u other
One to one between ESPs/DisCos and Quality of Service Management
*One in case on one ESPs/DisCos

with quality of service requirements of

High availability
Rapid respond
Specially during emergencies or contingencies
Data accuracy high
A rapid response is required to minimize a possible out of standard service

with security requirements of

Medium security requirement

with data management requirements of

Large databases randomly updated with
Data exchanges with other units of the company

with constraints of

No special constrains

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	1.0	1.0	1.0

COMMENTS:

Some of the requirements here could underwrite some of the improvements noted in earlier comments above. However, I'm unfamiliar with this function. I also wonder if cell phones, etc. won't suffice for the extracompany activities.
-- William Smith - 27 Jun 2003

C-3.1 Customer reports trouble and trouble ticket is generated (see Call Center Management and Support under Information Management Domain)

The Purpose of *Customer reports trouble and trouble ticket is generated (see Call Center Management and Support under Information Management Domain)* ***function***

is to permit to inform the company about a trouble with a customer in order to start working on solve that

directly involving

Energy Services Providers ESPs
Customers
Distribution Operations
Historical Records

performing

Customers notify ESPs / DisCos
ESPs / DisCos generate trouble ticket

with key interfaces between

Customer and ESPs / DisCos
ESPs / DisCos and Quality of Service Management Program

with communication configuration requirements of

One* to many between ESPs/DisCos and Customers over Phone, Internet u other
One to one between ESPs/DisCos and Quality of Service Management
*One in case on one ESPs/DisCos

with quality of service requirements of

High availability
Rapid respond
Specially during emergencies or contingencies
Data accuracy high
A rapid response is required to minimize a possible out of standard service

with security requirements of

Medium security requirement

with data management requirements of

Large databases randomly updated with
Data exchanges with other units of the company

with constraints of

No special constrains

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	1.0	1.0	1.0

COMMENTS:

C-3.2 Trouble ticket is used by outage management function (see Distribution Operations)

The Purpose of *Trouble ticket is used by outage management function (see Distribution Operations)* ***function***

is to obtain all the data about the fault to solve it as fast as possible
directly involving
ESPs
Customers
Distribution Operations
Historical Records
performing
ESPs / DisCos check SCADA-EMS
ESPs send a crew*
Crew communicate via radio (internet-notebook-handheld also)
Crew perform manual or request switching operations*
* if necessary
with key interfaces between
ESPs / DisCos and Quality of Service Management Program
with communication configuration requirements of
One* to many between ESPs/DisCos and Customers over Phone, Internet u other
*One in case on one ESPs/
One to many between ESPs/DisCos and crew
with quality of service requirements of
High availability
Rapid respond
Specially during emergencies or contingencies
Data accuracy high
A rapid response is required to minimize a possible out of standard service
with security requirements of
High security requirement to keep a clean Quality of service management program
with data management requirements of
Large databases randomly updated with
Data exchanges with other units of the company
with constraints of
No special constrains

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	1.0	1.0	1.0

COMMENTS:

C-3.3 Trouble ticket is used for statistical analysis (see Distribution Operations)

The Purpose of *Trouble ticket is used for statistical analysis (see Distribution Operations)* ***function***
is to keep updated the outage statistics to compute quality indexes, pay fines or compensate (if the regulatory scheme consider that)., plan network improvements
directly involving
ESPs
Customers
Distribution Operations
Historical Records
performing
ESPs / DisCos update statistics
with key interfaces between
ESPs / DisCos and Quality of Service Management Program
ESPs / DisCos and Historical Records
with communication configuration requirements of
One to one between ESPs/DisCos and Quality of Service Management Program
One to one between ESPs/DisCos and Historical Records
with quality of service requirements of
High availability to keep an accurate record of outages
Failures
Etc
with security requirements of
High security requirement to keep an accurate record of outages
Failures
Etc
with data management requirements of
Large databases randomly updated with
Data exchanges with other units of the company
with constraints of
No special constrains

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	1.0	1.0	1.0

COMMENTS:

C-4 Real-time Pricing (RTP)

The Purpose of *Real-time Pricing (RTP)* ***function is described below...***

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.5	2.5	3.0	2.0	2.0	2.4

COMMENTS:

This is certainly one of the defining horizons for CEIDS, with stringent requirements on all fronts, including regulatory policy.
-- William Smith - 27 Jun 2003

C-4.1 ESP issues updated RTP schedules for subscribing customers

The Purpose of** ESP issues updated RTP schedules for subscribing customers **function

is to

To create a two-way communication channel that sends information to the customers
to allow them to plan and modify their load and generation in response to price signals in "real-time" (operational timeframe which can range from seconds to days ahead), and to provide real-time information about the behavior of the customer in response to the price

This service shall not be limited to
energy

Other services such as voltage regulation (reactive power), contributions to frequency regulation, and contribution to reserves can also be part of this protocol, once again both for purposes of conveying to the customer what is desired and at what price, and to measure and record what the customer is providing to the system

directly involving

Market Operations
Energy Services Providers
Customers
Distribution Operations
Transmission Operations
And Distributed Resources

performing

The computation of base RTP by Market operations, calculation of specific RTPs by
ESPs, posting and/or multicasting of RTPs to specific and/or to all customers, determination and recording of customer generation and load and its correlation to the RTP signals, scheduling of loads and DR based on RTP, management of loads and DR in real-

This includes scheduling and metering not only energy but of ancillary services as well

with key interfaces between

ESPs and Market Operations (DisCo
RTO
TransCo)
ESPs and Customer Building Automation systems

with communication configuration requirements of

Multicast of RTP data to large numbers of customers
Within contractual timeframes
With contractual availability
And collection and transmittal of customer
Information back to a collection site for purposes of settlement and payments based
On both RTP and quantities of various items for, which a contract has been
Established

with quality of service requirements of

High availability of RTP data
Timeliness of RTP data

with security requirements of

authentication of RTP data,
non-repudiation of RTP data, accurate audit logs, and sufficient redundancy to ensure that information from the user about its production and/or consumption of energy and other ancillary services is not only sent back but also archived and reasonably secure from failures in the real time communications
See Energy
Scheduling and DR Management for additional requirements

with data management requirements of

Large numbers of customers

with constraints of

New applications
Many different types of systems
Unvalidated cost-benefit

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	3.0	2.0	1.0	2.0

COMMENTS:
The following comments were collected during the team rating review:

Config=2 large number of customer sites
QoS = 2 due to need for highly accurate financial information

Security=3 controlling load; financial consequence of tampering
Data Mgmt=2 volume

The Configuration issues for this function have a significant impact on the IECSA architecture, because the ESPs will need to have multi-cast communications links with a large number of dispersed customers, ranging from large industrial and commercial customers to small residential customers. These communication links will also need to have high overall availability and rapid response times (probably on the order of a few minutes) so that the customers are provided with pricing information in a timely manner that meets the market tariff requirements. The security of these communication links will need to be very high, both because there could be significant market operations financial consequences to eavesdropping, modification of data, or denial of service, but also because the information could be used for controlling loads, which could impact customer operations, and therefore have direct impacts on customer finances. Finally, the ESP will need to manage a large amount of data from the different customers that it serves, and may have significant and on-going changes in customers, customer tariffs, and value-added services with those customers, making data management a significant issue.
-- Frances Cleveland - 01 May 2003

I concur with Frances' comments. I'm a little confused about the terms "base RTP" and "specific RTP" -- are you assuming a 2 part price structure with baselines? Adding in responsiveness to reserve issues and ancillary services (1 minute, 4 sec in CA) will greatly add to the time-sensitive information transfer and physical action requirements.
-- William Smith - 27 Jun 2003

C-4.1.1 ESP receives base RTP schedule from Market Operations

The Purpose of *ESP receives base RTP schedule from Market Operations* ***function***
is similar to function ***(C-4.1) ESP issues updated RTP schedules for subscribing customers*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	3.0	2.0	1.0	2.0

COMMENTS:

C-4.1.2 ESP calculates customer-specific RTP schedules

The Purpose of *ESP calculates customer-specific RTP schedules* ***function***
is similar to function ***(C-4.1) ESP issues updated RTP schedules for subscribing customers*** ***above.***

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	3.0	2.0	1.0	2.0

COMMENTS:

C-4.1.3 ESP multicasts RTP schedules to customers

The Purpose of** ESP multicasts RTP schedules to customers **function is similar to function** **(C-4.1) ESP issues updated RTP schedules for subscribing customers** **above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	3.0	2.0	1.0	2.0

COMMENTS:

C-4.2 Customer EMS manages energy usage based on RTP

The Purpose of** Customer EMS manages energy usage based on RTP **function
is to Manage energy usage based on pricing signals
directly involving
ESP RTP calculation engine/database
Customer user interface
Customer EMS
performing
Load control
Process
And staff scheduling
with key interfaces between
Customer Building Automation systems to End Devices
with communication configuration requirements of
Multicast of load and generation control commands within buildings
Campuses
And wider areas
with quality of service requirements of
High availability of control commands and monitored information
with security requirements of
High security due to control of end devices

with data management requirements of

Large numbers of a large variety of end devices

with constraints of

New applications
Many different types of systems
Unvalidated cost-benefit

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	2.0	3.0	2.8

COMMENTS:
The following comments were collected during the team rating review:

Config=3 large quantity of end devices in different areas
QoS = 3 due to need for highly accurate financial information
Security=3 controlling loads
Financial consequence of tampering
Data Mgmt=2 due to many different types of end devices and their needs
Constraints = 3 due to diversity of end devices
Compute-constrained nature of end devices

The configuration rating reflects the issue that customers could have a very large variety of end devices that they would like to control, possibly dispersed over large buildings or campuses. This means that there would be an architectural challenge for each customer on how best to handle a possible mix of media, end-device monitoring and control requirements, and possibly different protocols. Since controlling loads and/or DER devices could have significant financial impacts on a customer's business, the communications would need high availability and appropriately reliable response timing. For the same reasons, security will need to be very high to avoid financial consequences from tampering, including ensuring the security and accuracy of the audit records. Data management of the monitoring and control of the customer's end devices could provide challenges due to the large variety and varying characteristics of these end devices. In addition, the media to the end devices could be limited in bandwidth, and the end device controllers could be constrained in compute capabilities.
-- Frances Cleveland - 01 May 2003

I again agree with Frances' comments. Please change the term "end devices" to "end-use technologies" Clark won't like the first one.
-- William Smith - 27 Jun 2003

C-4.2.1 Customer EMS determines optimal mix of current load, deferred load, and DR generation, based on RTP schedule

The Purpose of *Customer EMS determines optimal mix of current load, deferred load, and DR generation, based on RTP schedule* ***function is similar to function*** ***(C-4.2) Customer EMS manages energy usage based on RTP*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	2.0	3.0	2.8

COMMENTS:

C-4.2.2 Customer EMS implements load and DR management

The Purpose of *Customer EMS implements load and DR management* ***function is similar to function*** ***(C-4.2) Customer EMS manages energy usage based on RTP*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	2.0	3.0	2.8

COMMENTS:

C-5 Load management

The Purpose of *Load management* ***function is to***

Permit companies make a better use of their installed capacity by reducing the system peak

Make the system more secure and more responsive to contingencies

directly involving

Energy Services Providers

Customers

Distribution Operations and Distributed Resources

performing

Managing controllable loads (Ex: radio controled A/C system

Heaters

Etc) and applying curtailment/interruptions/load shedding schemes

ESPs send a crew (if not remote control is available)
Crew communicate via radio and mobile phone (internet-notebook-handheld also)
Crew perform manual operations

with key interfaces between

Energy Services Providers / DisCos to Customer Controllable Load/Equipment
Energy Services Providers to Distribution Operation (crew)

with communication configuration requirements of

One to many between ESPs/DisCos and distributed Customer Controllable Load/Equipment
One to one between ESPs/DisCos and Distribution Operation (crew communication through radio
Mobile phone lines)

with quality of service requirements of

High availability
Rapid response
Data accuracy high
A rapid response is required to keep load/generation equilibrium and to minimize a possible out of standard service

with security requirements of

High security requirements to avoid undesirable disconnections in customers loads

with data management requirements of

Large databases randomly updated with events (mainly during contingencies and peak demand)
Data exchanges with other units of the company

with constraints of

No special constrains

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	1.0	2.0	2.0	2.5	2.1

COMMENTS:

I find this one somewhat archaic. The prevailing term nowadays is Demand Response (e.g., Program 90). The discussion above focuses only on the response to reliability constraints, and seems to mix rotating outages in with curtailment programs. It completely misses the economic motivations (spot prices) that have led to sophisticated demand bidding programs. The low Quality of Service rating is quite astounding. Suggest complete rewrite, as this function has critical needs akin to those of RTP. See EPRI Reports 1006015 (New

Principles for Demand Response Planning) and 1006017 (Demand Trading) for insights into how to proceed.
-- William Smith - 27 Jun 2003

C-5.1 ESP applies direct load control measures - residential

The Purpose of *ESP applies direct load control measures - residential* ***function***

is to Allow company to reduce load and in that way the installed capacity required making the system safer under contingencies

directly involving

Energy Services Providers
Customers
Customer Controllable Load/Equipment
Distribution Operations and Distributed Resources

performing

Managing controllable loads (Ex: radio controlled A/C system
Heaters
Etc) and applying curtailment/interruptions/load shedding schemes

with key interfaces between

Energy Services Providers / DisCos to Customer Controllable Load/Equipment
Energy Services Providers to Distribution Operation (crew)

with communication configuration requirements of

One to many between ESPs/DisCos and distributed Customer Controllable Load/Equipment
One to one between ESPs/DisCos and Distribution Operation (crew communication through radio
Mobile phone lines)

with quality of service requirements of

High availability
Rapid response
Data accuracy high
A rapid response is required to keep load/generation equilibrium and to minimize a possible out of standard service

with security requirements of

High security requirements to avoid undesirable disconnections in customers loads

with data management requirements of

Large databases randomly updated with events (mainly during contingencies and peak demand)
Data exchanges with other units of the company

with constraints of

No special constrains

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	1.0	2.0	2.0	3.0	2.2

COMMENTS:
The following comments were collected during the team rating review:

Config=3 links to large numbers of customers
Security=2 authentication of user/class
Data Mgmt=2 large numbers of customer groups
Constraints=3 compute-constrained
Media constrained

This is pretty basic stuff. The only new twist here is that we can now piggyback on existing digitial backbones (e.g., cell, pager). The fundamental flaws with remote devices (cycling switches, smart thermostats) remain; the remote technologies and strategies employed lead to customer overkill and free riders.
-- William Smith - 27 Jun 2003

C-5.1.1 Applies/requests direct load control (cycle water heaters, air conditioners, and other loads)

The Purpose of *Applies/requests direct load control (cycle water heaters, air conditioners, and other loads)* ***function is similar to function*** ***(C-5.1) ESP applies direct load control measures - residential*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	1.0	2.0	2.0	3.0	2.2

COMMENTS:

Should address "rebound" effects at the end of the control period. Need pretty sophisticated strategy to avoid adverse infrastructure impacts.
-- William Smith - 27 Jun 2003

C-5.1.2 Curtails customer loads

The Purpose of *Curtails customer loads* ***function is similar to function*** ***(C-5.1) ESP applies direct load control measures - residential*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3***

(highly likely to involve architectural challenges) ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	1.0	2.0	2.0	3.0	2.2

COMMENTS:

I'm totally confused about the difference between direct load control as used here, and "curtailing [residential] customers." Is this rotating outages in subdivisions? Please clarify.
-- William Smith - 27 Jun 2003

C-5.1.3 Interrupts customer loads

The Purpose of *Interrupts customer loads* ***function is similar to function*** ***(C-5.1) ESP applies direct load control measures - residential*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	1.0	2.0	2.0	3.0	2.2

COMMENTS:

Same issues -- I don't understand what differentiation you are getting at among these terms with respect to the residential sector.
-- William Smith - 27 Jun 2003

C-5.1.4 Sheds customer loads (under frequency / under voltage)

The Purpose of *Sheds customer loads (under frequency / under voltage)* ***function is similar to function*** ***(C-5.1) ESP applies direct load control measures - residential*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	2.0	3.0	1.0	1.0	2.0

COMMENTS:
The following comments were collected during the team rating review:

Config=3 will involve comm to home and comm in house
QoS=2 sub-second (100ms) performance in the home
Security=3 don't want undesired remote access

This one's pretty clear. Would the actuation be done by a device in the customer's home?
-- William Smith - 27 Jun 2003

C-5.1.5 Requests load-reducing volt/var control

The Purpose of *Requests load-reducing volt/var control* ***function is similar to function*** ***(C-5.1) ESP applies direct load control measures - residential*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	1.0	2.0	2.0	3.0	2.2

COMMENTS:

Has anyone estimated the relative value of this control to the standard demand reduction approaches? Also, per extensive conversations with the Cal-ISO, voltage reductions aren't quite CA's cup of tea. Seems more applicable back east. Don't know what the story is with VARs in this context (other than their relation to voltage support).
-- William Smith - 27 Jun 2003

C-5.2 Permissive power provision -- devices can request a limit of power. This would allow an emegency device to use power while other loads might not. Scheduled and load limited. Authenticated level control

The Purpose of *Permissive power provision -- devices can request a limit of power. This would allow an emegency device to use power while other loads might not. Scheduled and load limited. Authenticated level control*
function
is to permit devices to request limited amout of power for emergency/housekeeping functionality without fee or billing agreement in place
directly involving
ESP
Customers
Individual load equipment
performing
Load control based on equipment type
Load requirements
Customer class and location

with key interfaces between

ESP
Customer databases
Billing systems
Payment history
Individual load equipment

with communication configuration requirements of

One to many between ESPs/DisCos and distributed Customer Controllable Load/Equipment

with security requirements of

High security requirements to avoid undesirable disconnections in customers loads

with data management requirements of

Large databases, large numbers of
Data exchanges with other units of the company

with constraints of

No special constrains

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	1.0	2.0	2.0	2.0	2.0

COMMENTS:
The following comments were collected during the team rating review:

Config=3 potential national identity issue - recognizing the user anywhere in the contry/world
Security=2 authentication of user/class
Data Mgmt=2 point of sale issues
Constraints=2 unknown application

This is quite clever. I'd like to hear more. Might be applicable beyond the residential sector. We tried a variant of it in our response to the 2001 CA Power Crisis.
-- William Smith - 27 Jun 2003

C-6 Building/Home Energy Management Services

The Purpose of *Building/Home Energy Management Services* ***function is described below...***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.8	1.0	2.0	1.2	1.0	1.4

COMMENTS:

This activity has traditionally a hard sell to residential end-use customers. Most home automation firms have tried to get electric/telecommunications utilities to play a marketing/business partner role, to no avail. While the benefits from energy cost reductions usually outclasses the security and medical alarm capabilities, these benefits still don't seem to meet threshold requirements for achieving high market penetration of home automation. What architectural changes are being proposed that would help?
-- William Smith - 29 Jun 2003

C-6.1 ESP monitors building security systems (illegal entry, environmental alarms, health care signals, etc.) - no remote control

The Purpose of *ESP monitors building security systems (illegal entry, environmental alarms, health care signals, etc.) - no remote control* ***function***
is to see item 14 below

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.7	1.2	2.2	1.6	1.2	1.6

COMMENTS:
The following comments were collected during the peer review:

See #14 below

See comment on 6.0. Retrofit installations do come with some constraints. Depending on the interoperability desired with outside parties, Quality of Servie and Data Management might be revalued to the 2.0 range.
-- William Smith - 29 Jun 2003

C-6.2 Customer EMS manages building environment, based on preset parameters (security settings, temperature, appliances, lighting management, etc.)

The Purpose of *Customer EMS manages building environment, based on preset parameters (security settings, temperature, appliances, lighting management, etc.)* ***function***
is to provide energy management expertise and supervision to customer

purchased energy management equipment
directly involving
Service provider
Contractor
Customer
Customer facility
Tenant
performing
Load survey
Analysis
Equipment advice and planning
Installation contracting assistance
Monitoring of alarms
Dispatching
Customer gui gateway
with key interfaces between
Service provider
Contractor
Customer
Customer facility
Tenant
with communication configuration requirements of
Sensor configuration information
Setpoints for alarms / alerts
Subsystem control algorithm selection
with quality of service requirements of
Limits of communications to user interface and supervisory control and monitoring (not direct control)
Medium-high availability
Multiparty simultaneous access
with security requirements of
Privacy
Confidentiality
Authentication
with data management requirements of
Persistant and reliable storage and retrieval of records
Potentially large number of records / customer sites
with constraints of
large library of analytical tools and control algorithms and equipment
High level of control domain expertise for engineering and support required

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of	Security	Data	Constraints	Average

	Service		Management		
2.0	1.0	2.0	1.0	1.0	1.4

COMMENTS:
The following comments were collected during the team rating review:

Config=2 because of a large number of devices, significant setup information that must be communicated and varied low level communication protocols to these
Security=2 because building security management (alarm systems) may be controlled

---

Given that this section seems to advocate the real-time interaction with ESPs depending on the ESPs operations, availability should probably be high. Data frequency (under Data Management) should be added as a high. I'm suprised to see Constraints and Data Management rated only a 1, given what's under that category; I'd add the need for real time access and operations (with ESP) under Constraints, too.
-- William Smith - 29 Jun 2003

C-6.3 Customer status/control of building environment locally and/or remotely by modifying parameters

The Purpose of *Customer status/control of building environment locally and/or remotely by modifying parameters* ***function***
is to provide secure access to customer site through managed network
directly involving
Service provider
Customer
Service providers gateway
Installation/service personnel
performing
Gateway services between data access protocols and "web browser"
Management of security relationship with customer site
with key interfaces between
Service provider
Customer
Service providers gateway
with communication configuration requirements of
Customer premise layout and sensor network
Supervisory control over ems and security system
Reporting options
with quality of service requirements of
Reliable delivery of messages
Propagation delays of acceptable remote user interface (less than 1 sec?)
with security requirements of

Privacy
Confidentiality
Authentication of user
Security management protocols
Non-repudiation of customer intiated actions

with data management requirements of

Persistant and reliable storage and retrieval of archival records
Large number of entities

with constraints of

Communications to the customer site may include media costrained lines
High cost per kilobyte of data (dollars per KB)
Impacted by sheer number of customers
May be third party relationships with installing/service companies

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	3.0	1.0	1.0	1.6

COMMENTS:
The following comments were collected during the team rating review:

Config=2 because of a large number of devices, significant setup information that must be communicated and varied low level communication protocols to these
Security=3 remote control -most likely through the Internet

I find it odd that as more items are added to the Constraints category, the rating never moves up. My comments on 6.2 apply here, too.
-- William Smith - 29 Jun 2003

C-6.4 Customer EMS bids into power market for dynamic load profile

The Purpose of *Customer EMS bids into power market for dynamic load profile* ***function***
is to provide dynamic optimization of customer energy cost through interaction with power markets

directly involving

Service provider
Customer
Customer facility management system
Power market
Customer meter

performing

Machine bidding for power consumption based on load profile offered and accepted

Power quality needs and exposures

Aggregation of customer loads to form bid pool

with key interfaces between

Service provider

Customer

Customer facility management system

Power exchange

Customer meter

with communication configuration requirements of

Bid pool mutual agreements

Contract with market participants

Association with revenue meter

with quality of service requirements of

reliable delivery of messages, can tolerate relatively large propagation delays (

hours?)

with security requirements of

Privacy

Confidentiality

Authentication of user

Participation in external security regime

Non-repudiation of customer intiated actions

with data management requirements of

Persistant and reliable storage and retrieval of archival records

Large number of entities

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	1.0	3.0	2.0	2.0	2.2

COMMENTS:

The following comments were collected during the team rating review:

Config=3 large number

Bi-directional

Security=3 audit trails

Contract information

Non-repudiation

Data Mgmt=2 many contracts & relationship must be in place for this function to operate

Contraints=2 regulatory issues
Parallelism to stock market automated trading where it is regulated to avoid positive feedback loops

---

The following comments were collected during the peer review:

Like e-bay for energy

This is more like it. Now Constraints are a 2, and contain fewer and less onerous items that previously. Quality of Service seems underrated (2.0?).
-- William Smith - 29 Jun 2003

C-6.4.1 machine bidding for power consumption

The Purpose of *machine bidding for power consumption* ***function is similar to function*** ***(C-6.4) Customer EMS bids into power market for dynamic load profile*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	1.0	3.0	2.0	2.0	2.2

COMMENTS:

C-6.4.2 buildings of same owner collaborate on load profile

The Purpose of *buildings of same owner collaborate on load profile* ***function***
is similar to function ***(C-6.4) Customer EMS bids into power market for dynamic load profile*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	1.0	3.0	2.0	2.0	2.2

COMMENTS:

This a key benefit to customers, ranging from bill consolidation to facilitate enegy cost control, to participating actively in competitive electricity markets.
-- William Smith - 29 Jun 2003

C-6.4.3 negotiate for poor power quality events

The Purpose of *negotiate for poor power quality events* ***function is similar to function*** ***(C-6.4) Customer EMS bids into power market for dynamic load profile*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	1.0	3.0	2.0	2.0	2.2

COMMENTS:

I'm not quite clear regarding how power quality fits here, although it's intriguing conceptually. If an aggregate of remote actions can contribute to a PQ problem higher up in the system, then there might be quite a bit of value. However, the real-time and coordination requirements would be high (I see that Configuration is rated 3.0). I'd think that Data Management and Constraints might be >2.5, and Qof S a 2.0).
-- William Smith - 29 Jun 2003

C-6.5 Customer EMS tracks billing

The Purpose of *Customer EMS tracks billing* ***function***
is to provide dynamic access to premise revenue meter to guide facility management
directly involving
- Service provider
- Customer
- Customer facility management system
- Power market
- Customer meter

performing
- Retrieval of current consumption
- Bill to date
- Pricing forecasts
- Historic performance data
- Power quality events

with key interfaces between
- Service provider
- Customer
- Customer facility management system
- Power market
- Customer meter

with communication configuration requirements of
- Meter access information

Customer identification information
Access rights / limitations for customer access

with quality of service requirements of

Reliable delivery of messages

with security requirements of

Privacy
Confidentiality
Authentication of user
Security management protocols
Role based access control to isolate user permisions to view/read / change information

with data management requirements of

Access to customer information base for retrieval of historic data (not currently in meter)

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	2.0	2.0	1.0	1.6

COMMENTS:
The following comments were collected during the team rating review:

Config=2 because of a large number of devices and multiple user applications that may need to take advantage of billing
Security=2 because of dealing with billing information to make
Data management=2 because of need to maintain data for each customer and make it available on demand

---

This is fine, unless you are interacting with real-time pricing or demand-bidding programs. Then things should be rated higher.
-- William Smith - 29 Jun 2003

C-6.5.1 EMS receives bill to date

The Purpose of *EMS receives bill to date* ***function is similar to function*** ***(C-6.5) Customer EMS tracks billing*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	2.0	2.0	1.0	1.6

COMMENTS:
The following comments were collected during the team rating review:

{Description??}

C-6.5.2 EMS receives pricing forecasts

The Purpose of *EMS receives pricing forecasts* ***function***
is similar to function ***(C-6.5) Customer EMS tracks billing*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	2.0	2.0	1.0	1.6

COMMENTS:
The following comments were collected during the team rating review:

{Description??}

C-6.5.3 EMS receives history data - minute by minute and events

The Purpose of *EMS receives history data - minute by minute and events* ***function***
is similar to function ***(C-6.5) Customer EMS tracks billing*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	2.0	2.0	1.0	1.6

COMMENTS:
The following comments were collected during the team rating review:

{Description??}

C-6.6 Offsite premise management

The Purpose of *Offsite premise management* ***function***
is to provide remote access and monitoring to remote sites
directly involving

Service provider
Customer
Service providers gateway
Customer security system
Police
Fire
Emergency personnel
Installation/service

performing

Data verification and validation
Gateway services between data access protocols and notification recipients
Management of security relationship with customer site

with key interfaces between

Service provider
Customer
Service providers gateway
Customer security system
Police
Fire
Emergency personnel
Installation/service

with communication configuration requirements of

Customer premise layout and sensor network
Reporting options
Sensor confirmation tree

with quality of service requirements of

Reliable delivery of messages
Propagation delays of acceptable notification delay (~20 sec?)
Relatively infrequent access (ie mostly idle)

with security requirements of

Privacy
Confidentiality
Authentication of user
Security management protocols

with data management requirements of

Persistant and reliable storage and retrieval of archival records
Large number of entities

with constraints of

Communications to the customer site may include media costrained lines
High cost per kilobyte of data (dollars per KB)
Impacted by sheer number of customers
May be third party relationships with installing/service companies
For some sites with minimal requirements
POTS modem access may be most cost effective network connection

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	3.0	1.0	1.0	1.6

COMMENTS:
This function has similar interfaces (and ratings) to function (C-6.3) Customer status/control of building environment locally and/or remotely by modifying parameters above.

The following comments were collected during the team rating review:

Config=2 because of potential for large number of devices to control over varied lower level protocols and physical
Security=3 because Internet likey to be used and risk of unauthorized remote control of systems

---

Given the entries in the categories above, these seem quite underrated, except for Security. This where some of the trickier (but potentially higher value) capabilities come into play.
-- William Smith - 29 Jun 2003

C-6.6.1 Provide analysis and control of homes / businesses /vacation property

The Purpose of** Provide analysis and control of homes / businesses /vacation property **function** **is similar to function (C-6.6) Offsite premise management above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	3.0	1.0	1.0	1.6

COMMENTS:

C-6.7 Occupancy based heating and lighting controls

The Purpose of** Occupancy based heating and lighting controls **function** **is similar to function (C-6) Building/Home Energy Management Services above.

On a scale of 0** (does not involve significant architectural challenges) **to 3

(highly likely to involve architectural challenges) ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	0.0	0.0	0.0	0.0

COMMENTS:
The following comments were collected during the peer review:

Local contol only

See comments above. Market is not sufficiently conducive that these systems can penetrate to a high degree in isolation.
-- William Smith - 29 Jun 2003

C-6.8 Building VAR Control

The Purpose of *Building VAR Control* ***function is to*** dynamically adjust the power factor of the load in a building

directly involving

The building pf controller and the capacitor bank controller the supplier who set the pf penalty rates and the building energy management contractor and other local var controllers

performing

On/off control or linear control of power factor compensation in a facility

with key interfaces between

Pf controller and the compensation device
The utility and the controller
The energy management contractor and the controller
The pf controller and other pf controllers in the area

with communication configuration requirements of

One to one and many to many

with quality of service requirements of

Relatively high-speed data communications (sub-second) and high accuracy

with security requirements of

Authentication and access control for interface between various energy control systems

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	1.0	1.0	1.0	1.4

COMMENTS:
The following comments were collected during the team rating review:

QoS=2 special case when closed loop control is implemented

This item has modest bottom line benefits to the system and the customer. It would seem to be a case where an aggregate of buildings can contribute to votage support.
-- William Smith - 29 Jun 2003

C-7 Weather

The Purpose of *Weather* ***function***
is to provide access to real-time and historical weather data
directly involving
National weather service
Third party providers
Automated weather stations
Customer equipment
Automated warning systems
performing
On-line analysis
Event correlation
Storm track prediction
Impact prediction
with key interfaces between
Customer service
Crew dispatch
Operations
with communication configuration requirements of
Sensor connectivity over disparate networks
Internet
Serial interface
Satellite
Publish/subscribe model
Event triggers
Warning levels
with quality of service requirements of
Reliable delivery of messages
Real time data
Propogation delays of seconds OK
with security requirements of
Data from third parties subject to licensing restrictions so data must be secured to prevent unauthorized use
Anti-spoofing
with data management requirements of

Large databases of data may need to be maintained with fast retrieval

Large number of entities - similar to classic SCADA

with constraints of

Many legacy systems in place using proprietery protocols and data formats

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	0.7	1.0	1.0	1.3	1.0

COMMENTS:

C-7.1 Lightening and severe weather alert notification

The Purpose of *Lightening and severe weather alert notification* ***function is to*** provide access to real-time and historical weather data

directly involving

National weather service

Third party providers

Automated weather stations

Customer equipment

Automated warning systems

performing

On-line analysis

Event correlation

Storm track prediction

Impact prediction

with key interfaces between

Customer service

Crew dispatch

Operations

with communication configuration requirements of

Sensor connectivity over disparate networks

Internet

Serial interface

Satellite

Publish/subscribe model

Event triggers

Warning levels

with quality of service requirements of

Reliable delivery of messages

Real time data

Propogation delays of seconds OK

with security requirements of

Data from third parties subject to licensing restrictions so data must be secured to prevent unauthorized use

Anti-spoofing

with data management requirements of

Large databases of data may need to be maintained with fast retrieval

Large number of entities - similar to classic SCADA

with constraints of

Many legacy systems in place using proprietery protocols and data formats

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	1.0	1.0	1.0	1.2

COMMENTS:

The following comments were collected during the team rating review:

Qos=2 because of need for timely warning information which may be used for notifying exposed personnel that may be exposed to danger - life safety

Mainly an issue for lightning notification which requires quick action by personnel working outside in an affected area

---

The following comments were collected during the peer review:

Erich to review - lowered security and data mgmt to 1 - OK - EWG

C-7.1.1 Notification of emergency transient conditions

The Purpose of *Notification of emergency transient conditions* ***function is similar to function*** ***(C-7.1) Lightening and severe weather alert notification*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	1.0	1.0	1.0	1.2

COMMENTS:

C-7.2 Weather to consumer

The Purpose of *Weather to consumer* ***function***
is to provide access to real-time and historical weather data
directly involving
- National weather service
- Third party providers
- Automated weather stations
- Customer equipment
- Automated warning systems

performing
- On-line analysis
- Event correlation
- Storm track prediction
- Impact prediction

with key interfaces between
- Customer service
- Crew dispatch
- Operations

with communication configuration requirements of
- Sensor connectivity over disparate networks
- Internet
- Serial interface
- Satellite
- Publish/subscribe model
- Event triggers
- Warning levels

with quality of service requirements of
- Reliable delivery of messages
- Real time data
- Propogation delays of seconds OK

with security requirements of
- Data from third parties subject to licensing restrictions so data must be secured to prevent unauthorized use
- Anti-spoofing

with data management requirements of
- Large databases of data may need to be maintained with fast retrieval
- Large number of entities - similar to classic SCADA

with constraints of
- Many legacy systems in place using proprietery protocols and data formats

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	0.0	1.0	0.0	1.0	0.6

COMMENTS:
The following comments were collected during the peer review:

EMS can use this input to make decistion, as to how to optimize decisions for the day such, as pre-heating and pre-cooling

---

I'm amazed at the low ratings here, given all the items in the discussion above. This gets amplified when tying an aggregate of customers to a system or market condition. What am I missing?
-- William Smith - 29 Jun 2003

C-7.2.1 Provide day or multiday ahead weather forecasts, alerts

The Purpose of *Provide day or multiday ahead weather forecasts, alerts* ***function***
is similar to function ***(C-7.2) Weather to consumer*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	0.0	1.0	0.0	1.0	0.6

COMMENTS:

C-7.2.2 Provide dynamic/periodic wind/solar/thermal/precipitation status for optimal control

The Purpose of *Provide dynamic/periodic wind/solar/thermal/precipitation status for optimal control* ***function***
is similar to function ***(C-7.2) Weather to consumer*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	0.0	1.0	0.0	1.0	0.6

COMMENTS:

Same comment as for 7.2
-- William Smith - 29 Jun 2003

C-7.3 Weather from consumer

The Purpose of *Weather from consumer* ***function***
is to gather weather information from customer owned sensors
directly involving
- National weather service
- Third party providers
- Automated weather stations
- Customer equipment
- Automated warning systems

performing
- On-line analysis
- Event correlation
- Storm track prediction
- Impact prediction

with key interfaces between
- Customer service
- Crew dispatch
- Operations

with communication configuration requirements of
- Sensor connectivity over disparate networks
- Internet
- Serial interface
- Satellite
- Publish/subscribe model
- Event triggers
- Warning levels

with quality of service requirements of
- Reliable delivery of messages
- Real time data
- Propogation delays of seconds OK

with security requirements of
- Data from third parties subject to licensing restrictions so data must be secured to prevent unauthorized use
- Anti-spoofing

with data management requirements of
- Large databases of data may need to be maintained with fast retrieval
- Large number of entities - similar to classic SCADA

with constraints of
- Many legacy systems in place using proprietery protocols and data formats

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	0.0	1.0	2.0	2.0	1.2

COMMENTS:
The following comments were collected during the team rating review:

Data Mgmt=2 data from large volume of users
Constraints=2 analysis of micro-climate information does not exist today

---

The following comments were collected during the peer review:

Micro-climate analysis - information could be used to predict load from windmills and solar

---

Agree with the comments above, but am surprised at the low Configuration and Quality of Service ratings.
-- William Smith - 29 Jun 2003

C-7.3.1 Retrieve microclimate data from consumer controls -- outside air, solar, precipitation

The Purpose of *Retrieve microclimate data from consumer controls -- outside air, solar, precipitation* ***function***
is similar to function ***(C-7.3) Weather from consumer*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	0.0	1.0	2.0	2.0	1.2

COMMENTS:

C-8 Third party services

The Purpose of *Third party services* ***function***
is described below...

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	2.0	2.0	1.6

COMMENTS:

C-8.1 Contractor use of utility gateway and communications

The Purpose of *Contractor use of utility gateway and communications*
function
is to provide managed access to customer premise network for third party contracting organizations
directly involving
- Service provider
- Contractor
- Customer
- Customer facility
- Tenant

performing
- Gateway between gui applications at contractor site and customer sited equipment
- Persistant logging and retrieval of notification events

with key interfaces between
- Service provider
- Contractor
- Customer
- Customer facility
- Tenant

with communication configuration requirements of
- Sensor configuration information
- Setpoints for alarms / alerts
- Subsystem content models

with quality of service requirements of
- Reliable delivery of messages
- Propagation delays of acceptable remote user interface (less than 1 sec?)

with security requirements of
- Privacy
- Confidentiality
- Authentication of user
- Security management protocols
- Role based access control to isolate independent contractors from each others authorized accesses

with data management requirements of
- Persistant and reliable storage and retrieval of records
- Potentially large number of records / customer sites

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	2.0	2.0	1.6

COMMENTS:
The following comments were collected during the team rating review:

Security=2 privacy issues
Data Mgmt=2 large quantity of data
Constraints=2 hugh interoperability problem due to the large diversity of products and interfaces

---

C-8.1.1 Remote servicing of HVAC control

The Purpose of *Remote servicing of HVAC control* ***function is similar to function*** ***(C-8.1) Contractor use of utility gateway and communications*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	2.0	2.0	1.6

COMMENTS:

C-9 Power Quality

The Purpose of *Power Quality* ***function is described below...***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.8	2.0	2.2	2.0	1.0	1.8

COMMENTS:

C-9.1 Notify customer of current PQ information

The Purpose of *Notify customer of current PQ information* ***function is to*** notify customer of supply system power quality conditions in real time and provide information for coordination with facility equipment ***directly involving***

Distribution operations
Customers
Marketing

performing

Power quality performance monitoring and reporting in real time

with key interfaces between

Distribution operations and customer facility managers; distribution power quality reporting system and customer system equipment

with communication configuration requirements of

Distribution system power quality monitoring system and interfaces to customer systems

with quality of service requirements of

Accurate
Fast reporting of power quality conditions cor coordination with customer systems

with security requirements of

Confidentiality
Authentication of user
Security management protocols

with data management requirements of

Large pq monitoring database describing both historical and real time system conditions
Database of customer system characteristics for coordination

with constraints of

Ability of customer to use the power quality information effectively

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	2.0	2.0	1.0	2.0

COMMENTS:

The following comments were collected during the team rating review:

Config=2 because power quality monitors have a lot of settings that need to be input and maintained and numberous communication protocols and user interfaces are
QoS=3 because decisions are made by many entities based on the information and it's timliness and the potential of some applications requiring high-accuracy time
The information is needed within minutes of capture and it is large (megabyte).

Security= 2 because of spoofing concern and concern for information getting into competitor hands regarding quality of
Data Management=2 because of large database requirements

The following comments were collected during the peer review:

Lot's of legacy protocols and user interfaces

C-9.1.1 Current harmonic content

The Purpose of *Current harmonic content* ***function is similar to function*** ***(C-9.1) Notify customer of current PQ information above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	2.0	2.0	1.0	2.0

COMMENTS:

C-9.1.2 PQ events

The Purpose of *PQ events* ***function is similar to function*** ***(C-9.1) Notify customer of current PQ information above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	2.0	2.0	1.0	2.0

COMMENTS:

C-9.2 Implement power quality contracts

The Purpose of *Implement power quality contracts* ***function is to***

Improve customer process performance and productivity through coordination with and knowledge of the power supply conditions
Coordinate with DA systems to achieve maximum power quality levels possible within system constraintsprovide reporting Evaluation
And billing functions for power quality and custom power contracts

directly involving

Marketing

Customers

performing

Coordination functions to help optimize the performance of customer equipment and facilities based on the power supply system conditions

Including notification of power quality conditions, that can be a concern to equipment operation

Coordination with equipment controls to improve performance

And automatic identification of system changes and equipment modifications, that can improve performance

Reporting and billing functions for PQ contracts

with key interfaces between

Marketing and customers

with communication configuration requirements of

Report formats for PQ contracts

with quality of service requirements of

Accurate reports based on contract conditions

with security requirements of

Confidentiality

Authentication of user

Security management protocols

with data management requirements of

Pq database information for generation of appropriate reports

with constraints of

Contract terms and conditions

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	3.0	2.0	1.0	1.8

COMMENTS:

The following comments were collected during the team rating review:

QoS=2 because some contracts require immediate notification of

Security-3 because contracts and serious money are

Data Mgmt=2 because of large databases for PQ data, the need for frequent backups, and off-ste storage

---

C-9.3 Coordinate with power conditioning equipment and process equipment to improve performance

The Purpose of *Coordinate with power conditioning equipment and process equipment to improve performance* ***function***
is to coordinate the operation of power conditioning equipment and critical loads with actual system power quality conditions
directly involving
Distribution operations
Customers
Marketing
performing
Direct coordination with customer equipment to facilitate optimum response to actual power quality conditions
with key interfaces between
System pq reporting system
Customer power conditioning and critical equipment
with communication configuration requirements of
Control functions available in customer equipment in response to power quality conditions
with quality of service requirements of
Reliable communication between the distribution pq system and actual customer equipment controls
with security requirements of
Security management protocols
with data management requirements of
System power quality data for coordination with equipment; equipment databases to know equipment response alternatives
with constraints of
Ability of equipment to respond to real-time PQ conditions

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	1.0	1.8

COMMENTS:
The following comments were collected during the team rating review:

Config=2 because power quality monitors have a lot of settings that need to be input and maintained and numberous communication protocols and user interfaces are
QoS=2 because decisions are made by many entities based on the information and it's

The information is needed within minutes of capture and it is large (megabyte).

Security= 2 because of spoofing concern and concern for information getting into competitor hands regarding quality of

Data Management=2 because of large database requirements

C-9.3.1 power factor correction and harmonic filters

The Purpose of *power factor correction and harmonic filters* ***function is similar to function*** ***(C-9.3) Coordinate with power conditioning equipment and process equipment to improve performance*** ***above. performing***

Background harmonic distortion, system voltage profiles, and billing systems can influence the optimum configuration and switching of power factor correction

Automatic overload detection and switching to avoid resonance problems

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	1.0	1.8

COMMENTS:

C-9.3.2 UPS and power conditioning equipment

The Purpose of *UPS and power conditioning equipment* ***function is similar to function*** ***(C-9.3) Coordinate with power conditioning equipment and process equipment to improve performance*** ***above. performing***

Status of the supply system can influence optimum operation of power conditioning

Coordination during switching operations can prevent equipment outages

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	1.0	1.8

COMMENTS:

C-9.3.3 Process equipment and machine controls

The Purpose of *Process equipment and machine controls* ***function is similar to function*** ***(C-9.3) Coordinate with power conditioning equipment and process equipment to improve performance*** ***above.***

performing

Monitoring of equipment response to disturbances can lead to real time adjustments and power conditioning

Response to capacitor switching transients, voltage sags, momentary interruptions, harmonic distortion levels can all be critical

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	1.0	1.8

COMMENTS:

C-9.4 Improve power quality through data acquistion and supervisory control

The Purpose of *Improve power quality through data acquistion and supervisory control* ***function***

is to

coordinate with customer systems to improve power quality being supplied in real time (

capacitor switching to reduce harmonics, system reconfiguration to improve voltage control

)

directly involving

Distribution operations

Industrial control and automation systems

Capacitor bank controllers

Tap changer controllers

performing

System control functions to improve power quality

with key interfaces between

Power quality reporting system and distribution automation system

with communication configuration requirements of

Parameters of power quality, that require improvement and alternatives available in the system control to improve PQ

Access to on-line impact assessment calculation engine

with quality of service requirements of

Reliable reporting of PQ conditions

Equipment configuration status

And interface to DA system for implementation of PQ improvement actions

with security requirements of

Confidentiality

Authentication of user

Security management protocols

with data management requirements of

Large database of real time power quality information

System configuration information

Alternatives for improving power quality

Logging system

Priority system

Models of power system for on-line simulation and assessment of configuration changes

with constraints of

System configuration alternatives for improving power quality

Availability of controls for changing the system configuration

Priorities for the power quality levels

Legacy PQ equipment with a myriad of protocols and file formats

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	1.0	1.8

COMMENTS:

The following comments were collected during the team rating review:

Config=2 because power quality monitors have a lot of settings that need to be input and maintained and numberous communication protocols and user interfaces are

QoS=2 because decisions are made by many entities based on the information and it's

The information is needed within minutes of capture (sometimes seconds) and it is large (megabyte).

Security= 2 because of spoofing concern and concern for information getting into competitor hands regarding quality of

Data Management=2 because of large database requirements

C-9.5 Prioritize system improvements based on reliability and PQ levels being supplied to customers

The Purpose of *Prioritize system improvements based on reliability and PQ levels being supplied to customers* ***function***

is to prioritize future maintenance and capital improvements based on power quality and reliability levels

directly involving

Distribution planning

performing

Prioritizing of system improvements

with key interfaces between

Power quality reporting system and distribution system design options

with communication configuration requirements of

Report specification and delivery

with quality of service requirements of

Reliable availability of reports (web-based) per specifications

with security requirements of

Confidentiality

Authentication of user

Security management protocols

with data management requirements of

Historical pq database management for assessment of pq performance and potential improvement through system improvements

Impacts of pq levels of customer operation for the prioritizing process

Report formats for prioritizing

with constraints of

System alternatives for improving performance

Needs of customers for pq improvement

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	2.0	2.0	1.0	1.6

COMMENTS:

The following comments were collected during the team rating review:

Config=2 because power quality monitors have a lot of settings that need to be input and maintained and numberous communication protocols and user interfaces are

Security= 2 because of spoofing concern and concern for information getting into competitor hands regarding quality of

Data Management=2 because of large database requirements

C-10 Electric Vehicle / home co-gen

The Purpose of *Electric Vehicle / home co-gen* ***function is described below...***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.5	1.0	2.5	1.5	1.0	1.5

COMMENTS:

C-10.1 Billing a "consumption event" when consumer charges up at another customers "pump" (charging station)

The Purpose of *Billing a "consumption event" when consumer charges up at another customers "pump" (charging station)* ***function is to***

Provide a means for a consumer
Eg owner of electric vehicle
To be billed for a "fill up" regardless of where in the electric grid he "plugs in" for power

directly involving

Service provider
Ev
EStation
Customer

performing

Enable consumer access from eStation based on some authentication method
Measure the consumption event during filling
Provide billing event associated with consumption event
Provide receipt mechanism for those fillups, that occur in a non-retail location

with key interfaces between

Service provider
Ev
EStation
Customer

with communication configuration requirements of

Customer account
eStation account
Customer authentication means

with quality of service requirements of

Reliable delivery of messages
Propagation delays of several seconds is tolerable

with security requirements of

Privacy
Confidentiality
Authentication of user
Security management protocols
Non-repudiation of customer intiated actions

with data management requirements of

Persistant and reliable storage and retrieval of records
Potentially large number of records / customer sites

with constraints of

need to be able to support both retail establishments, as well as, consumers "home" outlets as viable eStations for this
Retail establishments can have obligations for fancy user interfaces and receipt printing, customer premise can not

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	3.0	2.0	1.0	1.6

COMMENTS:
The following comments were collected during the team rating review:

Security=3 multi-home access
Data Mgmt=2 many nodes

C-10.1.1 When consumer charges up at another customers "pump" (charging station)

The Purpose of *When consumer charges up at another customers "pump" (charging station)* ***function is similar to function*** ***(C-10.1) Billing a "consumption event" when consumer charges up at another customers "pump" (charging station) above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	3.0	2.0	1.0	1.6

COMMENTS:

C-10.2 EV as generator: permit EV generator to emit power into power grid

The Purpose of *EV as generator: permit EV generator to emit power into power grid* ***function***
is to
support the occasional use of an EV as an emergency generator or power
Fuel cells could be a source of energy
It also could help to reduce peak power (an in this way reduce the energy/power bills)

directly involving
Service provider
Ev
EStation
Customer
performing
Ability to tolerate the attachment to an eStation at any location and source power into it
The ability to account for net power flowing back from this source into the power grid
with key interfaces between
Service provider
Ev
EStation
Customer
with communication configuration requirements of
Customer account
eStation account
Customer authentication means
with quality of service requirements of
Reliable delivery of messages
Propagation delays of several seconds is tolerable
with security requirements of
Privacy
Confidentiality
Authentication of user
Security management protocols
Non-repudiation of customer intiated actions
with data management requirements of
Persistant and reliable storage and retrieval of records
Potentially large number of records / customer sites
with constraints of
need to be able to support both retail establishments, as well as, consumers "home" outlets as viable eStations for this
Retail establishments can have obligations for fancy user interfaces and receipt printing, customer premise can not

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	3.0	2.0	1.0	1.6

COMMENTS:
This function has similar interfaces (and ratings) to function (C-10.1) Billing a "consumption event" when consumer charges up at another customers "pump" (charging station) above.

C-10.2.1 Permit EV generator to emit power into power grid

The Purpose of** Permit EV generator to emit power into power grid **function
is similar to function (C-10.2) EV as generator: permit EV generator to emit power into power grid above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	3.0	2.0	1.0	1.6

COMMENTS:

C-11 Energy efficiency monitoring

The Purpose of** Energy efficiency monitoring **function
is described below...

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	2.0	1.0	1.0	1.4

COMMENTS:
The following comments were collected during the team rating review:

Config=2 large base
Security=2 privacy issues

C-11.1 Appliance performance monitoring

The Purpose of *Appliance performance monitoring* ***function is to*** provide advanced analysis to customer sited sensor data to achieve proactive maintenance and performance analysis

directly involving

Service provider
Customer
Customer facility
Tenant

performing

Data acquisition
Appliance signature analysis (non-intrusive appliance load monitoring)
simulated operation modeling
Predictive maintenance algorithmic analysis
Historical trend logging and event recording

with key interfaces between

Service provider
Customer
Customer facility
Tenant

with communication configuration requirements of

Sensor configuration information
Setpoints for alarms / alerts
Algorithm selection

with quality of service requirements of

Reliable delivery of messages
Minimal demands on performance

with security requirements of

Privacy
Confidentiality
Authentication

with data management requirements of

Persistant and reliable storage and retrieval of records
Potentially large number of records / customer sites

with constraints of

Potentially large computation requirements for continuous analysis of customer sited data

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	2.0	1.0	1.0	1.4

COMMENTS:

C-11.1.1 Monitor and compute energy efficiency for applicances and subsystems

The Purpose of *Monitor and compute energy efficiency for applicances and subsystems* ***function***
is similar to function ***(C-11.1) Appliance performance monitoring*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	2.0	1.0	1.0	1.4

COMMENTS:

C-11.2 Fault detection and diagnostics

The Purpose of *Fault detection and diagnostics* ***function***
is to

Not unique use case
Part of above

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	2.0	1.0	1.0	1.4

COMMENTS:

C-11.2.1 Detect specific appliance signature and analyze for drift or fault

The Purpose of *Detect specific appliance signature and analyze for drift or fault* ***function***
is similar to function ***(C-11.2) Fault detection and diagnostics*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	2.0	1.0	1.0	1.4

COMMENTS:

C-12 Indoor Air Quality

The Purpose of *Indoor Air Quality* ***function is described below...***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	3.0	1.0	1.0	1.4

COMMENTS:

C-12.1 Monitoring of sensors

The Purpose of *Monitoring of sensors* ***function***
is to support performance requirements for indoor air quality and facilitate conflict resolution in disputes related to air quality in buildings
directly involving
- Service provider
- Customer
- Customer facility
- Tenant

performing
- Monitoring of sensors
- Sending signals for local environmental conditions (outside air quality)
- Journalling of IAQ measurements

with key interfaces between
- Service provider
- Customer
- Customer facility
- Tenant

with communication configuration requirements of
- Sensor configuration information
- Setpoints for alarms / alerts

with quality of service requirements of
- Reliable delivery of messages
- Minimal demands on performance

with security requirements of
- Privacy
- Confidentiality
- Non-repudiation
- Authentication

with data management requirements of

Persistant and reliable storage and retrieval of records
Potentially large number of records / customer sites

with constraints of

Communications to the customer site may include media costrained lines
High cost per kilobyte of data (dollars per KB)
Impacted by sheer number of customers
May be third party relationships with installing/service companies

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	3.0	1.0	1.0	1.4

COMMENTS:
The following comments were collected during the team rating review:

Security=3 possibility of use of data in litigation

C-12.1.1 regulatory support / documentation of compliance

The Purpose of *regulatory support / documentation of compliance* ***function***
is similar to function ***(C-12.1) Monitoring of sensors*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	3.0	1.0	1.0	1.4

COMMENTS:

C-12.1.2 remote monitoring and alarming of measurements

The Purpose of *remote monitoring and alarming of measurements* ***function***
is similar to function ***(C-12.1) Monitoring of sensors*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average

1.0	1.0	3.0	1.0	1.0	1.4

COMMENTS:

C-13 ISP services to customer

The Purpose of *ISP services to customer* ***function is described below...***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	2.0	2.0

COMMENTS:

C-13.1 Reselling of bandwidth to conventional communication service providers (including telephone, TV, and ISP)

The Purpose of *Reselling of bandwidth to conventional communication service providers (including telephone, TV, and ISP)* ***function is to*** sell excess communications capacity/dark fiber of DisCo to third parties

directly involving

ESP
DisCo
Customer
Telephone company
ISP's
Other third parties

performing

Ancillary communications and data services directy to customers through previously established communications media

with key interfaces between

ESP
DisCo
Customer
Telephone company
ISP's
Other third parties

with communication configuration requirements of

Many and varied - internet
Telephony
Complex addresing issues

with quality of service requirements of

Wide range of requirements depending on particular ancillary services provided

with security requirements of

Wide range of requirements depending on particular ancillary services provided

with data management requirements of

Wide range of requirements depending on particular ancillary services provided

with constraints of

Wide range of requirements depending on particular ancillary services provided

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	2.0	2.0

COMMENTS:
The following comments were collected during the team rating review:

All items 2 or 3 because specific use of bandwidth is by definition unknown

---

C-14 Third party Service Support

The Purpose of *Third party Service Support* ***function is described below...***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.4	2.2	2.6	1.2	1.0	1.7

COMMENTS:

C-14.1 Homes security services - owner managed

The Purpose of *Homes security services - owner managed* ***function is to*** provide secure access to customer site through managed network ***directly involving***

Service provider

Customer

Service providers gateway
Installation/service personnel

performing

Data verification and validation
Gateway services between data access protocols and "web browser"
Management of security relationship with customer site

with key interfaces between

Service provider
Customer
Service providers gateway

with communication configuration requirements of

Customer premise layout and sensor network
Supervisory control over security system
Reporting options

with quality of service requirements of

Reliable delivery of messages
Propagation delays of acceptable remote user interface (less than 1 sec?)

with security requirements of

Privacy
Confidentiality
Authentication of user
Security management protocols

with data management requirements of

Persistant and reliable storage and retrieval of archival records
Large number of entities

with constraints of

Communications to the customer site may include media costrained lines
High cost per kilobyte of data (dollars per KB)
Impacted by sheer number of customers
May be third party relationships with installing/service companies

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	3.0	1.0	1.0	1.6

COMMENTS:
The following comments were collected during the team rating review:

QoS=2 timely delivery of alarms
Security=3 remote control through the utility network

C-14.2 Home health (patient monitoring / health emergency alarm)

The Purpose of *Home health (patient monitoring / health emergency alarm)* ***function***

is to provide reliable monitoring services for home health care emergencies

directly involving

- Service provider
- Customer
- Service providers gateway
- Physician
- Emergency personnel
- Installer/service personnel

performing

- Data verification and validation
- Gateway services between data access protocols and "web browser"
- Management of security relationship with customer site
- Dispatching of emergency personnel

with key interfaces between

- Gateway
- Service provider
- Installer/service
- Personnel
- Customer
- Customers information distribution list

with communication configuration requirements of

- Customer information
- Sensor list
- Reporting options
- Performance requirements

with quality of service requirements of

- Reliable delivery of messages
- Propagation delays of acceptable minimal impact ot injured persons (seconds?)

with security requirements of

- Privacy
- Confidentiality
- Authentication of user
- Security management protocols

with data management requirements of

- Persistant and reliable storage and retrieval of archival records
- Large number of entities

with constraints of

- High availability of service due to life or death nature of message contents

Transaction processing needs confirmed acknowledgement of delivery to key parties

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	3.0	1.0	1.0	2.0

COMMENTS:
The following comments were collected during the team rating review:

Config=2 more parameter involved; may include health record access
QoS=3 health care issues
Security=3 sensitive information

C-14.3 Alarm qualification

The Purpose of** Alarm qualification **function
is to provide false alarm filtering and data validation of customer alarm system
directly involving
Service provider
Customer
Service providers gateway
Customer security system
Police
Fire
Emergency personnel
Installation/service
performing
Data verification and validation
Gateway services between data access protocols and notification recipients
Management of security relationship with customer site
with key interfaces between
Service provider
Customer
Service providers gateway
Customer security system
Police
Fire
Emergency personnel
Installation/service

with communication configuration requirements of

Customer premise layout and sensor network

Reporting options

Sensor confirmation tree

with quality of service requirements of

Reliable delivery of messages

Propagation delays of acceptable notification delay (~20 sec?)

with security requirements of

Privacy

Confidentiality

Authentication of user

Security management protocols

with data management requirements of

Persistant and reliable storage and retrieval of archival records

Large number of entities

with constraints of

Communications to the customer site may include media costrained lines

High cost per kilobyte of data (dollars per KB)

Impacted by sheer number of customers

May be third party relationships with installing/service companies

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	3.0	1.0	1.0	1.6

COMMENTS:

The following comments were collected during the team rating review:

QoS=2 timely delivery of alarms

Security=3 remote control through the utility network

C-14.4 Remote video surveilence -- monitoring of home "web cams"

The Purpose of *Remote video surveilence -- monitoring of home "web cams"* ***function***

is to provide video gateway services for customer sited web cams

directly involving

Service provider

Customer

Service providers gateway

Customer camera

Installation/service

performing

Access control of video stream
Optional encryption of images
Storage and retrieval of recordings

with key interfaces between

Service provider
Customer
Service providers gateway
Customer camera(s)
Installation/service

with communication configuration requirements of

Customer premise layout and camera locations
Reporting options
Storage options

with quality of service requirements of

Video buffering to provide customer contiguous viewing

with security requirements of

Privacy
Confidentiality
Authentication of user
Security management protocols

with data management requirements of

Persistant and reliable storage and retrieval of archival records
Large number of entities
Potentially huge data sets

with constraints of

Possible law enforcement / privacy issues

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	1.0	1.8

COMMENTS:
The following comments were collected during the team rating review:

Config=2 high bandwidth
QoS=2 alarm system
Security=2 privacy
Data Mgmt=2 high volume of video data

C-14.5 home alarms -e.g. -water in basement

The Purpose of *home alarms -e.g. -water in basement* ***function is to*** provide for the annunciation and routing of alarm messages
directly involving
Service provider
Customer
Service providers gateway
Customer security system
Police
Fire
Emergency personnel
Installation/service
performing
Annunciation of emergency conditions
Validation and verification of alarm data and sensor quality
Dispatch of emergency personnel
with key interfaces between
Service provider
Customer
Service providers gateway
Customer security system
Police
Fire
Emergency personnel
Plumber
Electrician
Cable guy
Installation/service
with communication configuration requirements of
Customer premise layout and sensor network
Reporting options
Sensor confirmation tree
with quality of service requirements of
Reliable delivery of messages
Propagation delays of acceptable notification delay (~20 sec?)
with security requirements of
Privacy
Confidentiality
Authentication of user
Security management protocols
with data management requirements of
Persistant and reliable storage and retrieval of archival records
Large number of entities
with constraints of
Communications to the customer site may include media costrained lines
High cost per kilobyte of data (dollars per KB)

Impacted by sheer number of customers
May be third party relationships with installing/service companies

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	2.0	1.0	1.0	1.4

COMMENTS:
This function has similar interfaces (and ratings) to function (C-14.1) Homes security services - owner managed above.

C-15 Transmission and Distribution Operations Support

The Purpose of** Transmission and Distribution Operations Support **function
is described below...

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.5	1.8	2.4	1.8	1.8	2.0

COMMENTS:

C-15.1 Detecting light outages in street lights

The Purpose of** Detecting light outages in street lights **function
***is to** Detect street light outages*
directly involving
Street lights
ESP
DisCo
performing
Street light asset management
with key interfaces between
Street lights
ESP
DisCo
with communication configuration requirements of
Low cost
Low bandwidth

High point count
Power line carrier

with quality of service requirements of

Eventual delivery of messages with no significant time contrain

with security requirements of

Little or none

with data management requirements of

Database to track assets

Low volume data but lots of points

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	1.0	0.0	0.8

COMMENTS:

C-15.2 Downed Conductor / Power Outage region detection

The Purpose of *Downed Conductor / Power Outage region detection* ***function***

is to Narrow down location of broken/misoperating power system infrastructure

directly involving

MDMAs
Customers
Meters
Historical Records
ESP-SCADA/EMS

performing

Identify meters without power or non-responsive to infer affected equipment location

with key interfaces between

ESP SCADA/EMS and Settlement System
ESP SCADA/EMS and Historical Records

with communication configuration requirements of

One to one between ESP SCADA/EMS and Settlement System over WAN
One to one between ESP SCADA/EMS and Historical Records System
*One in case on one MDMA
Many in case of many MDMAs

with quality of service requirements of

High availability
Data accuracy medium

High data frequency

with security requirements of

Medium security level

with data management requirements of

Large metering database with frequent updates

with constraints of

No special constrains

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	1.0	0.0	1.4

COMMENTS:

This function has similar interfaces (and ratings) to function (C-1.10) Outage detection above.

The following comments were collected during the team rating review:

Config=2 coordination with dist sys protection

QoS=2 performance

Security=2 reaches into home

C-16 Calculation of home R factor

The Purpose of *Calculation of home R factor* ***function is to*** Dynamically calculate the heating "R" factor of a home

directly involving

Home energy controller

Interior temperature sensors

External temperature sensors

Solar sensors

And wind sensors

performing

Calculation of a homes heat loss given the input values from the sensors

with key interfaces between

All sensors and the home energy controller and the home energy controller and third party service providers

with communication configuration requirements of

Many to one

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3***

(highly likely to involve architectural challenges) ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	1.0	1.0	0.0	0.4

COMMENTS:

L - DR Functions

L-1 Interconnection planning (months to years ahead for new construction)

The Purpose of *Interconnection planning (months to years ahead for new construction)* ***function***
is described below...

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	2.0	1.0	1.4

COMMENTS:
The following comments were collected during the team rating review:

Security = 2 to maintain data integrity from competetors Data Mgmt = 2 because data is from multiple sources and needs to be synchronized

L-1.1 Distributed Resources (DR) owner plans (technically) for DR devices

The Purpose of *Distributed Resources (DR) owner plans (technically) for DR devices* ***function***
is to determine whether a proposed DR installation will likely provide the required electrical power economically at the appropriate time without detriment to the grid and to estimate the value of the proposed installation to the grid
directly involving
DR owner
DR Aggregator
DisCo
Permitting Authorities (government agencies)
performing
Load forcast and energy requirements
Pricing projections
Site analysis
Environmental impact studies
Review of interconnection requirements and economics
with key interfaces between

- DR owner and Permitting Authority
- DR owner and DisCo
- DR owner and DR Aggregator
- DR Aggregator and RTO/ISO

with communication configuration requirements of

e-mail, phone, fax, document transfer to communicate with parties

Internet access to download DisCo interconnection specs, government regulations, etc

with quality of service requirements of

Medium availability and response; not a real-time

Data must be timely and accurate to minimize approval delays

with security requirements of

High confidentiality of DR owner plans for competitive reasons and to prevent use of the plans for acts aimed at disrupting the owners operation

with data management requirements of

Tracking numerous legal and contractural documents; a few databases with variant forms of data updated infrequently

with constraints of

highly iterative nature of procedure to identify appropriate sites, or to negotiate the value of a particular site, that can meet the technical interconnection requirments and satisfy economic

Numerous procedural delays are common extending

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	2.0	1.0	1.4

COMMENTS:
This function has similar interfaces (and ratings) to function (L-1) Interconnection planning (months to years ahead for new construction) above.

L-1.2 DisCo studies the impact of high levels of DR on distribution system

The Purpose of *DisCo studies the impact of high levels of DR on distribution system* ***function***
is to determine general limits for DR connections to the distributions systems and to establish standards for system design to better accommodate DR in the future
directly involving

Distribution planners

Consultants

DR vendors
Research organizations (DOE
EPRI
National laboratories)

performing

Detailed performance studies on both specific systems and generalized systems for transient and and steady-state performance with a variety of DR located throughout the system

with key interfaces between

- DisCo Planners and DisCo Protection personnel
- DisCo Planners and Consultants
- Consultants and Research funding agencies
- DisCo Planners and Research funding agencies
- DisCo Planners and DR vendors

with communication configuration requirements of

e-mail, phone, fax, document transfer to communicate with parties
Connection to internal planning and system model databases

with quality of service requirements of

Medium availability and response; not a real-time
Data must be timely and accurate to facilitate studies

with security requirements of

Low to high
Many reports of results will be public or made available to prospective DR sites, but system data may be considered confidential

with data management requirements of

converting system model data from some stored form to a form appropriate for transfer third parties (
consultants) to perform studies (likely several variant forms of model data and documents) with studies updated every few years

with constraints of

Obtaining accurate system data and descriptions of characteristics of DR devices suitable for studies

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	2.0	1.0	1.4

COMMENTS:
This function has similar interfaces (and ratings) to function (L-1) Interconnection planning (months to years ahead for new construction) above.

L-1.3 DisCo acquires DR base information (to provide ratings and device models)

The Purpose of *DisCo acquires DR base information (to provide ratings and device models)* ***function***

is to

Perform studies
To determine how to dispatch the DR

directly involving

DisCo planners
Disco DMS
DR vendor
DR owner
DR aggregator

performing

Detailed system performance studies to determine best locations on system
Or the value of a specific location
For DR of particular type and size

with key interfaces between

- DisCo Planners and DR Owners
- DR owners and DR vendors
- DisCo Planners and DisCo DMS
- DR aggregators and DR owners

with communication configuration requirements of

e-mail, phone, fax, document transfer to communicate with parties involved, transfer drawings and numerical (text)
Key data transferred to DisCo DMS for dispatching and monitoring

with quality of service requirements of

Medium availability and response; not a real-time
Data must be timely and accurate to facilitate interconnection studies and dispatch or monitoring of DR by DisCo DMS

with security requirements of

High confidentiality of DR vendor and DR owner for competitive
Certain key data such as base rating may be published according to state and local policies

with data management requirements of

A few databases updated infrequently requiring conversion of DR device data from printed form to digital form accurately and keeping current on devices whose characteristics change with time with ambient conditions or human intervention

with constraints of

obtaining sufficiently accurate system data and descriptions of characteristics of DR devices suitable for studies and dispatch and control of
Also, capturing present characteristics of devices that can be reprogrammed remotely by changing firmware

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	2.0	1.0	1.4

COMMENTS:
This function has similar interfaces (and ratings) to function (L-1) Interconnection planning (months to years ahead for new construction) above.

L-1.4 DisCo analyzes DR interconnection to the power system

The Purpose of** DisCo analyzes DR interconnection to the power system **function
is to
Determine what changes
If any
Must be made to the operation of the distribution system to
accommodate the DR and to determine the protective equipment necessary and the settings for such equipment

directly involving
DisCo Planner
DisCo protection engineers
DisCo rates personnel
DisCo Account representatives
Consultants
DR Owner
DR Vendor

performing
Analysis and simulation to verify protection performance and safety issues of proposed DR installation, as well, as the value of the proposed site relative to DisCo planning issues

with key interfaces between
- DR owner and DisCo account reps
- DisCo planners and protection engineers and consultants
- DisCo planners and DisCo rates personnel
- DisCo protection engineers and DisCo account reps

with communication configuration requirements of
E-mail
Phone
Fax
Document transfer to communicate with parties involved

Transfer drawings
Numerical (text) data
And documents related to negotiations on rates and other aspects of interconnection agreements

with quality of service requirements of

Medium availability and response; not a real-time
Data must be timely and accurate to facilitate interconnection studies and negotiation of interconnection agreement

with security requirements of

High confidentiality of DR owner for competitive reasons during performance of interconnection
After successful negotiations, certain key data will become public

with data management requirements of

A few databases
Updated infrequently containing several documents and non-integrated system models derived from conversion of DR interconnection and proposed operations data from drawings and other printed form to digital form for engineering models and

with constraints of

Obtaining sufficiently accurate system data and descriptions of characteristics of DR devices suitable for technical studies and economic impact studies on the proposed DR interconnection and monitoring of compliance with the interconnection agreements

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	2.0	1.0	1.4

COMMENTS:
This function has similar interfaces (and ratings) to function (L-1) Interconnection planning (months to years ahead for new construction) above.

L-1.5 Energy services provider installs and tests DR and DR interconnection

The Purpose of *Energy services provider installs and tests DR and DR interconnection* ***function***
is to implement the DR installation and verify that it is functioning according to specifications
directly involving

Disco account representative
DisCo service crew
DR owner

Electrical contractor
Electrical inspectors

performing

installation and testing of the DR equipment and final electrical
The DisCo makes final connection to distribution system

with key interfaces between

- Disco and DR owner
- DR installer and DR owner for coordiation and scheduling of resources

with communication configuration requirements of

Elements sufficient to test communications equipment installed with the DR

with quality of service requirements of

High reliability
Medium speed data communications between DR equipment and DisCo

with security requirements of

High confidentiality of DR owner and energy services provider for competitive reasons

with data management requirements of

A few databases with infrequent updating

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	2.0	1.0	1.4

COMMENTS:
This function has similar interfaces (and ratings) to function (L-1) Interconnection planning (months to years ahead for new construction) above.

L-1.6 RTO/ISO/DisCo certifies DR units

The Purpose of *RTO/ISO/DisCo certifies DR units* ***function is to*** provide oversight of DR installations to maintain a high level of reliability and to ensure the compliance of DR owners with interconnection agreements

directly involving

Disco account representative
DisCo protection engineers
DisCo line maintenance personnel
DisCo DMS
DR owner

DR installer

performing

Oversight and inspection of installation and testing, communication testing for DisCo DMS (or SCADA). Also production of formal certification for DR

with key interfaces between

- DR owner and DisCo account reps
- DR Installer and DisCo Acct Rep
- DR Installer and DisCo DMS
- DisCo Line maintenance personnel and DR owner

with communication configuration requirements of

e-mail, phone, fax, document transfer for off line

Communications agreed upon for interconnection agreement between DisCo DMS and DR equipment

with quality of service requirements of

Hi reliability

High speed data communications between DR equipment and DisCo DMS

with security requirements of

Low for certification since this public

Connection to DisCo DMS would have security specified in interconnection agreement

with data management requirements of

A few databases with infrequent updating

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	2.0	1.0	1.4

COMMENTS:

This function has similar interfaces (and ratings) to function [(L-1) Interconnection planning (months to years ahead for new construction)] above.

L-1.7 RTO/ISO/DisCo coordinate long term transmission and generation maintenance

The Purpose of *RTO/ISO/DisCo coordinate long term transmission and generation maintenance* ***function***

is to maintain adequate generation capacity during equipment outages

directly involving

RTO/ISO Dispatching

DisCo Operations

DR owner
DR Aggregator

performing

Coordination between each entity for scheduling maintenance and outage of facilities

with key interfaces between

- DisCo Operations and DR owner
- DR Aggregator and DR owner
- RTO/ISO Dispatch and DR Aggregator
- RTO/ISO Dispatch and DisCo Operations

with communication configuration requirements of

e-mail, phone, fax, document transfer to communication maintenance plans and schedules to selected DR

DisCo and/or DR aggregator have secure resource planning data link

with quality of service requirements of

Medium for email and telecom

But High reliabilty and High security for scheduling interface

with security requirements of

Medium High since this information might be used to disable the power

This information should be provided only to larger, dispatchable DR facilities capable of controlling access to the information

with data management requirements of

A few databases with daily/weekly/monthly updating and coordinated among the various parties

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	2.0	1.0	1.4

COMMENTS:

This function has similar interfaces (and ratings) to function (L-1) Interconnection planning (months to years ahead for new construction) above.

L-1.8 RTO/ISO/DisCo register and perform credit rating of DR owners

The Purpose of *RTO/ISO/DisCo register and perform credit rating of DR owners* ***function***

is to ensure that the DR owner has the access to cash to meet fiduciary responsibilities

directly involving

Market participants

performing
Credit scoring
with key interfaces between
Market participants
with communication configuration requirements of
Interconnection with credit agencies and DisCo customer databases through secure public channels in most cases
with quality of service requirements of
Medium availability
Medium response
Because process is not real time
with security requirements of
High confidentiality
with data management requirements of
Large database
Infrequent updating
with constraints of
Similar to market operations

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	2.0	1.0	1.4

COMMENTS:
This function has similar interfaces (and ratings) to function (L-1) Interconnection planning (months to years ahead for new construction) above.

L-1.9 RTO/ISODisCo register DR meters

The Purpose of *RTO/ISODisCo register DR meters* ***function is to***
Have metering used by DR certified and registered with the DisCo RTO and ISO

directly involving
DisCo IT department
Disco account representative
DR owners
DR aggregators
with key interfaces between
DisCo IT department and DR owners
Disco account rep and DR owners

RTO/ISO/DisCo and DR aggregators

with communication configuration requirements of

custom AMR system or secure internet connection to
(Meters will be read manually if not
)

with quality of service requirements of

typically monthly
Future requirements related to DR may require more rapid reconciliation of accounts for better managing of energy
Real-time meter reading will be used to verify output of DR for conformance and estimating additional ne

with security requirements of

High
Only DisCo and possbily aggregator should have access to the
Details of interconnection agreement should be restricted to DisCo management and appropriate DR owner personnel unless required to be public by regulatory agency

with data management requirements of

Large datatbase
Infrequent updating
With confidentiallity of metering agreements and data

with constraints of

Similar to market operations

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	2.0	1.0	1.4

COMMENTS:
This function has similar interfaces (and ratings) to function (L-1) Interconnection planning (months to years ahead for new construction) above.

L-2 Real-time interconnected DR management (micro EMS concept)

The Purpose of *Real-time interconnected DR management (micro EMS concept)* ***function is described below...***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of	Security	Data	Constraints	Average

	Service		Management		
2.7	2.7	3.0	2.0	2.7	2.6

COMMENTS:

L-2.1 DR operates in local power system only, with load following

The Purpose of *DR operates in local power system only, with load following* ***function***
is to
- Follow normal daily load changes
- Analyze load requirements
- Forecast load requirements
- Provide means for supplying replacement power following loss of generation
- Optimize system operation

directly involving
- Dr Operator/Owner
- DisCo Operator/Owner
- RTO

performing
- System operation to maximize asset utilization
- Routine maintenance activities
- Control functions for meeting load demand

with key interfaces between
- DR owner/operator and DisCo
- DR owner/operator and RTO

with communication configuration requirements of
- LAN for internal DR system operation
- WAN for DR to DisCo and DR to RTO communication

with quality of service requirements of
- High availability
- Medium volume
- Frequent updates

with security requirements of
- High to allow for continuous operation of local system

with data management requirements of
- Mainly associated with the operation of the local system and related data recording and transferring functions

with constraints of
- Accurate coordination with DisCo to avoid synchronization problems if local system is to be connected to grid

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	2.0	3.0	2.8

COMMENTS:
The following comments were collected during the team rating review:

Configuration = 3 because DR penetration will change distribution system paradiagm and data is retrieved from many diverse sites probably with diverse media and
Performance = 3 because real-time (on the order of 15-20 mseconds) SCADA operations require high availability, rapid and timely responses, with high frequency and high volumes of
Security = 3 because SCADA involves control of power system
Also to maintain confidentiality from
Data Management = 2 because of large volumes of frequent data across orginazational
Constraints = 3 because media-constrained communications and compute-constrained field devices

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L-2.2 DR operator's SCADA monitors and controls aggregated DR devices

The Purpose of *DR operator's SCADA monitors and controls aggregated DR devices* ***function***
is to
Supervise DR generation
Control DR generation
Perform data transfers
Monitor power flows

directly involving
DR owner/operator
DisCo
RTO/ISO
performing
Overall DR system supervision
Data acquisition
Data logging
Control functions
Alarm processing
with key interfaces between
DR system operator and DisCo
DR system operator and RTO
with communication configuration requirements of
WAN for DR owner / operator to DiscCo
And to RTO ; LAN for internal DR

with quality of service requirements of

High availability
Medium volume
Frequent updates

with security requirements of

High
To assure reliable DR/grid interconnection

with data management requirements of

Associated with the monitoring of the DR/grid interconnection power flows and DR generation control

with constraints of

Equipment compatibility

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	2.0	3.0	2.8

COMMENTS:

This function has similar interfaces (and ratings) to function (L-2.1) DR operates in local power system only, with load following above.

L-2.2.1 Continuous monitoring (mini SCADA)

The Purpose of *Continuous monitoring (mini SCADA)* ***function is similar to function (L-2.2) DR operator's SCADA monitors and controls aggregated DR devices above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	2.0	3.0	2.8

COMMENTS:

L-2.2.2 Periodic monitoring (download information periodically)

The Purpose of *Periodic monitoring (download information periodically)* ***function is similar to function (L-2.2) DR operator's SCADA monitors and controls aggregated DR devices above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3***

(highly likely to involve architectural challenges) ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	2.0	3.0	2.8

COMMENTS:

L-2.3 Local power system with DR interconnects with utility power system

The Purpose of *Local power system with DR interconnects with utility power system* ***function***
is to

Provide/receive reactive power support
Provide reactive power coordination
Provide synchronizing control
Implement voltage regulation
Implement anti islanding protection
Monitor power flow
Coordinate protective functions

directly involving

DR Owner/ Operator
DisCo
RTO

performing

DR/Grid Interface control and monitoring

with key interfaces between

DR system operator / DisCo / RTO

with communication configuration requirements of

LAN within DR
WAN for communication bewteen DR and DisCO and DR and RTO

with quality of service requirements of

High availability
Medium volume
Frequent updates

with security requirements of

High to assure reliable DR/grid interconnection

with data management requirements of

Moderate – mainly associated with the monitoring of the DR/grid interconnection

with constraints of

Synchronization issues if DR/grid interconnection opens to grid

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	2.0	3.0	2.8

COMMENTS:
This function has similar interfaces (and ratings) to function [(L-2.1) DR operates in local power system only, with load following] above.

L-2.4 DisCo's SCADA system monitors DR devices

The Purpose of *DisCo's SCADA system monitors DR devices* ***function is to***

Monitor DR device status
Alarm processing
Data logging
Power flow forecasting
Monitor DR/grid interactions
Supervise generation
Perform data validation
Perform data acquisition
Handle communication failures

directly involving

DisCo
DR Operator
TransCo
RTO

performing

Monitor and control functions to maximize asset utilization

with key interfaces between

DR and DisCo SCADA
DisCo SCADA and RTO

with communication configuration requirements of

Disco's SCADA system to RTO and DR owner/operator over WAN

with quality of service requirements of

High availability
High data accuracy
Frequent updates

with security requirements of

High to assure maintain overall system integrity

with data management requirements of

Data exchange between organizations

with constraints of

No specific constraints

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3***

(highly likely to involve architectural challenges) ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	2.0	3.0	2.8

COMMENTS:
This function has similar interfaces (and ratings) to function (L-2.1) DR operates in local power system only, with load following above.

L-2.5 DR protection devices react to system conditions

The Purpose of *DR protection devices react to system conditions* ***function is to***

Provide fault detection and protection coordination
Provide system reliability
Prevent islanding condition

directly involving

DR devices
DR operator
DisCo
RTO

performing

System protection by implementing protective functions

with key interfaces between

DR operator and individual DR devices
DR operator and DisCo
Event recorders and DR archival center

with communication configuration requirements of

Interface between protection equipment and DR control center and data archival facilities

with quality of service requirements of

High availability
High accuracy

with security requirements of

High
To assure reliable overall system operation

with data management requirements of

Infrequent data transfers
Accurate data processing

with constraints of

Failure to operate properly may lead to equipment damage
With subsequent loss of revenue and system availability

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3***

(highly likely to involve architectural challenges) ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	2.0	3.0	2.8

COMMENTS:
This function has similar interfaces (and ratings) to function (L-2.1) DR operates in local power system only, with load following above.

L-2.5.1 Direct Transfer Tripping

The Purpose of *Direct Transfer Tripping* ***function is similar to function (L-2.5) DR protection devices react to system conditions above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	2.0	3.0	2.8

COMMENTS:

L-2.5.2 Disconnects local EPS from utility EPS without turning off DR – intentional islanding

The Purpose of *Disconnects local EPS from utility EPS without turning off DR – intentional islanding* ***function is similar to function (L-2.5) DR protection devices react to system conditions above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	2.0	3.0	2.8

COMMENTS:

L-2.6 DisCo manages microgrid with DR

The Purpose of *DisCo manages microgrid with DR* ***function is to***

Optimize asset utilization
Monitor DR/grid interaction

Manage DR power import/export
Provide voltage regulation
Manage DR dispatch
Allow for seamless DR/grid resynchronization
Implement black start
Monitor power quality
Power and ancillary services
Manage restoration protocol
Provide supervisory control on power interchange
Schedule transmission
Monitor reserves
Forecast and schedule resources
Schedule generation dispatch
Reconfigure system

directly involving
DisCo
GenCo
TransCo
RTO
ISO
performing
Overall system management including resource allocation and power system analysis
with key interfaces between
DisCo SCADA system/control center and other SCADA systems (GenCo
TransCo
RTO
ISO)
with communication configuration requirements of
WAN - Requires interconnection between microgrid control center and other control centers
with quality of service requirements of
High availability
High volume
Frequent updates
with security requirements of
High to assure reliable overall system operation
with data management requirements of
Frequent data transfers
Frequent data logging
with constraints of
DR/grid synchronization issues and effective handling of fault-on and post-fault system
Communication and coordinated control of microgrid components

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	2.0	3.0	2.8

COMMENTS:
This function has similar interfaces (and ratings) to function (L-2.1) DR operates in local power system only, with load following above.

L-2.7 All systems log significant events and store statistically important data

The Purpose of** All systems log significant events and store statistically important data **function
is to

Provide GPS time-stamped records of events
Provide record of system variables
Provide record of system settings
Provide record of system topology
Allow for data access to different organizations
Message processing and management
Data maintenance

directly involving

DR owner/operator
DisCo
RTO

performing

Archival functions and data maintenance

with key interfaces between

DR archival center/data base and DR owner/operator
DR archival center/data base and DisCo
DR archival center / data base and RTO

with communication configuration requirements of

Requires communication between archival center and other control centers over
DR local data acquisition/processing over LAN

with quality of service requirements of

High availability
Fast accessibility
Medium volume
Frequent updates

with security requirements of

High

To assure access to critical data

with data management requirements of

May require multiple data bases

May require the storage of large amounts of data

with constraints of

Data storage software obsolescence and resultant loss of data accessibility

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	3.0	2.0	1.0	1.6

COMMENTS:

The following comments were collected during the team rating review:

Security = 3 to maintain data integrity from competetors

Data Mgmt = 2 because data is from multiple sources and needs to be synchronized and crosses organizational boundaries

---

L-3 Advanced Distribution Automation (ADA) with DR installed on distribution system

The Purpose of *Advanced Distribution Automation (ADA) with DR installed on distribution system* ***function is described below...***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.7	2.7	3.0	1.9	2.7	2.6

COMMENTS:

L-3.1 ADA system updates power system model and analyze distribution operations

The Purpose of *ADA system updates power system model and analyze distribution operations* ***function***

is to Maintain the complete power system model to assure that the automation system uses the appropriate system parameters during operation

directly involving

DR Operator/Owner
DisCo Operator/Owner
RTO/ISO

performing

Topology maintenance
Load model maintenance
GIS maintenance
Distribution sub model maintenance

with key interfaces between

DR owner/operator and DisCo
DisCo and RTO/ISO
DR owner/operator and RTO/ISO
Internal DisCo Operations

with communication configuration requirements of

WAN for communication from DisCo to RTO/ISO and LAN for internal DisCo
DR owner/operator will communicate via WAN with all interfaces

with quality of service requirements of

Power system model update requires medium
Real-time operational conditions require high availability, high volume, and frequent updates

with security requirements of

DA critical data requires very high
Breach of DA system can result in severe disruption

with data management requirements of

Model maintenance will require update of many legacy and non-legacy data
Real-time DA data will generally be stored in commercial data sources

with constraints of

Real-time data storage and
Connection to legacy systems data and data structure incompatibility issues

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	2.0	3.0	2.8

COMMENTS:
This function has similar interfaces (and ratings) to function [(L-2.1) DR operates in local power system only, with load following] above.

The following comments were collected during the team rating review:

Configuration = 3 because this is a new
Performance = 3 because real-time (on the order of 15-20 mseconds) SCADA operations require high availability, rapid and timely responses, with high frequency and high volumes of
Security = 3 because SCADA involves control of power system
Also to maintain confidentiality from
Data Management = 2 because of large volumes of frequent
Constraints = 3 because media-constrained communications and compute-constrained field devices

---

L-3.1.1 Update topology model

The Purpose of *Update topology model* ***function is similar to function*** ***(L-3.1) ADA system updates power system model and analyze distribution operations*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	2.0	3.0	2.8

COMMENTS:

L-3.1.2 Update facilities model

The Purpose of *Update facilities model* ***function is similar to function*** ***(L-3.1) ADA system updates power system model and analyze distribution operations*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	2.0	3.0	2.8

COMMENTS:

L-3.1.3 Update load model

The Purpose of *Update load model* ***function is similar to function*** ***(L-3.1) ADA system updates power system model and analyze distribution operations*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3***

(highly likely to involve architectural challenges) ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	2.0	3.0	2.8

COMMENTS:

L-3.1.4 Update vicinity model

The Purpose of *Update vicinity model* ***function***
is similar to function ***(L-3.1) ADA system updates power system model and analyze distribution operations*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	2.0	3.0	2.8

COMMENTS:

L-3.1.5 Analyze real-time operation conditions using distribution power flow

The Purpose of *Analyze real-time operation conditions using distribution power flow* ***function***
is similar to function ***(L-3.1) ADA system updates power system model and analyze distribution operations*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	2.0	3.0	2.8

COMMENTS:

L-3.2 ADA system performs fault location, fault isolation, and power restoration

The Purpose of *ADA system performs fault location, fault isolation, and power restoration* ***function***
is to Identify distribution system fault conditions and automatically restore power
directly involving
DR Owner/Operator
DisCo Operator/Owner

performing

Using power system model information and real-time system data, identify location of system fault and automatically take action to restore

DA may instruct DR device to disconnect or operate in isolation depending on system conditions

with key interfaces between

DR owner/operator and DisCo

Internal DisCo Operations

with communication configuration requirements of

WAN for communication from DisCo to DR/

LAN communication within DisCo to coordinate power restoration

with quality of service requirements of

High availability and fast accessibility

with security requirements of

DA critical data requires very high

Breach of DA system can result in severe disruption

with data management requirements of

Real-time DA data will generally be stored in commercial data sources

with constraints of

Real-time data storage and retrieval and data transfer

System must act very quickly against real-time data

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	2.0	3.0	2.8

COMMENTS:

This function has similar interfaces (and ratings) to function (L-3.1) ADA system updates power system model and analyze distribution operations above.

L-3.3 Operators restore power manually

The Purpose of *Operators restore power manually* ***function is to*** Identify distribution system fault conditions and manually restore power

directly involving

DR Owner/Operator

DisCo Operator/Owner

performing

Using power system model information and real-time system data, identify location of system fault and take action to restore

Operator may instruct DR device to disconnect or operate in isolation depending on system conditions

with key interfaces between

DR owner/operator and DisCo

Internal DisCo Operations

with communication configuration requirements of

WAN for communication from DisCo to DR/

LAN communication within DisCo to coordinate power restoration

with quality of service requirements of

High availability and fast accessibility

with security requirements of

DA critical data requires very high

Breach of DA system can result in severe disruption

with data management requirements of

Real-time DA data will generally be stored in commercial data sources

with constraints of

Fast

Manual retrieval of system data to make appropriate decisions

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	3.0	2.0	2.0	2.2

COMMENTS:

This function has similar interfaces (and ratings) to function (L-3.1) ADA system updates power system model and analyze distribution operations above.

L-3.4 ADA system restores power using automation

The Purpose of *ADA system restores power using automation* ***function is to*** Identify distribution system fault conditions and automatically restore power

directly involving

DR Owner/Operator

DisCo Operator/Owner

performing

Using power system model information and real-time system data, take action to restore

DA may instruct DR device to disconnect or operate in isolation depending on system conditions

with key interfaces between

DR owner/operator and DisCo

Internal DisCo Operations

with communication configuration requirements of

WAN for communication from DisCo to DR/

LAN communication within DisCo to coordinate power restoration

with quality of service requirements of

High availability and fast accessibility

with security requirements of

DA critical data requires very high

Breach of DA system can result in severe disruption

with data management requirements of

Real-time DA data will generally be stored in commercial data sources

with constraints of

Real-time data storage and retrieval and data transfer

System must act very quickly against real-time data

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	2.0	3.0	2.8

COMMENTS:

This function has similar interfaces (and ratings) to function (L-3.1) ADA system updates power system model and analyze distribution operations above.

L-3.5 ADA system reconfigures feeders to meet differing requirements

The Purpose of *ADA system reconfigures feeders to meet differing requirements* ***function***

is to Identify system conditions and reconfigure distribution system optimally for the given the system conditions

directly involving

DR Owner/Operator

DisCo Operator/Owner

performing

Using power system model information and real-time system data

Identify alternative feeder configurations to optimally serve current and forecasted load

with key interfaces between

DR owner/operator and DisCo

Internal DisCo Operations

with communication configuration requirements of

WAN for communication from DisCo to DR/

LAN communication within DisCo to coordinate system configuration

with quality of service requirements of
High availability and fast accessibility
with security requirements of
DA critical data requires very high
Breach of DA system can result in severe disruption
with data management requirements of
Real-time DA data will generally be stored in commercial data sources
with constraints of
Fast retrieval of system data to make appropriate decisions

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	2.0	3.0	2.8

COMMENTS:
This function has similar interfaces (and ratings) to function (L-3.1) ADA system updates power system model and analyze distribution operations above.

L-3.6 ADA system controls volt/var to meet criteria optimally

The Purpose of *ADA system controls volt/var to meet criteria optimally* ***function***
is to Identify system conditions and reconfigure distribution system optimally for the given the system conditions
directly involving
DR Owner/Operator
DisCo Operator/Owner
performing
Using power system model information and real-time system data
Identify alternative feeder configurations to optimally serve current and forecasted load
with key interfaces between
DR owner/operator and DisCo
Internal DisCo Operations
with communication configuration requirements of
WAN for communication from DisCo to DR/
LAN communication within DisCo to coordinate system configuration
with quality of service requirements of
High availability and fast accessibility
with security requirements of
DA critical data requires very high
Breach of DA system can result in severe disruption

with data management requirements of

Real-time DA data will generally be stored in commercial data sources

with constraints of

Fast retrieval of system data to make appropriate decisions

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	2.0	3.0	2.8

COMMENTS:

This function has similar interfaces (and ratings) to function (L-3.1) ADA system updates power system model and analyze distribution operations above.

L-3.7 ADA system analyzes planned outage requests

The Purpose of *ADA system analyzes planned outage requests* ***function is to*** Identify the planned outages on the distribution system and connected DR devices that are critical in serving loads

directly involving

DR Owner/Operator

DisCo Operator/Owner

performing

Outage requests analysis initiated by the DisCo and DR owner/operators

with key interfaces between

DR owner/operator and DisCo

Internal DisCo Operations

with communication configuration requirements of

WAN for communication from DisCo to DR/

LAN communication between DisCo Operations

with quality of service requirements of

Medium availability and medium

Data will be filtered by Disco into the DA system for analysis

with security requirements of

DA critical data requires very high

Breach of DA system can result in severe disruption

with data management requirements of

DA outage data will generally be stored in commercial data sources

with constraints of

Integration of legacy outage data into DA outage analysis software

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3***

(highly likely to involve architectural challenges) ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	3.0	1.0	1.0	1.4

COMMENTS:
The following comments were collected during the team rating review:

Security = 3 to maintain data integrity from competetors

L-3.8 ADA system creates and performs switching orders

The Purpose of *ADA system creates and performs switching orders*
function
is to Analyze system conditions and identify optimal switching sequences
directly involving
DR Owner/Operator
DisCo Operator/Owner
performing
Using power system model information and real-time system data
Identify optimal switching orders
with key interfaces between
DR owner/operator and DisCo
Internal DisCo Operations
with communication configuration requirements of
WAN for communication from DisCo to DR/
LAN communication within DisCo
with quality of service requirements of
High availability and fast accessibility
with security requirements of
DA critical data requires very high
Breach of DA system can result in severe disruption
with data management requirements of
Real-time DA data will generally be stored in commercial data sources
with constraints of
Fast retrieval and analysis of system data to make appropriate decisions

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	2.0	3.0	2.8

COMMENTS:
This function has similar interfaces (and ratings) to function (L-3.1) ADA system updates power system model and analyze distribution operations above.

L-3.9 ADA system creates islands intentionally

The Purpose of *ADA system creates islands intentionally* ***function is to*** Analyze system conditions and identify optimal switching sequences to island the DR device

directly involving
DR Owner/Operator
DisCo Operator/Owner

performing
Using power system model information and real-time system data
Identify optimal switching orders

with key interfaces between
DR owner/operator and DisCo
Internal DisCo Operations

with communication configuration requirements of
WAN for communication from DisCo to DR/
LAN communication within DisCo

with quality of service requirements of
High availability and fast accessibility

with security requirements of
DA critical data requires very high
Breach of DA system can result in severe disruption

with data management requirements of
Real-time DA data will generally be stored in commercial data sources

with constraints of
Fast retrieval and analysis of system data to make appropriate decisions

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	2.0	3.0	2.8

COMMENTS:
This function has similar interfaces (and ratings) to function (L-3.1) ADA system updates power system model and analyze distribution operations above.

L-4 Post operations

The Purpose of *Post operations* ***function is described below...***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.5	1.0	2.8	2.0	1.0	1.6

COMMENTS:

L-4.1 Meter Data Management Agents (MDMAs) retrieve DR meter data

The Purpose of *Meter Data Management Agents (MDMAs) retrieve DR meter data* ***function***
is to

Manage meter readings and usage profile
Provide the means for sharing meter data
Maintain equipment

directly involving

DR owner/operator
DisCo
ESP
Customers

performing

Data management functions
Data verification

with key interfaces between

ESP and DR operator
ESP and recording equipment

with communication configuration requirements of

Automatic reading from remote sensors
"on-demand" readings from remote sensors over WAN

with quality of service requirements of

High availability
Fast accessibility
Frequent updates

with security requirements of

High security to prevent unauthorized access to data

with data management requirements of

Data base for fast data storage and retrieval

with constraints of

Communication equipment compatibility

Equipment obsolescence
Reliability under severe wheather conditions

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	1.0	3.0	2.0	1.0	2.0

COMMENTS:
The following comments were collected during the team rating review:

Configation = 3 due to large number of dispersed loactions
Security = 3 to maintain data integrity from competetors
Data Mgmt = 2 because data is from multiple sources and needs to be synchronized

---

L-4.2 Statistical data on operational conditions are collected and calculated

The Purpose of** Statistical data on operational conditions are collected and calculated **function
is to Infer statistically significant information such as end-user's load demand profile
directly involving
DR owner/operator
DisCo
ESP
Customers
performing
Statistical computations
Data analyses
Data collection
Data verification
with key interfaces between
ESP and DR operator
ESP and recording equipment
with communication configuration requirements of
Automatic reading from remote sensors
"on-demand" readings from remote sensors over WAN
with quality of service requirements of
High availability
Fast accessibility
Frequent updates
with security requirements of
High security to prevent unauthorized access to data

with data management requirements of

Data base for fast data storage and retrieval

with constraints of

Communication equipment compatibility
Equipment obsolescence
Reliability under severe wheather conditions

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	3.0	2.0	1.0	1.6

COMMENTS:
This function has similar interfaces (and ratings) to function (L-4.1) Meter Data Management Agents (MDMAs) retrieve DR meter data above.

The following comments were collected during the team rating review:

Configation = 3 due to large number of dispersed loactions
Security = 3 to maintain data integrity from competetors
Data Mgmt = 2 because data is from multiple sources and needs to be synchronized

---

L-4.3 Systems create reports

The Purpose of *Systems create reports* ***function is to*** Compile and generate reports

directly involving

ESP and DR owner/operator
ESP and DisCo
ESP and Energy Service Provider
ESP and end user

performing

Data search and retrieval Data compilation

with key interfaces between

ESP and DR owner/operator
ESP and DisCo
ESP and end user
ESP and GenCo

with communication configuration requirements of

Internet
Phone
Dedicated communication channels

with quality of service requirements of
High availability
Fast accessibility
Frequent updates
with security requirements of
High security to prevent unauthorized access to data
with data management requirements of
Data base for fast data retrieval
with constraints of
Communication equipment compatibility
Equipment obsolescence
Reliability under severe wheather conditions

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	3.0	2.0	1.0	1.6

COMMENTS:
This function has similar interfaces (and ratings) to function (L-4.1) Meter Data Management Agents (MDMAs) retrieve DR meter data above.

L-4.4 Environmental system collect environmental and pollution statistics
The Purpose of *Environmental system collect environmental and pollution statistics* ***function***
is to Collect data that might have an adverse impact on the enviroment
directly involving
DR operator
performing
Data collection
with key interfaces between
DR operator / RTO /DisCo
with communication configuration requirements of
DR operator and data recording equipment
with quality of service requirements of
High availability
Moderate access rate
with security requirements of
High security to prevent unauthorized access to data
with data management requirements of
Requires data base for storage and retrieval of data

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	2.0	1.0	1.4

COMMENTS:
The following comments were collected during the team rating review:

Configation = 3 due to large number of dispersed loactions
Security = 2 to maintain data integrity from competetors
Data Mgmt = 2 because data is from multiple sources and needs to be synchronized

---

L-5 DR equipment maintenance

The Purpose of** DR equipment maintenance **function is described below...

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	3.0	2.0	1.0	1.6

COMMENTS:

L-5.1 DR maintenance staff collect statistics on DR operations and all operating conditions

The Purpose of** DR maintenance staff collect statistics on DR operations and all operating conditions **function is to

Plan the performance and down times of the DR's
Identify times during a period to get optimal value of operating cost

directly involving

DR Owner/Operator
RTO/ ISO

performing

Optimization of operating cost and efficiency

with key interfaces between

DR owner/operator and DisCo

DisCo and RTO/ISO
DR owner/operator and RTO/ISO

with communication configuration requirements of

WAN for communication from DisCo to DR/Owner

with quality of service requirements of

High availability
Medium volume
Frequent updates

with security requirements of

DA critical data requires very high
Breach of DA system can result in severe disruption

with data management requirements of

Model maintenance will require update of many legacy and non-legacy data
Real-time DA data will generally be stored in commercial data sources

with constraints of

Real-time data storage and
Connection to legacy systems data and data structure incompatibility issues

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	3.0	2.0	1.0	1.6

COMMENTS:
The following comments were collected during the team rating review:

Security = 3 to maintain data integrity from competetors Data Mgmt = 2 because data is from multiple sources and needs to be synchronized

---

L-5.2 DR maintenance staff maintain DR equipment

The Purpose of *DR maintenance staff maintain DR equipment* ***function is to*** 1. Reduce the number of un-scheduled outages

directly involving

DR Owner/Operator

performing

Routine Maintenance

with key interfaces between

DR owner/operator and DisCo

with communication configuration requirements of

WAN for communication from DisCo to DR/Owner

with quality of service requirements of
Medium availability
Medium volume
with security requirements of
DA critical data requires very high
Breach of DA system can result in severe disruption
with data management requirements of
May require multiple data bases
May require the storage of large amounts of data
with constraints of
Data storage software obsolescence and resultant loss of data accessibility

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	3.0	2.0	1.0	1.6

COMMENTS:
This function has similar interfaces (and ratings) to function (L-5.1) DR maintenance staff collect statistics on DR operations and all operating conditions above.

L-5.3 DR maintenance staff test DR equipment

The Purpose of *DR maintenance staff test DR equipment* ***function is to***
Validate ratings, capacity
Interconnecting infrastructure to allow the DR's to participate in the market operations

directly involving
DR Owner/Operator
performing
Equipment testing
with key interfaces between
DR owner/operator and DisCo
with communication configuration requirements of
WAN for communication from DisCo to DR/Owner
with quality of service requirements of
Medium availability
Medium volume
with security requirements of
DA critical data requires very high

Breach of DA system can result in severe disruption

with data management requirements of

May require multiple data bases

May require the storage of large amounts of data

with constraints of

Data storage software obsolescence and resultant loss of data accessibility

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	3.0	2.0	1.0	1.6

COMMENTS:

This function has similar interfaces (and ratings) to function (L-5.1) DR maintenance staff collect statistics on DR operations and all operating conditions above.

L-5.4 RTO/ISO/DisCo SCADA system monitors DR

The Purpose of *RTO/ISO/DisCo SCADA system monitors DR* ***function is to***

Supervise DR generation

Control DR generation

Perform data transfers

Monitor power flow

directly involving

DR operator

DisCo

RTO

performing

Overall DR system supervision

Data acquisition

Data logging

Control functions

Alarm processing

with key interfaces between

DR system operator and DisCo

DR system operator and RTO

with communication configuration requirements of

Disco’s SCADA system to GenCos

RTO over WAN

with quality of service requirements of

High availability
Medium volume
Frequent updates

with security requirements of

High
To assure reliable DR/grid interconnection

with data management requirements of

Moderate – mainly associated with the monitoring of the DR/grid interconnection power flows and DR generation control

with constraints of

Synchronization issues if DR/grid interconnection opens to grid
Power flow reversal

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	3.0	2.0	1.0	1.6

COMMENTS:

This function has similar interfaces (and ratings) to function [(L-5.1) DR maintenance staff collect statistics on DR operations and all operating conditions] above.

L-6 Market operations

The Purpose of *Market operations* ***function is described below...***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	3.0	2.0	1.0	1.6

COMMENTS:

L-6.1 DR owners analyze operational conditions: e.g. load forecasts, weather conditions, energy prices, DR maintenance requirements, DR capabilities and capacity, etc

The Purpose of *DR owners analyze operational conditions: e.g. load forecasts, weather conditions, energy prices, DR maintenance*

requirements, DR capabilities and capacity, etc ***function is to***

To evaluate energy capture (wind systems) and availability
Maximize productivity and anticipate revenue potential from the resource

directly involving

Owners
Operators
SCADA
Digital control systems
Analog sensors
Actuators and other automatic and/or remote systems

performing

Monitoring of system performance and measurement and collection of real-time data

with key interfaces between

Operators and SCADA and/or energy management systems

with communication configuration requirements of

"one-to-many"
SCADA sytems
Field devices

with quality of service requirements of

Protected electronics
Well-maintained mechanical control systems
High availability
Rapid response
High data accuracy and throughput

with security requirements of

Information integrity

with data management requirements of

Database systems requiring timely access and frequent updates across organizational boundaries

with constraints of

Information security
Back-up power to control systems

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	3.0	2.0	1.0	1.6

COMMENTS:

The following comments were collected during the team rating review:

Security = 3 to maintain data integrity from competetors Data Mgmt = 2 because data is from multiple sources and needs to be synchronized

L-6.2 DR owners enter into bilateral energy contracts with other Market Participants

The Purpose of *DR owners enter into bilateral energy contracts with other Market Participants* ***function***

is to

Establish bilateral contracts ("long-term" or hourly) between generation and loads to negotiate the price of energy

To agree on congestion rents between points-of-deelivery and points-of-receipt and to schedule transmission services

directly involving

Market participants (generators
Ancillary service providers
Demand-side resources
Power exchanges
Energy traders
Load serving entities
Energy service companies
Municipalities
Cooperatives
Industrials
Commercials
Marketers
Transmission rights traders
Transmission owners
Public interest groups
Distribution companies
Regulators
Auditors)

performing

Financial contracts for energy between market participants

with key interfaces between

Market participants

with communication configuration requirements of

Internet
Telephone
Satellite
Radio
Fax
E-mail

And other interfaces

with quality of service requirements of

High availability
Rapid response
High data accuracy and throughput for negotiating energy contracts

with security requirements of

high security (encryption, virus protection, physical device protection)

with data management requirements of

Database systems requiring timely access and frequent updates across organizational boundaries

with constraints of

Information security

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	3.0	2.0	1.0	1.6

COMMENTS:

This function has similar interfaces (and ratings) to function (L-6.1) DR owners analyze operational conditions: e.g. load forecasts, weather conditions, energy prices, DR maintenance requirements, DR capabilities and capacity, etc above.

L-6.3 DR owners submit Day-Ahead energy schedules to RTO/ISO/DisCo

The Purpose of *DR owners submit Day-Ahead energy schedules to RTO/ISO/DisCo* ***function is to***

provide settlement data [
run time
down time, daily availability, start-up notification time, start-up cost curves
generation value ($/hr), incremental operating costs ($), operating limits, unit status (fixed, on-dispatch, on-control)] for determining LBMP for transmission pricing for the next day (24 hrs) so that market participants may lock in their day-ahead buy-sell prices and avoid real-time volatility

directly involving

Market participants (generators
Ancillary service providers
Demand-side resources

Power exchanges
Energy traders
Load serving entities
Energy service companies
Municipalities
Cooperatives
Industrials
Commercials
Marketers
Transmission rights traders
Transmission owners
Public interest groups
Distribution companies
Regulators
Auditors)

performing

Accessing market information system(s) and supplying data

with key interfaces between

System operator and market participants

with communication configuration requirements of

Web-based market information system(s)
"Open Access Same-time Information System (OASIS"

with quality of service requirements of

High availability
Rapid response
High data accuracy and throughput

with security requirements of

high security (encryption, virus protection, physical device protection)

with data management requirements of

Database systems requiring timely access and frequent updates across organizational boundaries

with constraints of

Information security

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	3.0	2.0	1.0	1.6

COMMENTS:

This function has similar interfaces (and ratings) to function [(L-6.1) DR owners analyze operational conditions: e.g. load forecasts, weather]

***conditions, energy prices, DR maintenance requirements, DR capabilities and capacity, etc* above.**

L-6.4 DR owners submit Day-Ahead bids for ancillary services: reserve, regulation, frequency response, etc

The Purpose of *DR owners submit Day-Ahead bids for ancillary services: reserve, regulation, frequency response, etc* ***function is to***

Provide voltage support
System regulation (balance)
Reliable operation and to lock in day-ahead buy-sell prices and avoid real-time volatility

directly involving

Generation owners
Transmission owners and system operator (and control centers)

performing

Accessing market information system(s) and supplying data

with key interfaces between

System operator and market participants

with communication configuration requirements of

Web-based market information system(s)
"Open Access Same-time Information System (OASIS"

with quality of service requirements of

High availability
Rapid response
High data accuracy and throughput

with security requirements of

high security (encryption, virus protection, physical device protection
)

with data management requirements of

Database systems requiring timely access and frequent updates across organizational boundaries

with constraints of

Information security

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	3.0	2.0	1.0	1.6

COMMENTS:

This function has similar interfaces (and ratings) to function (L-6.1) DR owners analyze operational conditions: e.g. load forecasts, weather conditions, energy prices, DR maintenance requirements, DR capabilities and capacity, etc above.

L-6.5 DR owners submit adjustments to real-time energy schedules

The Purpose of *DR owners submit adjustments to real-time energy schedules* ***function***
is to account for "current-day" changes and enable real-time security constrained dispatch based on bid energy costs and improved tracking of system security
directly involving
Generation owners
Transmission owners and system operator (and control centers)
performing
Accessing market information system(s) and supplying data
with key interfaces between
System operator and market participants
with communication configuration requirements of
Web-based market information system(s)
"Open Access Same-time Information System (OASIS"
with quality of service requirements of
High availability
Rapid response
High data accuracy and throughput
with security requirements of
high security (encryption, virus protection, physical device protection
)
with data management requirements of
Database systems requiring timely access and frequent updates across organizational boundaries
with constraints of
Information security

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	3.0	2.0	1.0	1.6

COMMENTS:
This function has similar interfaces (and ratings) to function (L-6.1) DR owners analyze operational conditions: e.g. load forecasts, weather

***conditions, energy prices, DR maintenance requirements, DR capabilities and capacity, etc* above.**

L-6.6 DR owners submit real-time bids for ancillary services

The Purpose of *DR owners submit real-time bids for ancillary services*
function
is to

Provide voltage support
System regulation (balance)
Reliable operation

directly involving

Generation owners
Transmission owners and system operator (and control centers)

performing

Accessing market information system(s) and supplying data

with key interfaces between

System operator and market participants

with communication configuration requirements of

Web-based market information system(s)
"Open Access Same-time Information System (OASIS"

with quality of service requirements of

High availability
Rapid response
High data accuracy and throughput

with security requirements of

high security (encryption, virus protection, physical device protection
)

with data management requirements of

Database systems requiring timely access and frequent updates across organizational boundaries

with constraints of

Information security

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	3.0	2.0	1.0	1.6

COMMENTS:
This function has similar interfaces (and ratings) to function (L-6.1) DR owners analyze operational conditions: e.g. load forecasts, weather

***conditions, energy prices, DR maintenance requirements, DR capabilities and capacity, etc* above.**

L-7 Wind-related issues/functions/applications

The Purpose of** Wind-related issues/functions/applications **function is described below...

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	3.0	2.0	1.0	1.6

COMMENTS:

L-7.1 Day Ahead Wind Prediction from Metorlogical Sources

The Purpose of** Day Ahead Wind Prediction from Metorlogical Sources **function
is to Plan wind turbine-genertor output for the Day Ahead Market
directly involving
DR operator
DisCo
RTO
Metorlogical Sevices
performing
System planning/operation to maximize asset utilization
with key interfaces between
DR system operator and DisCo
DR system operator and RTO
DR system operator and Metorlogical Services
with communication configuration requirements of
Disco's SCADA system to GenCos
RTO over WAN
Metorlogical Services over WWW or satelite communications
with quality of service requirements of
High availability
Medium volume
Frequent updates
with security requirements of
High
To assure confidential DR/grid interconnection
Low to Metorlogical service
with data management requirements of

Database systems requiring timely access and frequent updates across organizational boundaries

with constraints of

Information security

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	3.0	2.0	1.0	1.6

COMMENTS:

The following comments were collected during the team rating review:

Security = 3 to maintain data integrity from competetors Data Mgmt = 2 because data is from multiple sources and needs to be synchronized

---

L-7.2 Real Time Wind Prediction from Metorlogical Sources

The Purpose of *Real Time Wind Prediction from Metorlogical Sources* ***function***

is to Plan wind turbine-genertor output for the Hourly Market

directly involving

DR operator

DisCo

RTO

Metorlogical Sevices

performing

System planning/operation to maximize asset utilization

with key interfaces between

DR system operator and DisCo

DR system operator and RTO

DR system operator and Metorlogical Services

with communication configuration requirements of

Disco's SCADA system to GenCos

RTO over WAN

Metorlogical Services over WWW or satelite communications

with quality of service requirements of

High availability

Medium volume

Frequent updates

with security requirements of

High

To assure confidential DR/grid interconnection

Low to Metorlogical service

with data management requirements of

Database systems requiring timely access and frequent updates across organizational boundaries

with constraints of

Information security

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	3.0	2.0	1.0	1.6

COMMENTS:

This function has similar interfaces (and ratings) to function (L-7.1) Day Ahead Wind Prediction from Metorlogical Sources above.

L-8 Dispersed Storage (functions unique to this form of DR)

The Purpose of *Dispersed Storage (functions unique to this form of DR)* ***function is described below...***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.3	2.1	2.9	1.7	2.0	2.2

COMMENTS:

The following comments were collected during the team rating review:

Existing processes

L-8.1 DR owners store energy from the power system

The Purpose of *DR owners store energy from the power system* ***function is to*** store energy when it is at its lowest cost and when it has least possibility to be detrimental to the power system

directly involving

DR owners or aggregators and RTO/ISO/DisCo

performing

Capture (purchase) of sufficient energy to meet projected demand at an appropriate time and economical cost

with key interfaces between

DR owners or aggregators and RTO/ISO/DisCo

with communication configuration requirements of

High availability

Medium speed in most cases although some may require high speed

with quality of service requirements of

High reliability

Medium speed

with security requirements of

Medium

with data management requirements of

Conventional demand interval metering databases with real-time monitoring of available energy and projected schedules

with constraints of

ability to draw power without impacting system

Automatic monitoring of electricity prices in unattended installations (likely the norm)

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	3.0	1.0	0.0	1.2

COMMENTS:

The following comments were collected during the team rating review:

Security = 3 to maintain data integrity from competetors

L-8.2 DR owners discharge stored energy into the system

The Purpose of *DR owners discharge stored energy into the system* ***function***

is to sell energy at a favorable price when capacity is needed and to provide T&D grid support

directly involving

DR owners or aggregators and RTO/ISO/DisCo

performing

Managing real-time bids for energy and ancillary services while meeting agreements regarding delivery of power to meet dispatched demand and grid support requirements during emergency conditions

with key interfaces between

DR owners or aggregators and RTO/ISO/DisCo

with communication configuration requirements of

High availability

Medium speed in most cases although some may require high speed if required to respond to sudden loss of capacity (some technologies can respond within seconds)

with quality of service requirements of

High reliability

Medium speed

with security requirements of

Medium

with data management requirements of

Conventional demand interval metering databases with real-time monitoring of available energy remaining

with constraints of

Limited storage resource

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	3.0	1.0	0.0	1.2

COMMENTS:

This function has similar interfaces (and ratings) to function [(L-8.1) DR owners store energy from the power system] above.

L-8.3 RTO/ISO/DisCo dispatches storage to meet power demand

The Purpose of *RTO/ISO/DisCo dispatches storage to meet power demand* ***function***

is to reclaim stored energy to meet local or regional power demand with competitively-priced energy and to support the distribution or transmission system

directly involving

DR owners or aggregators and RTO/ISO/DisCo

performing

Determination of the need for additional power to meet demand and monitoring ability of storage to make up projected deficits

with key interfaces between

DR owners or aggregators and RTO/ISO/DisCo

with communication configuration requirements of

High availability

Medium speed to DisCo control center

with quality of service requirements of

High reliability
Medium speed

with security requirements of

Medium

with data management requirements of

Conventional demand interval metering databases with real-time monitoring of available energy and energy remaining

with constraints of

Limited storage resource

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	3.0	1.0	0.0	1.2

COMMENTS:

This function has similar interfaces (and ratings) to function [(L-8.1) DR owners store energy from the power system] above.

L-8.4 RTO/ISO/DisCo dispatches storage to support intentional islanding

The Purpose of *RTO/ISO/DisCo dispatches storage to support intentional islanding* ***function***

is to utilize stored energy in combination with other DR to supply power to a group of end users separated from bulk power supply (either intentionally as in the case of microgrids or unintentionally due to equipment outage)

directly involving

DR owners or aggregators and RTO/ISO/DisCo
DisCo operations

performing

Control of restoration of the system to exploit the capability of storage to temporarily supply an isolated part of the system

with key interfaces between

- DR owners or aggregators and RTO/ISO/DisCo
- DR owners and DisCo operations

with communication configuration requirements of

High availability
Medium speed to DisCo control center with connections to other DR for real-time control functions

with quality of service requirements of

High reliability
Medium speed

with security requirements of

Medium

with data management requirements of

Conventional demand interval metering databases with real-time monitoring of available energy and energy remaining

with constraints of

Limited storage resource and ability to support an island, which may require, that some other form of DR also be operating

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	3.0	1.0	1.0	1.6

COMMENTS:

The following comments were collected during the team rating review:

Configuration = 2 because fairly new operational concept with limited capabilities must coordinate with other DR during islanding

Security = 3 to maintain data integrity from competetors

L-8.5 DR owners provide fast voltage sag correction

The Purpose of *DR owners provide fast voltage sag correction* ***function is to*** utilize the stored energy to support the system voltage during short to medium duration disturbances to enable critical customers to continue operations

directly involving

DR owners

DisCo

Customers

performing

Ancillary support and energy supply functions

with key interfaces between

DR owner and DisCo

with communication configuration requirements of

Telecom or internet connection to transfer power quality monitor data post-event

with quality of service requirements of

Medium availablity and speed (not critical to operation

But desirable in a prompt fashion)

with security requirements of

Medium, although many DisCos will want to treat their power quality data as highly

Performance base rate information may eventually become public

with data management requirements of

a power quality database capable of storing various types of data and more conventional energy metering

Updating is infrequent, but can be voluminous after an event, depending on contractural arrangement of performance-based rates

with constraints of

Many different types of power quality monitors with diverse data representations and transfer capabilities

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	3.0	1.0	0.0	1.2

COMMENTS:

This function has similar interfaces (and ratings) to function (L-8.1) DR owners store energy from the power system above.

L-9 Non-grid connected generation (monitoring for safety)

The Purpose of *Non-grid connected generation (monitoring for safety)* ***function is described below...***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	1.0	2.0	2.0	1.6

COMMENTS:

The following comments were collected during the team rating review:

Configuration = 2 because data is retrieved from many diverse sites probably with diverse media and

Database Mgmt & Constraints = 2 because systems will be widely dispersed and possible numerous

---

L-9.1 DR owners collect DR operational information

The Purpose of *DR owners collect DR operational information* ***function is to***

Follow normal daily load changes
Analyze load requirements
Forecast load requirements
Provide means for supplying replacement power following loss of generation
Optimize system operation

directly involving

DR Operator/Owner
DisCo Operator/Owner

performing

System operation to maximize asset utilization
Routine maintenance activities
Control functions for meeting load demand
Monitoring operation of DR device

with key interfaces between

DR Owner/Operator and DisCo

with communication configuration requirements of

WAN communications with DisCo
LAN communication internal to DR owner/operator

with quality of service requirements of

High availability
Medium volume
Frequent updates

with security requirements of

High to allow for continuous operation of local system

with data management requirements of

Moderate – mainly associated with the operation of the local system and associated data recording and transferring functions

with constraints of

Synchronization issues if local system is to be connected to grid

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	1.0	2.0	2.0	1.6

COMMENTS:
This function has similar interfaces (and ratings) to function [(L-9) Non-grid connected generation (monitoring for safety)] above.

L-10 DSM (Demand Side Management)

The Purpose of** DSM (Demand Side Management) **function is to

Optimize asset utilization by pricing Industrial loads higher than normal during peak hours inorder to compensate for more expensive generation utilised at those times

Regulating consumer and industrial loads in greater constrined regions to be able to transfer power more efficiently

directly involving

DR operator

DisCo

RTO

Special Customers

performing

Optimization of operating cost and efficiency

with key interfaces between

DR owner/operator and DisCo

with communication configuration requirements of

WAN for communication from DisCo to DR/Owner

with quality of service requirements of

High availability

Medium volume

Frequent updates

with security requirements of

DA critical data requires very high

Breach of DA system can result in severe disruption

with data management requirements of

Model maintenance will require update of many legacy and non-legacy data

Real-time DA data will generally be stored in commercial data sources

with constraints of

Real-time data storage and

Connection to legacy systems data and data structure incompatibility issues

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	3.0	2.0	2.0	2.0

COMMENTS:

The following comments were collected during the team rating review:

Configuration = 2 because data is retrieved from many diverse sites probably with diverse media and

Security = 3 to maintain data integrity from competetors

Database Mgmt & Constraints = 2 because systems will be widely dispersed and possible numerous

---

L-10.1 DR owner initiated

The Purpose of *DR owner initiated* ***function is to***

Optimize asset utilization by pricing Industrial loads higher than normal during peak hours inorder to compensate for more expensive generation utilised at those times

Regulating consumer and industrial loads in greater constrined regions to be able to transfer power more efficiently

directly involving

DR operator

DisCo

RTO

Special Customers

performing

Optimization of operating cost and

DR owner may choose to purchase versus produce power based upon cost analysis

with key interfaces between

DR owner/operator and DisCo

with communication configuration requirements of

WAN for communication from DisCo to DR/Owner

with quality of service requirements of

High availability

Medium volume

Frequent updates

with security requirements of

DA critical data requires very high

Breach of DA system can result in severe disruption

with data management requirements of

Model maintenance will require update of many legacy and non-legacy data

Real-time DA data will generally be stored in commercial data sources

with constraints of

Real-time data storage and

Connection to legacy systems data and data structure incompatibility issues

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3***

(highly likely to involve architectural challenges) ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	3.0	2.0	2.0	2.0

COMMENTS:
This function has similar interfaces (and ratings) to function [(L-10) DSM (Demand Side Management)] above.

L-10.2 Utility initiated

The Purpose of *Utility initiated* ***function is to***

Optimize asset utilization by pricing Industrial loads higher than normal during peak hours inorder to compensate for more expensive generation utilised at those times

Regulating consumer and industrial loads in greater constrined regions to be able to transfer power more efficiently

directly involving

DR operator

DisCo

RTO

Special Customers

performing

Optimization of operating cost and

Utility initiates DSM based upon real time conditions to support load and/or ancillary services

with key interfaces between

DR owner/operator and DisCo

with communication configuration requirements of

WAN for communication from DisCo to DR/Owner

with quality of service requirements of

High availability

Medium volume

Frequent updates

with security requirements of

DA critical data requires very high

Breach of DA system can result in severe disruption

with data management requirements of

Model maintenance will require update of many legacy and non-legacy data

Real-time DA data will generally be stored in commercial data sources

with constraints of

Real-time data storage and

Connection to legacy systems data and data structure incompatibility issues

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	3.0	2.0	2.0	2.0

COMMENTS:
This function has similar interfaces (and ratings) to function [(L-10) DSM (Demand Side Management)] above.

L-11 Residential generation devices

The Purpose of** Residential generation devices **function
***is to** Provide electrical power to residence while remaining in parallel with ESP*
directly involving
Residential DR owner/operator
ESP
performing
System operation to maximize asset utilization
Routine maintenance activities
Control functions for meeting load demand
Monitoring operation of DR device
with key interfaces between
DR owner/operator and ESP
with communication configuration requirements of
WAN for communication from ESP to DR/Owner
with quality of service requirements of
High availability, medium volume, frequent
On/off control by ESP
with security requirements of
DA critical data requires very high
Breach of DA system can result in severe disruption
with data management requirements of
Moderate – mainly associated with the operation of the local system and associated data recording and transferring functions
with constraints of
Real-time data storage and
Connection to legacy systems data and data structure incompatibility issues

On a scale of 0** (does not involve significant architectural challenges) **to 3

(highly likely to involve architectural challenges) ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	1.0	3.0	2.0	2.0	2.2

COMMENTS:
The following comments were collected during the team rating review:

Configuration = 3 because new process data is retrieved from many diverse sites probably with diverse media and
Security = 3 to ensure correct operation (incorrect operation could leave residence without power)
Database Mgmt & Constraints = 2 because systems will be widely dispersed and possible numerous

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D - Distribution Operations Domain

- D-1 Long term distribution planning (1 year to 5 years)
  - D-1.1 Distribution planners forecast loads for the long term by area
  - D-1.2 Distribution planners plan distribution upgrades and additions in accordance with the long-term transmission plan (using planning simulation and optimization software)
    - D-1.2.1 New T/D substations
    - D-1.2.2 New distribution circuits/conductors
    - D-1.2.3 New distribution transformers
    - D-1.2.4 New distributed generation, including distributed resources impact studies
      - D-1.2.4.1 DisCo plans utility-owned DR to meet reliability and power quality targets
      - D-1.2.4.2 DisCo acquires DR base information (to provide ratings and device models)
      - D-1.2.4.3 DisCo analyzes DR interconnection to the power system
    - D-1.2.5 New circuit boundaries
    - D-1.2.6 New switch allocation
    - D-1.2.7 New capacitor allocation
  - D-1.3 Distribution planners plan distribution automation
    - D-1.3.1 SCADA
    - D-1.3.2 DA functions
      - D-1.3.2.1 Fault Location
      - D-1.3.2.2 Fault isolation and service restoration
      - D-1.3.2.3 Outage statistics calculations
      - D-1.3.2.4 Volt/Var control
      - D-1.3.2.5 Planned outage management
      - D-1.3.2.6 Feeder reconfiguration
      - D-1.3.2.7 Cold load pickup
      - D-1.3.2.8 Dynamic limit calculations
      - D-1.3.2.9 Feeder paralleling
      - D-1.3.2.10 Integration with EMS/MOS
      - D-1.3.2.11 Equipment monitoring and diagnostics
      - D-1.3.2.12 Other
  - D-1.4 Distribution planners prepare long-term contracts with transmission companies covering mutual obligations for the T&D interfaces, operation coordination, and information exchange
  - D-1.5 Distribution planners prepare long-term contracts with generators connected to distribution
  - D-1.6 Distribution planners prepare long-term contract with customers regarding service reliability and power quality
  - D-1.7 Distribution planners generate requirements for information support of distribution domain activities

D-12 Dispatcher Training Simulator
D-13 Distribution Asset Management

D-1 Long term distribution planning (1 year to 5 years)

The Purpose of *Long term distribution planning (1 year to 5 years)* ***function***
is to

Develop strategic development alternatives for the distribution utility coordinated with the expansion alternatives of regional transmission systems and realistically possible market environment
Providing reliable service with self-healing distribution system
Standard power quality and competitive rates

directly involving

RTO/ISO
Local government entities
Major businesses
Relevant research institutions and other relevant parties
RTO expansion alternatives
Utility historic data
Local government development plans
Major business development plans
Energy conservation prospective
Distributed resources prospective

performing

Feasibility studies based on predictive simulation and optimization applications

with key interfaces between

DisCOs and TransCOs
DisCOs and RTO/ISO
Engineering and AM/FM/GIS/CIS databases within DisCo
DisCOs and DER owners
DisCOs and major customers
Utility departments within DisCOs
DisCos and local government
DisCos and area developers
DisCo and relevant research institutions and other relevant parties

with communication configuration requirements of

WAN
LAN
Internet

with quality of service requirements of

For DisCOs and TransCOs and DisCOs and RTO/ISO - high-volume databases including landbases and transmission system topology
Mapping
And operational parameters

For Engineering and AM/FM/GIS databases within DisCo - high volume AM/FM/GIS databases with detailed geographic maps displaying existing and future buildings

with security requirements of

High security due to sensitive information about area development and power supply plans

with data management requirements of

Geographic maps

Distribution and transmission AM/FM/GIS databases

Transmission expansion alternative databases (models)

with constraints of

Existence and comprehensiveness of applications for development of optimal expansion plans under conditions of uncertainty in the open market environment

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	2.0	3.0	2.0	2.0

COMMENTS:

The following comments were collected during the team rating review:

Quality of Service = 2 due to data accuracy and synchronization

Significant volume of exchange data between DisCO and multiple external parties

Security =2 due to sensitive information about area development and power supply plans

Data Management =3 due to high volume data exchange

Different data interfaces

And diverse databases

Constraints = 2 due to uncertainty of information and immature applications

---

D-1.1 Distribution planners forecast loads for the long term by area

The Purpose of *Distribution planners forecast loads for the long term by area* ***function***

is to

Determine the demand and consumption of electricity by areas with a given resolution

Defining reasonable ranges of demand and consumption trends and distributed resources contribution

directly involving

Utility historic data
Local government development plans
Major business development plans
Energy conservation prospective
Distributed resources prospective

performing

Alternative simulation studies

with key interfaces between

DisCOs and DER owners
Engineering and CIS databases
DisCos and area developers
DisCOs and major customers
DisCos and local government
DisCo and relevant research institutions and other relevant parties

with communication configuration requirements of

WAN
LAN
Internet

with quality of service requirements of

High data volume
Including detailed area maps with buildings
Communications and utility facilities

with security requirements of

High security due to sensitive information about area development and power supply plans

with data management requirements of

Geographic maps
Distribution and transmission AM/FM/GIS databases
Transmission expansion alternative databases (models)

with constraints of

New consumption patterns due to market impacts

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	3.0	2.0	1.8

COMMENTS:
The following comments were collected during the team rating review:

Security =2 due to sensitive information about area development and power supply plans

Data Management =3 due to high volume data exchange
Different data interfaces
And diverse databases
Constraints = 2 due to uncertainty of information and immature applications

---

D-1.2 Distribution planners plan distribution upgrades and additions in accordance with the long-term transmission plan (using planning simulation and optimization software)

The Purpose of *Distribution planners plan distribution upgrades and additions in accordance with the long-term transmission plan (using planning simulation and optimization software)* ***function is to***

Plan new T/D substations
Distribution circuits
Transformers
Distributed generation
New feeder boundaries
Var compensation means
Sectionalizing switches
Etc

directly involving

Transmission owners
RTO/ISO
DR owners
Major customers
Local government

performing

Simulation and optimization studies

with key interfaces between

DisCOs and TransCOs
DisCOs and RTO/ISO
DisCos and area developers
DisCos and local government
Engineering and AM/FM/GIS databases within DisCo
Utility departments within DisCOs
DisCo and DER

with communication configuration requirements of

WAN
LAN
Internet

with quality of service requirements of

High data volume
Including detailed area maps with buildings

Communications and utility facilities

with security requirements of

Limited disclosure

with data management requirements of

Geographic maps

Distribution and transmission AM/FM/GIS databases

Transmission expansion alternative databases (models)

with constraints of

Existence and comprehensiveness of applications for development of optimal expansion plans under conditions of uncertainty in the open market environment

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	2.0	3.0	2.0	2.0

COMMENTS:

The following comments were collected during the team rating review:

Quality of Service = 2 due to data accuracy and synchronization

Security =2 due to sensitive information about area development and power supply plans

Data Management =3 due to high volume data exchange

Different data interfaces

And diverse databases

Constraints = 2 due to uncertainty of information and immature applications

---

D-1.2.1 New T/D substations

The Purpose of *New T/D substations* ***function is similar to function*** ***(D-1.2) Distribution planners plan distribution upgrades and additions in accordance with the long-term transmission plan (using planning simulation and optimization software) above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	2.0	3.0	2.0	2.0

COMMENTS:

D-1.2.2 New distribution circuits/conductors

The Purpose of *New distribution circuits/conductors* ***function is similar to function*** ***(D-1.2) Distribution planners plan distribution upgrades and additions in accordance with the long-term transmission plan (using planning simulation and optimization software) above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	2.0	3.0	2.0	2.0

COMMENTS:

D-1.2.3 New distribution transformers

The Purpose of *New distribution transformers* ***function is similar to function*** ***(D-1.2) Distribution planners plan distribution upgrades and additions in accordance with the long-term transmission plan (using planning simulation and optimization software) above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	2.0	3.0	2.0	2.0

COMMENTS:

D-1.2.4 New distributed generation, including distributed resources impact studies

The Purpose of *New distributed generation, including distributed resources impact studies* ***function is similar to function*** ***(D-1.2) Distribution planners plan distribution upgrades and additions in accordance with the long-term transmission plan (using planning simulation and optimization software) above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	2.0	3.0	2.0	2.0

COMMENTS:

D-1.2.4.1 DisCo plans utility-owned DR to meet reliability and power quality targets

The Purpose of** DisCo plans utility-owned DR to meet reliability and power quality targets **function
is similar to function** [(D-1.2.4) New distributed generation, including distributed resources impact studies] **above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	2.0	3.0	2.0	2.0

COMMENTS:

D-1.2.4.2 DisCo acquires DR base information (to provide ratings and device models)

The Purpose of** DisCo acquires DR base information (to provide ratings and device models) **function
is similar to function** [(D-1.2.4) New distributed generation, including distributed resources impact studies] **above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	2.0	3.0	2.0	2.0

COMMENTS:

D-1.2.4.3 DisCo analyzes DR interconnection to the power system

The Purpose of** DisCo analyzes DR interconnection to the power system **function
is similar to function** [(D-1.2.4) New distributed generation, including distributed resources impact studies] **above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	2.0	3.0	2.0	2.0

COMMENTS:

D-1.2.5 New circuit boundaries

The Purpose of** New circuit boundaries **function** **is similar to function** **(D-1.2) Distribution planners plan distribution upgrades and additions in accordance with the long-term transmission plan (using planning simulation and optimization software)** **above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	2.0	3.0	2.0	2.0

COMMENTS:

D-1.2.6 New switch allocation

The Purpose of** New switch allocation **function** **is similar to function** **(D-1.2) Distribution planners plan distribution upgrades and additions in accordance with the long-term transmission plan (using planning simulation and optimization software)** **above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	2.0	3.0	2.0	2.0

COMMENTS:

D-1.2.7 New capacitor allocation

The Purpose of** New capacitor allocation **function** **is similar to function** **(D-1.2) Distribution planners plan distribution upgrades and additions in accordance with the long-term transmission plan (using planning simulation and optimization software)** **above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	2.0	3.0	2.0	2.0

COMMENTS:

D-1.3 Distribution planners plan distribution automation

The Purpose of *Distribution planners plan distribution automation*
function
is to include distribution automation in the standard procedures of planning and procurement in conjunction with the long-term plans of distribution system development in order to benefit from distribution automation in the most efficient way
directly involving
- Planning
- Operation
- And IT departments of the utility
- Automation plans (requirements) of transmission owners and RTO/ISO

performing
- Simulation and optimization studies for the alternative expansion scenarios

with key interfaces between
- DisCOs and TransCOs
- DisCOs and RTO/ISO

with communication configuration requirements of
- WAN
- LAN
- Internet

with quality of service requirements of
- Low data volume

with security requirements of
- Limited disclosure

with data management requirements of
- Large distribution system model with layers of alternative expansions
- Storage

with constraints of
- Legacy of planning procedures and immaturity of relevant applications

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	1.0	1.0	3.0	2.0	1.4

COMMENTS:
The following comments were collected during the team rating review:

Data Management =3
Due to high volume data for existing and future models
Data storage

Constraints = 2 due to immature applications (no optimization and coordination)

D-1.3.1 SCADA

The Purpose of** SCADA **function
is similar to function [(D-1.3) Distribution planners plan distribution automation] above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	1.0	1.0	3.0	2.0	1.4

COMMENTS:

D-1.3.2 DA functions

The Purpose of** DA functions **function
is similar to function [(D-1.3) Distribution planners plan distribution automation] above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	1.0	1.0	3.0	2.0	1.4

COMMENTS:

D-1.3.2.1 Fault Location

The Purpose of** Fault Location **function
is similar to function [(D-1.3.2) DA functions] above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	1.0	1.0	3.0	2.0	1.4

COMMENTS:

D-1.3.2.2 Fault isolation and service restoration

The Purpose of** Fault isolation and service restoration **function is similar to function (D-1.3.2) DA functions above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	1.0	1.0	3.0	2.0	1.4

COMMENTS:

D-1.3.2.3 Outage statistics calculations

The Purpose of** Outage statistics calculations **function is similar to function (D-1.3.2) DA functions above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	1.0	1.0	3.0	2.0	1.4

COMMENTS:

D-1.3.2.4 Volt/Var control

The Purpose of** Volt/Var control **function is similar to function (D-1.3.2) DA functions above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	1.0	1.0	3.0	2.0	1.4

COMMENTS:

D-1.3.2.5 Planned outage management

The Purpose of** Planned outage management **function is similar to function (D-1.3.2) DA functions above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of	Security	Data	Constraints	Average

	Service		Management		
0.0	1.0	1.0	3.0	2.0	1.4

COMMENTS:

D-1.3.2.6 Feeder reconfiguration

The Purpose of *Feeder reconfiguration* ***function is similar to function*** ***(D-1.3.2) DA functions*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	1.0	1.0	3.0	2.0	1.4

COMMENTS:

D-1.3.2.7 Cold load pickup

The Purpose of *Cold load pickup* ***function is similar to function*** ***(D-1.3.2) DA functions*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	1.0	1.0	3.0	2.0	1.4

COMMENTS:

D-1.3.2.8 Dynamic limit calculations

The Purpose of *Dynamic limit calculations* ***function is similar to function*** ***(D-1.3.2) DA functions*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	1.0	1.0	3.0	2.0	1.4

COMMENTS:

D-1.3.2.9 Feeder paralleling

The Purpose of** Feeder paralleling **function
is similar to function (D-1.3.2) DA functions above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	1.0	1.0	3.0	2.0	1.4

COMMENTS:

D-1.3.2.10 Integration with EMS/MOS

The Purpose of** Integration with EMS/MOS **function
is similar to function (D-1.3.2) DA functions above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	1.0	1.0	3.0	2.0	1.4

COMMENTS:

D-1.3.2.11 Equipment monitoring and diagnostics

The Purpose of** Equipment monitoring and diagnostics **function
is similar to function (D-1.3.2) DA functions above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	1.0	1.0	3.0	2.0	1.4

COMMENTS:

D-1.3.2.12 Other

The Purpose of** Other **function
is similar to function (D-1.3.2) DA functions above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of	Security	Data	Constraints	Average

	Service		Management		
0.0	1.0	1.0	3.0	2.0	1.4

COMMENTS:

D-1.4 Distribution planners prepare long-term contracts with transmission companies covering mutual obligations for the T&D interfaces, operation coordination, and information exchange

The Purpose of *Distribution planners prepare long-term contracts with transmission companies covering mutual obligations for the T&D interfaces, operation coordination, and information exchange* ***function is to*** include in the planning process the possible alternative conditions of the T&D interfaces and select the most efficient combination of distribution facility upgrades and contractual obligations between D&T

directly involving

DIsCo and TransCo

performing

Simulation and optimization studies

with key interfaces between

DisCOs and TransCo

with communication configuration requirements of

WAN

LAN

with quality of service requirements of

Low volume and speed of data exchange

with security requirements of

Limited disclosure

with data management requirements of

Large distribution system model with layers of alternative expansions

with constraints of

Legacy of planning procedures and immaturity of relevant applications

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	1.0	1.0	3.0	2.0	1.4

COMMENTS:

The following comments were collected during the team rating review:

Data Management =3

Due to high volume data for existing and future models

Constraints = 2 due to immature applications (no optimization and coordination)

D-1.5 Distribution planners prepare long-term contracts with generators connected to distribution

The Purpose of *Distribution planners prepare long-term contracts with generators connected to distribution* ***function***
is to include in the planning process the possible alternative conditions of the D&DR interfaces and select the most efficient combination of distribution facility upgrades and contractual obligations between D&DR
directly involving
DIsCo and DR
performing
Simulation
Impact
And optimization studies
with key interfaces between
DisCOs and DER owners
with communication configuration requirements of
WAN
LAN
Internet
with quality of service requirements of
Low volume and low speed of data exchange
with security requirements of
Limited disclosure
with data management requirements of
Large distribution system model with layers of alternative expansions
with constraints of
Legacy of planning procedures and immaturity of relevant applications

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	1.0	1.0	3.0	2.0	1.4

COMMENTS:
The following comments were collected during the team rating review:

Data Management =3
Due to high volume data for existing and future models
Constraints = 2 due to immature applications (no optimization and coordination)

D-1.6 Distribution planners prepare long-term contract with customers regarding service reliability and power quality

The Purpose of *Distribution planners prepare long-term contract with customers regarding service reliability and power quality* ***function is to***

Include in the planning process the possible alternative conditions of the DisCO&Customer interfaces and relationships and select the most efficient combination of distribution facility upgrades and contractual obligations between DisCO and major customers regarding load management
Reliability
Power quality
Var compensation
Etc

directly involving

DIsCo and major customers

performing

Simulation
Impact
And optimization studies

with key interfaces between

DisCOs and major customers

with communication configuration requirements of

WAN
LAN
Internet

with quality of service requirements of

Low volume and low speed of data exchange

with security requirements of

Limited disclosure

with data management requirements of

Large distribution system model with layers of alternative expansions

with constraints of

Legacy of planning procedures and immaturity of relevant applications

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	3.0	2.0	1.6

COMMENTS:

The following comments were collected during the team rating review:

Data Management =3
Due to high volume data for existing and future models
Constraints = 2 due to immature applications (no optimization and coordination)

D-1.7 Distribution planners generate requirements for information support of distribution domain activities

The Purpose of *Distribution planners generate requirements for information support of distribution domain activities* ***function***
is to prepare the system models of the future for the information support of the planned distribution operation processes
directly involving
Planning
Operation
And IT departments of the utility
Distribution expansion and automation plans
performing
Information model specifications
with key interfaces between
DisCOs and utility departments
with communication configuration requirements of
LAN
with quality of service requirements of
Low value and low speed of external information flows
with security requirements of
Limited disclosure
with data management requirements of
Low level
with constraints of
Legacy of planning procedures

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	0.0	1.0	0.8

COMMENTS:

D-1.8 Distribution planners update the future layers of relevant databases

The Purpose of *Distribution planners update the future layers of relevant databases* ***function***
is to populate the future distribution model based on planning decisions
directly involving

Planning
Operation
And IT departments of the utility
Distribution expansion and automation plans

performing

Update of AM/FM/GIS and Asset Management databases
Data consistency checking
Error corrections

with key interfaces between

Utility departments within DisCOs
Engineering and AM/FM/GIS/CIS databases

with communication configuration requirements of

LAN

with quality of service requirements of

Low value and low speed of external information flows

with security requirements of

Limited disclosure

with data management requirements of

Average volume of incremental data

with constraints of

Legacy of database support

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	1.0	1.0	1.0

COMMENTS:

D-2 Short-term distribution planning (1 week to 1 year)

The Purpose of *Short-term distribution planning (1 week to 1 year)* ***function is to***

Update circuit boundaries
Switch placement
Capacitor placement
No-load tap positions
Phase load allocation
Controller and DA application settings
Contracts with other parties
Conduct DER impact studies
Issue permits for constructions
Prepare maintenance plans
And update databases

Providing reliable service with self-healing distribution system
Standard power quality and competitive rates

directly involving
Short-term load forecasts
Builder requests
Work
Maintenance requests
performing
Simulation and optimization studies
with key interfaces between
Engineering and AM/FM/GIS and CIS databases within DisCo
DisCOs and DER owners
DisCos and customer representatives (serving entities)
DisCos and area developers
DisCOs and TransCOs
Within DisCo's departments
DisCOs and RTO/ISO
DisCos and customers
DisCos and contractors
with communication configuration requirements of
WAN
LAN
Internet
with quality of service requirements of
Low volume data exchange
With somehow flexible timeframes
with security requirements of
Information exchange is limited to relevant parties due to sensitive information about area development and power supply plans
with data management requirements of
Geographic maps
Distribution and transmission AM/FM/GIS and CIS databases for internal use by utility departments
with constraints of
Existence and comprehensiveness of applications for development of optimal short-term plans under conditions of uncertainty in the open market environment

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	2.0	3.0	2.0	2.0

COMMENTS:
The following comments were collected during the team rating review:

Quality of service = 2 due to data accuracy and synchronization
Significant volume of exchange data between DisCO and multiple external parties
Security =2 due to sensitive information about area development and power supply plans
Data Management =3
Due to high volume data exchange
Archive data
Unique interfaces
And diverse database structures
Constraints = 2 due to uncertainty of information and immature applications

---

D-2.1 Short-term load forecast

The Purpose of *Short-term load forecast* ***function***
is to update the demand and consumption forecast based on the latest available information
directly involving
Utility historic data
New development schedules
Major business predictions
Energy conservation actions
Distributed resources schedules
performing
Load forecast for existing nodal loads
Forecast of allocation and amount of new loads
Forecast/scheduling of distributed resources
with key interfaces between
Engineering and AM/FM/GIS and CIS databases within DisCo
DisCOs and DER owners
DisCos and major customers
DisCos and customer representatives (serving entities)
DisCos and area developers
with communication configuration requirements of
WAN
LAN
Internet
with quality of service requirements of
Low volume of external data exchange
With somehow flexible timeframes
with security requirements of

Information exchange is limited to relevant parties due to sensitive information about area development and power supply plans

with data management requirements of

Geographic maps

Distribution and transmission AM/FM/GIS and CIS databases for internal use by utility departments

with constraints of

Existence and comprehensiveness of applications for development of optimal short-term plans under conditions of uncertainty in the open market environment

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	3.0	2.0	1.8

COMMENTS:

The following comments were collected during the team rating review:

Security =2 due to sensitive information about area development and power supply plans

Data Management =3

Due to high volume data exchange

Archive data

Unique interfaces

And diverse database structures

Constraints = 2 due to uncertainty of information and immature applications

---

D-2.1.1 Load forecast for existing nodal loads

The Purpose of *Load forecast for existing nodal loads* ***function is similar to function*** ***(D-2.1) Short-term load forecast*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	3.0	2.0	1.8

COMMENTS:

D-2.1.2 Forecast of allocation and amount of new loads

The Purpose of *Forecast of allocation and amount of new loads* ***function is similar to function*** ***(D-2.1) Short-term load forecast*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	3.0	2.0	1.8

COMMENTS:

D-2.1.3 Forecast/scheduling of distributed resources

The Purpose of *Forecast/scheduling of distributed resources* ***function is similar to function*** ***(D-2.1) Short-term load forecast*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	3.0	2.0	1.8

COMMENTS:

D-2.2 Update of circuit boundaries

The Purpose of *Update of circuit boundaries* ***function is to***

Enhance reliability
Power quality
Utilization of distribution facilities
And operational efficiency based on the latest load and facility data by adjusting the operating parameters not controllable in real time

directly involving

Planning
Operation
Engineering departments of the utility

performing

Multi-level feeder reconfiguration studies based on multiple criteria coordinated with other optimization planning studies

with key interfaces between

DisCOs and TransCOs
Engineering and AM/FM/GIS and CIS databases within DisCo
DisCOs and DER owners
DisCos and major customers

DisCos and customer representatives (serving entities)

with communication configuration requirements of

WAN
LAN
Internet

with quality of service requirements of

Low volume of external data exchange
With somehow flexible timeframes

with data management requirements of

Geographic maps
Distribution and transmission AM/FM/GIS and CIS databases for internal use by utility departments

with constraints of

Existence and comprehensiveness of applications for development of optimal short-term plans under conditions of uncertainty in the open market environment

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	3.0	2.0	1.8

COMMENTS:
The following comments were collected during the team rating review:

Security =2 due to sensitive information about area development and power supply plans
Data Management =3
Due to high volume data exchange
Archive data
Unique interfaces
And diverse database structures
Constraints = 2 due to uncertainty of information and immature applications

---

D-2.3 Update of switch placement

The Purpose of *Update of switch placement* ***function is to***

Enhance reliability
Power quality
Utilization of distribution facilities
And operational efficiency based on the latest load and facility data by adjusting the operating parameters not controllable in real time

directly involving

Planning
Operation
Engineering departments of the utility

performing

Predictive reliability assessment and sectionalizing optimization coordinated with other planning optimization functions

with key interfaces between

DisCOs and TransCOs
Planning and AM/FM/GIS and CIS databases within DisCo
DisCOs and DER owners
DisCos and major customers
DisCos and customer representatives (serving entities)
DisCos and area developers

with communication configuration requirements of

WAN
LAN
Internet

with quality of service requirements of

Low volume of external data exchange
With somehow flexible timeframes

with data management requirements of

Geographic maps
Distribution and transmission AM/FM/GIS and CIS databases for internal use by utility departments

with constraints of

Existence and comprehensiveness of applications for development of optimal short-term plans under conditions of uncertainty in the open market environment

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	3.0	2.0	1.8

COMMENTS:
The following comments were collected during the team rating review:

Security =2 due to sensitive information about area development and power supply plans
Data Management =3
Due to high volume data exchange
Archive data

Unique interfaces
And diverse database structures
Constraints = 2 due to uncertainty of information and immature applications

---

D-2.4 Update of capacitor placement and sizing

The Purpose of *Update of capacitor placement and sizing* ***function is to***

Enhance reliability
Power quality
Utilization of distribution facilities
And operational efficiency based on the latest load and facility data by adjusting the operating parameters not controllable in real time

directly involving

Planning
Operation
Engineering departments of the utility

performing

Multi-objective feeder capacitor optimization coordinated with other planning optimization functions

with key interfaces between

DisCOs and TransCOs
Planning and AM/FM/GIS and CIS databases within DisCo
DisCOs and DER owners
DisCos and major customers
DisCos and customer representatives (serving entities)
DisCos and area developers

with communication configuration requirements of

WAN
LAN
Internet

with quality of service requirements of

Low volume of external data exchange
With somehow flexible timeframes

with data management requirements of

Geographic maps
Distribution and transmission AM/FM/GIS and CIS databases for internal use by utility departments

with constraints of

Existence and comprehensiveness of applications for development of optimal short-term plans under conditions of uncertainty in the open market environment

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3***

(highly likely to involve architectural challenges) ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	3.0	2.0	1.8

COMMENTS:
The following comments were collected during the team rating review:

Security =2 due to sensitive information about area development and power supply plans
Data Management =3
Due to high volume data exchange
Archive data
Unique interfaces
And diverse database structures
Constraints = 2 due to uncertainty of information and immature applications

---

D-2.5 Update of no-load tap positions

The Purpose of *Update of no-load tap positions* ***function is to***

Enhance reliability
Power quality
Utilization of distribution facilities
And operational efficiency based on the latest load and facility data by adjusting the operating parameters not controllable in real time

directly involving

Planning
Operation
Engineering departments of the utility

performing

Multi-objective no-load tap position optimization coordinated with the capabilities of real-time multi-criteria volt-var control coordinated with other planning optimization functions

with key interfaces between

DisCOs and TransCOs
Planning and AM/FM/GIS and CIS databases within DisCo
DisCOs and DER owners
DisCos and major customers
DisCos and customer representatives (serving entities)
DisCos and area developers

with communication configuration requirements of

WAN

LAN
Internet

with quality of service requirements of

Low volume of external data exchange
With somehow flexible timeframes

with data management requirements of

Geographic maps
Distribution and transmission AM/FM/GIS and CIS databases for internal use by utility departments

with constraints of

Existence and comprehensiveness of applications for development of optimal short-term plans under conditions of uncertainty in the open market environment

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	3.0	2.0	1.8

COMMENTS:
The following comments were collected during the team rating review:

Security =2 due to sensitive information about area development and power supply plans
Data Management =3
Due to high volume data exchange
Archive data
Unique interfaces
And diverse database structures
Constraints = 2 due to uncertainty of information and immature applications

---

D-2.6 Update phase load allocation for better load and voltage balancing

The Purpose of *Update phase load allocation for better load and voltage balancing* ***function is to***

Enhance reliability
Power quality
Utilization of distribution facilities
And operational efficiency based on the latest load and facility data by adjusting the operating parameters not controllable in real time

directly involving

Planning
Operation
Engineering departments of the utility

performing

Phase loading optimization for the planning time frame coordinated with other planning optimization functions

with key interfaces between

Planning and AM/FM/GIS and CIS databases within DisCo
DisCOs and DER owners
DisCos and major customers
DisCos and customer representatives (serving entities)

with communication configuration requirements of

WAN
LAN
Internet

with quality of service requirements of

Low volume of external data exchange
With somehow flexible timeframes

with data management requirements of

Geographic maps
Distribution and transmission AM/FM/GIS and CIS databases for internal use by utility departments

with constraints of

Existence and comprehensiveness of applications for optimum load and voltage balancing due to uncertainty of the load forecast on per phase basis

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	3.0	2.0	1.8

COMMENTS:
The following comments were collected during the team rating review:

Security =2 due to sensitive information about area development and power supply plans
Data Management =3
Due to high volume data exchange
Archive data
Unique interfaces
And diverse database structures
Constraints = 2 due to uncertainty of information and immature applications

D-2.7 Update of contracts with transmission company

The Purpose of *Update of contracts with transmission company* ***function is to***

Adjust the contractual agreements to the latest available information
Based on the updated planned operating conditions and new information from other parties

directly involving

Planning
Operation
Engineering departments of the utility
TransCos

performing

Simulation and optimization studies of the alternative operational parameters in the DisCO-TransCO interfaces

with key interfaces between

DisCos and TransCo

with communication configuration requirements of

WAN
LAN
Internet

with quality of service requirements of

Low volume data exchange between external parties

with security requirements of

Limited disclosure

with data management requirements of

Large distribution system model

with constraints of

Legacy of planning procedures and immaturity of relevant applications

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	1.0	1.0	3.0	2.0	1.4

COMMENTS:

The following comments were collected during the team rating review:

Data Management =3
Due to high volume data for existing and future models
Constraints = 2 due to immature applications (no optimization and coordination)

D-2.8 Update of automation settings

The Purpose of *Update of automation settings* ***function is to***

- Adjust the relay protection settings and coordination
- Load shedding amount
- Its number and settings of groups
- Distribution automation tuning parameters in accordance with the updated plans

directly involving

- Planning
- Operation
- Engineering
- Relay protection departments of the utility
- TransCos
- ISO/RTO
- DER
- Major customers

performing

- Contingency analysis and relay coordination studies

with key interfaces between

- Within DisCo's departments
- DisCO and RTO/ISO
- DisCo and TransCOs
- DisCOs and DER owners
- DisCos and major customers
- DisCos and customer representatives (serving entities)

with communication configuration requirements of

- WAN
- LAN
- Internet

with quality of service requirements of

- Low volume of external data exchange

with security requirements of

- Limited disclosure

with data management requirements of

- Large distribution AM/FM databases
- Transmission equivalents
- DER and major customer parameters

with constraints of

- Immature applications for complex distribution systems with multiple DERs
- Looped circuits

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	2.0	2.0	1.4

COMMENTS:
The following comments were collected during the team rating review:

Data Management =2 due to high volume data for distribution models
Constraints = 2 due to immature applications

D-2.9 Short-term distributed resources impact studies

***The Purpose of** Short-term distributed resources impact studies **function is to** determine the requirements for connection of a new DER*
directly involving
DisCo planning
Relaying
And operation departments
DER owners
performing
Simulation and optimization studies
with key interfaces between
DisCos and DER owners
with communication configuration requirements of
LAN
Internet
with quality of service requirements of
Accurate data from DER owners
Limited time for DisCo response (about 2 weeks)
with security requirements of
Limited disclosure
with data management requirements of
Large distribution models synchronized with the time of requested connection and later
with constraints of
Comprehensiveness of applications

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average

1.0	1.0	1.0	3.0	2.0	1.6

COMMENTS:
The following comments were collected during the team rating review:

Data Management =3 due to high volume data for distribution models
Synchronization with the required time frame, which may be different for different DERs
Constraints = 2 due to immature applications

D-2.10 Update of contracts with distribution generators

The Purpose of *Update of contracts with distribution generators* ***function is to***

Adjust the contractual agreements to the latest available information
Based on the updated planned operating conditions and new information from other parties

directly involving

Planning
Operation
Engineering departments of the utility
DER owners

performing

Simulation and optimization studies of the alternative operational parameters in the DisCO-DER interfaces

with key interfaces between

DisCos and DER owners

with communication configuration requirements of

LAN
Internet

with quality of service requirements of

Low volume data exchange between external parties

with security requirements of

Limited disclosure

with data management requirements of

Large distribution system model
Localized around the DER's locations

with constraints of

Legacy of planning procedures and immaturity of relevant applications

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average

0.0	1.0	1.0	2.0	2.0	1.2

COMMENTS:
The following comments were collected during the team rating review:

Data Management =2
Due to high volume data for distribution models
Constraints = 2 due to immature applications (no optimization and coordination)

The rating for Data Management does not match the comment. -- Peter Sanza - 05 Apr 2003

D-2.11 Update of contracts with customers

The Purpose of *Update of contracts with customers* ***function is to***

Adjust the contractual agreements to the latest available information
Based on the updated planned operating conditions and new information from other parties

directly involving

Planning
Operation
Engineering departments of the utility
Major customers
Customer representatives

performing

Simulation and optimization studies of the alternative operational parameters in the DisCO-customer interfaces
Load management studies
Power quality studies

with key interfaces between

DisCos and major customers
DisCos and customer representatives (serving entities)

with communication configuration requirements of

LAN
Internet

with quality of service requirements of

Average volume data exchange between external parties

with security requirements of

Limited disclosure

with data management requirements of

Large distribution system model
Localized around the major customer locations

with constraints of

Legacy of planning procedures and immaturity of relevant applications

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	2.0	1.0	3.0	2.0	1.6

COMMENTS:
The following comments were collected during the team rating review:

Quality of service = 2 due to significant volume of exchange data between DisCO and multiple external parties
Data Management =3
Due to high volume data for distribution models
Average volume data for external parties
And diverse nature of data
Constraints = 2 due to immature applications (no optimization and coordination)

D-2.12 Contractor /Builder requests new service connection (see IEC WG14 Use Case #2 and 3)

The Purpose of** Contractor /Builder requests new service connection (see IEC WG14 Use Case #2 and 3) **function
is to determine the requirements for connection of a new major service connection
directly involving
DisCo planning
Relaying
And operation departments
Contractor/Builder/customer
performing
Simulation and optimization studies
with key interfaces between
DisCos and customers
DisCos and contractor
with communication configuration requirements of
LAN
Internet
with quality of service requirements of
Accurate data from builders
Limited time for DisCo response
with security requirements of
Limited disclosure
with data management requirements of

Large distribution models synchronized with the time of requested connection and later

with constraints of

Comprehensiveness of applications

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	3.0	2.0	1.6

COMMENTS:

The following comments were collected during the team rating review:

Data Management =3 due to high volume data for distribution models

Synchronization with the required time frame, which may be different for different constructions

Constraints = 2 due to immature applications

D-2.13 Update of relevant databases

The Purpose of *Update of relevant databases* ***function is to*** populate the future distribution model based on updated planning decisions

directly involving

Planning

Operation

And IT departments of the utility

performing

Update of AM/FM/GIS

Asset Management and other relevant databases

Data consistency checking

Error corrections

with key interfaces between

DisCos and utility departments

with communication configuration requirements of

LAN

with quality of service requirements of

Low volume and low speed of external information flows

with security requirements of

Limited disclosure

with data management requirements of

Average volume of incremental data

with constraints of

Legacy of database support

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	1.0	1.0	1.0

COMMENTS:

D-2.14 Prepare maintenance plan

The Purpose of** Prepare maintenance plan **function is to

Calculate system utilization based on forecast load and nameplate ratings
Schedule maintenance operations
Schedule equipment replacement

directly involving

Operation
Planning
Maintenance
IT departments of the utility

performing

Diagnostic analysis
Scheduling
Simulation
And optimization studies

with key interfaces between

DisCos and utility departments
DisCos and major customers
DisCos and DER owners

with communication configuration requirements of

LAN
Internet

with quality of service requirements of

Low volume and low speed of external information flows

with security requirements of

Limited disclosure

with data management requirements of

Large distribution models synchronized with the time of requested maintenance

with constraints of

Comprehensiveness of applications

On a scale of 0** (does not involve significant architectural challenges) **to 3

(highly likely to involve architectural challenges) ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	1.0	3.0	2.0	1.2

COMMENTS:
The following comments were collected during the team rating review:

Data Management =3 due to high volume data for distribution models
Synchronization with the required time frame, which may be different for different constructions
Constraints = 2 due to immature applications

D-2.14.1 Calculate system utilization based on forecast load and nameplate ratings

The Purpose of *Calculate system utilization based on forecast load and nameplate ratings* ***function is similar to function*** ***(D-2.14) Prepare maintenance plan*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	1.0	3.0	2.0	1.2

COMMENTS:

D-2.14.2 Schedule maintenance operations - time-based

The Purpose of *Schedule maintenance operations - time-based* ***function is similar to function*** ***(D-2.14) Prepare maintenance plan*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	1.0	3.0	2.0	1.2

COMMENTS:

D-2.14.3 Schedule maintenance operations - predictive, based on data and models

The Purpose of *Schedule maintenance operations - predictive, based on data and models* ***function is similar to function*** ***(D-2.14) Prepare maintenance plan*** ***above.***

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	1.0	3.0	2.0	1.2

COMMENTS:

D-2.14.4 Schedule equipment replacement - based on age of equipment

The Purpose of** Schedule equipment replacement - based on age of equipment **function
is similar to function** (D-2.14) Prepare maintenance plan **above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	1.0	3.0	2.0	1.2

COMMENTS:

D-2.14.5 Schedule equipment replacement - predictive, based on data and models

The Purpose of** Schedule equipment replacement - predictive, based on data and models **function
is similar to function** (D-2.14) Prepare maintenance plan **above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	1.0	3.0	2.0	1.2

COMMENTS:

D-2.14.6 Schedule equipment replacement - based on contingency scenarios

The Purpose of** Schedule equipment replacement - based on contingency scenarios **function
is similar to function** (D-2.14) Prepare maintenance plan **above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	1.0	3.0	2.0	1.2

COMMENTS:

D-2.14.7 Schedule spare distribution, ensure sufficient at each site

The Purpose of *Schedule spare distribution, ensure sufficient at each site* ***function***
is similar to function ***(D-2.14) Prepare maintenance plan*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	1.0	3.0	2.0	1.2

COMMENTS:

D-3 Operational planning (1 day to 1 week ahead)

The Purpose of *Operational planning (1 day to 1 week ahead)* ***function is to***

Optimally prepare the short-term operating conditions of the distribution system
Providing reliable service with self-healing distribution system
Standard power quality and competitive rates

directly involving

Short-term load forecasts
Information about on-going maintenance
Short-term outage requests
Real-time and nominal databases

performing

Simulation and optimization studies for the look-ahead time interval

with key interfaces between

Operation and Work management departments of DisCo
Within DisCo's departments
DisCo and contractor
DisCos and field crews
DisCos and customers
DisCos and weather system
DisCos and security institutions
DisCOs and TransCOs
DisCOs and RTO/ISO
Engineering and AM/FM/GIS databases within DisCo

DisCOs and DER owners
DisCos and major customers
DisCos and customer representatives (serving entities)
Operation planning databases and real-time databases
Operation planning databases and work management databases

with communication configuration requirements of

WAN
LAN
Internet

with quality of service requirements of

High availability and accuracy
Several times a day with due times

with security requirements of

Moderate security

with data management requirements of

Geographic maps
Distribution and transmission AM/FM/GIS and CIS databases for internal use by utility departments

with constraints of

Existence and comprehensiveness of applications for development of optimal operation plans under conditions of uncertainty in the open market environment
Necessity of taking into account coordination of different distribution operation processes (reconfiguration
Volt/var control
DER re-dispatch
Relay protection re-coordination)

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	3.0	3.0	2.4

COMMENTS:
The following comments were collected during the team rating review:

Configuration = 2 due to diversity of multiple communications
Quality of Service =2 due to accuracy and clarity requirements
Security =2 due to planning for major events including terror alarm conditions
Data Management =3
Due to high volume data model for look-ahead studies
Constraints = 3 due to immature applications (no optimization and coordination)

D-3.1 Planned outage management by using DA applications in study/look-ahead mode and DA databases

The Purpose of *Planned outage management by using DA applications in study/look-ahead mode and DA databases* ***function***

is to

Optimally arrange the planned outages based on the latest prediction of the operating conditions based on DisCO
TransCo
ISO/RTO
MOS information
Maximizing the reliability of service and power quality

directly involving

Operation planners
Maintenance department

performing

Analyses of expected loads
Transmission maintenance
Transmission operation support
ISO/RTO load management requirements
Ongoing maintenance in distribution
New outage request analyses and scheduling
Multi-level feeder reconfiguration
Contingency analysis
Reliability assessment
DER rescheduling
Relay protection re-coordination
And switching order creation

with key interfaces between

Operation and Work management departments of DisCo
DisCos and TransCo
DisCos and ISO/RTO
DisCos and DER owners
DisCos and major customers
DisCos and customer representatives (serving entities)
Operation planning databases and real-time databases

with communication configuration requirements of

WAN
LAN
Internet

with quality of service requirements of

Low volume of external exchanges
High accuracy of data
Timely response

with security requirements of

Moderate security

with data management requirements of

Geographic maps

Distribution and transmission AM/FM/GIS and CIS databases for internal use by utility departments

with constraints of

Existence and comprehensiveness of applications for development of optimal operation plans under conditions of uncertainty in the open market environment

Necessity of taking into account coordination of different distribution operation processes (reconfiguration

Volt/var control

DER re-dispatch

Relay protection re-coordination)

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	1.0	3.0	3.0	2.0

COMMENTS:

The following comments were collected during the team rating review:

Quality of Service =2 due to accuracy requirements

Data Management =3

Due to high volume data model for look-ahead studies

Constraints = 3 due to immature applications (no optimization and coordination)

D-3.1.1 Outage request analysis and scheduling, taking into account the capabilities of real-time DA functions

The Purpose of *Outage request analysis and scheduling, taking into account the capabilities of real-time DA functions* ***function is similar to function*** ***(D-3.1) Planned outage management by using DA applications in study/look-ahead mode and DA databases above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	1.0	3.0	3.0	2.0

COMMENTS:

D-3.1.2 Planners/operators perform load analysis of substation equipment based on data

The Purpose of *Planners/operators perform load analysis of substation equipment based on data* ***function***
is similar to function ***(D-3.1) Planned outage management by using DA applications in study/look-ahead mode and DA databases*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	1.0	3.0	3.0	2.0

COMMENTS:

D-3.1.3 Multi-level feeder reconfiguration

The Purpose of *Multi-level feeder reconfiguration* ***function***
is similar to function ***(D-3.1) Planned outage management by using DA applications in study/look-ahead mode and DA databases*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	1.0	3.0	3.0	2.0

COMMENTS:

D-3.1.4 Contingency analysis/reliability (risk) assessment

The Purpose of *Contingency analysis/reliability (risk) assessment* ***function***
is similar to function ***(D-3.1) Planned outage management by using DA applications in study/look-ahead mode and DA databases*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	1.0	3.0	3.0	2.0

COMMENTS:

D-3.1.5 Distributed resources re-scheduling

The Purpose of *Distributed resources re-scheduling* ***function is similar to function*** ***(D-3.1) Planned outage management by using DA applications in study/look-ahead mode and DA databases above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	1.0	3.0	3.0	2.0

COMMENTS:

D-3.1.6 Protection coordination analysis

The Purpose of *Protection coordination analysis* ***function is similar to function*** ***(D-3.1) Planned outage management by using DA applications in study/look-ahead mode and DA databases above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	1.0	3.0	3.0	2.0

COMMENTS:

D-3.1.7 Switching order generation for facilitating the planned outages and for return to normal

The Purpose of *Switching order generation for facilitating the planned outages and for return to normal* ***function is similar to function*** ***(D-3.1) Planned outage management by using DA applications in study/look-ahead mode and DA databases above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	1.0	3.0	3.0	2.0

COMMENTS:

D-3.2 Work management (planning stage)

The Purpose of *Work management (planning stage)* ***function is to***

Authorize scheduled work
Schedule work crews for authorized work
Identify assets required for the work
Design/plan work site for safety
Prepare working and switching orders

directly involving

Work management
Maintenance
Operation departments
And utility and contractor's field crews

performing

Verification of work and switching orders
Preparing work permits
Verifying conditions for recall of work
If needed

with key interfaces between

Within DisCo's departments
DisCo and contractor
DisCos and field crews
Engineering and AM/FM/GIS databases within DisCo
Operation planning databases and work management databases

with communication configuration requirements of

LAN
Internet
Mobile communications

with quality of service requirements of

High accuracy and clarity of operational and safety related information

with security requirements of

Limited disclosure

with data management requirements of

Drawing and maps transmitted over mobile communications
Sufficient time for verification of transmittal

with constraints of

Legacy procedures

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	1.0	1.0	1.0

COMMENTS:

D-3.2.1 Schedulers interface with contractors

The Purpose of *Schedulers interface with contractors* ***function is similar to function*** ***(D-3.2) Work management (planning stage)*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	1.0	1.0	1.0

COMMENTS:

D-3.2.2 Schedulers schedule work crews for scheduled work

The Purpose of *Schedulers schedule work crews for scheduled work* ***function is similar to function*** ***(D-3.2) Work management (planning stage)*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	1.0	1.0	1.0

COMMENTS:

D-3.2.3 System operators review and approve scheduled work

The Purpose of *System operators review and approve scheduled work* ***function is similar to function*** ***(D-3.2) Work management (planning stage)*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	1.0	1.0	1.0

COMMENTS:

D-3.2.4 Schedulers identify assets required for scheduled work

The Purpose of *Schedulers identify assets required for scheduled work* ***function is similar to function*** ***(D-3.2) Work management (planning stage)*** ***above.***

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	1.0	1.0	1.0

COMMENTS:

D-3.2.5 Work crews perform scheduled work, coordinating with operators for switching operations

The Purpose of** Work crews perform scheduled work, coordinating with operators for switching operations **function
is similar to function** (D-3.2) Work management (planning stage) **above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	1.0	1.0	1.0

COMMENTS:

D-3.3 Operators prepare (plan) for storm conditions and other alerting situations based on weather data, other alarming systems, and history

The Purpose of** Operators prepare (plan) for storm conditions and other alerting situations based on weather data, other alarming systems, and history **function
is to

Prepare for major event conditions following relevant guidelines
Providing necessary information to relevant parties
Changing schedules
Settings
Work permits
Etc

directly involving

Different utility departments
Field crews
DERs
Major customers

performing

Warnings
Schedule changes
Work recalls

Setting changes
Changes of automated system modes of operation
Changing alarm tolerances

with key interfaces between

DisCos and TransCO
DisCos and ISO/RTO
DisCos and field crews
DisCos and customers
DisCos and DER owners
DisCos and weather systems
DisCos and security institutions

with communication configuration requirements of

WAN
LAN
Mobile
Internet
One-to-many

with quality of service requirements of

High availability
Data accuracy

with security requirements of

Prevention of interference

with data management requirements of

Different types of data over different types of communications

with constraints of

Diversity of non-standard situations

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	3.0	3.0	2.4

COMMENTS:
The following comments were collected during the team rating review:

Configuration = 2 due to diversity of multiple communications
Quality of Service =2 due to accuracy and clarity requirements
Security =2 due to planning for major events including terror alarm conditions
Data Management =3
Due to high volume data model for look-ahead studies
Constraints = 3 due to immature applications (no optimization and coordination)

D-3.3.1 Change recloser settings

The Purpose of *Change recloser settings* ***function is similar to function*** ***(D-3.3) Operators prepare (plan) for storm conditions and other alerting situations based on weather data, other alarming systems, and history above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	3.0	3.0	2.4

COMMENTS:

D-3.3.2 Change alarm thresholds

The Purpose of *Change alarm thresholds* ***function is similar to function*** ***(D-3.3) Operators prepare (plan) for storm conditions and other alerting situations based on weather data, other alarming systems, and history above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	3.0	3.0	2.4

COMMENTS:

D-3.3.3 Prepare for transformer clipping (e.g. Solar wind raising ground DC offset)

The Purpose of *Prepare for transformer clipping (e.g. Solar wind raising ground DC offset)* ***function is similar to function*** ***(D-3.3) Operators prepare (plan) for storm conditions and other alerting situations based on weather data, other alarming systems, and history above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	3.0	3.0	2.4

COMMENTS:

D-4 Real-time operations

The Purpose of *Real-time operations* ***function is to***

- Monitor and control the distribution operations in real time providing timely and reliable information and control by the operators and automated applications
- Implement scheduled working orders
- Following reliability
- Power quality
- Safety
- And efficiency standards
- And provide adequate recording of the activities

directly involving

- Field IEDs
- Substation automation
- Real-time databases
- Data links to other real-time systems (EMS
- OMS
- MO)
- Communication systems
- Field crews
- Other utility departments
- TransCos
- ISO/RTO
- DER's
- Major customers
- Market participants

performing

- Fast data acquisition
- Reasonability check
- Alarm processing
- Crew dispatching
- Coordination with TransCOs
- ISO/RTO
- And market participants
- Event recording
- Supervisory status and setpoint control

with key interfaces between

- SCADA and field IEDs
- SCADA and mobile computers
- DisCOs and TransCOs
- DisCOs and RTO/ISO
- DisCOs and DER owners
- Distribution Automation System (DAS) and SCADA+G82

DisCos and major customers
DisCos and customer representatives (serving entities)
SCADA and OMS
Real-time databases and work management databases
Operation
Work management
Relay protection
Power quality
IT
And OMS departments of DisCo
DisCos and MOS
DisCos and customers

with communication configuration requirements of

WAN
LAN
Internet
One-to-many
Mobile
Special media

with quality of service requirements of

High availability
Response
Data accuracy
Data frequency

with security requirements of

Prevention of interference

with data management requirements of

Timely access
Large historic databases

with constraints of

Difficult to change legacy field IEDs

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:
The following comments were collected during the team rating review:

Configuration = 3 due to data gathering from multiple sources via different communication systems
Quality = 3 due to high availability
Response

Data accuracy
Data frequency
Security = 3 for prevention of interference
Data Management =3 for timely access
Large historic databases
Constraints/concerns = 2 due to difficulty to change legacy field IEDs

---

D-4.1 SCADA system monitors distribution system

The Purpose of *SCADA system monitors distribution system* ***function is to***

Monitor and control the distribution operations in real time providing timely and reliable information and control by the operators and automated applications
Implement scheduled working orders
Following reliability
Power quality
Safety
And efficiency standards
And provide adequate recording of the activities

directly involving

Field IEDs
Substation automation
Real-time databases
Data links to other real-time systems (EMS
OMS
MO)
Communication systems

performing

Fast data acquisition
Reasonability check
Alarm processing
Event recording
Supervisory status and setpoint control

with key interfaces between

SCADA and field IEDs
SCADA and mobile computers
DisCOs and TransCOs
DisCOs and RTO/ISO
DisCOs and DER owners
DisCos and major customers
DisCos and customer representatives (serving entities)
SCADA and OMS
Real-time databases and work management databases

with communication configuration requirements of

WAN
LAN
Internet
One-to-many
Mobile
Special media

with quality of service requirements of

High availability
Response
Data accuracy
Data frequency

with security requirements of

Prevention of interference

with data management requirements of

Timely access
Large historic databases

with constraints of

Difficult to change legacy field IEDs

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:
The following comments were collected during the team rating review:

Configuration = 3 due to data gathering from multiple sources via different communication systems
Quality = 3 due to high availability
Response
Data accuracy
Data frequency
Security = 3 for prevention of interference
Data Management =3 for timely access
Large historic databases
Constraints/concerns = 3 due to difficulty to change legacy field IEDs

---

D-4.1.1 Monitor plant state (open/close)

The Purpose of *Monitor plant state (open/close)* ***function is similar to function*** ***(D-4.1) SCADA system monitors distribution system above.***

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:

D-4.1.2 Monitor system activity and load (current, voltage, frequency, energy)

The Purpose of** Monitor system activity and load (current, voltage, frequency, energy) **function
is similar to function** **(D-4.1) SCADA system monitors distribution system** **above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:

D-4.1.3 Monitor equipment condition (overheat, overload, battery level, capacity)

The Purpose of** Monitor equipment condition (overheat, overload, battery level, capacity) **function
is similar to function** **(D-4.1) SCADA system monitors distribution system** **above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:

D-4.1.4 Monitor environmental (fire, smoke, temperature, sump level)

The Purpose of** Monitor environmental (fire, smoke, temperature, sump level) **function
is similar to function** **(D-4.1) SCADA system monitors distribution system** **above.

On a scale of 0** (does not involve significant architectural challenges) **to 3

(highly likely to involve architectural challenges) ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:

D-4.1.5 Monitor security (door alarm, intrusion, cyber attack, audio/video recording)

The Purpose of *Monitor security (door alarm, intrusion, cyber attack, audio/video recording)* ***function is similar to function*** ***(D-4.1) SCADA system monitors distribution system*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:

D-4.2 Operators handle alarms

The Purpose of *Operators handle alarms* ***function is to***

Time notice
React
And acknowledge alarming situation in the power system

directly involving

SCADA
Shift operators
Work management
Relay protection
Power quality department
OMS
DisCo management
Field crews

performing

Intelligent alarm processing
Reporting
Acknowledgement

with key interfaces between

Operation
Work management

Relay protection
Power quality
And OMS departments of DisCo
DisCos and TransCo
DisCos and ISO/RTO
DisCos and DER owners
DisCos and major customers
DisCos and customer representatives (serving entities)
DisCos and field crews

with communication configuration requirements of

WAN
LAN
Mobile
Internet
One-to-many

with quality of service requirements of

High availability
Accuracy
Possible high volume (many parameters changing- high activity conditions)

with security requirements of

Authorized access

with data management requirements of

High speed processing of multiple data

with constraints of

Immature applications for intelligent alarm processing

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:
The following comments were collected during the team rating review:

Configuration = 3 due to data gathering from multiple sources via different communication systems
Quality = 3 due to high availability
Fast response
Data accuracy
Security = 3 for prevention of interference
Authorized access
Data Management =3 for timely access
Speed of processing high volumes of data

Constraints/concerns =3 due to immaturity of intelligent alarm processing

---

D-4.2.1 Intelligent alarm processing by SCADA system

The Purpose of *Intelligent alarm processing by SCADA system* ***function is similar to function*** ***(D-4.2) Operators handle alarms*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:

D-4.2.2 Distribution of alarms to non-operators

The Purpose of *Distribution of alarms to non-operators* ***function is similar to function*** ***(D-4.2) Operators handle alarms*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:

D-4.3 Operators dispatch field crews for scheduled work

The Purpose of *Operators dispatch field crews for scheduled work*
function
is to to timely and safely implement scheduled work
directly involving
Operators
Field crews
performing
Work permits
Work description
Authorization of switching orders
Verification of safety rules and actions
with key interfaces between
DisCos and field crews
DisCos and major customers
with communication configuration requirements of

LAN
Mobile
Internet

with quality of service requirements of

Accuracy and clarity of information

with security requirements of

Authorized access

with data management requirements of

Transmitting drawings and maps over mobile communications

with constraints of

Diverse data nature

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	3.0	2.0	2.0	2.2

COMMENTS:

The following comments were collected during the team rating review:

Configuration = 2 due to data gathering and transmitting via multiple and different communication systems
Quality = 2 due to data accuracy and clarity
Security = 3 for prevention of interference
Authorized access
Data Management =2 due transmitting maps and drawings over mobile
Constraints/concerns =2 diverse structure of data

D-4.3.1 Crew acquires drawings, previous records, customer profile

The Purpose of *Crew acquires drawings, previous records, customer profile* ***function***
is similar to function ***(D-4.3) Operators dispatch field crews for scheduled work*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	3.0	2.0	2.0	2.2

COMMENTS:

D-4.3.2 Operator establishes limits on what crew is permitted to do

The Purpose of *Operator establishes limits on what crew is permitted to do* ***function***
is similar to function ***(D-4.3) Operators dispatch field crews for scheduled work*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	3.0	2.0	2.0	2.2

COMMENTS:

D-4.3.3 Using mobile radio system

The Purpose of *Using mobile radio system* ***function***
is similar to function ***(D-4.3) Operators dispatch field crews for scheduled work*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	3.0	2.0	2.0	2.2

COMMENTS:

D-4.3.4 Using mobile computing

The Purpose of *Using mobile computing* ***function***
is similar to function ***(D-4.3) Operators dispatch field crews for scheduled work*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	3.0	2.0	2.0	2.2

COMMENTS:

D-4.4 Work crews provide information for updating relevant databases

The Purpose of *Work crews provide information for updating relevant databases* ***function***
is to

To update databases in the course of the work progress and, as soon, as possible after completion
Before the facility is put in service

directly involving

Field crews
IT personnel
Maintenance management

performing

Recording data using standard forms
Transmitting form via available communications
Populating databases
And verifying consistency of data

with key interfaces between

DIsCo operation
Work management
Maintenance
And IT departments
DisCos and field crews

with communication configuration requirements of

LAN
Internet
Mobile communications

with quality of service requirements of

High accuracy and clarity of information

with security requirements of

Limited disclosure

with data management requirements of

Drawing and maps transmitted over mobile communications
Limited time for verification of transmittal

with constraints of

Legacy performance

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	2.0	1.0	1.2

COMMENTS:
The following comments were collected during the team rating review:

Data Management = 2 due to transmittal of graphic data over mobile communications

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D-4.4.1 Work crews log activities and results of tests

The Purpose of *Work crews log activities and results of tests* ***function is similar to function*** ***(D-4.4) Work crews provide information for updating relevant databases*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	2.0	1.0	1.2

COMMENTS:

D-4.4.2 Work crews identifies assets installed and/or removed

The Purpose of *Work crews identifies assets installed and/or removed* ***function is similar to function*** ***(D-4.4) Work crews provide information for updating relevant databases*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	2.0	1.0	1.2

COMMENTS:

D-4.5 Operators perform supervisory and/or manual (using field crews) control of switching operations, load tap changers and voltage controllers, capacitor statuses

The Purpose of *Operators perform supervisory and/or manual (using field crews) control of switching operations, load tap changers and voltage controllers, capacitor statuses* ***function is to***

Controlling the distribution operations in real time providing implementation of scheduled working orders
Load balancing
Power quality
Meeting contractual obligations with TransCos and DERs
And customers

Following reliability
Power quality
Safety
And efficiency standards

directly involving
Shift operators
Field crews
SCADA
TransCos
Major customers

performing
Monitoring operating conditions
Generating switching orders
Dispatching and managing field crews

with key interfaces between
DisCos and field crews
DisCos and TransCos
DisCos and major customers
SCADA and field IEDs

with communication configuration requirements of
WAN
LAN
Mobile
SCADA communications
Internet

with quality of service requirements of
High availability
Data accuracy
Data clarity
High frequency

with security requirements of
Prevention of interference
Authorized access

with data management requirements of
Timely access

with constraints of
Limited time and ability for optimal decision making in complex situation
Lack of experience of new personnel

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average

3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:
The following comments were collected during the team rating review:

Configuration = 3 due to data gathering from multiple sources via different communication systems
Quality = 3 due to high availability
Response
Data accuracy
Data frequency
Security = 3 for prevention of interference
Data Management =3 for timely access
Large historic databases
Constraints/concerns = 3 due to difficulty to change legacy field IEDs

---

D-4.6 Operator defines objectives and other parameters of DA functions, e.g

The Purpose of *Operator defines objectives and other parameters of DA functions, e.g* ***function***

is to

Use the flexibility of advanced distribution automation applications to adjust to the changing objectives and needs of DisCos
Customers
TransCos
ISO/RTO
And MOS

directly involving

Distribution Automation Systems
EMS
MOS
OMS
TransCos
ISO/RTO
DER
Customers

performing

Adjustment of option provided by the DA applications

with key interfaces between

DisCos and EMS
DisCos and MOS
Distribution Automation System (DAS) and SCADA

with communication configuration requirements of

WAN
LAN

with quality of service requirements of

High availability
Data accuracy
User-friendly interface

with security requirements of

Authorized access

with data management requirements of

Timely access

with constraints of

User-friendly interface
New applications

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	3.0	1.0	2.0	1.8

COMMENTS:
The following comments were collected during the team rating review:

Quality = 2 due to high availability
Response
Data accuracy
User-friendly interface
Security = 3 for prevention of interference
Authorized access
Constraints/concerns = 2 due to new applications

D-4.6.1 Closed-loop control of service restoration function

The Purpose of *Closed-loop control of service restoration function* ***function***
is similar to function ***(D-4.6) Operator defines objectives and other parameters of DA functions, e.g*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	3.0	1.0	2.0	1.8

COMMENTS:

D-4.6.2 Use emergency limits for service restoration

The Purpose of *Use emergency limits for service restoration* ***function is similar to function*** ***(D-4.6) Operator defines objectives and other parameters of DA functions, e.g*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	3.0	1.0	2.0	1.8

COMMENTS:

D-4.6.3 Provide volt/var support for transmission

The Purpose of *Provide volt/var support for transmission* ***function is similar to function*** ***(D-4.6) Operator defines objectives and other parameters of DA functions, e.g*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	3.0	1.0	2.0	1.8

COMMENTS:

D-4.6.4 Provide Peak Load reduction within voltage quality limits

The Purpose of *Provide Peak Load reduction within voltage quality limits* ***function***
is similar to function ***(D-4.6) Operator defines objectives and other parameters of DA functions, e.g*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	3.0	1.0	2.0	1.8

COMMENTS:

D-4.6.5 Provide Peak Load reduction within voltage emergency limits

The Purpose of *Provide Peak Load reduction within voltage emergency limits* ***function***

is similar to function [(D-4.6) Operator defines objectives and other parameters of DA functions, e.g] above.

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	3.0	1.0	2.0	1.8

COMMENTS:

D-5 Automation of distribution operations

The Purpose of *Automation of distribution operations* ***function is to***

Automate data preparation
Optimal decision making
And control of distribution operations in a coordinated with other power systems manner

directly involving

Interfacing with different corporate databases
EMS
OMS
CIS
MOS
Comprehensive near real-time simulations of the operating conditions
Near real-time optimization
And real-time control of distribution operations

performing

Database consistency checking and corrections
Power system model integrity checking
Periodic and by-event system modeling and analysis
Current and predictive alarming
Contingency analysis
Volt/var optimization
Fault location
Isolation
And service restoration
Multi-level feeder reconfiguration
Operation diagnostic
Logging and reporting
Etc

with key interfaces between

Distribution Automation System (DAS) and SCADA
DisCOs/DAS and WMS

DAS and field crews
DAS and field IEDs
DisCOs/DAS and DER owners
DisCOs/DAS and TransCOs/EMS
DisCOs/DAS and RTO/ISO/EMS
DisCOs/DAS and MOS
DisCos/DAS and major customers
DisCos/DAS and customer representatives (serving entities)
DAS and OMS
DAS and AM/FM/GIS/CIS databases
Real-time databases and work management databases

with communication configuration requirements of

WAN
LAN
Internet
One-to-many
Mobile
Special media

with quality of service requirements of

High availability
Response
Data accuracy
Data frequency
High volume of databases
And high speed of processing high volume data

with security requirements of

High security

with data management requirements of

Management of many large databases in a synchronized manner with strict time constraints

with constraints of

Legacy paradigm of the utility personnel

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:
The following comments were collected during the team rating review:

Configuration = 3 due to data gathering from multiple sources via different communication systems, interfaces with other real-time databases, integration into transmission and market

Quality = 3 due to high availability, response, data accuracy, data frequency

Security = 3 for prevention of interference Data Management =3 for timely access, coordination of different databases, time updates without interruption of operations, Constraints/concerns = 3 due to difficulty to change legacy paradigm of the utility personnel, high performance requirements for the applications

---

D-5.1 DA system updates power system model and analyzes distribution operations

The Purpose of *DA system updates power system model and analyzes distribution operations* ***function***

is to

Running in real-time unbalanced distribution power flow for the dynamically changing distribution operating conditions

Analyze the results

And provide the operator with the summary results of the analysis and the DA applications with pseudo-measurements for each element of the distribution system down to the load centers in the secondaries

directly involving

SCADA

AF/FM

CIS

DA real-time power database

And other corporate databases

performing

Load modeling

Topology modeling

State estimation

Facility modeling

Power calculations and analyses of its results

And reporting

with key interfaces between

DAS and SCADA

DisCOs/DAS and TransCOs/EMS

DisCOs/DAS and RTO/ISO/EMS

DAS and OMS

DAS and AM/FM/GIS/CIS databases

DisCOs/DAS and MOS

DisCos/DAS and major customers

DisCos/DAS and customer representatives (serving entities)

with communication configuration requirements of

WAN

LAN

SCADA communications

with quality of service requirements of

High availability
Response
Data accuracy
Data volume
Data frequency (every 5 minutes)
User-friendly interface

with security requirements of

Authorized access

with data management requirements of

Large databases
Comprehensive modeling

with constraints of

New application

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:

The following comments were collected during the team rating review:

Configuration = 3 due to data gathering from multiple sources via different communication systems, interfaces with other and different databases
Quality = 3 due to high availability, response, data accuracy, data frequency
Security = 3 for prevention of interference
Data Management =3 for timely access, coordination of different databases of large volumes, time updates without interruption of operations
Constraints/concerns = 3 due to difficulty to change legacy paradigm of the utility personnel, high performance requirements for the applications

---

D-5.1.1 Update topology model

The Purpose of *Update topology model* ***function is similar to function*** ***(D-5.1) DA system updates power system model and analyzes distribution operations*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3***

(highly likely to involve architectural challenges) ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:

D-5.1.2 Update facilities model

The Purpose of *Update facilities model* ***function is similar to function*** ***(D-5.1) DA system updates power system model and analyzes distribution operations*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:

D-5.1.3 Update load model

The Purpose of *Update load model* ***function is similar to function*** ***(D-5.1) DA system updates power system model and analyzes distribution operations*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:

D-5.1.4 Update relevant transmission model

The Purpose of *Update relevant transmission model* ***function is similar to function*** ***(D-5.1) DA system updates power system model and analyzes distribution operations*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of	Security	Data	Constraints	Average

	Service		Management		
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:

D-5.1.5 Update and analyze real-time operating conditions using distribution power flow/state estimation

The Purpose of *Update and analyze real-time operating conditions using distribution power flow/state estimation* ***function***
is similar to function ***(D-5.1) DA system updates power system model and analyzes distribution operations*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:

D-5.1.6 Update system capacity based on real-time equipment monitoring data

The Purpose of *Update system capacity based on real-time equipment monitoring data* ***function***
is similar to function ***(D-5.1) DA system updates power system model and analyzes distribution operations*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:

D-5.1.7 Issue alarming/warning messages to the operator

The Purpose of *Issue alarming/warning messages to the operator* ***function***
is similar to function ***(D-5.1) DA system updates power system model and analyzes distribution operations*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:

D-5.1.8 Generate distribution operation reports and logs

The Purpose of *Generate distribution operation reports and logs* ***function is similar to function*** ***(D-5.1) DA system updates power system model and analyzes distribution operations*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:

D-5.2 DA system performs fault location, fault isolation, and service restoration

The Purpose of *DA system performs fault location, fault isolation, and service restoration* ***function***

is to

Automatically define

Isolate the faulted section(s)) of the distribution system and maximally and optimally restore service to the customers utilizing all available distribution facilities for the backup of de-energized customers without unacceptable violations of the operating parameters

directly involving

SCADA

AF/FM

CIS

OMS

DA real-time power database

And other corporate databases

performing

Fault data analysis

Status changes analysis

Comprehensive search of alternative supply for the de-energized portion of distribution system

Switching order generation

Recommendation and/or execution

with key interfaces between

DAS and SCADA
DisCOs/DAS and TransCOs/EMS
DisCOs/DAS and RTO/ISO/EMS
DAS and OMS
DAS and AM/FM/GIS/CIS databases

with communication configuration requirements of

WAN
LAN
SCADA communications

with quality of service requirements of

High availability
Response
Data accuracy
Data volume
Data frequency (every 5 minutes)
User-friendly interface

with security requirements of

Authorized Access
Prevention of interference

with data management requirements of

Management of high volume database and numerous alternative solutions within seconds

with constraints of

New application

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:
The following comments were collected during the team rating review:

Configuration = 3 due to data gathering from multiple sources via different communication systems, interfaces with other real-time databases
Quality = 3 due to high availability, response, data accuracy, data frequency, user-friendly interface
Security = 3 for prevention of interference
Data Management =3 for management of high volume database and numerous alternative solutions within seconds
Constraints/concerns = 3 due to difficulty to change legacy paradigm of the utility personnel, high performance requirements for the application

D-5.2.1 DA indicates the faults cleared by controllable protective devices

The Purpose of *DA indicates the faults cleared by controllable protective devices* ***function***
is similar to function ***(D-5.2) DA system performs fault location, fault isolation, and service restoration*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:

D-5.2.1.1 Distinguish faults cleared by fuses

The Purpose of *Distinguish faults cleared by fuses* ***function***
is similar to function ***(D-5.2.1) DA indicates the faults cleared by controllable protective devices*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:

D-5.2.1.2 Distinguish momentary outages

The Purpose of *Distinguish momentary outages* ***function***
is similar to function ***(D-5.2.1) DA indicates the faults cleared by controllable protective devices*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:

D-5.2.1.3 Distinguish inrush/cold load current

The Purpose of** Distinguish inrush/cold load current **function** **is similar to function** [(D-5.2.1) DA indicates the faults cleared by controllable protective devices] **above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:

D-5.2.2 DA determines the faulted sections based on SCADA fault indications and protection lockout signals

The Purpose of** DA determines the faulted sections based on SCADA fault indications and protection lockout signals **function** **is similar to function** [(D-5.2) DA system performs fault location, fault isolation, and service restoration] **above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:

D-5.2.3 DA estimates the probable fault locations based on SCADA fault current measurements and real-time fault analysis

The Purpose of** DA estimates the probable fault locations based on SCADA fault current measurements and real-time fault analysis **function** **is similar to function** [(D-5.2) DA system performs fault location, fault isolation, and service restoration] **above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:

D-5.2.4 DA determines the fault-clearing non-monitored protective device based on trouble call inputs and dynamic connectivity model

The Purpose of *DA determines the fault-clearing non-monitored protective device based on trouble call inputs and dynamic connectivity model* ***function***
is similar to function ***(D-5.2) DA system performs fault location, fault isolation, and service restoration*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:

D-5.2.5 DA generates switching orders for fault isolation, service restoration, and return to normal (taking into account the availability of remotely controlled switching devices, feeder paralleling, and cold-load pickup)

The Purpose of *DA generates switching orders for fault isolation, service restoration, and return to normal (taking into account the availability of remotely controlled switching devices, feeder paralleling, and cold-load pickup)* ***function***
is similar to function ***(D-5.2) DA system performs fault location, fault isolation, and service restoration*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:

D-5.2.5.1 Operators executes switching orders by using SCADA

The Purpose of *Operators executes switching orders by using SCADA* ***function***
is similar to function ***(D-5.2.5) DA generates switching orders for fault isolation, service restoration, and return to normal (taking into account the availability of remotely controlled switching devices, feeder paralleling, and cold-load pickup)*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:

D-5.2.5.2 Operator authorizes the DA application to execute the switching orders in closed-loop mode

The Purpose of *Operator authorizes the DA application to execute the switching orders in closed-loop mode* ***function***
is similar to function ***(D-5.2.5) DA generates switching orders for fault isolation, service restoration, and return to normal (taking into account the availability of remotely controlled switching devices, feeder paralleling, and cold-load pickup)*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:

D-5.2.6 DA system isolates the fault and restores service automatically by-passing the operator based on operator's authorization in advance

The Purpose of *DA system isolates the fault and restores service automatically by-passing the operator based on operator's authorization in advance* ***function***
is similar to function ***(D-5.2) DA system performs fault location, fault isolation, and service restoration*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:

D-5.2.7 DA considers creation of islands supported by distributed resources for service restoration

The Purpose of *DA considers creation of islands supported by distributed resources for service restoration* ***function***
is similar to function ***(D-5.2) DA system performs fault location, fault isolation, and service restoration*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:

D-5.3 DA system performs multi-level feeder reconfiguration for different objectives

The Purpose of *DA system performs multi-level feeder reconfiguration for different objectives* ***function***

is to

- Maximally and optimally utilize all available distribution facilities for load balancing
- Voltage equalization
- Reliability maximization
- Loss minimization transmission unloading under normal
- Maintenance
- And emergency conditions
- Without unacceptable violations of the operating parameters

directly involving

- SCADA
- AF/FM
- CIS
- OMS
- WMS
- DA real-time power database
- And other corporate databases
- Field crews
- DERs

performing

- Status changes analysis
- Comprehensive search of alternative supply connectivity
- Switching order generation
- Recommendation and/or execution

with key interfaces between

- DAS and SCADA
- DisCOs/DAS and TransCOs/EMS
- DisCOs/DAS and RTO/ISO/EMS
- DAS and OMS
- DAS and AM/FM/GIS/CIS databases
- DisCos/DAS and WMS
- DisCos/DAS and field crews
- DisCos/DAS and major customers

Real-time databases and work management databases

with communication configuration requirements of

WAN
LAN
SCADA communications
Internet
Mobile

with quality of service requirements of

High availability
Response
Data accuracy
Data volume
User-friendly interface

with security requirements of

Authorized Access
Prevention of interference

with data management requirements of

Management of high volume database and numerous alternative solutions

with constraints of

New application

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	2.0	2.0

COMMENTS:
The following comments were collected during the team rating review:

Configuration =2due to data gathering from multiple sources via different communication systems, interfaces with other real-time databases
Quality = 2 due to high availability, response, data accuracy, user-friendly interface
Security = 2 for prevention of interference
Data Management =2 for management of high volume database and numerous alternative solutions
Constraints/concerns = 2 due to difficulty to change legacy paradigm of the utility personnel, high performance requirements for the application

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D-5.3.1 Service restoration

The Purpose of** Service restoration **function
is similar to function** (D-5.3) DA system performs multi-level feeder reconfiguration for different objectives **above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	2.0	2.0

COMMENTS:

D-5.3.2 Overload elimination

The Purpose of** Overload elimination **function
is similar to function** (D-5.3) DA system performs multi-level feeder reconfiguration for different objectives **above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	2.0	2.0

COMMENTS:

D-5.3.3 Load balancing

The Purpose of** Load balancing **function
is similar to function** (D-5.3) DA system performs multi-level feeder reconfiguration for different objectives **above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	2.0	2.0

COMMENTS:

D-5.3.4 Transmission facilities overload

The Purpose of** Transmission facilities overload **function
is similar to function** (D-5.3) DA system performs multi-level feeder reconfiguration for different objectives **above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	2.0	2.0

COMMENTS:

D-5.3.5 Loss minimization

The Purpose of** Loss minimization **function is similar to function** [(D-5.3) DA system performs multi-level feeder reconfiguration for different objectives] **above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	2.0	2.0

COMMENTS:

D-5.3.6 Voltage balancing

The Purpose of** Voltage balancing **function is similar to function** [(D-5.3) DA system performs multi-level feeder reconfiguration for different objectives] **above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	2.0	2.0

COMMENTS:

D-5.3.7 Reliability improvement

The Purpose of** Reliability improvement **function is similar to function** [(D-5.3) DA system performs multi-level feeder reconfiguration for different objectives] **above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	2.0	2.0

COMMENTS:

D-5.4 DA performs relay protection re-coordination

The Purpose of *DA performs relay protection re-coordination* ***function is to*** adjust relay protection settings to the real-time conditions based on preset rules

directly involving

Real-time connectivity models
SCADA
DERs

performing

Relay protection settings and switch mode operation analyses for real-time connectivity tagging and weather conditions

with key interfaces between

DAS and SCADA
DisCos/DAS and field IEDs
DisCo and DER

with communication configuration requirements of

LAN
SCADA

with quality of service requirements of

High availability
Response
Data accuracy
User-friendly interface

with security requirements of

Authorized Access
Prevention of interference

with data management requirements of

Management of high volume data for seeking optimal solutions

with constraints of

New application

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	2.0	2.0

COMMENTS:

The following comments were collected during the team rating review:

Configuration =2 due to data gathering from multiple sources via different communication systems, interfaces with other real-time databases
Quality = 2 due to high availability, response, data accuracy, user-friendly interface
Security = 2 for prevention of interference
Data Management =2 for management of high volume data for optimization
Constraints/concerns = 2 due to difficulty to change legacy paradigm of the utility personnel

D-5.4.1 After feeder reconfiguration

The Purpose of** After feeder reconfiguration **function is similar to function [(D-5.4) DA performs relay protection re-coordination] above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	2.0	2.0

COMMENTS:

D-5.4.2 In case of changed conditions for fuse saving

The Purpose of** In case of changed conditions for fuse saving **function is similar to function [(D-5.4) DA performs relay protection re-coordination] above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	2.0	2.0

COMMENTS:

D-5.5 DA system optimally controls volt/var by changing the states of voltage controllers, shunts, and distributed resources in a coordinated manner for different objectives under normal and emergency conditions

***The Purpose of** DA system optimally controls volt/var by changing the states of voltage controllers, shunts, and distributed resources in a*

coordinated manner for different objectives under normal and emergency conditions ***function***

is to

- Power quality improvement
- Non-intrusive load management
- Load balancing
- Transmission operation support

directly involving

- SCADA
- AF/FM
- CIS
- DA real-time power database
- And other corporate databases
- Voltage and capacitor controller
- DERs

performing

- Simulation and optimization calculations
- Implementation of optimal settings and statuses of controllable devices in coordinated manner in closed-loop mode of operations

with key interfaces between

- DAS and SCADA
- DAS and DER owners
- DisCos/DAS and field IEDs
- DisCOs/DAS and TransCOs/EMS
- DisCOs/DAS and RTO/ISO/EMS
- DisCOs/DAS and MOS
- DisCos/DAS and major customers
- DisCos/DAS and customer representatives (serving entities)

with communication configuration requirements of

- WAN
- LAN
- SCADA

with quality of service requirements of

- High availability
- Response
- Data accuracy
- Data volume
- High frequency
- User-friendly interface

with security requirements of

- Authorized Access
- Prevention of interference

with data management requirements of

- Management of high volume database and numerous alternative solutions

with constraints of

New application with high performance requirements

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:

The following comments were collected during the team rating review:

Configuration = 3 due to data gathering from multiple sources via different communication systems, interfaces with other real-time databases

Quality = 3 due to high availability, response, data accuracy, data frequency, user-friendly interface

Security = 3 for prevention of interference

Data Management =3 for management of high volume database and numerous alternative solutions within seconds

Constraints/concerns = 3 due to difficulty to change legacy paradigm of the utility personnel, high performance requirements for the application

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D-5.5.1 Power quality improvement

The Purpose of *Power quality improvement* ***function is similar to function*** ***(D-5.5) DA system optimally controls volt/var by changing the states of voltage controllers, shunts, and distributed resources in a coordinated manner for different objectives under normal and emergency conditions*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:

D-5.5.2 Overload elimination/reduction

The Purpose of *Overload elimination/reduction* ***function is similar to function*** ***(D-5.5) DA system optimally controls volt/var by changing the states of voltage controllers, shunts, and distributed***

***resources in a coordinated manner for different objectives under normal and emergency conditions* above.**

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:

D-5.5.3 Load management

The Purpose of** Load management **function
is similar to function** (D-5.5) DA system optimally controls volt/var by changing the states of voltage controllers, shunts, and distributed resources in a coordinated manner for different objectives under normal and emergency conditions **above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:

D-5.5.4 Transmission operation support in accordance with T&D contracts

The Purpose of** Transmission operation support in accordance with T&D contracts **function
is similar to function** (D-5.5) DA system optimally controls volt/var by changing the states of voltage controllers, shunts, and distributed resources in a coordinated manner for different objectives under normal and emergency conditions **above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:

D-5.5.5 Loss minimization in distribution and transmission

The Purpose of *Loss minimization in distribution and transmission* ***function***
is similar to function ***(D-5.5) DA system optimally controls volt/var by changing the states of voltage controllers, shunts, and distributed resources in a coordinated manner for different objectives under normal and emergency conditions*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:

D-6 Real-time emergency operations

The Purpose of *Real-time emergency operations* ***function***
is to provide maximally possible self-healing properties of distribution systems including disaster conditions
directly involving
- Emergency automatic schemes and devices
- More reliable distribution system structures
- Distributed resources
- Distribution automation
- Fast and high capacity communications

performing
- Fast (automatic) location and isolation of faults
- Backup of services
- And automatic or automated service restoration

with key interfaces between
- Substation and feeder relay protection schemes and SCADA/DAS
- SCADA/DAS and DER owners
- Operators and SCADA
- Operators and DER owners
- Operators and TransCo
- Operators and DAS
- Operators and DIsCo operation
- Work management
- Maintenance
- And IT departments
- Operators and field crews
- Operators and customers
- Operators and OMS
- Operators and Maintenance department
- DisCo and customers

OMS and Customer Information System
OMS and SCADA
OMS and AMR system
OMS and call in fault detection system
DAS and OMS
OMS and WMS
OMS and field crews
DisCo and affected customers
DisCo and external warning systems
DAS and SCADA
DisCOs/DAS and TransCOs/EMS
DisCOs/DAS and RTO/ISO/EMS
DisCOs/DAS and MOS
DisCos/DAS and DER owners
DisCos/DAS and major customers
DisCos/DAS and customer representatives (serving entities)
DAS and AM/FM/GIS/CIS databases
SCADA and field IEDs

with communication configuration requirements of

WAN
LAN
Internet
One-to-many
SCADA communications
Mobile
High speed
High capacity
Two-way special media

with quality of service requirements of

High availability
Extremely fast response
Data accuracy
High data frequency
High volume of databases
And high speed of processing high volume data

with security requirements of

High security

with data management requirements of

Management of many large databases and high intensity of real-time data in a synchronized manner with strict time constraints

with constraints of

Legacy paradigm of the utility personnel
Safety requirements

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3***

(highly likely to involve architectural challenges) ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:
The following comments were collected during the team rating review:

Configuration = 3 due to data gathering from multiple sources via different communication systems, interfaces with other real-time databases, integration into transmission
Quality = 3 due to high availability, response, data accuracy, data frequency
Security =3 for prevention of interference due to safety concerns, data
Data Management =3 for timely access, coordination of different databases, time updates without interruption of operations,
Constraints/concerns = 3 due to difficulty to change legacy paradigm of the utility personnel, high performance requirements for the applications and due to the fact that a self-healing distribution system under disastrous conditions is the most challenging function in the power system operations

---

The comments indicate a similar interface (and rating) to a non-existent or mis-labeled function. -- Peter Sanza - 05 Apr 2003

D-6.1 Protection equipment performs system protection actions

The Purpose of *Protection equipment performs system protection actions* ***function***
is to fast detection of disturbances and automatic actions minimizing the damage
directly involving
Relay protection schemes
Automatic load shedding systems
DER separation schemes
Pre-arming applications
performing
Fast disconnection of faulted facilities
Automatic load balancing based on local voltage and frequency measurements
And other fast acting automatic actions based on local measurements and on locally or remotely installed settings and adjustment of the setup of the automatic schemes by DA applications
with key interfaces between
Substation and feeder relay protection schemes and SCADA/DAS/EMS
SCADA/DAS/EMS and DER owners

with communication configuration requirements of

SCADA communications

with quality of service requirements of

Availability
Response
Accuracy
Frequency

with security requirements of

Prevention of interference
Authorized access

with data management requirements of

Timely access

with constraints of

New applications for pre-arming and intelligence of the local devices

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:
The following comments were collected during the team rating review:

Configuration = 3 due to data gathering from multiple sources via different communication systems, interfaces with other real-time databases, integration into transmission

Quality = 3 due to high availability, response, data accuracy, data frequency

Security =3 for prevention of interference due to safety concerns, data

Data Management =3 for timely access, coordination of different databases, time updates without interruption of operations,

Constraints/concerns = 3 due to difficulty to change legacy paradigm of the utility personnel, high performance requirements for the applications and due to the fact that a self-healing distribution system under disastrous conditions is the most challenging function in the power system operations

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D-6.1.1 Fault detection, clearing, and reclosing

The Purpose of *Fault detection, clearing, and reclosing* ***function is similar to function*** ***(D-6.1) Protection equipment performs system protection actions*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3***

(highly likely to involve architectural challenges) ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:

D-6.1.2 Under-frequency load-shedding

The Purpose of *Under-frequency load-shedding* ***function is similar to function*** ***(D-6.1) Protection equipment performs system protection actions*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:

D-6.1.3 Under-voltage load-shedding

The Purpose of *Under-voltage load-shedding* ***function is similar to function*** ***(D-6.1) Protection equipment performs system protection actions*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:

D-6.2 Operators manage multiple emergency alarms

The Purpose of *Operators manage multiple emergency alarms* ***function is to***

Timely detect the disturbance
Prioritize the events

directly involving

SCADA
DA applications

performing

Intelligent alarm processing
Reporting
Acknowledgement

with key interfaces between

Operators and SCADA
Operators and field IEDs
Operators and DER owners
Operators and TransCo
Operators and DAS

with communication configuration requirements of

SCADA communications
WAN

with quality of service requirements of

Availability
Response
Accuracy
Frequency

with security requirements of

Prevention of interference
Authorized access

with data management requirements of

Timely access

with constraints of

New applications for intelligent and fast alarm processing

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	2.0	2.0

COMMENTS:
The following comments were collected during the team rating review:

Configuration = 2 due to data gathering from multiple sources via different communication systems
Quality = 2 due to high availability
Response
Data accuracy
Data frequency
Security =2 for prevention of interference
Data Management =2 for timely access
Constraints/concerns = 2 due high performance requirements for the applications

D-6.2.1 Intelligent alarm processing by SCADA system

The Purpose of *Intelligent alarm processing by SCADA system* ***function is similar to function*** ***(D-6.2) Operators manage multiple emergency alarms*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	2.0	2.0

COMMENTS:

D-6.3 SCADA system performs disturbance monitoring

The Purpose of *SCADA system performs disturbance monitoring* ***function is to***

Recording and analysis of the performance of distribution system and its components during contingencies

Providing reliable and accurate data storage and analysis

directly involving

SCADA

DA applications

performing

Event recording

Disturbance analysis

with key interfaces between

SCADA and field IEDs

DAS and SCADA

with communication configuration requirements of

SCADA communications

with quality of service requirements of

Response

Accuracy

with security requirements of

Prevention of interference

Authorized access

with data management requirements of

Timely access

with constraints of

New applications

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3***

(highly likely to involve architectural challenges) ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	2.0	2.0

COMMENTS:
The following comments were collected during the team rating review:

Configuration = 2 due to data gathering from multiple IEDs within short time frame
Quality = 2 due to high availability
Response
Data accuracy
Security =2 for prevention of interference
Data Management =2 for timely access
Constraints/concerns = 2 due high performance requirements for the applications

---

D-6.3.1 Fault current recording

The Purpose of *Fault current recording* ***function is similar to function*** ***(D-6.3) SCADA system performs disturbance monitoring*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	2.0	2.0

COMMENTS:

D-6.3.2 Fault location

The Purpose of *Fault location* ***function is similar to function*** ***(D-6.3) SCADA system performs disturbance monitoring*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	2.0	2.0

COMMENTS:

D-6.3.3 Event recording

The Purpose of *Event recording* ***function***
is similar to function ***(D-6.3) SCADA system performs disturbance monitoring*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	2.0	2.0

COMMENTS:

D-6.4 Operators dispatch field crews to troubleshoot system and customer power problems

The Purpose of *Operators dispatch field crews to troubleshoot system and customer power problems* ***function***
is to rapidly restore normal operating conditions
directly involving
DisCo operators
Field crews
Customers
performing
Issuing working orders
Working permits
Monitoring progress of work
with key interfaces between
Operators and DIsCo operation
Work management
Maintenance
And IT departments
Operators and field crews
Operators and customers
with communication configuration requirements of
SCADA
Mobile communications
Internet
with quality of service requirements of
Data accuracy
Data frequency during the major event
with security requirements of
Authentication

Prevention of interference
with data management requirements of
Timely access
with constraints of
Mobile computing

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	2.0	2.0

COMMENTS:
The following comments were collected during the team rating review:

Configuration = 2 due to data transferring over multiple links within short time frame
Quality = 2 due to high availability
Response
Data accuracy
Security =2 for prevention of interference
Data Management =2 for timely access
Constraints/concerns = 2 due high performance requirements for the mobile computing applications

---

D-6.4.1 Mobile radio system

The Purpose of *Mobile radio system* ***function is similar to function*** ***(D-6.4) Operators dispatch field crews to troubleshoot system and customer power problems*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	2.0	2.0

COMMENTS:

D-6.4.2 Mobile computing

The Purpose of *Mobile computing* ***function is similar to function*** ***(D-6.4) Operators dispatch field crews to troubleshoot system and customer power problems*** ***above.***

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	2.0	2.0

COMMENTS:

D-6.5 Operators perform emergency switching operations

***The Purpose of** Operators perform emergency switching operations*
function
is to rapidly restore normal operating conditions
directly involving
- SCADA
- DA applications
- Field crews information
- DER information
- Major customers' information

performing
- Analysis of emergency situation
- Creation of switching orders providing safety under rapidly changing operating conditions

with key interfaces between
- Operators and DIsCo operation
- Work management
- Maintenance
- And IT departments
- Operators and SCADA
- Operators and OMS
- Operators and field crews
- Operators and customers

with communication configuration requirements of
- LAN
- Mobile
- Internet

with quality of service requirements of
- Availability
- Response
- Accuracy
- Frequency during major events

with security requirements of
- Prevention of interference
- Authorized access

with data management requirements of
- Timely access to real-time and OMS databases

with constraints of

New applications

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:

The following comments were collected during the team rating review:

Configuration = 3 due to data gathering from multiple sources via different communication systems
Interfaces with other real-time databases
Quality = 3 due to high availability
Response
Data accuracy
Data frequency during limited time-frame
Security =3 for prevention of interference due to safety concerns
Data integrity
Data Management =3 for timely access
Coordination of different databases
Timely updates without interruption of operations
Constraints/concerns = 3 due to high performance requirements for the applications and due to the fact, that a self-healing distribution system under disastrous conditions is the most challenging function in the power system operations

---

D-6.6 Operators performs intrusive load management activities

The Purpose of *Operators performs intrusive load management activities*
function
is to balance load with available supply under severe emergency conditions
directly involving

DisCo operators
Customers
DA applications

performing

Direct load control
Load curtailment
Load interruption
Load shedding
Emergency volt/var control

with key interfaces between

Operators and customer
Operators and field crews
Operators and SCADA
Operators and DAS

with communication configuration requirements of

LAN
One-to-many
Mobile
SCADA

with quality of service requirements of

Availability

with security requirements of

Limited disclosure

with data management requirements of

Timely access

with constraints of

New applications

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	1.0	1.0	2.0	1.4

COMMENTS:
The following comments were collected during the team rating review:

Configuration = 2 due to data transferring over multiple links within short time frame
Constraints/concerns = 2 due high performance requirements for the applications

---

D-6.6.1 Operators or planners identify critical loads (hospitals, etc.) ahead of time

The Purpose of *Operators or planners identify critical loads (hospitals, etc.) ahead of time* ***function is similar to function*** ***(D-6.6) Operators performs intrusive load management activities*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average

2.0	1.0	1.0	1.0	2.0	1.4

COMMENTS:

D-6.6.2 DA system locks out load shedding of critical loads

The Purpose of *DA system locks out load shedding of critical loads* ***function***
is similar to function ***(D-6.6) Operators performs intrusive load management activities*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	1.0	1.0	2.0	1.4

COMMENTS:

D-6.6.3 Operator activates direct load control

The Purpose of *Operator activates direct load control* ***function***
is similar to function ***(D-6.6) Operators performs intrusive load management activities*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	1.0	1.0	2.0	1.4

COMMENTS:

D-6.6.4 Operator activates load curtailment

The Purpose of *Operator activates load curtailment* ***function***
is similar to function ***(D-6.6) Operators performs intrusive load management activities*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	1.0	1.0	2.0	1.4

COMMENTS:

D-6.6.5 Operator applies load interruption

The Purpose of *Operator applies load interruption* ***function is similar to function*** ***(D-6.6) Operators performs intrusive load management activities*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	1.0	1.0	2.0	1.4

COMMENTS:

D-6.6.6 Operators enables emergency load reduction via volt/var control

The Purpose of *Operators enables emergency load reduction via volt/var control* ***function is similar to function*** ***(D-6.6) Operators performs intrusive load management activities*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	1.0	1.0	2.0	1.4

COMMENTS:

D-6.6.7 Operator applies manual rolling blackouts

The Purpose of *Operator applies manual rolling blackouts* ***function is similar to function*** ***(D-6.6) Operators performs intrusive load management activities*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	1.0	1.0	2.0	1.4

COMMENTS:

D-6.7 Operator enables emergency (major event) mode of operations of operation and maintenance personnel, and enables major event emergency mode of operation of DA applications

The Purpose of *Operator enables emergency (major event) mode of operations of operation and maintenance personnel, and enables major event emergency mode of operation of DA applications* ***function is to*** prepare the personnel and automated system for actions under severe emergency conditions

directly involving

DisCo operation and maintenance personnel
DA applications

performing

Announcements of expected conditions
Guidelines to be used
Changes of the setup of DA applications

with key interfaces between

Operators and field crews
Operators and maintenance department
Operators and DAS

with communication configuration requirements of

LAN
One-to-many
Mobile
SCADA

with quality of service requirements of

Availability

with security requirements of

Limited disclosure

with data management requirements of

Low volume

with constraints of

New applications

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	1.0	1.0	2.0	1.4

COMMENTS:
The following comments were collected during the team rating review:

Configuration = 2 due to data transferring over multiple links within short time frame

Constraints/concerns = 2 due high performance requirements for the applications

---

D-6.8 Outage management systems collect trouble calls, generate outage information, arrange work for trouble shooting

The Purpose of *Outage management systems collect trouble calls, generate outage information, arrange work for trouble shooting* ***function is to*** expedite fault location based on customer call in information by using dynamic connectivity models

directly involving

- Troublecall personnel
- OMS
- Operation personnel
- SCADA

performing

- Tracing deeenrgized customer locations to the closest common protective device based on real-time connectivity model supported by SCADA and DMS
- Work management
- Crew dispatching

with key interfaces between

- DisCo and customers
- OMS and Customer Information System
- OMS and SCADA
- OMS and AMR system
- OMS and call in fault detection system
- DAS and OMS
- OMS and WMS
- OMS and field crews

with communication configuration requirements of

- LAN
- Internet
- Telephone systems
- Mobile communications

with quality of service requirements of

- High availability
- Response
- Data frequency
- Data volumes

with security requirements of

- Authentication
- Prevention of interference

with data management requirements of

- Large databases for dynamic support of the connectivity model
- Timely access

with constraints of

New applications for integration of information from different sources:
SCADA
Customers via telephone
Internet
Call in systems
DA applications

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	2.0	2.0	3.0	2.0	2.4

COMMENTS:
The following comments were collected during the team rating review:

Configuration = 3 due to data gathering from multiple sources via different communication systems
Interfaces with other real-time databases
Quality = 2 due to high availability
Response
Data frequency during limited time-frame
Security =2 for prevention of interference due to safety concerns
Data Management =3 for timely access
Coordination of different databases
High volume
Timely updates without interruption of operations
Constraints/concerns = 2 due to high performance requirements for the applications

---

D-6.9 Interactive utility-customer systems inform the customers about the progress of events

The Purpose of *Interactive utility-customer systems inform the customers about the progress of events* ***function***
is to timely updating the customers about the progress of their service restoration
directly involving
Interactive communication systems between DisCO and customers
performing
Automated messaging based on service restoration progress and association of the customers' communication nodes with the faulted area
with key interfaces between

DisCo and affected customers

with communication configuration requirements of

Telephone systems

Internet

with quality of service requirements of

Availability

Response

Data volume

Data frequency (several times per hour)

with security requirements of

Authentication

Access

with data management requirements of

Large databases for dynamic support of the association model

Timely access

with constraints of

New application

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	2.0	2.0	2.0	2.0	2.2

COMMENTS:

The following comments were collected during the team rating review:

Configuration = 3 due to data gathering from multiple sources and data transmittals via different communication systems

Quality = 2 due to high availability

Response

Data frequency during limited time-frame

Security =2 authentication

Data Management =2 for timely access

High volume

Timely updates

Constraints/concerns = 2 due to new applications

The rating for Configuration does not match the comment. -- Peter Sanza - 05 Apr 2003

D-6.10 DA performs in major event emergency mode

The Purpose of *DA performs in major event emergency mode* ***function is to***

Automate data preparation

Optimal decision making
And control of distribution operations in a coordinated with other power systems manner under conditions of major events with more challenging safety and timing requirements

directly involving

High speed communication systems
Local and centralized automatic/automated systems
DAS applications

performing

Pre-arming of the automatic/automated systems for the operations under major event conditions and fast acting fault location
Isolation
Service restoration
Feeder reconfiguration
Volt and var control
And operation analysis

with key interfaces between

DisCo and external warning systems
DAS and SCADA
DisCOs/DAS and TransCOs/EMS
DisCOs/DAS and RTO/ISO/EMS
DisCOs/DAS and MOS
DisCOs/DAS and DER owners
DisCos/DAS and major customers
DisCos/DAS and customer representatives (serving entities)
DAS and OMS
DAS and AM/FM/GIS/CIS databases
Real-time databases and work management databases

with communication configuration requirements of

WAN
LAN
Internet
One-to-many
SCADA communications
Mobile
High speed
High capacity
Two-way special media

with quality of service requirements of

High availability
Extremely fast response
Data accuracy
High data frequency
High volume of databases
And high speed of processing high volume data

with security requirements of

High security

with data management requirements of

Management of many large databases and high intensity of real-time data in a synchronized manner with strict time constraints

with constraints of

Legacy paradigm of the utility personnel

Safety requirements

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	3.0	3.0	3.0

COMMENTS:

The following comments were collected during the team rating review:

Configuration = 3 due to data gathering from multiple sources via different communication systems, interfaces with other real-time databases, integration into transmission

Quality = 3 due to high availability, response, data accuracy, data frequency

Security =3 for prevention of interference due to safety concerns, data

Data Management =3 for timely access, coordination of different databases, time updates without interruption of operations,

Constraints/concerns = 3 due to difficulty to change legacy paradigm of the utility personnel, high performance requirements for the applications and due to the fact that a self-healing distribution system under disastrous conditions is the most challenging function in the power system operations

---

D-7 Post operations

The Purpose of *Post operations* ***function is to*** recording and analysis of the performance of distribution system and its components providing reliable and accurate data storage and comprehensive analysis

directly involving

All automated systems

Historic databases

Archives

performing

Logging

Archiving

Preparing application performance report

And their analysis
Diagnostic analysis of equipment

with key interfaces between

DAS and SCADA
DAS and other corporate databases
SCADA and historic databases
DAS and historic databases
OMS and historic databases
WMS and historic databases
Historic databases and maintenance personnel
Historic databases and contractors

with communication configuration requirements of

WAN
LAN

with quality of service requirements of

Transferring high volume data between various databases

with security requirements of

Moderate security

with data management requirements of

Easy and timely access to stored data

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	2.0	2.0	1.4

COMMENTS:
The following comments were collected during the team rating review:

Data management = 2 due to volume and high accessibility and retrieval by different departments
Constraints/Concerns =2 due to the new applications for diagnostic analyses

---

D-7.1 All systems create and archive logs and reports

The Purpose of *All systems create and archive logs and reports* ***function is similar to function*** ***(D-7) Post operations*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average

1.0	1.0	1.0	2.0	2.0	1.4

COMMENTS:

D-7.2 System records voice logs of interaction between operators and field crews

The Purpose of *System records voice logs of interaction between operators and field crews* ***function is similar to function*** ***(D-7) Post operations*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	2.0	2.0	1.4

COMMENTS:

D-7.3 All systems transmit reports to key parties

The Purpose of *All systems transmit reports to key parties* ***function is similar to function*** ***(D-7) Post operations*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	2.0	2.0	1.4

COMMENTS:

D-7.4 Maintenance personnel of the automated systems (DAS, OMS, WMS) performs diagnostic analysis of system performance

The Purpose of *Maintenance personnel of the automated systems (DAS, OMS, WMS) performs diagnostic analysis of system performance* ***function is to***

Timely determine system performance problems and fix them
Learn about additional functional requirements for the systems

directly involving

System maintenance personnel
Maintenance contractors
System performance reports

performing

Regular and by-event report analyses

Generation of statistics
Evaluation of the system performance
Recommendations for improvement

with key interfaces between

SCADA and historic databases
DAS and historic databases
OMS and historic databases
WMS and historic databases
Historic databases and maintenance personnel
Historic databases and contractors

with communication configuration requirements of

WAN
LAN
Internet
Other remote-access communication systems

with quality of service requirements of

Data volumes
Frequency several times per day

with security requirements of

Authentication
Authorized access

with data management requirements of

Large logs and reports

with constraints of

Easy search of relevant data

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	1.0	1.0	1.0

COMMENTS:

D-7.5 Diagnostic analysis based on real-time equipment monitoring data, e.g. using predictive models to determine when the equipment needs maintenance

The Purpose of *Diagnostic analysis based on real-time equipment monitoring data, e.g. using predictive models to determine when the equipment needs maintenance* ***function***
is to perform diagnostic-based maintenance instead of time-based in order to enhance the reliability of service and to extend the lifetime of the equipment
directly involving

SCADA

local monitoring and/or diagnostic systems (

g, for power transformers)
applications for predictive assessment of the state of equipment
performing
Event recording uploading
Analysis
And predictive assessment modeling
with key interfaces between
SCADA and historic databases
DAS and historic databases
OMS and historic databases
WMS and historic databases
Historic databases and maintenance personnel
Historic databases and contractors
with communication configuration requirements of
WAN
LAN
Mobile
SCADA communications
Internet
with quality of service requirements of
Frequency several times per day
with security requirements of
Authorized access
with data management requirements of
Small to average volumes
with constraints of
New applications for predictive assessment

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	1.0	2.0	1.2

COMMENTS:
The following comments were collected during the team rating review:

Constraints/Concerns = 2 due to new applications for predictive assessment

---

D-8 Power system equipment maintenance

The Purpose of *Power system equipment maintenance* ***function is to*** provide reliable and quality power to the customers in the most efficient way based on reliable performance of distribution facilities

within their nominal or extended life expectancy
directly involving
Maintenance departments
Utility and contracted personnel
performing
Time and condition-based maintenance
with key interfaces between
DAS and SCADA (diagnostics)
DisCOs and TransCOs
DisCOs and RTO/ISO
DisCOs and MOS
DisCos/DAS and DER owners
DisCos and major customers
DisCos and customer representatives (serving entities)
DAS and OMS
DAS and AM/FM/GIS/CIS databases
Real-time databases and work management databases
AM/FM/GIS/CIS databases and work management databases
Maintenance field crews and DISCo databases
WMS and maintenance personnel
with communication configuration requirements of
WAN
LAN
Internet
One-to-many
Mobile
Special media
Site with limited access
with quality of service requirements of
Low volume data
High availability
Low frequency
with security requirements of
High security
with data management requirements of
Timely access

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	2.0	1.0	2.0	1.6

COMMENTS:
The following comments were collected during the team rating review:

Configuration =2 due to mobile computing
Security =2 due to authentication
Constraints/concerns =2 due to mobile computing
Incremental updates of the databases and consistency checking

D-8.1 Maintenance staff maintain distribution equipment and lines

The Purpose of *Maintenance staff maintain distribution equipment and lines* ***function***

is to provide reliable and quality power to the customers in the most efficient way based on reliable performance of distribution facilities within their nominal or extended life expectancy

directly involving

Maintenance departments
Utility and contracted personnel

performing

Time and condition-based maintenance

with key interfaces between

DAS and SCADA (diagnostics)
DisCOs and TransCOs
DisCOs and RTO/ISO
DisCOs and MOS
DisCos/DAS and DER owners
DisCos and major customers
DisCos and customer representatives (serving entities)
DAS and OMS
DAS and AM/FM/GIS/CIS databases
Real-time databases and work management databases
AM/FM/GIS/CIS databases and work management databases

with communication configuration requirements of

WAN
LAN
Internet
One-to-many
Mobile
Special media
Site with limited access

with quality of service requirements of

Low volume data
High availability
Low frequency

with security requirements of

Authentication

with data management requirements of

Timely access

with constraints of
0

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	2.0	1.0	1.0	1.4

COMMENTS:
The following comments were collected during the team rating review:

Configuration =2 due to mobile computing
Security =2 due to authentication

D-8.1.1 Maintenance staff analyzes equipment diagnostic results, compares it with the predictive models

The Purpose of *Maintenance staff analyzes equipment diagnostic results, compares it with the predictive models* ***function is similar to function*** ***(D-8.1) Maintenance staff maintain distribution equipment and lines*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	2.0	1.0	1.0	1.4

COMMENTS:

D-8.1.2 Maintenance staff prepares outage requests based on time and condition criteria

The Purpose of *Maintenance staff prepares outage requests based on time and condition criteria* ***function is similar to function*** ***(D-8.1) Maintenance staff maintain distribution equipment and lines*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	2.0	1.0	1.0	1.4

COMMENTS:

D-8.1.3 Operations staff review and approve outage requests

The Purpose of *Operations staff review and approve outage requests* ***function***
is similar to function ***(D-8.1) Maintenance staff maintain distribution equipment and lines*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	2.0	1.0	1.0	1.4

COMMENTS:

D-8.1.4 Maintenance staff identifies assets and work crew requirements

The Purpose of *Maintenance staff identifies assets and work crew requirements* ***function***
is similar to function ***(D-8.1) Maintenance staff maintain distribution equipment and lines*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	2.0	1.0	1.0	1.4

COMMENTS:

D-8.1.5 Work crew carries out maintenance, coordinating with operators for switching

The Purpose of *Work crew carries out maintenance, coordinating with operators for switching* ***function***
is similar to function ***(D-8.1) Maintenance staff maintain distribution equipment and lines*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	2.0	1.0	1.0	1.4

COMMENTS:

D-8.2 Maintenance staff provides information for updating relevant databases

The Purpose of *Maintenance staff provides information for updating relevant databases* ***function***
is to timely and accurately update relevant databases in accord with the changes implemented by the maintenance activity and verify the correctness of the data existing in the databases
directly involving
- Maintenance personnel
- IT personnel
- WMS
- Corporate databases

performing
- Preparation of forms for the maintenance personnel by the work management personnel (system)
- Completion of prepared forms by the maintenance personnel based on changes made and parameters observed
- Transmission of the forms to the relevant IT interfaces (AM/FM/GIS/Asset management system (AMS))

with key interfaces between
- Maintenance field crews and DISCo databases
- WMS and maintenance personnel

with communication configuration requirements of
- WAN
- LAN
- Mobile communications
- Internet

with quality of service requirements of
- Data accuracy
- Data frequency during the major event

with security requirements of
- Authentication

with data management requirements of
- Low volume

with constraints of
- Incremental update of databases and consistency checking

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	1.0	1.0	2.0	1.4

COMMENTS:
The following comments were collected during the team rating review:

Configuration = 2 due to mobile communications
Constraints/concerns =2 due to mobile computing
Incremental updates of the databases and consistency checking

---

D-8.2.1 Work crew logs activities and results of tests

The Purpose of *Work crew logs activities and results of tests* ***function is similar to function*** ***(D-8.2) Maintenance staff provides information for updating relevant databases*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	1.0	1.0	2.0	1.4

COMMENTS:

D-8.2.2 Work crew identifies assets removed and/or installed

The Purpose of *Work crew identifies assets removed and/or installed* ***function***
is similar to function ***(D-8.2) Maintenance staff provides information for updating relevant databases*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	1.0	1.0	2.0	1.4

COMMENTS:

D-8.2.3 Maintenance staff identifies errors in documentation and maps

The Purpose of *Maintenance staff identifies errors in documentation and maps* ***function***
is similar to function ***(D-8.2) Maintenance staff provides information for updating relevant databases*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3***

(highly likely to involve architectural challenges) ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	1.0	1.0	2.0	1.4

COMMENTS:

D-8.2.4 Maintenance staff identifies marks up documentation ("red/green")

The Purpose of *Maintenance staff identifies marks up documentation ("red/green")* ***function***
is similar to function ***(D-8.2) Maintenance staff provides information for updating relevant databases*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	1.0	1.0	2.0	1.4

COMMENTS:

D-8.2.5 Maintenance staff indicates permanent versus temporary changes

The Purpose of *Maintenance staff indicates permanent versus temporary changes* ***function***
is similar to function ***(D-8.2) Maintenance staff provides information for updating relevant databases*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	1.0	1.0	2.0	1.4

COMMENTS:

D-9 Engineering

The Purpose of *Engineering* ***function***
is to provide reliability and power quality based modern distribution facility designs
directly involving

Distribution facility design standards
Manufacturers' information

Upgrade and new construction requirements

performing

Field inspections
Equipment specifications
Automated design
Relevant database updates (AM/FM/GIS/AMS)
Cost optimization

with key interfaces between

Engineering and other DisCo departments
DisCo and equipment manufacturers
DisCo and contractors
DisCo and builders

with communication configuration requirements of

WAN
LAN
Internet

with quality of service requirements of

High data accuracy and completeness (provide all necessary information for engineering)

with security requirements of

Moderate security

with data management requirements of

Moderate information support with transmittal of drawings

with constraints of

May need a change of legacy approach

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	1.0	1.0	1.0

COMMENTS:

D-9.1 Engineering personnel perform distribution system engineering

The Purpose of *Engineering personnel perform distribution system engineering* ***function is similar to function*** ***(D-9) Engineering above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	1.0	1.0	1.0

COMMENTS:

D-9.2 Engineering personnel specifies distribution power and control equipment

The Purpose of *Engineering personnel specifies distribution power and control equipment* ***function***
is similar to function ***(D-9) Engineering*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	0.0	0.0	0.0	0.0

COMMENTS:

D-9.3 Engineering personnel provides information for updating relevant databases

The Purpose of *Engineering personnel provides information for updating relevant databases* ***function***
is similar to function ***(D-9) Engineering*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	1.0	1.0	1.0

COMMENTS:

D-10 Construction management

The Purpose of *Construction management* ***function***
is to timely upgrade the distribution system
directly involving
Construction department and contractors
Major customers
performing
Management and construction work
with key interfaces between
DisCO and contractor
DisCo and customers
with communication configuration requirements of
LAN
WAN

Internet
Mobile

with quality of service requirements of

High data accuracy

with security requirements of

Moderate security

with data management requirements of

Moderate information support with transmittal of drawings

with constraints of

May need a change of legacy approach

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	2.0	1.0	1.2

COMMENTS:

The following comments were collected during the team rating review:

Data Management = 2 due to interfacing with asset management database

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Does the comment regarding asset management correspond to the rating of 2 for Data Management ? -- Peter Sanza - 05 Apr 2003

D-10.1 Construction managers manage assets purchases

The Purpose of *Construction managers manage assets purchases* ***function is similar to function*** ***(D-10) Construction management*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	2.0	1.0	1.2

COMMENTS:

D-10.2 Construction managers plan construction projects

The Purpose of *Construction managers plan construction projects* ***function is similar to function*** ***(D-10) Construction management*** ***above.***

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	2.0	1.0	1.2

COMMENTS:

D-10.3 Construction managers manage crew assignments

The Purpose of** Construction managers manage crew assignments **function
is similar to function [(D-10) Construction management] above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	2.0	1.0	1.2

COMMENTS:

D-10.4 Construction personnel provides information for relevant databases

The Purpose of** Construction personnel provides information for relevant databases **function
is similar to function [(D-10) Construction management] above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	2.0	1.0	1.2

COMMENTS:

D-11 Power Quality Management

The Purpose of** Power Quality Management **function
is to

Evaluate actual power quality
Determine the sources of power quality disturbances
Provide customers with power quality needed (custom power)
Coordinate power quality with customer systems
Provide power quality reports and real time information to customers

Manage power quality in real time
Provide information for managing long term power quality

directly involving

Distribution operations
Planning
Monitoring systems
Modeling and simulation systems
Power conditioning equipment
Controlling equipment

performing

Field monitoring
Real-time modeling
Analysis and optimization of power quality
Predictive modeling
Analysis and optimization studies
Power quality focused control of distribution operations
Reporting to the customers about the utility performance
Managing power quality through interfacing customer equipment
Populating relevant databases (monitoring information
Distribution system information
Customer system information
Asset management information)

with key interfaces between

DisCo and customers
DAS and OMS
A variety of different types of permanently installed monitoring equipment and DisCo databases
A variety of different types of temporary installed monitoring equipment and DisCo databases
Multi-functional AMR and DisCo databases
Call in devices and DisCo databases
DAS and PQ databases
PQ management system and various corporate and real-time databases
DisCO and individual customers
DisCo and WEB servers
Lighting system and PQ database
Weather system and PQ database
SCADA and PQ database
PQ management systems and PQ database
Between different utility departments
PQ management systems and TransCo
PQ management systems and SCADA
PQ management systems and DAS
PQ management systems and equipment diagnostic systems
PQ and other corporate databases

with communication configuration requirements of

WAN

LAN

One-to-many

Mobile

Special media

Internet

Customer communication systems

with quality of service requirements of

High data accuracy

High data volumes

with security requirements of

Moderate security

with data management requirements of

Large databases

Comprehensive modeling

Sophisticated optimization procedures

with constraints of

Challenge of coordinating directly with customer systems

Challenge of optimizing system performance in the real time based on customer priorities and conditions

New systems without significant precedent

Large databases and computation requirements

Interfaces between real time databases and system model databases

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	2.0	2.0	3.0	2.4

COMMENTS:

The following comments were collected during the team rating review:

Configuration =2 due to variety of data sources and communication systems

Service quality =3 due to high volume data (1-5 MB/day), high data accuracy, high frequency of data transfers, high availability, time sensitive data Security =2 due to privacy policies for PQ data exchange with individual customers Data management =2 due to large databases, comprehensive modeling, sophisticated optimization procedures Constraints/Concerns =3 due to difficult-to-change legacy, challenges of new applications and systems (

new conditioning equipment coordinated with DRs, PQ state estimation) of data integration and recovery in case of loss of original

(data deleted from most PQ meters after read so transfer error results in data loss - can't read again to recover like a SCADA point misread)

D-11.1 Utility measures power quality parameters, transmits them to central location, processes data, and stores data in PQ database in real time

The Purpose of *Utility measures power quality parameters, transmits them to central location, processes data, and stores data in PQ database in real time* ***function***

is to collect and manage power quality monitoring information for entire system

directly involving

Monitoring system equipment

Distribution automation systems (DAS)

PQ

CIS and other corporate databases

performing

Monitoring

Transmitting

Processing

And storing PQ data

with key interfaces between

A variety of different types of permanently installed monitoring equipment and DisCo databases

A variety of different types of temporary installed monitoring equipment and DisCo databases

Multi-functional AMR and DisCo databases

Call in devices and DisCo databases

DAS and PQ databases

with communication configuration requirements of

WAN

LAN

Internet

Mobile

Special media

Telephone systems

Customer communication systems

with quality of service requirements of

High data accuracy

Real time data collection

High data volume

with security requirements of

Limited disclosure

with data management requirements of

Large databases

with constraints of

Diversity of data structures

Existing infrastructures and databases for separate monitoring systems must be incorporated into a common system for overall data collection and database management

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	1.0	2.0	2.0	2.0

COMMENTS:

The following comments were collected during the team rating review:

Configuration =2 due to variety of data sources and communication systems

Service quality =3 due to high volume data (1-5 MB/day)

High data accuracy

High frequency of data transfers

High availability

Time sensitive data

Data management =2 due to large databases

Comprehensive modeling

Sophisticated optimization procedures

Constraints/Concerns =2 due to challenges of data integration and recovery in case of loss of original measurements

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D-11.2 Real time power quality state estimation system calculates power quality characteristics based on limited monitoring information from substations, distribution systems, and customer systems and models (pseudo-measurements) supplementing to the needed redundancy

The Purpose of *Real time power quality state estimation system calculates power quality characteristics based on limited monitoring information from substations, distribution systems, and customer systems and models (pseudo-measurements) supplementing to the needed redundancy* ***function is to***

In addition to the DA applications

Expands the value of power quality monitoring (especially for higher harmonics and rapid transient processes) by calculating the power

quality levels throughout the system using a combination of limited monitoring information and models of the electrical system

Providing reasonable estimates of the power quality characteristics and relationships

directly involving

Real time monitoring systems

PQ databases

Real time database of system electrical characteristics

Modeling and optimization algorithms

performing

State-estimation like procedures based on simulation and optimization algorithms

with key interfaces between

PQ management system and various corporate and real-time databases

with communication configuration requirements of

WAN

LAN

Internet

Mobile

Special media

Telephone systems

Customer communication systems

with quality of service requirements of

High data accuracy

Real time data collection

High data volume

with security requirements of

Limited disclosure

with data management requirements of

Large databases of monitoring data combined with databases describing system electrical system configuration and characteristics

with constraints of

System models incorporate a wide variety of components (GIS

Load characteristic models

Including higher frequencies component

Short circuit models

Load flow models

Including for higher harmonics

Equipment databases), that must be combined for real time state estimation

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3***

(highly likely to involve architectural challenges) ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	1.0	2.0	3.0	2.2

COMMENTS:
The following comments were collected during the team rating review:

Configuration =2 due to variety of data sources and communication systems
Service quality =3 due to high volume data (1-5 MB/day), high data accuracy, high frequency of data transfers, high availability, time sensitive data Data management =2 due to large databases, comprehensive modeling, sophisticated optimization procedures Constraints/Concerns =3 due to difficult-to-change legacy, challenges of new applications and systems (
new conditioning equipment coordinated with DRs, PQ state estimation)

D-11.3 Utility exposes historical and real-time power quality data to customers

The Purpose of *Utility exposes historical and real-time power quality data to customers* ***function***
is to provide real time and statistic PQ Information to customers
directly involving
PQ databases
Communication systems
Customers
performing
Selection of customer-customized data of power quality following privacy policies and preparation of general performance characteristics for all customers of the utility
with key interfaces between
DisCO and individual customers
DisCo and WEB servers
with communication configuration requirements of
LAN
Internet
Telephone systems
with quality of service requirements of
Real time access to the PQ monitoring database
Data accuracy
Data volumes
with security requirements of

Authentication and security for customers to access their own PQ data

with data management requirements of

Individual customer based

with constraints of

Legacy reluctance of the utilities to provide access to this type of database information

New applications

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	2.0	1.0	2.0	1.6

COMMENTS:

The following comments were collected during the team rating review:

Service quality = 2 due to high volume data

High data accuracy

High frequency of data transfers

High availability

Time sensitive data

Security =2 due to privacy policies for PQ data exchange with individual customers

Constraints/Concerns =2 due to difficult-to-change legacy

Challenges of new applications

D-11.4 Utility correlates data from utility operations database, lightning database, and other operations related database with PQ event database and generates reports and/or stores analysis results for future reporting

The Purpose of *Utility correlates data from utility operations database, lightning database, and other operations related database with PQ event database and generates reports and/or stores analysis results for future reporting* ***function***

is to automatically identify cause and possible impacts for different disturbances and conditions on PQ

directly involving

Weather systems

Lighting systems

SCADA disturbance monitoring system

SOE systems

Event recorders

PQ monitoring systems and database

performing

Correlation of disturbances with power quality characteristics

with key interfaces between

Lighting system and PQ database

Weather system and PQ database

SCADA and PQ database

PQ management systems and PQ database

with communication configuration requirements of

WAN

LAN

Internet

Mobile

Special media

Telephone systems

Customer communication systems

with quality of service requirements of

Timely availability

Data volumes during major events

Data frequency during limited time

with security requirements of

Low level

with data management requirements of

Coordination of data according relevant associations

with constraints of

Different multiple systems and access requirements

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	1.0	2.0	2.0	2.0

COMMENTS:

The following comments were collected during the team rating review:

Configuration =2 due to variety of data sources and communication systems

Service quality =3 due to high volume data

High frequency of data transfers

High availability

Time-synchronization sensitive data

Data management =2 due to large databases and data coordination

Constraints/Concerns =2 due to challenges of data integration from different systems

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D-11.5 The utility PQ evaluation system analyzes PQ events, trends, and profiles of power quality levels of the supply system against planning limits and operation objectives. The system is used to generate recommendations and priorities for system improvements

The Purpose of *The utility PQ evaluation system analyzes PQ events, trends, and profiles of power quality levels of the supply system against planning limits and operation objectives. The system is used to generate recommendations and priorities for system improvements* ***function is to*** provide power quality performance reports for use in distribution planning and asset management

directly involving

Distribution planning
Asset management
And maintenance personnel

performing

Performance reports focused on prioritizing system improvements, that can improve power quality levels

with key interfaces between

Between different utility departments

with communication configuration requirements of

LAN
Internet

with quality of service requirements of

Availability of access to power quality monitoring database along with functions to evaluate effect of system improvements on expected power quality levels in the future

with security requirements of

Low level

with data management requirements of

Several databases

with constraints of

Difficult to change legacy approach (power quality has generally not been considered in the past for prioritizing maintenance and system improvements)

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	1.0	1.0	1.0

COMMENTS:

D-11.6 The power quality management system analyzes PQ events and profiles to identify causes of PQ problems and possible equipment problems that could be corrected. Detailed recommendations are developed and automatic responses are implemented where possible

The Purpose of *The power quality management system analyzes PQ events and profiles to identify causes of PQ problems and possible equipment problems that could be corrected. Detailed recommendations are developed and automatic responses are implemented where possible*

function

is to

automatically identify possible equipment problems and operational problems based on power quality event characteristics (breaker problems, arrester problems, transformer problems, capacitor problems, cable insulation problems, line problems such as lines slapping together, regulator problems)

directly involving

Distribution operations systems
Asset management systems
Power quality monitoring database
Equipment diagnostic systems and databases

performing

Analysis and reporting of possible equipment problems
Recommendations for DA system to implement remedial measures where possible

with key interfaces between

PQ management systems and TransCo
PQ management systems and SCADA
PQ management systems and DAS
PQ management systems and PQ databases
PQ management systems and equipment diagnostic systems

with communication configuration requirements of

WAN
LAN
SCADA communications

with quality of service requirements of

Real time availability of monitoring data and equipment status information for evaluation in expert systems and timely identification of possible problems

with security requirements of

Low level

with data management requirements of

Several databases (monitoring database
Equipment databases
Expert systems)

Timely access

with constraints of

Configuration of expert systems to identify equipment problems requires extensive monitoring and correlation of problems with actual events

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	1.0	1.0	1.0

COMMENTS:

D-11.7 The power quality information is evaluated with respect to specific customer requirements on the specific system. Coordination with equipment and power conditioning equipment within customer facilities is implemented to improve productivity and reliability of customer systems. (See description in Customer Services Domain)

The Purpose of *The power quality information is evaluated with respect to specific customer requirements on the specific system. Coordination with equipment and power conditioning equipment within customer facilities is implemented to improve productivity and reliability of customer systems. (See description in Customer Services Domain)* ***function***
is similar to function ***(D-11) Power Quality Management*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	2.0	2.0	3.0	2.4

COMMENTS:

D-11.8 Utility accesses PQ database and generates bill/refund/penalty statement for events that exceed contract limits. (see description in the Customer Services Domain)

The Purpose of *Utility accesses PQ database and generates bill/refund/penalty statement for events that exceed contract limits. (see description in the Customer Services Domain)* ***function***
is similar to function ***(D-11) Power Quality Management*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3***

(highly likely to involve architectural challenges) ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	2.0	2.0	3.0	2.4

COMMENTS:

D-11.9 Utility generates various reports from PQ database for operation, management, engineering, and customer consumption via e-mail and web interfaces

The Purpose of *Utility generates various reports from PQ database for operation, management, engineering, and customer consumption via e-mail and web interfaces* ***function***
is to reporting on power quality conditions and causes/effects
directly involving
Management
Distribution planning
Distribution operations
Marketing
Customers
performing
Summary analyses of large databases of information in useful forms for decision making and assessment and preparation of reports of power quality conditions for use in assessing system performance
Power quality impacts
Economic impacts
And improvement alternatives
with key interfaces between
PQ and other corporate databases
with communication configuration requirements of
WAN
LAN
Internet
with quality of service requirements of
Availability
with security requirements of
Limited disclosure
with data management requirements of
Using large power quality monitoring databases and integrating results of intelligent analysis systems
State estimation systems
And equipment effect analysis
Etc
with constraints of

Needs of understanding of economic issues associated with PQ parameters, as well, as technical issues

And r importance of impacts of power quality conditions

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	1.0	1.0	1.0

COMMENTS:

D-12 Dispatcher Training Simulator

The Purpose of** Dispatcher Training Simulator **function is to

Provide the distribution operation personnel with a comprehensive training means to analyze a variety of practically possible operating conditions

The individual and coordinated behavior of the distribution automation systems

The interrelationships of different operational parameters

The role of information support of the computing applications

And the user interfaces of the systems in use

directly involving

The operation

Operation planning

DAS maintenance personnel

SCADA

DAS

OMS

WMS

AM/FM systems

performing

"what if" studies of the distribution system operation based either on real-time information or on other base-cases

with key interfaces between

DTS and SCADA/DA

DTS and MOS

DTS and OMS

DTS and AM/FM/GIS/CIS databases

DTS and WMS

DTS and other Utility Departments

with communication configuration requirements of

WAN

LAN
Internet

with quality of service requirements of

Transferring large volumes of data

with security requirements of

Limited disclosure

with data management requirements of

Creating large models combining existing models with hypothetical scenarios without disrupting the operations of the automated systems in production

with constraints of

New sophisticated applications

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	2.0	3.0	1.6

COMMENTS:

The following comments were collected during the team rating review:

Data Management =2 due to combination of data of different time frames

Constraints/Concerns =3 due to the need to develop new sophisticated applications

---

D-13 Distribution Asset Management

The Purpose of *Distribution Asset Management* ***function is to*** store asset information in one centralized database providing access to all relevant parties

directly involving

System planners
Engineers
Operation personnel
Maintenance personnel
Construction personnel
Power quality personnel
IT personnel

performing

Recording of asset data
Up-front consistency checking
Updating records
Adding and cloning new assets

Submitting defaults
Asset tracking
Sorting
Filtering
Finding required information about assets
Identifying trends in asset usage and replacement
Monitoring maintenance periodicity
Contract progress
And life cycles of assets
Alarming and announcement about asset conditions
Generating reports
Providing total and incremental extracts for different users
Output consistency checking
Preparing forms for different input data providers
Etc

with key interfaces between

Asset Management System (AMS) and other utility departments
AMS and DAS
AMS and PQ database
AMS and OMS
AMS and WMS

with communication configuration requirements of

WAN
LAN
Mobile
Internet
One-to-many

with quality of service requirements of

Availability
Data accuracy
Data volumes

with security requirements of

Authentication
Access Control
Information Integrity
Confidentiality

with data management requirements of

Large database
Timely update
Timely access

with constraints of

Difficult-to-change legacy system
New applications

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3***

(highly likely to involve architectural challenges) ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	3.0	3.0	2.4

COMMENTS:
The following comments were collected during the team rating review:

Configuration = 2 due to different communication systems
Quality of service = 2 due to accuracy
Data volumes
Security = 2 due to access control
Confidentiality
Data management= 3 due to large database
Timely update and access
Constraints = 3 due to need of significant changes in existing databases to accommodate new applications

---

M - Market Operations Domain

M-6.1 Handle energy reporting
M-6.2 Meter Data Management Agents (MDMAs) retrieve, validate, and process meter revenue data
M-6.3 Market Products Schedule Checkout
M-6.4 Financial Settlements
M-6.5 Accounting and Billing
M-6.6 Market Monitoring and Auditing

M-1 Long Term Planning (1 year to 5 years)

The Purpose of** Long Term Planning (1 year to 5 years) **function is described below...

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.5	3.0	2.0	1.7

COMMENTS:

---

just a test of the comment box-ivan bel-4/16/2003
-- Ivan BEL - 16 Apr 2003

M-1.1 ISO/RTO: Regional Expansion Planning

The Purpose of** ISO/RTO: Regional Expansion Planning **function is to

develop load and capacity forecast alternatives, by collecting load and capacity forecasts from different market participants inside and outside the region, developing regional and local alternatives of load and capacity, including coordination with customers with special loads and/or generation

Also coordinating transmission system planning submitted by transmission owners, developing future regional power system model alternatives, calculating and publishing future major operational parameters for the expansion alternatives, and developing requirements for system automation

directly involving

RTO/ISO planners
Generation planners
DR planners
Transmission planners
Distribution planners
Regulators
Auditors

Regional planning agencies
Special Customers
NERC
And Market Participants

performing

Regional
Long term load and capacity planning and coordination of other planners within the region
Including long term adequacy and reliability analysis via studies to assist in market decisions

with key interfaces between

RTO/ISO and other RTOs
RTO and Transmission Owners
RTO and Generation Companies
RTO and DisCos
RTO and Special Customers
RTO and Security Coordinating Councils
RTO and NERC
RTO and Regulators
RTO and Auditors
RTO and Planning Agencies
RTO and Government offices

with communication configuration requirements of

All interfaces are one-to-one over WAN to external companies
And LAN within ISO/RTO planning systems
SCADA systems
And other control center databases

with quality of service requirements of

Medium availablity needed since have time to re-send
Medium response times
Medium data accuracy since it will be reviewed over time by many people and systems
Could entail high data volumes but infrequently

with security requirements of

All security requirements are Medium High
Since security breaches could have financial consequences but on the other hand
The data would be checked over a long period of time and security breaches could therefore be detected

with data management requirements of

Many databases are involved across many organizational boundaries; Updates would be infrequent (
monthly)

with constraints of

New applications imply

No other special constraints, since not many legacy systems or small devices involved; primary need is the development of methodologies and application tools which are consistent with evolving market rules

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	3.0	2.0	1.6

COMMENTS:
The following comments were collected during the team rating review:

Data management = 3
Since the function requires data from multiple sources to be synchronized
Checked for reliability
And validated
Constraints = 2
Since new and/or modified applicaitons will be required
And legacy applications will need to be dealt with until they are upgraded

---

Why are Contraints rated 2? -- Peter Sanza - 05 Apr 2003

M-1.2 Transmission owners/distribution utilities: System Planning

The Purpose of** Transmission owners/distribution utilities: System Planning **function
is to

develop transmission and distribution facility plans for the long term, based on load and capacity forecasts, RTO or other regional plans, regulator requirements, neighboring utility requirements, and customer
In addition to facility plans, detailed automation plans will be developed

directly involving

Transmission data
Distribution data
Generation planners
Customers
DR planners
Regulators
Auditors

Vendors
Regional planning agencies
And government agencies

performing

Long term transmission and distribution facilities and automation planning

with key interfaces between

TransCos and RTOs
TransCos and neighboring utilities
TransCos and generation companies
TransCos and DR owners
TransCos and planning agencies
TransCos and large customers
TransCos and goverrnment agencies

with communication configuration requirements of

All interfaces are one-to-one over WAN to external companies
And LAN within ISO/RTO planning systems
SCADA systems
And other control center databases

with quality of service requirements of

Medium availablity needed since have time to re-send
Medium response times
Medium data accuracy since it will be reviewed over time by many people and systems
Could entail high data volumes but infrequently

with security requirements of

All security requirements are Medium High
Since security breaches could have financial consequences but on the other hand
The data would be checked over a long period of time and security breaches could therefore be detected

with data management requirements of

Many databases are involved across many organizational boundaries; Updates would be infrequent (
monthly)

with constraints of

Need new/modified applications to coordinate with other
No other special constraints, since not many legacy systems or small devices involved; primary need is the development of methodologies and application tools which are consistent with evolving market rules

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of	Security	Data	Constraints	Average

	Service		Management		
1.0	1.0	2.0	3.0	2.0	1.8

COMMENTS:
The following comments were collected during the team rating review:

Security = 2 because confidentiality of data is a concern across organizational boundaries
Data management = 3 due to heterogeneous data across multiple databases in multiple companies
Constraints = 2 since new and/or modified applications will be needed
So, that legacy applications will need to be dealt with until they are upgraded

---

Why is QOS rated 2? Why is Security rated 2? -- Peter Sanza - 05 Apr 2003

M-2 Medium Term Planning (Weeks Ahead to One Year Ahead)

The Purpose of *Medium Term Planning (Weeks Ahead to One Year Ahead)* ***function***
is described below...

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.4	1.1	2.0	1.8	0.4	1.1

COMMENTS:

M-2.1 RTO/ISO/TransCos/DisCos forecast load

The Purpose of *RTO/ISO/TransCos/DisCos forecast load* ***function***
is to

Provide load MW estimates for each region and local area
Based on energy schedules
Weather forecasts
Historical load shapes
Forecast special events
And expected new loads at their connection points

directly involving

RTOs
Transmission owners
Distribution companies
National Weather Services

Market Participants
Energy Service Providers
And Customers

performing

Regional and local load forecasts for different time periods
Updating the precision of the forecasts, as each time period approaches

with key interfaces between

all three types of utilities: RTOs, transmission owners, and distribution companies
Utilities and National Weather Services
RTOs and Market Participants
DisCos and Energy Service Providers
DisCos and Customers

with communication configuration requirements of

All interfaces are one-to-one over WAN to external companies
And LAN within ISO/RTO planning systems
SCADA systems
And other control center databases

with quality of service requirements of

Medium availablity needed since have time to re-send
Medium response times
Medium data accuracy since it will be reviewed over time by many people and systems
Infrequent updates

with security requirements of

All security requirements are Medium Low since security breaches have minimal financial consequences and the data would be checked over a long period of time so, that security breaches could therefore be detected

with data management requirements of

Many databases are involved across many organizational boundaries; Updates would be infrequent (
weekly). Small databases of historical forecasts and other
Archiving is particularly difficult

with constraints of

Legacy systems perform load
Many may not entail significant changes to the systems for utilities whose load forecasting is already satisfactory, but the advent of significant penetrations of DR, demand-side management, RTP, and other new functions affecting load forecasts could require significant upgrades of legacy systems

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of	Security	Data	Constraints	Average

	Service		Management		
0.0	0.0	2.0	2.0	0.0	0.8

COMMENTS:
The following comments were collected during the team rating review:

Data management = 2 since data will be obtained from different data sources across organizational boundaries
But data is relatively low volume and generally one-way data exchanges
Security = 2 because confidentiality of data is a concern across organizational boundaries

---

M-2.2 RTO/ISO certify generation units

The Purpose of *RTO/ISO certify generation units* ***function is to***

Validate the generation ratings
Capacity
And interconnecting infrastructure to allow these generators to participate in the market operations

directly involving

Generators
GenCos
Regulators
Government agencies

performing

Cerification of generators and the interfaces to the RTO for monitoring and control

with key interfaces between

RTOs and the Generators being certified
RTOs and Scheduling Coordinator responsible for the Generator

with communication configuration requirements of

One RTO control system to many generators
One RTO energy scheduling system to many Scheduling Coordinators

with quality of service requirements of

High availability
Rapid response
High data accuracy
And high data frequency needed for RTO control to generator
High availability and high data accuracy needed for interface with Scheduling Coordinator

with security requirements of

High security of all types needed for RTO control to generator; high security of all types needed for interface with Scheduling Coordinator

with data management requirements of

Certification database infrequently updated

with constraints of

Certification implies, that the RTO can also monitor and control the generating unit - see constraints on AGC control

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.5	3.0	1.0	1.0	1.9

COMMENTS:

The following comments were collected during the team rating review:

---

* Configuration = 2 because generators (including DR) may be located in areas with poor communications

Performance =

5 because this function is for testing and certifying the generators systems to ensure they will be able to run in real-time, therefore the QoS requirements must match the real-time requirements

Security = 3 because secure control of generation is required for safe, reliable, and financially correct operation of the power system

---

Why is Security rated 3? -- Peter Sanza - 05 Apr 2003

M-2.3 RTO/ISO analyze generation market for capacity and adequacy to meet load

The Purpose of *RTO/ISO analyze generation market for capacity and adequacy to meet load* ***function***

is to

Analyze the generation market to determine if there is adequate capacity available to meet loads

Based on load forecast

Generation outages

Transmission outages

And other system constraints

directly involving

Generators

GenCos

Regulators

Government agencies

performing

Analysis of generation

Using power flow models

with key interfaces between

RTO capacity analysis function and load forercasts

RTO capacity analysis function, generation planning data, and other planning data

with communication configuration requirements of

LAN within planning and control centers

with quality of service requirements of

Medium availablity

Low frequency

Low volumes

with security requirements of

Medium security

Except high confidentiality

with data management requirements of

A few databases mostly likely populated within the planning department and/or operations department

with constraints of

Some legacy systems

But not significant changes to interfaces

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	2.0	2.0	0.0	0.8

COMMENTS:

The following comments were collected during the team rating review:

Data management = 2 because it requires synchronization of data across multiple organizations

Security =2 because confidentiality of data is a concern across organizations

---

M-2.4 RTO/ISO register and perform credit rating of Market Participants (MPs)

The Purpose of *RTO/ISO register and perform credit rating of Market Participants (MPs)* ***function***

is to register and perform credit rating of market participants to determine what limits they will have on trading (depends on market design)

directly involving

Market Participants

RTOs/ISOs
Financial instituitions

performing

Credit rating

with key interfaces between

RTOs and Market Participants
RTOs and financial institutions

with communication configuration requirements of

Fax
Phone
Document transfers between Market Participants
RTOs
And banks

with quality of service requirements of

Medium availability
Medium response because this process is not in real-time
High data accuracy
Low volume
Low frequency

with security requirements of

High security in all areas because of financial implications

with data management requirements of

A few databases with minimal updates

with constraints of

Some legacy systems
But not significant changes to interfaces

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	1.0	3.0	2.0	0.0	1.2

COMMENTS:
The following comments were collected during the team rating review:

Security = 3 because credit data is very sensitive and an attractive target for unauthorized access and strong authentication is needed
Data Management = 2 because must be connected to financial systems outside of the IECSA domain

---

M-2.5 RTO/ISO validate and register revenue meters

The Purpose of *RTO/ISO validate and register revenue meters* ***function is to*** validate and register all revemue meters to be used in market

settlements
directly involving
RTOs/ISOs
Meter Data Management Agents (MDMAs)
Customers
Settlement systems
Regulatory agencies
performing
Identifying location and associated load/generation of meters
Testing of meters
Submittal of testing results to appropriate agencies
with key interfaces between
MDMAs and settlement systems
MDMAs and meters
MDMAs and regulators
with communication configuration requirements of
One to one between settlement system and MDMA
with quality of service requirements of
Low availability
Since meter reading is not time-constrained
High data accuracy because of financial consequences of inaccurate data
Low data volumes
Low data frequencies for the validation process
with security requirements of
Low security during the validation
But need to validate high security
with data management requirements of
Large database for meters
Data exchanges across organizational boundaries
with constraints of
Compute-constrained meters and likely to be media-constrained channels

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	3.0	2.0	3.0	2.2

COMMENTS:
The following comments were collected during the team rating review:

Configuration = 2 because revenue meters may require widely dispersed communications (especially to large customers and DR

devices). On the other hand, revenue meter reading does not have to be done

this function will test and validate any communications as well as the meters

Security = 3 because meter data is highly sensitive AND meters are compute-

Data management = 2 because metering data may come from many different sources, different types of meters

Constraints = 3 because communication channels may be limited and meters are compute-constrained and because the RTO could contract through a third party (MDMA)

M-2.6 TransCos/GenCos propose scheduled transmission and generation outages which are validated via congestion management analysis

The Purpose of *TransCos/GenCos propose scheduled transmission and generation outages which are validated via congestion management analysis* ***function***

is to

Validate TransCo and GenCo proposed transmission and generation outages to determine if any major conflicts exist, that could cause power system problems

Using congestion management analysis

directly involving

RTOs/ISOs

TransCos

GenCos

Regulators

Auditors

performing

Power system analysis of the impact of the proposed outages on system conditions and financial situations

with key interfaces between

RTOs and TransCos

RTOs and GenCos

Power system analysis applications with RTO SCADA

with communication configuration requirements of

All interfaces are one-to-one over WAN to external companies

And LAN within ISO/RTO planning systems

SCADA systems

And other control center databases

with quality of service requirements of

Medium high availablity needed since have time to re-send

But now tighter timeframe than for weeks ahead

Medium response times

Medium high data accuracy
Some updates

with security requirements of

All security requirements are Medium High since security breaches have some financial consequences

with data management requirements of

Many databases are involved across many organizational boundaries; Updates would be infrequent (weekly). Small databases of historical forecasts and other data

with constraints of

No special constraints
Since WAN connections to TransCos and GenCos

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	1.0	1.0	2.0	0.0	0.8

COMMENTS:
The following comments were collected during the team rating review:

Data Management = 2 because the exchange of data models involves large volumes of complex model data, that must be accurate and properly merged
With no standard methods for exchanging this type of data yet finalized

---

M-2.7 RTO/ISO perform congestion management and security analysis on proposed outages and to determine possible ancilliary services

The Purpose of *RTO/ISO perform congestion management and security analysis on proposed outages and to determine possible ancilliary services* ***function***
is to

Perform congestion management and security analysis on proposed outages to determine Total Transmission Capacity (TTC)
Available Transmission Capacity (ATC)
And what ancillary services might be needed

directly involving

RTO/ISO Scheduler
Other RTOs
Scheduling Coordinators
Other Market Participants

TransCos
GenCos
Regulators
Auditors

performing

Power system analysis of the impact of the proposed outages on system conditions to determine probable ancillary services

with key interfaces between

RTOs and TransCos
RTOs and GenCos
Power system analysis applications with RTO SCADA
RTOs and other RTOs
RTOs and Web Server for Market Participants

with communication configuration requirements of

All interfaces are one-to-one over WAN to external companies
And LAN within ISO/RTO planning systems
SCADA systems
And other control center databases

with quality of service requirements of

Medium high availablity needed since have time to re-send
But now tighter timeframe than for weeks ahead
Medium response times
Medium high data accuracy
Some updates

with security requirements of

All security requirements are Medium High since security breaches have some financial consequences

with data management requirements of

Many databases are involved across many organizational boundaries; Updates would be infrequent (
weekly). Small databases of historical forecasts and other data

with constraints of

No special constraints
Since WAN connections to TransCos and GenCos

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	1.0	1.0	2.0	0.0	0.8

COMMENTS:
This function has similar interfaces (and ratings) to function (M-2.6) TransCos/GenCos propose scheduled transmission and generation outages which are validated via congestion management analysis above.

M-2.8 RTO/ISO auction, sell, and/or track transmission rights and other energy services to Market Participants

The Purpose of *RTO/ISO auction, sell, and/or track transmission rights and other energy services to Market Participants* ***function is to*** for RTOs/ISOs to auction and/or sell and/or track transmission rights and other energy services to Market Participants (depends on market design)

directly involving

RTOs/ISOs
Market Participants
Regulators
Auditors

performing

Management of market-established algorithm for allocating transmission rights to Market Participants

with key interfaces between

RTOs and Transmission Owners
RTOs and Energy Traders
RTOs and Regulators
RTOs and Auditors
RTOs and Web Servers for Market Participants

with communication configuration requirements of

One to many WAN between RTOs and Market Participants

with quality of service requirements of

High availability
Rapid response
High data accuracy
And high data frequency needed for interactions between RTOs and Market Participants to ensure fairness in any auction or other process

with security requirements of

High security in all areas because of fairness of the market and financial implications

with data management requirements of

Data exchanges across organizational boundaries and require frequent updating to reflect electronic and/or manual changes

with constraints of

No special constraints
Since WAN connections to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of	Security	Data	Constraints	Average

	Service		Management		
0.0	3.0	3.0	3.0	0.0	1.8

COMMENTS:
The following comments were collected during the team rating review:

The following are important for all RTO/ISO interactions with Market Participants:
Configuration = 0 because using pre-existing communication systems and/or the Internet
Performance = 3 because timely delivery and response (on the order of minutes) between RTOs/ISOs and Market Participants is critical to meeting market
Security = 3 because interactions with Market Participants involves many only partially trusted parties, possibly with connections over the Public
Data Management = 3 because Market Participant characteristics will change frequently and large volumes of new types of data
Constraints = 2 because systems and applications are new and/or changing to meet changing market environments

---

M-2.9 Energy Traders, ESPs, and other authorized Market Participants establish bilateral energy contracts between Generation and Loads

The Purpose of *Energy Traders, ESPs, and other authorized Market Participants establish bilateral energy contracts between Generation and Loads* ***function***
is to
Energy Traders
ESPs
And other authorized Market Participants establish bilateral energy contracts between Generation and Loads

directly involving
Market Participants (Energy Traders
GenCos
Customers
ESPs
DisCos)
Regulators
Auditors
performing
Financial contracts for energy between Market Participants
with key interfaces between
Market Participants with other Market Participants
Market Participants and Regulators

Market Participants and Auditors

with communication configuration requirements of

WAN
Fax
Phone
Internet
And other one-to-one interfaces

with quality of service requirements of

High availability
Rapid response
High data accuracy for negotiating energy contracts

with security requirements of

High security in all areas because of financial implications

with data management requirements of

Many databases requiring timely access and frequent updates across organizational boundaries

with constraints of

No special constraints
Since WAN connections between companies

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	0.0	0.0	0.0	0.0

COMMENTS:
The following comments were collected during the team rating review:

Function does not affect utilities directly
Flag this for further discussion

The following comments were collected during the peer review:

Market Participants with other Market Participants
Market Participants and Regulators
Market Participants and Auditors

M-3 Short-term Planning (48 hours- one month)

The Purpose of *Short-term Planning (48 hours- one month)* ***function is described below...***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3***

(highly likely to involve architectural challenges) ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	2.0	2.0	2.0	0.0	1.2

COMMENTS:

M-3.1 Corrections of medium-planning actions, available capacity, and possible ancillary services, based on updated data on transmission outages, generation maintenance, load forecasts, etc

The Purpose of *Corrections of medium-planning actions, available capacity, and possible ancillary services, based on updated data on transmission outages, generation maintenance, load forecasts, etc*
function
is to
perform adjustments to the energy schedules considering congestion management and security analysis with updated data on transmision outages, generation maintenance, load forecast
to determine what ancillary services might be needed

directly involving
RTOs/ISOs
TransCos
GenCos
Regulators
Auditors
performing
Power system analysis of the impact of the proposed outages on system conditions to determine probable ancillary services
with key interfaces between
RTOs and TransCos
RTOs and GenCos
Power system analysis applications with RTO SCADA
with communication configuration requirements of
All interfaces are one-to-one over WAN to external companies
And LAN within ISO/RTO planning systems
SCADA systems
And other control center databases
with quality of service requirements of
Medium high availablity needed since have time to re-send
But now tighter timeframe than for weeks ahead
Medium response times
Medium high data accuracy
Some updates
with security requirements of

All security requirements are Medium High since security breaches have some financial consequences

with data management requirements of

Many databases are involved across many organizational boundaries; Updates would be infrequent (weekly). Small databases of historical forecasts and other data

with constraints of

No special constraints

Since WAN connections to TransCos and GenCos

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	2.0	2.0	2.0	0.0	1.2

COMMENTS:

This function has similar interfaces (and ratings) to function (M-2.1) RTO/ISO/TransCos/DisCos forecast load above.

The following comments were collected during the team rating review:

Performance = 2 because directly impacts the ability to balance the market and to determine who will participate in the market

---

The following comments were collected during the peer review:

RTOs and TransCos

RTOs and GenCos

Power system analysis applications with RTO SCADA

M-4 Day Ahead Market (24 hours to 48 hours ahead)

The Purpose of *Day Ahead Market (24 hours to 48 hours ahead)* ***function is described below...***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.1	3.0	3.0	2.9	1.4	2.1

COMMENTS:

M-4.1 RTO/ISO auction/sell remaining short term transmission rights and other energy services to Market Participants

The Purpose of *RTO/ISO auction/sell remaining short term transmission rights and other energy services to Market Participants* ***function is to*** for RTOs/ISOs to auction and/or sell transmission rights and other energy services to Market Participants (depends on market design)

directly involving

RTOs/ISOs
Scheduling Coordinators
Market Participants
Regulators
Auditors

performing

Market-established algorithm for allocating transmission rights to Market Participants

with key interfaces between

RTOs and Schedulilng Coordinators
RTOs and Regulators
RTOs and Auditors
RTOs and Web Servers for Market Participants

with communication configuration requirements of

One to many WAN between RTOs
Scheduling Coordinators
Other Market Participants
Regulators
And Auditors

with quality of service requirements of

High availability
Rapid response
High data accuracy
And high data frequency needed for interactions between RTOs and Market Participants to ensure fairness in any auction or other process

with security requirements of

High security in all areas because of fairness requirements with market rules and financial implications

with data management requirements of

Data exchanges across organizational boundaries

with constraints of

No special constraints
Since WAN connections to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	3.0	3.0	3.0	0.0	1.8

COMMENTS:
This function has similar interfaces (and ratings) to function (M-2.8) RTO/ISO auction, sell, and/or track transmission rights and other energy services to Market Participants above.

The following comments were collected during the peer review:

RTOs and Schedulilng Coordinators
RTOs and Regulators
RTOs and Auditors
RTOs and Web Servers for Market Participants

M-4.2 Scheduling Coordinators submit Day-Ahead energy schedules

The Purpose of *Scheduling Coordinators submit Day-Ahead energy schedules* ***function***
is to

For Scheduling Coordinators or other entities to submit 24-hour energy schedules in the Day-Ahead market
And the RTOs/ISOs to validate the submittals (depending on market design)

directly involving

Scheduling Coordinators (or other entities)
RTOs/ISOs
Auditors
Other Market Participants

performing

Energy schedule submittal and validation

with key interfaces between

Scheduling Coordinators and RTOs/ISOs
RTOs/ISOs and neighboring RTOs/ISOs
RTOs/ISOs and Web Server for Market Participants

with communication configuration requirements of

One to many WAN between RTOs
Scheduling Coordinators
Other Market Participants
Regulators
And Auditors

with quality of service requirements of

High availability
Rapid response

High data accuracy
And high data frequency needed for interactions between RTOs and Market Participants to ensure fairness in any energy scheduling process

with security requirements of

High security in all areas because of fairness requirements with market rules and financial implications

with data management requirements of

Large database for energy schedules
Requiring timely access
Frequent updates
And data exchanges across organizational boundaries

with constraints of

No special constraints
Since WAN connections to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	3.0	3.0	3.0	0.0	1.8

COMMENTS:
This function has similar interfaces (and ratings) to function (M-2.8) RTO/ISO auction, sell, and/or track transmission rights and other energy services to Market Participants above.

The following comments were collected during the peer review:

Scheduling Coordinators and RTOs/ISOs
RTOs/ISOs and neighboring RTOs/ISOs
RTOs/ISOs and Web Server for Market Participants

M-4.3 Scheduling Coordinators submit Day-Ahead bids for ancillary services: reserve, regulation, frequency response, etc

The Purpose of *Scheduling Coordinators submit Day-Ahead bids for ancillary services: reserve, regulation, frequency response, etc* ***function is to***

for Scheduling Coordinators to submit Day-Ahead bids for ancillary services: reserve, regulation, frequency response
and the RTOs/ISOs to validate the submittals

directly involving

Scheduling Coordinators

RTOs/ISOs
Auditors
Other Market Participants

performing

Ancillary services submittals and validation

with key interfaces between

Scheduling Coordinators and RTOs/ISOs
RTOs/ISOs and neighboring RTOs/ISOs
RTOs/ISOs and Web Server for Market Participants

with communication configuration requirements of

One to many WAN between RTOs
Scheduling Coordinators
Other Market Participants
Regulators
And Auditors

with quality of service requirements of

High availability
Rapid response
High data accuracy
And high data frequency needed for interactions between RTOs and Market Participants to ensure fairness in any energy scheduling process

with security requirements of

High security in all areas because of fairness requirements with market rules and financial implications

with data management requirements of

Large database for energy schedules
Requiring timely access
Frequent updates
And data exchanges across organizational boundaries

with constraints of

No special constraints
Since WAN connections to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	3.0	3.0	3.0	1.0	2.0

COMMENTS:

This function has similar interfaces (and ratings) to function (M-2.8) RTO/ISO auction, sell, and/or track transmission rights and other energy services to Market Participants above.

The following comments were collected during the team rating review:

Change from 2h: Constraint = 1 because data is less well known

---

The following comments were collected during the peer review:

Scheduling Coordinators and RTOs/ISOs
RTOs/ISOs and neighboring RTOs/ISOs
RTOs/ISOs and Web Server for Market Participants

M-4.4 RTO/ISO perform bid/auction management

The Purpose of *RTO/ISO perform bid/auction management* ***function is to***

Manage any bids or auctions
Depending upon the market rules

directly involving

Scheduling Coordinators
RTOs/ISOs
Auditors
Other Market Participants

performing

Bid and auction management

with key interfaces between

Scheduling Coordinators and RTOs/ISOs
RTOs/ISOs and neighboring RTOs/ISOs
RTOs/ISOs and Web Server for Market Participants

with communication configuration requirements of

One to many WAN between RTOs
Scheduling Coordinators
Other Market Participants
Regulators
And Auditors

with quality of service requirements of

High availability
Rapid response
High data accuracy
And high data frequency needed for interactions between RTOs and Market Participants to ensure fairness in any energy scheduling process

with security requirements of

High security in all areas because of fairness requirements with market rules and financial implications

with data management requirements of

Large database for energy schedules

Requiring timely access
Frequent updates
And data exchanges across organizational boundaries

with constraints of

No special constraints
Since WAN connections to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	3.0	3.0	3.0	2.0	2.2

COMMENTS:
This function has similar interfaces (and ratings) to function (M-2.8) RTO/ISO auction, sell, and/or track transmission rights and other energy services to Market Participants above.

The following comments were collected during the team rating review:

Change from 2h: Constraint = 2 because data is less well known

---

The following comments were collected during the peer review:

Scheduling Coordinators and RTOs/ISOs
RTOs/ISOs and neighboring RTOs/ISOs
RTOs/ISOs and Web Server for Market Participants

M-4.5 RTO/ISO perform congestion management and security analysis on submitted energy schedules

The Purpose of *RTO/ISO perform congestion management and security analysis on submitted energy schedules* ***function is to*** RTO/ISO perform congestion management and security analysis on submitted energy schedules (depending on market design)

directly involving

RTO/ISO Scheduler
Other RTOs
Scheduling Coordinators
Other Market Participants
TransCos
GenCos
Regulators
Auditors

performing

Power system analysis of the impact of the proposed energy on system conditions to determine probable ancillary services and any violations of power system security conditions

with key interfaces between

RTOs and TransCos

RTOs and GenCos

Power system analysis applications with RTO SCADA

RTOs and other RTOs

RTOs and Web Server for Market Participants

with communication configuration requirements of

All interfaces are one-to-one over WAN to external companies

And LAN within ISO/RTO planning systems

SCADA systems

And other control center databases

with quality of service requirements of

High availablity needed since do not have time to re-send

Rapid response times

High data accuracy

Frequent updates

with security requirements of

All security requirements are High since security breaches have some financial consequences

with data management requirements of

Large database for energy schedules

Requiring timely access

Frequent updates

And data exchanges across organizational boundaries

with constraints of

No special constraints

Since WAN connections to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	3.0	3.0	2.0	2.0	2.2

COMMENTS:

The following comments were collected during the team rating review:

Performance = 3 because data must have high availability from SCADA

Security = 3 because data exchanged with TransCos and others must be secure, but legacy ICCP without security is currently used

Data Management = 2 because information must be retrieved from many different types of legacy systems
Constraint = 2 because LMP prices and other data elements are not well defined nor are applications mature

---

M-4.6 RTO/ISO calculate operational parameters for Day-Ahead planning: Available Transmission Capacity (ATC), Regulated Must Run (RMR), Locational Marginal Price (LMP)

The Purpose of *RTO/ISO calculate operational parameters for Day-Ahead planning: Available Transmission Capacity (ATC), Regulated Must Run (RMR), Locational Marginal Price (LMP)* ***function***
is to
Perform congestion management and security analysis on proposed energy schedules
To determine Total Transmission Capacity (TTC)
Available Transmission Capacity (ATC)
Regulated Must Run (RMR) generation
And Locational Marginal Prices (LMPs) for each "location"

directly involving
RTO/ISO Scheduler
Other RTOs
Scheduling Coordinators
Other Market Participants
TransCos
GenCos
Regulators
Auditors
performing
Calculate TTC
ATC
RMR
LMP
with key interfaces between
RTOs/ISOs and neighboring RTOs/ISOs
RTOs/ISOs and Web Server for Market Participants
with communication configuration requirements of
All interfaces are internal to the RTO/ISO
Except for WAN connections to other RTOs/ISOs and the Web Server for Market Participants
with quality of service requirements of
High availablity needed since do not have time to re-send
Rapid response times
High data accuracy
Frequent updates

with security requirements of

All security requirements are High since security breaches have some financial consequences

with data management requirements of

Large database for energy schedules

Requiring timely access

Frequent updates

And data exchanges across organizational boundaries

with constraints of

No special constraints

Since WAN connections to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	3.0	3.0	3.0	2.0	2.2

COMMENTS:

This function has similar interfaces (and ratings) to function [(M-4.4) RTO/ISO perform bid/auction management] above.

The following comments were collected during the peer review:

RTOs/ISOs and neighboring RTOs/ISOs

RTOs/ISOs and Web Server for Market Participants

M-4.7 RTO/ISO provide information to Market Participants

The Purpose of *RTO/ISO provide information to Market Participants* ***function***

is to RTO/ISO provide information to Market Participants

directly involving

RTOs/ISOs

Market Participants

Regulators

Auditors

General Public

performing

Market-mandated information to Market Participants and general public

with key interfaces between

RTOs/ISOs and Web Server for Market Participants

with communication configuration requirements of

One to one WAN to Web Server

And WAN and public Internet access by Market Participants

with quality of service requirements of

High availability
Rapid response
High data accuracy
Frequent updates
High volumes
Due to stringent market requirements for providing information to Market Participants

with security requirements of

All security requirements are High since security breaches have market-compliance and financial consequences
And Web Server must be connected to the Internet

with data management requirements of

Large databases
Many databases
Timely access required
Frequent updates
And data exchanges across organizational boundaries

with constraints of

No special constraints
Since WAN connections to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	3.0	3.0	3.0	2.0	2.2

COMMENTS:
This function has similar interfaces (and ratings) to function (M-4.4) RTO/ISO perform bid/auction management above.

The following comments were collected during the peer review:

RTOs/ISOs and Web Server for Market Participants

M-4.8 Scheduling Coordinators support e-tagging

The Purpose of *Scheduling Coordinators support e-tagging* ***function is to*** Scheduling Coordinators to provide e-tagging information to Market Participants and NERC (depending on market design)

directly involving

Scheduling Coordinators
NERC

Tag Authority
performing
E-tagging
with key interfaces between
NERC etagging network
with communication configuration requirements of
Many to many WAN
Handled by NERC?
with quality of service requirements of
High availability
Frequent updates
High volumes
with security requirements of
High security
with data management requirements of
Large databases
Many databases
Timely access required
Frequent updates
And data exchanges across organizational boundaries
with constraints of
No special constraints
Since WAN connections to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	3.0	3.0	3.0	2.0	2.2

COMMENTS:
This function has similar interfaces (and ratings) to function (M-4.4) RTO/ISO perform bid/auction management above.

The following comments were collected during the peer review:

NERC etagging network

M-5 Real-Time (actual time to next hour)

The Purpose of *Real-Time (actual time to next hour)* ***function is described below...***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3***

(highly likely to involve architectural challenges) ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	3.0	3.0	2.5	2.5	2.4

COMMENTS:

M-5.1 Calculate operational parameters in real-time and state estimated data

The Purpose of *Calculate operational parameters in real-time and state estimated data* ***function***
is to calculate operational parameters of the power system
directly involving
RTO/ISO System operator
RTO SCADA/EMS system
performing
Analysis of operational parameters to ensure power system security
with key interfaces between
RTO SCADA/EMS and Generators
RTO SCADA/EMS and TransCos
RTO SCADA/EMS and DisCos
RTO SCADA/EMS and other RTO SCADA/EMS
RTO SCADA/EMS and Scheduling Coordinators
with communication configuration requirements of
One to many
From RTO SCADA/EMS to other companies and/or field devices
with quality of service requirements of
High availability
Frequent updates
High volumes
with security requirements of
High security in all areas
Because the security of the power system must be maintained
with data management requirements of
Large SCADA database requiring timely real-time access
Frequent (2-second) updates
And data exchanges across organizational boundaries to TransCos and DisCos
with constraints of
Legacy systems used for SCADA
Compute-constrained field devices
And media-constrained links to many remote sites

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3***

(highly likely to involve architectural challenges) ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	3.0	2.0	3.0	2.6

COMMENTS:
The following comments were collected during the team rating review:

Configuration = 2 because SCADA data is retrieved from many diverse sites probably with diverse media and
Performance = 3 because real-time (on the order of 1-2 seconds) SCADA operations require high availability, rapid and timely responses, with high frequency and high volumes of
Security = 3 because SCADA involves control of power system
Data Management = 2 because of large volumes of frequent data
Constraints = 3 because media-constrained communications and compute-constrained field devices

---

M-5.2 Market Participants submit adjustments to real-time energy schedules

The Purpose of *Market Participants submit adjustments to real-time energy schedules* ***function***
is to

For Scheduling Coordinators to submit energy schedule adjustments in the Hour-Ahead market
And the RTOs/ISOs to validate the submittals

directly involving

Scheduling Coordinators
RTOs/ISOs
Auditors
Other Market Participants

performing

Energy schedule submittal and validation

with key interfaces between

Scheduling Coordinators and RTOs/ISOs
RTOs/ISOs and neighboring RTOs/ISOs
RTOs/ISOs and Web Server for Market Participants

with communication configuration requirements of

One to many WAN between RTOs
Scheduling Coordinators
Other Market Participants
Regulators
And Auditors

with quality of service requirements of

High availability
Rapid response
High data accuracy
And high data frequency needed for interactions between RTOs and Market Participants to ensure fairness in any energy scheduling process

with security requirements of

High security in all areas because of fairness requirements with market rules and financial implications

with data management requirements of

Large database for energy schedules
Requiring timely access
Frequent updates
And data exchanges across organizational boundaries

with constraints of

No special constraints
Since WAN connections to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	3.0	3.0	3.0	2.0	2.2

COMMENTS:
This function has similar interfaces (and ratings) to function (M-4.4) RTO/ISO perform bid/auction management above.

The following comments were collected during the peer review:

Scheduling Coordinators and RTOs/ISOs
RTOs/ISOs and neighboring RTOs/ISOs
RTOs/ISOs and Web Server for Market Participants

M-5.3 Market Participants submit real-time bids for ancillary services

The Purpose of *Market Participants submit real-time bids for ancillary services* ***function is to***

for Scheduling Coordinators to submit Hour-Ahead bids for ancillary services: reserve, regulation, frequency response
and the RTOs/ISOs to validate the submittals

directly involving

Scheduling Coordinators

RTOs/ISOs
Auditors
Other Market Participants

performing

Ancillary services submittals and validation

with key interfaces between

Scheduling Coordinators and RTOs/ISOs
RTOs/ISOs and neighboring RTOs/ISOs
RTOs/ISOs and Web Server for Market Participants

with communication configuration requirements of

One to many WAN between RTOs
Scheduling Coordinators
Other Market Participants
Regulators
And Auditors

with quality of service requirements of

High availability
Rapid response
High data accuracy
And high data frequency needed for interactions between RTOs and Market Participants to ensure fairness in any energy scheduling process

with security requirements of

High security in all areas because of fairness requirements with market rules and financial implications

with data management requirements of

Large database for energy schedules
Requiring timely access
Frequent updates
And data exchanges across organizational boundaries

with constraints of

No special constraints
Since WAN connections to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	3.0	3.0	3.0	2.0	2.2

COMMENTS:
This function has similar interfaces (and ratings) to function (M-4.4) RTO/ISO perform bid/auction management above.

The following comments were collected during the peer review:

Scheduling Coordinators and RTOs/ISOs
RTOs/ISOs and neighboring RTOs/ISOs
RTOs/ISOs and Web Server for Market Participants

M-5.4 RTO/ISO dispatch generation power system under normal conditions

The Purpose of *RTO/ISO dispatch generation power system under normal conditions* ***function***

is to

RTO/ISO dispatch generation according to energy schedules
- RTO/ISO SCADA system monitors power system
- RTO/ISO EMS system performs Automatic Generation Control (AGC)
- RTO/ISO Market Operations system analyzes transmission capacity and reliability
- RTO/ISO Market Operations system balances energy/ancillary services
- RTO/ISO EMS system monitors interchange schedules with internal and external Control Areas

directly involving

RTO System Operator
RTO/ISO SCADA EMS
Scheduling Coordinators
Area Control Centers
Generators

performing

Automatic Generation Control

with key interfaces between

RTO SCADA/EMS and Generators
RTO SCADA/EMS and TransCos
RTO SCADA/EMS and DisCos
RTO SCADA/EMS and other RTO SCADA/EMS
RTO SCADA/EMS and Scheduling Coordinators

with communication configuration requirements of

One to many
From RTO SCADA/EMS to other companies and/or field devices

with quality of service requirements of

High availability
Frequent updates
High volumes

with security requirements of

High security in all areas
Because the security of the power system must be maintained

with data management requirements of

Large SCADA database requiring timely real-time access
Frequent (2-second) updates
And data exchanges across organizational boundaries to TransCos and DisCos

with constraints of

Legacy systems used for SCADA
Compute-constrained field devices
And media-constrained links to many remote sites

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	3.0	2.0	3.0	2.6

COMMENTS:
This function has similar interfaces (and ratings) to function (M-5.1) Calculate operational parameters in real-time and state estimated data above.

The following comments were collected during the peer review:

RTO SCADA/EMS and Generators
RTO SCADA/EMS and TransCos
RTO SCADA/EMS and DisCos
RTO SCADA/EMS and other RTO SCADA/EMS
RTO SCADA/EMS and Scheduling Coordinators

M-5.5 RTO/ISO coordinate operations with external entities

The Purpose of *RTO/ISO coordinate operations with external entities* ***function***
is to

RTO/ISO coordinate operations with external entities
- RTO/ISO Market Operations system coordinates operational activities with distribution operations of interconnected DisCos
- RTO/ISO Market Operations system coordinates operational activities with Reliability Councils and NERC
- RTO/ISO Market Operations system coordinates operational activities with Market Participants

directly involving

RTO System Operator
RTO/ISO SCADA EMS
Scheduling Coordinators

Area Control Centers
Generators
DisCos
NERC
Market Participants

performing

Coordination of activities

with key interfaces between

RTO SCADA/EMS and Generators
RTO SCADA/EMS and TransCos
RTO SCADA/EMS and DisCos
RTO SCADA/EMS and other RTO SCADA/EMS
RTO SCADA/EMS and Scheduling Coordinators
RTO SCADA/EMS and NERC/Reliability Councils

with communication configuration requirements of

One to many
From RTO SCADA/EMS to other companies and/or field devices

with quality of service requirements of

High availability
Frequent updates
High volumes

with security requirements of

High security in all areas
Because the security of the power system must be maintained

with data management requirements of

Large SCADA database requiring timely real-time access
Frequent (2-second) updates
And data exchanges across organizational boundaries to TransCos and DisCos

with constraints of

Legacy systems used for SCADA
Compute-constrained field devices
And media-constrained links to many remote sites

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	3.0	3.0	3.0	2.0	2.2

COMMENTS:
This function has similar interfaces (and ratings) to function (M-4.4) RTO/ISO perform bid/auction management above.

The following comments were collected during the peer review:

RTO SCADA/EMS and Generators
RTO SCADA/EMS and TransCos
RTO SCADA/EMS and DisCos
RTO SCADA/EMS and other RTO SCADA/EMS
RTO SCADA/EMS and Scheduling Coordinators
RTO SCADA/EMS and NERC/Reliability Councils

Why is Security rated higher (3) in this function than in function 5.1? -- Peter Sanza - 05 Apr 2003

M-5.6 RTO/ISO redispatch/emergency dispatch

The Purpose of *RTO/ISO redispatch/emergency dispatch* ***function is to***

RTO/ISO redispatch/emergency dispatch
- RTO/ISO EMS system redispatches generation to handle emergency
- RTO/ISO Market Operations system notifies Market Participants of redispatch
- RTO/ISO Market Operations system manages market external price caps (if they exist in the respective market)

directly involving

RTO System Operator
RTO/ISO SCADA EMS
Scheduling Coordinators
Area Control Centers
Generators

performing

Automatic Generation Control

with key interfaces between

RTO SCADA/EMS and Generators
RTO SCADA/EMS and TransCos
RTO SCADA/EMS and DisCos
RTO SCADA/EMS and other RTO SCADA/EMS
RTO SCADA/EMS and Scheduling Coordinators

with communication configuration requirements of

One to many
From RTO SCADA/EMS to other companies and/or field devices

with quality of service requirements of

High availability
Frequent updates
High volumes

with security requirements of

High security in all areas
Because the security of the power system must be maintained

with data management requirements of

Large SCADA database requiring timely real-time access

Frequent (2-second) updates
And data exchanges across organizational boundaries to TransCos and DisCos

with constraints of

Legacy systems used for SCADA
Compute-constrained field devices
And media-constrained links to many remote sites

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	3.0	2.0	3.0	2.6

COMMENTS:
This function has similar interfaces (and ratings) to function (M-5.1) Calculate operational parameters in real-time and state estimated data above.

The following comments were collected during the peer review:

RTO SCADA/EMS and Generators
RTO SCADA/EMS and TransCos
RTO SCADA/EMS and DisCos
RTO SCADA/EMS and other RTO SCADA/EMS
RTO SCADA/EMS and Scheduling Coordinators

M-6 Post-Dispatch (last hour to prior months)

The Purpose of *Post-Dispatch (last hour to prior months)* ***function is described below...***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.3	2.0	3.0	2.5	1.3	1.8

COMMENTS:

M-6.1 Handle energy reporting

The Purpose of *Handle energy reporting* ***function is to***

Handle energy reporting
- RTO/ISO Market Operations system calculates actual interchange information and energy schedules
- RTO/ISO Market Operations system calculates actual Locational Marginal Pricing (LMP)
- RTO/ISO Market Operations system calculates actual losses

directly involving
RTO System Operator
RTO SCADA/EMS
Settlement System
Historical Records
Auditors
performing
Energy reporting for final settlements
with key interfaces between
RTO SCADA/EMS and Settlement System
RTO SCADA/EMS and Historical Records System
with communication configuration requirements of
One to one
LAN between SCADA/EMS
Settlement System
And Historical System
with quality of service requirements of
High availability
Frequent updates
High volumes
with security requirements of
High security in all areas
Because of the financial and market implications
with data management requirements of
Large SCADA database
Energy scheduling database
Settlements database
And historical database
with constraints of
No special constraints since LAN connections

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	1.0	3.0	2.0	1.0	1.4

COMMENTS:
The following comments were collected during the team rating review:

Security = 3 because data has very significant financial implications, thus requiring very high data integrity and non-
Data Management = 2 because of the large volumes of sensitive data being collected from many different systems

---

M-6.2 Meter Data Management Agents (MDMAs) retrieve, validate, and process meter revenue data

The Purpose of *Meter Data Management Agents (MDMAs) retrieve, validate, and process meter revenue data* ***function is to***

Meter Data Management Agents (MDMAs) retrieve
Validate and process meter revenue data

directly involving

MDMAs (which may be DisCos
ESPs
GenCos
Scheduling Coordinators
Etc)
Meters
Settlement System

performing

Retrieve
Validate and process meter data

with key interfaces between

MDMAs and meters
MDMAs and Settlement System

with communication configuration requirements of

Many to many links to meters
Using many different types of access

with quality of service requirements of

Medium availabiity (meters can be read later if unavailable)
High data accuracy (direct financial consequences)
Total high volumes of data between MDMAs and Settlement system

with security requirements of

High security in all areas
Because of the financial and market implications

with data management requirements of

Large metering database
Frequent updates
And data exchanges across organizational boundaries

with constraints of

Channels to meters may be media-constrained
Meters are compute constrained

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	3.0	2.0	3.0	2.2

COMMENTS:
This function has similar interfaces (and ratings) to function (M-2.5) RTO/ISO validate and register revenue meters above.

The following comments were collected during the peer review:

MDMAs and meters
MDMAs and Settlement System

M-6.3 Market Products Schedule Checkout

The Purpose of *Market Products Schedule Checkout* ***function is to***

Market Products Schedule Checkout
- Settlement Agents validate implemented energy schedules against contracted energy schedules
- Settlement Agents validate implemented ancillary services against contracted ancillary services
- Settlement Agents reconcile differences

directly involving

Settlement Agents
Settlement System
Scheduling Coordinators
Other RTOs

performing

Validate the actual against the planned energy schedules and ancillary services provisions

with key interfaces between

Settlement Agents and Settlement System
Energy Schedules and Settlement System
Ancillary Services and Settlement System
RTO Settlement System and other RTOs

with communication configuration requirements of

One to one LAN and/or WAN connections between systems

with quality of service requirements of

Medium availability (since settlements can be re-run)
Medium response because this process is not in real-time
High data accuracy because of financial and market implications

with security requirements of

High security in all areas
Because of the financial and market implications

with data management requirements of

Large settlements database
Frequent updates
And data exchanges across organizational boundaries

with constraints of

No special constraints since LAN and/or WAN connections

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	3.0	3.0	3.0	0.0	1.8

COMMENTS:
This function has similar interfaces (and ratings) to function (M-2.8) RTO/ISO auction, sell, and/or track transmission rights and other energy services to Market Participants above.

The following comments were collected during the peer review:

Settlement Agents and Settlement System
Energy Schedules and Settlement System
Ancillary Services and Settlement System
RTO Settlement System and other RTOs

M-6.4 Financial Settlements

The Purpose of *Financial Settlements* ***function is to***

Financial Settlements
- Settlement Agents reconcile RTO/ISO market
- Settlement Agents reconcile transmission market
- Settlement Agents reconcile Market Participants spot market
- Settlement Agents resolve disputes
- Energy Traders reconcile bilateral schedules

directly involving

Settlement Agents

Settlement System
Scheduling Coordinators
Energy Traders
Other Market Participants
Other RTOs

performing

Settle financial invoices for energy schedules and other market products

with key interfaces between

Settlement Agents and Settlement System
Energy Traders with each other

with communication configuration requirements of

One to one LAN and/or WAN connections between systems

with quality of service requirements of

Medium availability (since settlements can be re-run)
Medium response because this process is not in real-time
High data accuracy because of financial and market implications

with security requirements of

High security in all areas
Because of the financial and market implications

with data management requirements of

Large settlements database
Frequent updates
And data exchanges across organizational boundaries

with constraints of

No special constraints since LAN and/or WAN connections

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	3.0	3.0	3.0	2.0	2.2

COMMENTS:
This function has similar interfaces (and ratings) to function (M-2.8) RTO/ISO auction, sell, and/or track transmission rights and other energy services to Market Participants above.

The following comments were collected during the team rating review:

Constraint = 2 because Settlement processes and applilcations are not well defined or integrated

---

The following comments were collected during the peer review:

Settlement Agents and Settlement System
Energy Traders with each other

M-6.5 Accounting and Billing

The Purpose of *Accounting and Billing* ***function is to***

Accounting and Billing
- Accounting Agents create budget and financial forecast
- Accounting Agents manage accounts payable
- Accounting Agents manage accounts receivable

directly involving

Settlement Agents
Settlement System
Billing System
Accounting System
MDMA metering
Scheduling Coordinators
Energy Traders
Other Market Participants
Other RTOs

performing

Handle accounting and billing

with key interfaces between

Settlement Agents and Settlement System
Settlement System and Billing System
Billing System and Market Participants

with communication configuration requirements of

One to one LAN and/or WAN connections between systems

with quality of service requirements of

Medium availability (since billing can be re-run)
Medium response because this process is not in real-time
High data accuracy because of financial and market implications

with security requirements of

High security in all areas
Because of the financial and market implications

with data management requirements of

Large accounting and billing database
Frequent updates
And data exchanges across organizational boundaries

with constraints of

No special constraints since LAN and/or WAN connections

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3***

(highly likely to involve architectural challenges) ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	3.0	3.0	2.0	0.0	1.6

COMMENTS:
This function has similar interfaces (and ratings) to function (M-2.8) RTO/ISO auction, sell, and/or track transmission rights and other energy services to Market Participants above.

The following comments were collected during the team rating review:

Change: Data Management = 2 because Back Office to Back Office is well defined
Question, as to whenther this function is within the scope of IECSA

The following comments were collected during the peer review:

Settlement Agents and Settlement System
Settlement System and Billing System
Billing System and Market Participants

M-6.6 Market Monitoring and Auditing

The Purpose of *Market Monitoring and Auditing* ***function is to***

Market Monitoring and Auditing
- Regulators and auditors apply monitoring criteria
- Auditors perform market assessment
- Auditors investigate market abuse
- Auditor should have access to all information about power system and market

All proposed schedulles
Bids
Auction transactions and data
Outage and maintenance plans
Historical data
Etc

directly involving

Auditors
Regulators
Historical Archives
Logs

performing

Audit market operations

with key interfaces between

Auditors and Historical Archives and Logs

with communication configuration requirements of

One to one LAN and/or WAN connections between systems

with quality of service requirements of

Medium availability (since auditing can be handled after-the-fact)

Medium response because this process is not in real-time

High data accuracy because of financial and market implications

with security requirements of

High security in all areas

Because of the financial and market implications

with data management requirements of

Large historical archives and logs database

Frequent updates

And data exchanges across organizational boundaries

with constraints of

No special constraints since LAN and/or WAN connections

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	1.0	3.0	3.0	2.0	1.8

COMMENTS:

The following comments were collected during the team rating review:

Security = 3 because audit data could have very significant financial and legal implications, requiring data integrity and non-

Data Management = 3 because of the vast amounts of data from different databases across many different organizations, which must be collected and correlated

Constraints = 2 because the applications are not well defined and may change

---

G - Primary Generation Operations Domain

G-1 Real Time Scheduling - Interface to RTO/ISO

The Purpose of *Real Time Scheduling - Interface to RTO/ISO* ***function is to***

Facilitate Real Time Commitment
Dispatch
And Contingency Operations of large scale generation with the RTO/ISO EMS

directly involving

RTO/ISO planners
Generation planners
Transmission planners
Regulators
Regional planning agencies
And Market Participants

performing

The real time generation commitment
Dispatch
And contingency operations functions with the RTO/ISO

with key interfaces between

Gen Cos and Scheduling Coordinators
Gen Cos and RTOs/ISOs
Gen Cos and Web Server for Market Participants

with communication configuration requirements of

One to One over WAN

with quality of service requirements of

High data availability
Rapid response times
High data accuracy and high data frequency needed for interactions between RTO/ISO to ensure energy scheduling process

with security requirements of

High security in all areas because of fairness requirements with market rules and financial implecations

with data management requirements of

Large database for energy schedules
Requiring timely access
Frequent updates and data exchange across organizational boundaries

with constraints of

No special constraints
Since WAN connections to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of	Security	Data	Constraints	Average

	Service		Management		
2.0	3.0	3.0	2.0	3.0	2.6

COMMENTS:
The following comments were collected during the team rating review:

Configuration = 2 because SCADA data is retrieved from many diverse sites probably with diverse media and
Performance = 3 because real-time (on the order of 1-2 seconds) SCADA operations require high availability, rapid and timely responses, with high frequency and high volumes of
Security = 3 because SCADA involves control of power system
Also to maintain confidentiality of bidders
Data Management = 2 because of large volumes of frequent data
Constraints = 3 because media-constrained communications and compute-constrained field devices

---

G-2 Real Time Commitment - Interface to RTO/ISO

The Purpose of *Real Time Commitment - Interface to RTO/ISO* ***function is to***

support minimum cost real time scheduling of generation units based upon a continuous economic evaluation of the
It commits units based upon availability, operational constraints, cost, weather, and ancillary services

directly involving

RTO/ISO planners
Generation planners
Transmission planners
Regulators
Regional planning agencies
And Market Participants

performing

Real time generation commitment functions listed to meet forecast load
Reserve
And regulation requirements with the RTO/ISO

with key interfaces between

Gen Cos and Scheduling Coordinators
Gen Cos and RTOs/ISOs
Gen Cos and Web Server for Market Participants

with communication configuration requirements of

One to One over WAN

with quality of service requirements of

High data availability

Rapid response times
High data accuracy and high data frequency needed for interactions between RTO/ISO to ensure energy commitment process

with security requirements of

High security in all areas because of fairness requirements with market rules and financial implecations

with data management requirements of

Large database for energy schedules
Requiring timely access
Frequent updates and data exchange across organizational boundaries

with constraints of

No special constraints
Since WAN connections to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.8	2.8	2.6	1.8	2.8	2.4

COMMENTS:

G-2.1 Unit scheduling

The Purpose of *Unit scheduling* ***function is to***

Faciliate the commitment of units based on load forecasts
Outage schedules
And price

directly involving

RTO/ISO planners
Generation planners
Transmission planners
Regulators
Regional planning agencies
And Market Participants

performing

Real time generation unit scheduling to meet forecast load
Reserve
And regulation requirements with the RTO/ISO

with key interfaces between

Gen Cos and Scheduling Coordinators
Gen Cos and RTOs/ISOs
Gen Cos and Web Server for Market Participants

with communication configuration requirements of

One to One over WAN

with quality of service requirements of

High data availability
Rapid response times
High data accuracy and high data frequency needed for interactions between RTO/ISO to ensure energy commitment process

with security requirements of

High security in all areas because of fairness requirements with market rules and financial implecations

with data management requirements of

Large database for energy schedules
Requiring timely access
Frequent updates and data exchange across organizational boundaries

with constraints of

No special constraints
Since WAN connections to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	3.0	2.0	3.0	2.6

COMMENTS:
The following comments were collected during the team rating review:

Configuration = 2 because SCADA data is retrieved from many diverse sites probably with diverse media and
Performance = 3 because real-time (on the order of 1-2 seconds) SCADA operations require high availability, rapid and timely responses, with high frequency and high volumes of
Security = 3 because SCADA involves control of power system
Also to maintain confidentiality of bidders
Data Management = 2 because of large volumes of frequent data
Constraints = 3 because media-constrained communications and compute-constrained field devices

---

G-2.2 Unit constraints

The Purpose of *Unit constraints* ***function is to*** faciliate the commitment of units based on the physical limitations listed

directly involving

RTO/ISO planners
Generation planners

Transmission planners
Regulators
Regional planning agencies
And Market Participants

performing

Real time generation unit constraints to meet forecast load
Reserve
And regulation requirements with the RTO/ISO

with key interfaces between

Gen Cos and Scheduling Coordinators
Gen Cos and RTOs/ISOs
Gen Cos and Web Server for Market Participants

with communication configuration requirements of

One to One over WAN

with quality of service requirements of

High data availability
Rapid response times
High data accuracy and high data frequency needed for interactions between RTO/ISO to ensure energy commitment process

with security requirements of

High security in all areas because of fairness requirements with market rules and financial implecations

with data management requirements of

Large database for energy schedules
Requiring timely access
Frequent updates and data exchange across organizational boundaries

with constraints of

No special constraints
Since WAN connections to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	3.0	2.0	3.0	2.6

COMMENTS:
This function has similar interfaces (and ratings) to function (G-2.1) Unit scheduling above.

G-2.2.1 Ramp rates

The Purpose of *Ramp rates* ***function is similar to function (G-2.2) Unit constraints above.***

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	3.0	2.0	3.0	2.6

COMMENTS:
The following comments were collected during the team rating review:

Security = 3 because SCADA involves control of power system equipment

G-2.2.2 Startup times

The Purpose of** Startup times **function is similar to function (G-2.2) Unit constraints above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	3.0	2.0	3.0	2.6

COMMENTS:

G-2.2.3 Minimum down times

The Purpose of** Minimum down times **function is similar to function (G-2.2) Unit constraints above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	3.0	2.0	3.0	2.6

COMMENTS:

G-2.2.4 Minimum generation levels

The Purpose of** Minimum generation levels **function is similar to function (G-2.2) Unit constraints above.

On a scale of 0** (does not involve significant architectural challenges) **to 3

(highly likely to involve architectural challenges) ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	3.0	2.0	3.0	2.6

COMMENTS:

G-2.2.5 Upper operating limits

The Purpose of *Upper operating limits* ***function is similar to function*** ***(G-2.2) Unit constraints*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	3.0	2.0	3.0	2.6

COMMENTS:

G-2.2.6 Minimum run times

The Purpose of *Minimum run times* ***function is similar to function*** ***(G-2.2) Unit constraints*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	3.0	2.0	3.0	2.6

COMMENTS:

G-2.3 Price mitigation

The Purpose of *Price mitigation* ***function is to***

Faciliate the commitment of units to provide power
Requlation
And reseveres based on least-as-bid cost analysis

directly involving

RTO/ISO planners
Generation planners
Transmission planners

Regulators
Regional planning agencies
And Market Participants

performing

Price Mitigation to meet forecast load
Reserve
And regulation requirements with the RTO/ISO

with key interfaces between

Gen Cos and Scheduling Coordinators
Gen Cos and RTOs/ISOs
Gen Cos and Web Server for Market Participants

with communication configuration requirements of

One to One over WAN

with quality of service requirements of

High data availability
Rapid response times
High data accuracy and high data frequency needed for interactions between RTO/ISO to ensure energy commitment process

with security requirements of

High security in all areas because of fairness requirements with market rules and financial implecations

with data management requirements of

Large database for energy schedules
Requiring timely access
Frequent updates and data exchange across organizational boundaries

with constraints of

No special constraints
Since WAN connections to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	3.0	2.0	3.0	2.6

COMMENTS:
This function has similar interfaces (and ratings) to function (G-2.1) Unit scheduling above.

G-2.3.1 Day-Ahead bidding

The Purpose of *Day-Ahead bidding* ***function is similar to function (G-2.3) Price mitigation above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3***

(highly likely to involve architectural challenges) ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	3.0	2.0	3.0	2.6

COMMENTS:

G-2.3.2 Spot-Price bidding

The Purpose of *Spot-Price bidding* ***function is similar to function*** ***(G-2.3) Price mitigation*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	3.0	2.0	3.0	2.6

COMMENTS:

G-2.4 Weather Analysis

The Purpose of *Weather Analysis* ***function***
is to consider the possible affects of adverse weather in the commitment of units
directly involving
RTO/ISO planners
Generation planners
Transmission planners
Regulators
Meteorological Services
Regional planning agencies
And Market Participants
performing
Weather Analysis effects to meet forecast load
Reserve
And regulation requirements with the RTO/ISO
with key interfaces between
Gen Cos and Scheduling Coordinators
Gen Cos and RTOs/ISOs
Gen Cos and Web Server for Market Participants
with communication configuration requirements of
One to One over WAN
with quality of service requirements of
High data availability
Rapid response times

High data accuracy and high data frequency needed for interactions between RTO/ISO to ensure energy commitment process

with security requirements of

High security in all areas because of fairness requirements with market rules and financial implecations

with data management requirements of

Large database for energy schedules

Requiring timely access

Frequent updates and data exchange across organizational boundaries

with constraints of

No special constraints

Since WAN connections to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	1.0	1.0	2.0	1.4

COMMENTS:

The following comments were collected during the team rating review:

Performance = 2 because there are time constraints on the data -- missed data can resutl in damage (windfarm application)

Constraints = 2 because of licensing issues

G-2.5 Ancillary services

The Purpose of *Ancillary services* ***function***

is to faciliate the commitment of units based on reserve and regulation forecasts and requirements

directly involving

RTO/ISO planners

Generation planners

Transmission planners

Regulators

Regional planning agencies

And Market Participants

performing

Ancillary services effects to meet forecast load

Reserve

And regulation requirements with the RTO/ISO

with key interfaces between

Gen Cos and Scheduling Coordinators

Gen Cos and RTOs/ISOs

Gen Cos and Web Server for Market Participants

with communication configuration requirements of

One to One over WAN

with quality of service requirements of

High data availability

Rapid response times

High data accuracy and high data frequency needed for interactions between RTO/ISO to ensure energy commitment process

with security requirements of

High security in all areas because of fairness requirements with market rules and financial implecations

with data management requirements of

Large database for energy schedules

Requiring timely access

Frequent updates and data exchange across organizational boundaries

with constraints of

No special constraints

Since WAN connections to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	3.0	2.0	3.0	2.6

COMMENTS:

This function has similar interfaces (and ratings) to function (G-2.1) Unit scheduling above.

G-2.5.1 Reserves commitment

The Purpose of *Reserves commitment* ***function is similar to function (G-2.5) Ancillary services above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	3.0	2.0	3.0	2.6

COMMENTS:

G-2.5.2 Regulation commitment

The Purpose of** Regulation commitment **function is similar to function** [(G-2.5) Ancillary services](#) **above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	3.0	2.0	3.0	2.6

COMMENTS:

G-3 Real Time Dispatching - Interface to RTO/ISO

The Purpose of** Real Time Dispatching - Interface to RTO/ISO **function is to

support minimum cost real time scheduling of generation units based upon a continuous load, reserves, and regulation evaluation of the

It dispatches units based upon availability, operational constraints, cost, weather, and ancillary services

directly involving

RTO/ISO planners, Generation planners, transmission planners, regulators, regional planning agencies, and Market

RTO/ISO Operators and GenCo Operators

performing

Real time generation dispatch functions listed to meet forecast load

Reserve

And regulation requirements with the RTO/ISO

with key interfaces between

RTO SCADA/EMS and Generators

RTO SCADA/EMS and TransCos

RTO SCADA/EMS and DisCos

RTO SCADA/EMS and other RTO SCADA/EMS

RTO SCADA/EMS and Scheduling Coordinators

RTO SCADA/EMS and NERC/Reliability Councils

with communication configuration requirements of

One to One over WAN

with quality of service requirements of

High data availability

Rapid response times

High data accuracy and high data frequency needed for interactions between RTO/ISO to ensure energy dispatching process

with security requirements of

High security in all areas because of fairness requirements with market rules and financial implecations

with data management requirements of

Large database for energy schedules
Requiring timely access
Frequent updates and data exchange across organizational boundaries

with constraints of

Special constraints of Legacy systems used for SCADA
Compute-constrained field devices and media-constrained links to many remote sites

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.7	2.5	2.1	1.4	1.5	1.8

COMMENTS:

G-3.1 Unit dispatching

The Purpose of *Unit dispatching* ***function***
is to dispatch units based on load requirements and on a least-as-bid cost basis

directly involving

RTO/ISO planners, Generation planners, transmission planners, regulators, regional planning agencies, and Market
RTO/ISO Operators and GenCo Operators

performing

Real time generation dispatch functions listed to meet forecast load
Reserve
And regulation requirements with the RTO/ISO

with key interfaces between

RTO SCADA/EMS and Generators
RTO SCADA/EMS and TransCos
RTO SCADA/EMS and DisCos
RTO SCADA/EMS and other RTO SCADA/EMS
RTO SCADA/EMS and Scheduling Coordinators
RTO SCADA/EMS and NERC/Reliability Councils

with communication configuration requirements of

One to One over WAN

with quality of service requirements of

High data availability
Rapid response times
High data accuracy and high data frequency needed for interactions between RTO/ISO to ensure energy dispatching process

with security requirements of

High security in all areas because of fairness requirements with market rules and financial implecations

with data management requirements of

Large database for energy schedules
Requiring timely access
Frequent updates and data exchange across organizational boundaries

with constraints of

Special constraints of Legacy systems used for SCADA
Compute-constrained field devices and media-constrained links to many remote sites

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	3.0	2.0	3.0	2.6

COMMENTS:
This function has similar interfaces (and ratings) to function (G-2.1) Unit scheduling above.

G-3.2 Unit constraints

The Purpose of *Unit constraints* ***function is to*** facilitate the dispatch of units based on the physical limitations listed

directly involving

RTO/ISO planners
Generation planners
Transmission planners
Regulators
Regional planning agencies
And Market Participants

performing

Real time generation dispatch functions listed to meet forecast load
Reserve
And regulation requirements with the RTO/ISO

with key interfaces between

RTO SCADA/EMS and Generators
RTO SCADA/EMS and TransCos
RTO SCADA/EMS and DisCos
RTO SCADA/EMS and other RTO SCADA/EMS
RTO SCADA/EMS and Scheduling Coordinators
RTO SCADA/EMS and NERC/Reliability Councils

with communication configuration requirements of

One to One over WAN

with quality of service requirements of

High data availability

Rapid response times
High data accuracy and high data frequency needed for interactions between RTO/ISO to ensure energy dispatching process

with security requirements of

High security in all areas because of fairness requirements with market rules and financial implecations

with data management requirements of

Large database for energy schedules
Requiring timely access
Frequent updates and data exchange across organizational boundaries

with constraints of

Special constraints of Legacy systems used for SCADA
Compute-constrained field devices and media-constrained links to many remote sites

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	3.0	2.0	3.0	2.6

COMMENTS:
This function has similar interfaces (and ratings) to function (G-2.1) Unit scheduling above.

G-3.2.1 Ramp rates

The Purpose of *Ramp rates* ***function is similar to function (G-3.2) Unit constraints above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	3.0	2.0	3.0	2.6

COMMENTS:

G-3.2.2 Startup times

The Purpose of *Startup times* ***function is similar to function (G-3.2) Unit constraints above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3***

(highly likely to involve architectural challenges) ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	3.0	2.0	3.0	2.6

COMMENTS:

G-3.2.3 Minimum down times

The Purpose of *Minimum down times* ***function is similar to function*** ***(G-3.2) Unit constraints*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	3.0	2.0	3.0	2.6

COMMENTS:

G-3.2.4 Minimum generation levels

The Purpose of *Minimum generation levels* ***function is similar to function*** ***(G-3.2) Unit constraints*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	3.0	2.0	3.0	2.6

COMMENTS:

G-3.2.5 Upper operating limits

The Purpose of *Upper operating limits* ***function is similar to function*** ***(G-3.2) Unit constraints*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	3.0	2.0	3.0	2.6

COMMENTS:

G-3.2.6 Minimum run times

The Purpose of *Minimum run times* ***function is similar to function*** ***(G-3.2) Unit constraints*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	3.0	2.0	3.0	2.6

COMMENTS:

G-3.3 Price mitigation

The Purpose of *Price mitigation* ***function***
is to

Faciliate the dispatch of units to provide power
Requlation
And reseveres based on least-as-bid cost analysis

directly involving

RTO/ISO planners
Generation planners
Transmission planners
Regulators
Regional planning agencies
And Market Participants

performing

Real time generation dispatch functions listed to meet forecast load
Reserve
And regulation requirements with the RTO/ISO

with key interfaces between

RTO SCADA/EMS and Generators
RTO SCADA/EMS and TransCos
RTO SCADA/EMS and DisCos
RTO SCADA/EMS and other RTO SCADA/EMS
RTO SCADA/EMS and Scheduling Coordinators
RTO SCADA/EMS and NERC/Reliability Councils

with communication configuration requirements of

One to One over WAN

with quality of service requirements of

High data availability
Rapid response times

High data accuracy and high data frequency needed for interactions between RTO/ISO to ensure energy dispatching process

with security requirements of

High security in all areas because of fairness requirements with market rules and financial implecations

with data management requirements of

Large database for energy schedules

Requiring timely access

Frequent updates and data exchange across organizational boundaries

with constraints of

Special constraints of Legacy systems used for SCADA

Compute-constrained field devices and media-constrained links to many remote sites

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	3.0	2.0	3.0	2.6

COMMENTS:

This function has similar interfaces (and ratings) to function (G-2.1) Unit scheduling above.

G-3.3.1 Day-Ahead bidding

The Purpose of *Day-Ahead bidding* ***function is similar to function (G-3.3) Price mitigation above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	3.0	2.0	3.0	2.6

COMMENTS:

G-3.3.2 Spot-Price bidding

The Purpose of *Spot-Price bidding* ***function is similar to function (G-3.3) Price mitigation above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	3.0	2.0	3.0	2.6

COMMENTS:

G-3.4 Weather Analysis

The Purpose of *Weather Analysis* ***function***
is to consider the possible affects of adverse weather in the dispatch of units
directly involving
RTO/ISO planners, Generation planners, transmission planners, regulators, regional planning agencies, and Market
RTO/ISO Operators and GenCo Operators
performing
Real time generation dispatch functions listed to meet forecast load Reserve
And regulation requirements with the RTO/ISO
with key interfaces between
RTO SCADA/EMS and Generators
RTO SCADA/EMS and TransCos
RTO SCADA/EMS and DisCos
RTO SCADA/EMS and other RTO SCADA/EMS
RTO SCADA/EMS and Scheduling Coordinators
RTO SCADA/EMS and NERC/Reliability Councils
with communication configuration requirements of
One to One over WAN
with quality of service requirements of
High data availability
Rapid response times
High data accuracy and high data frequency needed for interactions between RTO/ISO to ensure energy dispatching process
with security requirements of
High security in all areas because of fairness requirements with market rules and financial implecations
with data management requirements of
Large database for energy schedules
Requiring timely access
Frequent updates and data exchange across organizational boundaries
with constraints of
Special constraints of Legacy systems used for SCADA
Compute-constrained field devices and media-constrained links to many remote sites

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3***

(highly likely to involve architectural challenges) ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	1.0	1.0	2.0	1.4

COMMENTS:
The following comments were collected during the team rating review:

Performance = 2 because there are time constraints on the data -- missed data can resutl in damage (windfarm application)
Constraints = 2 because of licensing issues

G-3.5 Ancillary services

The Purpose of *Ancillary services* ***function***
is to dispatch units based on reserve and regulation requirements and on a least-as-bid cost basis
directly involving
RTO/ISO planners, Generation planners, transmission planners, regulators, regional planning agencies, and Market
RTO/ISO Operators and GenCo Operators
performing
Real time generation dispatch functions listed to meet forecast load
Reserve
And regulation requirements with the RTO/ISO
with key interfaces between
RTO SCADA/EMS and Generators
RTO SCADA/EMS and TransCos
RTO SCADA/EMS and DisCos
RTO SCADA/EMS and other RTO SCADA/EMS
RTO SCADA/EMS and Scheduling Coordinators
RTO SCADA/EMS and NERC/Reliability Councils
with communication configuration requirements of
One to One over WAN
with quality of service requirements of
High data availability
Rapid response times
High data accuracy and high data frequency needed for interactions between RTO/ISO to ensure energy dispatching process
with security requirements of
High security in all areas because of fairness requirements with market rules and financial implecations
with data management requirements of
Large database for energy schedules
Requiring timely access

Frequent updates and data exchange across organizational boundaries

with constraints of

Special constraints of Legacy systems used for SCADA

Compute-constrained field devices and media-constrained links to many remote sites

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	3.0	2.0	3.0	2.6

COMMENTS:

This function has similar interfaces (and ratings) to function (G-2.1) Unit scheduling above.

G-3.5.1 Reserves dispatch

The Purpose of *Reserves dispatch* ***function is similar to function (G-3.5) Ancillary services above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	3.0	2.0	3.0	2.6

COMMENTS:

G-3.5.2 Regulation dispatch

The Purpose of *Regulation dispatch* ***function is similar to function (G-3.5) Ancillary services above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	3.0	2.0	3.0	2.6

COMMENTS:

G-3.6 Equipment status

The Purpose of *Equipment status* ***function***
is to provide real time intellegence regarding equipment state
directly involving
RTO/ISO planners, Generation planners, transmission planners, regulators, regional planning agencies, and Market
RTO/ISO Operators and GenCo Operators
performing
Real time generation dispatch functions listed to meet forecast load
Reserve
And regulation requirements with the RTO/ISO
with key interfaces between
RTO SCADA/EMS and Generators
RTO SCADA/EMS and TransCos
RTO SCADA/EMS and DisCos
RTO SCADA/EMS and other RTO SCADA/EMS
RTO SCADA/EMS and Scheduling Coordinators
RTO SCADA/EMS and NERC/Reliability Councils
with communication configuration requirements of
One to One over WAN
with quality of service requirements of
High data availability
Rapid response times
High data accuracy and high data frequency needed for interactions between RTO/ISO to ensure energy dispatching process
with security requirements of
High security in all areas because of fairness requirements with market rules and financial implecations
with data management requirements of
Large database for energy schedules
Requiring timely access
Frequent updates and data exchange across organizational boundaries
with constraints of
Special constraints of Legacy systems used for SCADA
Compute-constrained field devices and media-constrained links to many remote sites

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	3.0	2.0	3.0	2.6

COMMENTS:
This function has similar interfaces (and ratings) to function (G-2.1) Unit scheduling above.

G-3.7 Equipment control

The Purpose of *Equipment control* ***function***
is to provide real time management of equipment
directly involving
RTO/ISO Operators and GenCo Operators
performing
Real time generation dispatch functions listed to meet forecast load
Reserve
And regulation requirements with the RTO/ISO
with key interfaces between
RTO SCADA/EMS and Generators
RTO SCADA/EMS and TransCos
RTO SCADA/EMS and DisCos
RTO SCADA/EMS and other RTO SCADA/EMS
RTO SCADA/EMS and Scheduling Coordinators
RTO SCADA/EMS and NERC/Reliability Councils
with communication configuration requirements of
One to One over WAN
with quality of service requirements of
High data availability
Rapid response times
High data accuracy and high data frequency needed for interactions between RTO/ISO to ensure energy dispatching process
with security requirements of
High security in all areas because of fairness requirements with market rules and financial implecations
with data management requirements of
Large database for energy schedules
Requiring timely access
Frequent updates and data exchange across organizational boundaries
with constraints of
Special constraints of Legacy systems used for SCADA
Compute-constrained field devices and media-constrained links to many remote sites

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	3.0	2.0	3.0	2.6

COMMENTS:

This function has similar interfaces (and ratings) to function (G-2.1) Unit scheduling above.

G-3.8 Metering

The Purpose of *Metering* ***function***
is to provide real time measurements to be used to calculate power system parameters
directly involving
RTO/ISO Operators and GenCo Operators
performing
Real time generation dispatch functions listed to meet forecast load
Reserve
And regulation requirements with the RTO/ISO
with key interfaces between
RTO SCADA/EMS and Generators
RTO SCADA/EMS and TransCos
RTO SCADA/EMS and DisCos
RTO SCADA/EMS and other RTO SCADA/EMS
RTO SCADA/EMS and Scheduling Coordinators
RTO SCADA/EMS and NERC/Reliability Councils
with communication configuration requirements of
One to One over WAN
with quality of service requirements of
High data availability
Rapid response times
High data accuracy and high data frequency needed for interactions between RTO/ISO to ensure energy dispatching process
with security requirements of
High security in all areas because of fairness requirements with market rules and financial implecations
with data management requirements of
Large database for energy schedules
Requiring timely access
Frequent updates and data exchange across organizational boundaries
with constraints of
Special constraints of Legacy systems used for SCADA
Compute-constrained field devices and media-constrained links to many remote sites

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	3.0	2.0	3.0	2.6

COMMENTS:
This function has similar interfaces (and ratings) to function (G-2.1) Unit scheduling above.

G-3.8.1 Real Time Power Flow measurements

The Purpose of *Real Time Power Flow measurements* ***function is similar to function (G-3.8) Metering above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	3.0	2.0	3.0	2.6

COMMENTS:

G-3.8.2 Real Time Var support measurements

The Purpose of *Real Time Var support measurements* ***function is similar to function (G-3.8) Metering above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	3.0	2.0	3.0	2.6

COMMENTS:

G-4 Real Time Contingency Operations

The Purpose of *Real Time Contingency Operations* ***function is to***

support minimum cost real time scheduling of generation units based upon unexpected , event driven emergency conditions that are not foreseen by Real Time Committment or Real Time

It dispatches units based upon ancillary services, availability, operational constraints, cost, and weather

directly involving

RTO/ISO planners, Generation planners, transmission planners, regulators, regional planning agencies, and Market

RTO/ISO Operators and GenCo Operators

performing

Real time generation contingency operations functions listed to meet forecast load
Reserve
And regulation requirements with the RTO/ISO

with key interfaces between

RTO SCADA/EMS and Generators
RTO SCADA/EMS and TransCos
RTO SCADA/EMS and DisCos
RTO SCADA/EMS and other RTO SCADA/EMS
RTO SCADA/EMS and Scheduling Coordinators
RTO SCADA/EMS and NERC/Reliability Councils

with communication configuration requirements of

One to One over WAN

with quality of service requirements of

High data availability
Rapid response times
High data accuracy and high data frequency needed for interactions between RTO/ISO to ensure energy Contingency Operations

with security requirements of

High security in all areas because of fairness requirements with market rules and financial implecations

with data management requirements of

Large database for energy schedules
Requiring timely access
Frequent updates and data exchange across organizational boundaries

with constraints of

No special constraints
Since WAN connectins to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	3.0	2.0	1.0	0.0	1.4

COMMENTS:
The following comments were collected during the team rating review:

QoS = 3 because there is a real-time (15-20 ms) requirements for communications to perform functions and maintain system stability
Security = 2 because data integrity / avoid spoofing

G-4.1 Reserve pickup

The Purpose of *Reserve pickup* ***function***
is to dispatch reserve units to serve load based on emergency requirements
directly involving
RTO/ISO planners, Generation planners, transmission planners, regulators, regional planning agencies, and Market
RTO/ISO Operators and GenCo Operators
performing
Real time generation contingency operations functions listed to meet forecast load
Reserve
And regulation requirements with the RTO/ISO
with key interfaces between
RTO SCADA/EMS and Generators
RTO SCADA/EMS and TransCos
RTO SCADA/EMS and DisCos
RTO SCADA/EMS and other RTO SCADA/EMS
RTO SCADA/EMS and Scheduling Coordinators
RTO SCADA/EMS and NERC/Reliability Councils
with communication configuration requirements of
One to One over WAN
with quality of service requirements of
High data availability
Rapid response times
High data accuracy and high data frequency needed for interactions between RTO/ISO to ensure energy Contingency Operations
with security requirements of
High security in all areas because of fairness requirements with market rules and financial implecations
with data management requirements of
Large database for energy schedules
Requiring timely access
Frequent updates and data exchange across organizational boundaries
with constraints of
No special constraints
Since WAN connectins to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	3.0	2.0	1.0	0.0	1.4

COMMENTS:
The following comments were collected during the team rating review:

QoS = 3 because there is a real-time (15-20 ms) requirements for communications to perform functions and maintain system stability

Security = 2 because data integrity / avoid spoofing

G-4.2 Regulation pickup

The Purpose of *Regulation pickup* ***function***

is to dispatch regulation units to provide voltage support based on emergency requirements

directly involving

RTO/ISO planners, Generation planners, transmission planners, regulators, regional planning agencies, and Market

RTO/ISO Operators and GenCo Operators

performing

Real time generation contingency operations functions listed to meet forecast load

Reserve

And regulation requirements with the RTO/ISO

with key interfaces between

RTO SCADA/EMS and Generators

RTO SCADA/EMS and TransCos

RTO SCADA/EMS and DisCos

RTO SCADA/EMS and other RTO SCADA/EMS

RTO SCADA/EMS and Scheduling Coordinators

RTO SCADA/EMS and NERC/Reliability Councils

with communication configuration requirements of

One to One over WAN

with quality of service requirements of

High data availability

Rapid response times

High data accuracy and high data frequency needed for interactions between RTO/ISO to ensure energy Contingency Operations

with security requirements of

High security in all areas because of fairness requirements with market rules and financial implecations

with data management requirements of

Large database for energy schedules

Requiring timely access

Frequent updates and data exchange across organizational boundaries

with constraints of

No special constraints

Since WAN connectins to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3***

(highly likely to involve architectural challenges) ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	3.0	2.0	1.0	0.0	1.4

COMMENTS:
This function has similar interfaces (and ratings) to function (G-4.1) Reserve pickup above.

G-4.3 Scheduled equipment outage contingencies

The Purpose of *Scheduled equipment outage contingencies* ***function is to*** facilitate uninterrupted operations due to expected equipment outages

directly involving

RTO/ISO planners, Generation planners, transmission planners, regulators, regional planning agencies, and Market
RTO/ISO Operators and GenCo Operators

performing

Real time generation contingency operations functions listed to meet forecast load
Reserve
And regulation requirements with the RTO/ISO

with key interfaces between

RTO SCADA/EMS and Generators
RTO SCADA/EMS and TransCos
RTO SCADA/EMS and DisCos
RTO SCADA/EMS and other RTO SCADA/EMS
RTO SCADA/EMS and Scheduling Coordinators
RTO SCADA/EMS and NERC/Reliability Councils

with communication configuration requirements of

One to One over WAN

with quality of service requirements of

High data availability
Rapid response times
High data accuracy and high data frequency needed for interactions between RTO/ISO to ensure energy Contingency Operations

with security requirements of

High security in all areas because of fairness requirements with market rules and financial implecations

with data management requirements of

Large database for energy schedules
Requiring timely access
Frequent updates and data exchange across organizational boundaries

with constraints of

No special constraints

Since WAN connectins to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	1.0	1.0	1.0

COMMENTS:

G-4.4 Unscheduled equipment outage contingencies (self-healing)

The Purpose of *Unscheduled equipment outage contingencies (self-healing)* ***function***
is to facilitate uninterrupted operations due to unexpected equipment outages
directly involving
RTO/ISO planners, Generation planners, transmission planners, regulators, regional planning agencies, and Market
RTO/ISO Operators and GenCo Operators
performing
Real time generation contingency operations functions listed to meet forecast load
Reserve
And regulation requirements with the RTO/ISO
with key interfaces between
RTO SCADA/EMS and Generators
RTO SCADA/EMS and TransCos
RTO SCADA/EMS and DisCos
RTO SCADA/EMS and other RTO SCADA/EMS
RTO SCADA/EMS and Scheduling Coordinators
RTO SCADA/EMS and NERC/Reliability Councils
with communication configuration requirements of
One to One over WAN
with quality of service requirements of
High data availability
Rapid response times
High data accuracy and high data frequency needed for interactions between RTO/ISO to ensure energy Contingency Operations
with security requirements of
High security in all areas because of fairness requirements with market rules and financial implecations
with data management requirements of
Large database for energy schedules
Requiring timely access
Frequent updates and data exchange across organizational boundaries

with constraints of

No special constraints
Since WAN connectins to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	2.0	1.0	0.0	1.6

COMMENTS:
The following comments were collected during the team rating review:

Configuration = 2 because requirements to coordinate with a variety of other networks and equipment for self-healiing implementations
QoS = 3 because there is a real-time (15-20 ms) requirements for communications to perform functions and maintain system stability
Security = 2 because data integrity / avoid spoofing

G-4.5 Electrical system fault/abnormal operation contingencies (self-healing)

The Purpose of *Electrical system fault/abnormal operation contingencies (self-healing)* ***function***
is to facilitate uninterrupted operations via unexpected outages due to faults or abnormal operating conditions
directly involving

RTO/ISO planners, Generation planners, transmission planners, regulators, regional planning agencies, and Market
RTO/ISO Operators and GenCo Operators

performing

Real time generation contingency operations functions listed to meet forecast load
Reserve
And regulation requirements with the RTO/ISO

with key interfaces between

RTO SCADA/EMS and Generators
RTO SCADA/EMS and TransCos
RTO SCADA/EMS and DisCos
RTO SCADA/EMS and other RTO SCADA/EMS
RTO SCADA/EMS and Scheduling Coordinators
RTO SCADA/EMS and NERC/Reliability Councils

with communication configuration requirements of

One to One over WAN

with quality of service requirements of

High data availability
Rapid response times
High data accuracy and high data frequency needed for interactions between RTO/ISO to ensure energy Contingency Operations

with security requirements of

High security in all areas because of fairness requirements with market rules and financial implecations

with data management requirements of

Large database for energy schedules
Requiring timely access
Frequent updates and data exchange across organizational boundaries

with constraints of

No special constraints
Since WAN connectins to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	2.0	1.0	0.0	1.6

COMMENTS:
This function has similar interfaces (and ratings) to function [(G-4.4) Unscheduled equipment outage contingencies (self-healing)] above.

G-4.6 Contingency analysis with optimal power flow

The Purpose of *Contingency analysis with optimal power flow* ***function is to*** continuously evaluate load requirements with preplanned contingency scenarios

directly involving

RTO/ISO planners, Generation planners, transmission planners, regulators, regional planning agencies, and Market
RTO/ISO Operators and GenCo Operators

performing

Real time generation contingency operations functions listed to meet forecast load
Reserve
And regulation requirements with the RTO/ISO

with key interfaces between

RTO SCADA/EMS and Generators
RTO SCADA/EMS and TransCos
RTO SCADA/EMS and DisCos
RTO SCADA/EMS and other RTO SCADA/EMS
RTO SCADA/EMS and Scheduling Coordinators

RTO SCADA/EMS and NERC/Reliability Councils

with communication configuration requirements of

One to One over WAN

with quality of service requirements of

High data availability

Rapid response times

High data accuracy and high data frequency needed for interactions between RTO/ISO to ensure energy Contingency Operations

with security requirements of

High security in all areas because of fairness requirements with market rules and financial implecations

with data management requirements of

Large database for energy schedules

Requiring timely access

Frequent updates and data exchange across organizational boundaries

with constraints of

No special constraints

Since WAN connectins to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	2.0	1.0	0.0	1.2

COMMENTS:

The following comments were collected during the team rating review:

QoS = 2 because relative high speed distribution and arming of contingency plans

Security = 2 because Prevent spoofing or DoS because the impact of spoofing or Dos could result in unintended operation of equipment - could initiate an erroneous contingency

---

G-4.7 Black Start (healthy grid)

The Purpose of *Black Start (healthy grid)* ***function is to*** facilitate bringing units on line when the system is healthy with the constraints listed

directly involving

RTO/ISO planners, Generation planners, transmission planners, regulators, regional planning agencies, and Market

RTO/ISO Operators and GenCo Operators

performing

Real time generation contingency operations functions listed to meet forecast load
Reserve
And regulation requirements with the RTO/ISO

with key interfaces between

RTO SCADA/EMS and Generators
RTO SCADA/EMS and TransCos
RTO SCADA/EMS and DisCos
RTO SCADA/EMS and other RTO SCADA/EMS
RTO SCADA/EMS and Scheduling Coordinators
RTO SCADA/EMS and NERC/Reliability Councils

with communication configuration requirements of

One to One over WAN

with quality of service requirements of

High data availability
Rapid response times
High data accuracy and high data frequency needed for interactions between RTO/ISO to ensure energy Contingency Operations

with security requirements of

High security in all areas because of fairness requirements with market rules and financial implecations

with data management requirements of

Large database for energy schedules
Requiring timely access
Frequent updates and data exchange across organizational boundaries

with constraints of

No special constraints
Since WAN connectins to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	1.0	0.0	1.0	1.0

COMMENTS:
The following comments were collected during the team rating review:

Configuration = 2 because a manual process today will be automated in future and requires coordination with many entiries over a variety of network systems

---

G-4.7.1 Maximum power output

The Purpose of *Maximum power output* ***function is similar to function*** ***(G-4.7) Black Start (healthy grid)*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	1.0	0.0	1.0	1.0

COMMENTS:

G-4.7.2 Reactive power limits

The Purpose of *Reactive power limits* ***function is similar to function*** ***(G-4.7) Black Start (healthy grid)*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	1.0	0.0	1.0	1.0

COMMENTS:

G-4.7.3 Start-up times

The Purpose of *Start-up times* ***function is similar to function*** ***(G-4.7) Black Start (healthy grid)*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	1.0	0.0	1.0	1.0

COMMENTS:

G-4.7.4 Ramp rates

The Purpose of *Ramp rates* ***function is similar to function*** ***(G-4.7) Black Start (healthy grid)*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	1.0	0.0	1.0	1.0

COMMENTS:

G-4.8 Black Start (system restoration)

The Purpose of *Black Start (system restoration)* ***function***
is to facilitate bringing units on line during system restoration with the constraints listed
directly involving
RTO/ISO planners, Generation planners, transmission planners, regulators, regional planning agencies, and Market
RTO/ISO Operators and GenCo Operators
performing
Real time generation contingency operations functions listed to meet forecast load
Reserve
And regulation requirements with the RTO/ISO
with key interfaces between
RTO SCADA/EMS and Generators
RTO SCADA/EMS and TransCos
RTO SCADA/EMS and DisCos
RTO SCADA/EMS and other RTO SCADA/EMS
RTO SCADA/EMS and Scheduling Coordinators
RTO SCADA/EMS and NERC/Reliability Councils
with communication configuration requirements of
One to One over WAN
with quality of service requirements of
High data availability
Rapid response times
High data accuracy and high data frequency needed for interactions between RTO/ISO to ensure energy Contingency Operations
with security requirements of
High security in all areas because of fairness requirements with market rules and financial implecations
with data management requirements of
Large database for energy schedules
Requiring timely access
Frequent updates and data exchange across organizational boundaries
with constraints of
No special constraints
Since WAN connectins to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3***

(highly likely to involve architectural challenges) ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	2.0	2.0	1.0	2.2

COMMENTS:
The following comments were collected during the team rating review:

Configuration = 3 because a manual process today will be automated in future and requires coordination with many entiries over a variety of netowrk systems
QoS = 3 because availability issue -- system is black -- absolutely critical to get grid back on line before backup power
Security = 2 because you cannot have anybody block you from starting the system (DoS) - guaranteed delivery
Data Mgmt = 2 because you want to be able to capture and store some of the real time data to do post mortem analysis

---

G-4.8.1 Physical constraints - startup times, real & reactive power, ramp times

The Purpose of *Physical constraints - startup times, real & reactive power, ramp times* ***function is similar to function*** ***(G-4.8) Black Start (system restoration)*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	2.0	2.0	1.0	2.2

COMMENTS:

G-4.8.2 Scheduling constraints - unit/personnel availability

The Purpose of *Scheduling constraints - unit/personnel availability* ***function is similar to function*** ***(G-4.8) Black Start (system restoration)*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	2.0	2.0	1.0	2.2

COMMENTS:

G-4.8.3 Policy constraints - owner dictated

The Purpose of *Policy constraints - owner dictated* ***function is similar to function*** ***(G-4.8) Black Start (system restoration)*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	2.0	2.0	1.0	2.2

COMMENTS:

G-4.9 Emergency Response - Disaster preparedness contingencies

The Purpose of *Emergency Response - Disaster preparedness contingencies* ***function***
is to

Facilitate scheduling of generation units based upon unexpected
Event driven emergency conditions, that are not foreseen by Real Time Committment or Real Time Dispatch

directly involving

RTO/ISO planners, Generation planners, transmission planners, regulators, regional planning agencies, and Market
RTO/ISO Operators and GenCo Operators

performing

Real time generation contingency operations functions listed to meet forecast load
Reserve
And regulation requirements with the RTO/ISO

with key interfaces between

RTO SCADA/EMS and Generators
RTO SCADA/EMS and TransCos
RTO SCADA/EMS and DisCos
RTO SCADA/EMS and other RTO SCADA/EMS
RTO SCADA/EMS and Scheduling Coordinators
RTO SCADA/EMS and NERC/Reliability Councils

with communication configuration requirements of

One to One over WAN

with quality of service requirements of

High data availability
Rapid response times

High data accuracy and high data frequency needed for interactions between RTO/ISO to ensure energy Contingency Operations

with security requirements of

High security in all areas because of fairness requirements with market rules and financial implecations

with data management requirements of

Large database for energy schedules

Requiring timely access

Frequent updates and data exchange across organizational boundaries

with constraints of

No special constraints

Since WAN connectins to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	3.0	2.0	1.0	0.0	1.4

COMMENTS:

This function has similar interfaces (and ratings) to function (G-4.1) Reserve pickup above.

The following comments were collected during the team rating review:

QoS=3 because there is a real-time (15-20 ms) requirements for communications to perform functions and maintain system stability

---

G-4.10 Performance standards data

The Purpose of *Performance standards data* ***function is to*** facilitate generation response to system demands within the limitations of the generators capability to perform the parameters listed

directly involving

RTO/ISO planners, Generation planners, transmission planners, regulators, regional planning agencies, and Market

RTO/ISO Operators and GenCo Operators

performing

Real time generation contingency operations functions listed to meet forecast load

Reserve

And regulation requirements with the RTO/ISO

with key interfaces between

RTO SCADA/EMS and Generators

RTO SCADA/EMS and TransCos
RTO SCADA/EMS and DisCos
RTO SCADA/EMS and other RTO SCADA/EMS
RTO SCADA/EMS and Scheduling Coordinators
RTO SCADA/EMS and NERC/Reliability Councils

with communication configuration requirements of

One to One over WAN

with quality of service requirements of

High data availability
Rapid response times
High data accuracy and high data frequency needed for interactions between RTO/ISO to ensure energy Contingency Operations

with security requirements of

High security in all areas because of fairness requirements with market rules and financial implecations

with data management requirements of

Large database for energy schedules
Requiring timely access
Frequent updates and data exchange across organizational boundaries

with constraints of

No special constraints
Since WAN connectins to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	1.0	0.0	0.8

COMMENTS:

G-4.10.1 Power flow

The Purpose of *Power flow* ***function is similar to function*** ***(G-4.10) Performance standards data*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	1.0	0.0	0.8

COMMENTS:

G-4.10.2 Var support

The Purpose of** Var support **function
is similar to function** (G-4.10) Performance standards data **above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	1.0	0.0	0.8

COMMENTS:

G-4.10.3 AGC

The Purpose of** AGC **function
is similar to function** (G-4.10) Performance standards data **above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	1.0	0.0	0.8

COMMENTS:

G-4.10.4 Excitation

The Purpose of** Excitation **function
is similar to function** (G-4.10) Performance standards data **above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	1.0	0.0	0.8

COMMENTS:

G-4.10.5 PSS

The Purpose of** PSS **function
is similar to function** (G-4.10) Performance standards data **above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	1.0	0.0	0.8

COMMENTS:

G-4.10.6 Emissions

The Purpose of *Emissions* ***function***
is similar to function ***(G-4.10) Performance standards data*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	1.0	0.0	0.8

COMMENTS:

G-4.11 k. Intentional Islanding

The Purpose of *k. Intentional Islanding* ***function***
is to facilitate islanding of the generation or region from the power system as a whole
directly involving
RTO/ISO planners, Generation planners, transmission planners, regulators, regional planning agencies, and Market
RTO/ISO Operators and GenCo Operators
performing
Real time generation contingency operations functions listed to meet forecast load
Reserve
And regulation requirements with the RTO/ISO
with key interfaces between
RTO SCADA/EMS and Generators
RTO SCADA/EMS and TransCos
RTO SCADA/EMS and DisCos
RTO SCADA/EMS and other RTO SCADA/EMS
RTO SCADA/EMS and Scheduling Coordinators
RTO SCADA/EMS and NERC/Reliability Councils
with communication configuration requirements of
One to One over WAN
with quality of service requirements of
High data availability
Rapid response times
High data accuracy and high data frequency needed for interactions between RTO/ISO to ensure energy Contingency Operations

with security requirements of

High security in all areas because of fairness requirements with market rules and financial implecations

with data management requirements of

Large database for energy schedules

Requiring timely access

Frequent updates and data exchange across organizational boundaries

with constraints of

No special constraints

Since WAN connectins to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	2.0	1.0	2.0	2.2

COMMENTS:

The following comments were collected during the team rating review:

Config=3 req to coordinate with variety of equip and networks for self-healing

QoS=3 because there is a real-time (15-20 ms) requirements for communications to perform functions and maintain system stability

Security=2 Must be spoof-proof to get the data delivered

Constraints=2 New systems must be installed to hand the micro grid

---

The following comments were collected during the peer review:

Note: the communication has to degrade favorably under islanding conditions

---

G-4.12 l. Weather Analysis

The Purpose of *l. Weather Analysis* ***function is to*** consider the possible affects of adverse weather in the dispatch of units

directly involving

RTO/ISO planners, Generation planners, transmission planners, regulators, regional planning agencies, and Market

RTO/ISO Operators and GenCo Operators

performing

Real time generation contingency operations functions listed to meet forecast load

Reserve
And regulation requirements with the RTO/ISO

with key interfaces between

RTO SCADA/EMS and Generators
RTO SCADA/EMS and TransCos
RTO SCADA/EMS and DisCos
RTO SCADA/EMS and other RTO SCADA/EMS
RTO SCADA/EMS and Scheduling Coordinators
RTO SCADA/EMS and NERC/Reliability Councils

with communication configuration requirements of

One to One over WAN

with quality of service requirements of

High data availability
Rapid response times
High data accuracy and high data frequency needed for interactions between RTO/ISO to ensure energy Contingency Operations

with security requirements of

High security in all areas because of fairness requirements with market rules and financial implecations

with data management requirements of

Large database for energy schedules
Requiring timely access
Frequent updates and data exchange across organizational boundaries

with constraints of

No special constraints
Since WAN connectins to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	1.0	1.0	2.0	1.4

COMMENTS:
This function has similar interfaces (and ratings) to function (G-3.4) Weather Analysis above.

G-5 Real Time Plant Operations

The Purpose of *Real Time Plant Operations* ***function is to*** facilitate a distributed control system that will optomize control and monitoring of the equipment and processes inside the generation plant

directly involving

RTO/ISO Operators
Generation planners

And plant operators

performing

Real time generation plant operations functions listed

with key interfaces between

Gen Cos and RTOs/ISOs

Inter-Plant systems

with communication configuration requirements of

Inter-Plant SCADA and One to One over WAN

with quality of service requirements of

High data availability

Rapid response times

High data accuracy and high data frequency needed for interactions within the plant for plant operations

with security requirements of

High security in all areas because of fairness requirements with market rules and financial implecations

with data management requirements of

Large database for control and monitoring plant operations

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.2	1.3	1.9	1.1	0.5	1.2

COMMENTS:

G-5.1 Generator power output and frequency control - governor and prime mover systems

The Purpose of *Generator power output and frequency control - governor and prime mover systems* ***function***

is to facilitate control and monitoring of generator power and speed

directly involving

RTO/ISO Operators

Generation planners

And plant operators

performing

Real time generation plant operations functions listed

with key interfaces between

Gen Cos and RTOs/ISOs

Inter-Plant systems

with communication configuration requirements of

Inter-Plant SCADA and One to One over WAN

with quality of service requirements of

High data availability

Rapid response times
High data accuracy and high data frequency needed for interactions within the plant for plant operations

with security requirements of

High security in all areas because of fairness requirements with market rules and financial implecations

with data management requirements of

Large database for control and monitoring plant operations

with constraints of

No special constraints
Since WAN connectins to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	1.0	1.0	1.2

COMMENTS:

The following comments were collected during the team rating review:

Security=2 external component to set frequency

G-5.2 Generator voltage control - excitation systems

The Purpose of *Generator voltage control - excitation systems* ***function is to*** facilitate control and monitoring of generator voltage regulation

directly involving

RTO/ISO Operators
Generation planners
And plant operators

performing

Real time generation plant operations functions listed

with key interfaces between

Gen Cos and RTOs/ISOs
Inter-Plant systems

with communication configuration requirements of

Inter-Plant SCADA and One to One over WAN

with quality of service requirements of

High data availability
Rapid response times
High data accuracy and high data frequency needed for interactions within the plant for plant operations

with security requirements of

High security in all areas because of fairness requirements with market rules and financial implecations

with data management requirements of

Large database for control and monitoring plant operations

with constraints of

No special constraints

Since WAN connectins to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	1.0	1.0	1.2

COMMENTS:

The following comments were collected during the team rating review:

Security=2 external component to set voltage support

G-5.3 Generator real time measurements

The Purpose of *Generator real time measurements* ***function is to***

Facilitate monitoring of generator quantities such, as real and reactive power

Speed

Phase angle

Voltage

And current

directly involving

RTO/ISO Operators

Generation planners

And plant operators

performing

Real time generation plant operations functions listed

with key interfaces between

Gen Cos and RTOs/ISOs

Inter-Plant systems

with communication configuration requirements of

Inter-Plant SCADA and One to One over WAN

with quality of service requirements of

High data availability

Rapid response times

High data accuracy and high data frequency needed for interactions within the plant for plant operations

with security requirements of

High security in all areas because of fairness requirements with market rules and financial implecations

with data management requirements of

Large database for control and monitoring plant operations

with constraints of

No special constraints

Since WAN connectins to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	1.0	1.0	1.2

COMMENTS:

The following comments were collected during the team rating review:

Security=2 external access to data

G-5.4 Fuel management

The Purpose of *Fuel management* ***function is to*** facilitate control and monitoring of the generator's fuel system

directly involving

Generation planners and plant operators

performing

Real time generation plant operations functions listed

with key interfaces between

Gen Cos and RTOs/ISOs

Inter-Plant systems

with communication configuration requirements of

Inter-Plant SCADA

with quality of service requirements of

High data availability

Rapid response times

High data accuracy and high data frequency needed for interactions within the plant for plant operations

with security requirements of

High security in all areas because of fairness requirements with market rules and financial implecations

with data management requirements of

Large database for control and monitoring plant operations

with constraints of

Special constraints of Legacy systems used for SCADA
Compute-constrained field devices

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	1.0	0.0	0.8

COMMENTS:

G-5.4.1 Supply

The Purpose of *Supply* ***function is similar to function*** ***(G-5.4) Fuel management*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	1.0	0.0	0.8

COMMENTS:

G-5.4.2 Fuel system monitor

The Purpose of *Fuel system monitor* ***function is similar to function*** ***(G-5.4) Fuel management*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	1.0	0.0	0.8

COMMENTS:

G-5.5 Balance-of-Plant SCADA

The Purpose of *Balance-of-Plant SCADA* ***function is to***

Facilitate supervisory
Control and data acquisition of the balance-of-plant systems in a generation plant

directly involving
Generation plant operators
performing
Real time generation plant operations functions listed
with key interfaces between
Inter-Plant systems
with communication configuration requirements of
Inter-Plant SCADA
with quality of service requirements of
High data availability
Rapid response times
High data accuracy and high data frequency needed for interactions within the plant for plant operations
with security requirements of
High security in all areas because of fairness requirements with market rules and financial implecations
with data management requirements of
Large database for control and monitoring plant operations
with constraints of
Special constraints of Legacy systems used for SCADA
Compute-constrained field devices

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	1.0	1.0	1.6

COMMENTS:
The following comments were collected during the team rating review:

Conf;QoS;Security=2 Real time control & integration of multiple systems and high-speed performance (sub-cycle time frame)

G-5.5.1 Equipment status

The Purpose of *Equipment status* ***function is similar to function*** ***(G-5.5) Balance-of-Plant SCADA above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average

2.0	2.0	2.0	1.0	1.0	1.6

COMMENTS:

G-5.5.2 Equipment control

The Purpose of *Equipment control* ***function is similar to function*** ***(G-5.5) Balance-of-Plant SCADA*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	1.0	1.0	1.6

COMMENTS:

G-5.5.3 Equipment monitoring

The Purpose of *Equipment monitoring* ***function is similar to function*** ***(G-5.5) Balance-of-Plant SCADA*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	1.0	1.0	1.6

COMMENTS:

G-5.5.4 Real time measurements

The Purpose of *Real time measurements* ***function is similar to function*** ***(G-5.5) Balance-of-Plant SCADA*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	1.0	1.0	1.6

COMMENTS:

G-5.6 Black start procedures/process

The Purpose of *Black start procedures/process* ***function***
is to facilitate the procedures/processes particular to bringing a cold unit on line
directly involving
RTO/ISO Operators
Generation planners
And plant operators
performing
Real time generation plant operations functions listed
with key interfaces between
Gen Cos and RTOs/ISOs
Inter-Plant systems
with communication configuration requirements of
Inter-Plant SCADA and One to One over WAN
with quality of service requirements of
High data availability
Rapid response times
High data accuracy and high data frequency needed for interactions within the plant for plant operations
with security requirements of
High security in all areas because of fairness requirements with market rules and financial implecations
with data management requirements of
Large database for control and monitoring plant operations
with constraints of
No special constraints
Since WAN connectins to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	1.0	0.0	1.0	1.0

COMMENTS:
This function has similar interfaces (and ratings) to function (G-4.7) Black Start (healthy grid) above.

G-5.7 Diagnostic Maintenance Data
The Purpose of *Diagnostic Maintenance Data* ***function***
is to
Facilitate investigation
Analysis
Or history of equipment maintenance problems

directly involving
Generation planners and plant operators
performing
Real time generation plant operations functions listed
with key interfaces between
Inter-Plant systems
with communication configuration requirements of
Inter-Plant SCADA and One to One over WAN
with quality of service requirements of
High data availability
Rapid response times
High data accuracy and high data frequency needed for interactions within the plant for plant operations
with security requirements of
High security in all areas because of fairness requirements with market rules and financial implecations
with data management requirements of
Large database for control and monitoring plant operations
with constraints of
No special constraints
Since WAN connectins to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	1.0	1.0	1.6

COMMENTS:
This function has similar interfaces (and ratings) to function (G-5.5) Balance-of-Plant SCADA above.

G-5.8 Emissions monitoring and control
The Purpose of *Emissions monitoring and control* ***function is to*** facilitate control and monitoring of generator emmisions
directly involving
Generation planners
Plant operators
And govenrmental agencies
performing
Real time generation plant operations functions listed
with key interfaces between
Gen Cos and RTOs/ISOs

Inter-Plant systems
Government agencies

with communication configuration requirements of

Inter-Plant SCADA and One to One over WAN

with quality of service requirements of

High data availability
Rapid response times
High data accuracy and high data frequency needed for interactions within the plant for plant operations

with security requirements of

High security in all areas because of fairness requirements with market rules and financial implecations

with data management requirements of

Large database for control and monitoring plant operations

with constraints of

No special constraints
Since WAN connectins to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	1.0	0.0	0.8

COMMENTS:

G-5.9 Contingency Operations

The Purpose of *Contingency Operations* ***function is to***

Facilitate corrective actions to maintain operations based upon unexpected
Event driven emergency conditions, that are not foreseen

directly involving

RTO/ISO Operators
Generation planners
And plant operators

performing

Real time generation plant operations functions listed

with key interfaces between

Gen Cos and RTOs/ISOs
Inter-Plant systems

with communication configuration requirements of

Inter-Plant SCADA and One to One over WAN

with quality of service requirements of

High data availability
Rapid response times
High data accuracy and high data frequency needed for interactions within the plant for plant operations

with security requirements of

High security in all areas because of fairness requirements with market rules and financial implecations

with data management requirements of

Large database for control and monitoring plant operations

with constraints of

No special constraints
Since WAN connectins to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	2.0	1.0	0.0	1.6

COMMENTS:
This function has similar interfaces (and ratings) to function (G-4.4) Unscheduled equipment outage contingencies (self-healing) above.

G-5.9.1 Protection Functions

The Purpose of *Protection Functions* ***function is similar to function (G-5.9) Contingency Operations above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	2.0	1.0	0.0	1.6

COMMENTS:

G-5.9.2 Scheduled equipment outage contingencies

The Purpose of *Scheduled equipment outage contingencies* ***function is similar to function (G-5.9) Contingency Operations above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of	Security	Data	Constraints	Average

	Service		Management		
2.0	3.0	2.0	1.0	0.0	1.6

COMMENTS:

G-5.9.3 Unscheduled equipment outage contingencies (self-healing)

The Purpose of *Unscheduled equipment outage contingencies (self-healing)* ***function***
is similar to function ***(G-5.9) Contingency Operations*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	2.0	1.0	0.0	1.6

COMMENTS:

G-5.9.4 Electrical system fault/abnormal operation contingencies (self-healing)

The Purpose of *Electrical system fault/abnormal operation contingencies (self-healing)* ***function***
is similar to function ***(G-5.9) Contingency Operations*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	2.0	1.0	0.0	1.6

COMMENTS:

G-5.9.5 Mechanical systems operation contingencies (self-healing)

The Purpose of *Mechanical systems operation contingencies (self-healing)* ***function***
is similar to function ***(G-5.9) Contingency Operations*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	2.0	1.0	0.0	1.6

COMMENTS:

G-5.10 Emergency Response - Disaster preparedness contingencies

The Purpose of *Emergency Response - Disaster preparedness contingencies* ***function***
is to
Facilitate corrective actions to maintain operations based upon unexpected
Event driven emergency conditions, that are not foreseen

directly involving
RTO/ISO Operators
Generation planners
And plant operators
performing
Real time generation plant operations functions listed
with key interfaces between
Gen Cos and RTOs/ISOs
Inter-Plant systems
with communication configuration requirements of
Inter-Plant SCADA and One to One over WAN
with quality of service requirements of
High data availability
Rapid response times
High data accuracy and high data frequency needed for interactions within the plant for plant operations
with security requirements of
High security in all areas because of fairness requirements with market rules and financial implecations
with data management requirements of
Large database for control and monitoring plant operations
with constraints of
No special constraints
Since WAN connectins to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	2.0	1.0	0.0	1.6

COMMENTS:
This function has similar interfaces (and ratings) to function (G-4.4) Unscheduled equipment outage contingencies (self-healing) above.

G-5.11 Compliance with performance standards

The Purpose of *Compliance with performance standards* ***function is to*** monitor and control a plant's compliance to meet contactual obligations

directly involving

Generation planners and plant operators

performing

Real time generation plant operations functions listed

with key interfaces between

Gen Cos and RTOs/ISOs

Inter-Plant systems

with communication configuration requirements of

Inter-Plant SCADA and One to One over WAN

with quality of service requirements of

High data availability

Rapid response times

High data accuracy and high data frequency needed for interactions within the plant for plant operations

with security requirements of

High security in all areas because of fairness requirements with market rules and financial implecations

with data management requirements of

Large database for control and monitoring plant operations

with constraints of

No special constraints

Since WAN connectins to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	1.0	1.0	1.2

COMMENTS:

This function has similar interfaces (and ratings) to function (G-5.1) Generator power output and frequency control - governor and prime mover systems above.

The following comments were collected during the team rating review:

Security=2 data may go outside the plant - need to for data integrity

G-6 Real Time Maintenance Control

The Purpose of *Real Time Maintenance Control* ***function***
is to facilitate a system that will optomize maintenance of the equipment inside the generation plant
directly involving
RTO/ISO Operators
Generation planners
And plant operators
performing
The real time generation maintenance control functions listed
with key interfaces between
Gen Cos and RTOs/ISOs
Inter-Plant systems
with communication configuration requirements of
Inter-Plant SCADA and One to One over WAN
with quality of service requirements of
High data availability
Rapid response times
High data accuracy and high data frequency needed for interactions within the plant for plant maintenance control
with security requirements of
High security with RTO/ISO
Breach would give unfair advantage to competitors
with data management requirements of
Large database for control and monitoring plant operations
with constraints of
Special constraints of Legacy systems used for SCADA
Compute-constrained field devices

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	1.0	0.0	1.0

COMMENTS:
The following comments were collected during the team rating review:

Security=2 Need for data security

The following comments were collected during the peer review:

Maintain data integrity/privacy so, that competitors cannot see your maintenance schedule so, that they cannot obtain a competitive advantage

G-6.1 Outage Schedules

The Purpose of *Outage Schedules* ***function is to***

Plan
Monitor and control equipment maintenance

directly involving

RTO/ISO Operators
Generation planners
And plant operators

performing

The real time generation maintenance control functions listed

with key interfaces between

Gen Cos and RTOs/ISOs
Inter-Plant systems

with communication configuration requirements of

Inter-Plant SCADA and One to One over WAN

with quality of service requirements of

High data availability
Rapid response times
High data accuracy and high data frequency needed for interactions within the plant for plant maintenance control

with security requirements of

High security with RTO/ISO
Breach would give unfair advantage to competitors

with data management requirements of

Large database for control and monitoring plant operations

with constraints of

Special constraints of Legacy systems used for SCADA
Compute-constrained field devices

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	1.0	0.0	1.0

COMMENTS:

G-6.2 Equipment Maintenance

The Purpose of *Equipment Maintenance* ***function is to***

Plan

Monitor and control Equipment Maintenance

directly involving
RTO/ISO Operators
Generation planners
And plant operators
performing
The real time generation maintenance control functions listed
with key interfaces between
Gen Cos and RTOs/ISOs
Inter-Plant systems
with communication configuration requirements of
Inter-Plant SCADA and One to One over WAN
with quality of service requirements of
High data availability
Rapid response times
High data accuracy and high data frequency needed for interactions within the plant for plant maintenance control
with security requirements of
High security with RTO/ISO
Breach would give unfair advantage to competitors
with data management requirements of
Large database for control and monitoring plant operations
with constraints of
Special constraints of Legacy systems used for SCADA
Compute-constrained field devices

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	1.0	0.0	1.0

COMMENTS:
The following comments were collected during the team rating review:

Condition based monitoring emerging - IEEE 1541 in process - Peter & Rui to elaborate

---

G-6.3 Equipment Inspection

The Purpose of *Equipment Inspection* ***function is to***
Plan
Monitor and control Equipment Inspection

directly involving
RTO/ISO Operators
Generation planners
And plant operators
performing
The real time generation maintenance control functions listed
with key interfaces between
Gen Cos and RTOs/ISOs
Inter-Plant systems
with communication configuration requirements of
Inter-Plant SCADA
with quality of service requirements of
High data availability
Rapid response times
High data accuracy and high data frequency needed for interactions within the plant for plant maintenance control
with security requirements of
High security with RTO/ISO
Breach would give unfair advantage to competitors
with data management requirements of
Large database for control and monitoring plant operations
with constraints of
Special constraints of Legacy systems used for SCADA
Compute-constrained field devices

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	1.0	0.0	1.0

COMMENTS:

G-6.4 Equipment Replacement

The Purpose of *Equipment Replacement* ***function is to***
Plan
Monitor and control Equipment Replacement

directly involving
RTO/ISO Operators
Generation planners
And plant operators
performing

The real time generation maintenance control functions listed

with key interfaces between

Gen Cos and RTOs/ISOs

Inter-Plant systems

with communication configuration requirements of

Inter-Plant SCADA and One to One over WAN

with quality of service requirements of

High data availability

Rapid response times

High data accuracy and high data frequency needed for interactions within the plant for plant maintenance control

with security requirements of

High security with RTO/ISO

Breach would give unfair advantage to competitors

with data management requirements of

Large database for control and monitoring plant operations

with constraints of

Special constraints of Legacy systems used for SCADA

Compute-constrained field devices

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	1.0	0.0	1.0

COMMENTS:

G-6.5 Equipment Contingencies

The Purpose of *Equipment Contingencies* ***function is to***

Plan

Monitor and control Equipment Contingencies

directly involving

RTO/ISO Operators

Generation planners

And plant operators

performing

The real time generation maintenance control functions listed

with key interfaces between

Gen Cos and RTOs/ISOs

Inter-Plant systems

with communication configuration requirements of

Inter-Plant SCADA and One to One over WAN

with quality of service requirements of

High data availability
Rapid response times
High data accuracy and high data frequency needed for interactions within the plant for plant maintenance control

with security requirements of

High security with RTO/ISO
Breach would give unfair advantage to competitors

with data management requirements of

Large database for control and monitoring plant operations

with constraints of

Special constraints of Legacy systems used for SCADA
Compute-constrained field devices

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	1.0	0.0	1.0

COMMENTS:

G-6.6 Maintenance History

The Purpose of *Maintenance History* ***function is to***

Plan
Monitor and control Maintenance History

directly involving

RTO/ISO Operators
Generation planners
And plant operators

performing

The real time generation maintenance control functions listed

with key interfaces between

Gen Cos and RTOs/ISOs
Inter-Plant systems

with communication configuration requirements of

Inter-Plant SCADA

with quality of service requirements of

High data availability
Rapid response times
High data accuracy and high data frequency needed for interactions within the plant for plant maintenance control

with security requirements of

High security with RTO/ISO
Breach would give unfair advantage to competitors

with data management requirements of

Large database for control and monitoring plant operations

with constraints of

Special constraints of Legacy systems used for SCADA
Compute-constrained field devices

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	1.0	0.0	1.0

COMMENTS:

G-6.7 Parts Inventory Management

The Purpose of *Parts Inventory Management* ***function is to***

Plan
Monitor and control Parts Inventory Management

directly involving

Generation planners
Operators and maintainers

performing

The real time generation maintenance control functions listed

with key interfaces between

Gen Cos and RTOs/ISOs
Inter-Plant systems

with communication configuration requirements of

Inter-Plant SCADA

with quality of service requirements of

High data availability
Rapid response times
High data accuracy and high data frequency needed for interactions within the plant for plant maintenance control

with security requirements of

High security with RTO/ISO
Breach would give unfair advantage to competitors

with data management requirements of

Large database for control and monitoring plant operations

with constraints of

Special constraints of Legacy systems used for SCADA
Compute-constrained field devices

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	1.0	0.0	1.0

COMMENTS:

G-7 Long term planning (Years ahead)

The Purpose of** Long term planning (Years ahead) **function is to

develop load and capacity forcast from different market participants inside and outside the region, developing regional alternatives of load and capacity alternatives, including coordination with internal and external

Also coordinating transmission system planning submitted by transmission owners, developing future regional power system model alternatives, calculating and publishing future major operational parameters for expansion alternatives, and developing requirements for system automation

directly involving

Planners
Generation planners
Transmission planners
Distribution planners
Regulators
Auditors
Regional planning agencies
And Market Participants

performing

Regional
Long term load and capacity planning and coordination of other planners within the region

with key interfaces between

Gen Cos and Scheduling Coordinators
Gen Cos and RTOs/ISOs
Gen Cos and Web Server for Market Participants

with communication configuration requirements of

One to One over WAN

with quality of service requirements of

Medium data availability
Rapid response times

High data accuracy and high data frequency needed for interactions within the plant for plant maintenance control

with security requirements of

All security requirements are medium high since security breaches could have financial consequences

with data management requirements of

Large database for energy schedules
Requiring timely access
Frequent updates and data exchange across organizational boundaries

with constraints of

No special constraints
Since not many legacy systems or small devices involved
Primary need is the development of methodologies and application tools, which are consistent with evolving market rules

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	2.0	1.0	1.4

COMMENTS:
The following comments were collected during the team rating review:

Security=2 keep data from competitors
Data Mgmt=2 data from multiple sources and needs to be synchronized

---

The following comments were collected during the peer review:

Frences requested to review and comment and relate to Market Operations

---

G-7.1 Generation planners perform long terms load forecasts

The Purpose of *Generation planners perform long terms load forecasts*
function
is similar to function ***(G-7) Long term planning (Years ahead)*** ***above.***
directly involving

Planners
Generation planners
Transmission planners
Distribution planners
Regulators
Auditors

Regional planning agencies
And Market Participants

performing

Regional
Long term load and capacity planning and coordination of other planners within the region

with key interfaces between

Gen Cos and Scheduling Coordinators
Gen Cos and RTOs/ISOs
Gen Cos and Web Server for Market Participants

with communication configuration requirements of

One to One over WAN

with quality of service requirements of

Medium data availability
Rapid response times
High data accuracy and high data frequency needed for interactions within the plant for plant maintenance control

with security requirements of

All security requirements are medium high since security breaches could have financial consequences

with data management requirements of

Large database for energy schedules
Requiring timely access
Frequent updates and data exchange across organizational boundaries

with constraints of

No special constraints
Since not many legacy systems or small devices involved
Primary need is the development of methodologies and application tools, which are consistent with evolving market rules

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	2.0	1.0	1.4

COMMENTS:

G-7.2 Generation planners plan generation

The Purpose of *Generation planners plan generation* ***function is similar to function*** ***(G-7) Long term planning (Years ahead)*** ***above.***

directly involving

Planners
Generation planners
Transmission planners

Distribution planners
Regulators
Auditors
Regional planning agencies
And Market Participants

performing

Regional
Long term load and capacity planning and coordination of other planners within the region

with key interfaces between

Gen Cos and Scheduling Coordinators
Gen Cos and RTOs/ISOs
Gen Cos and Web Server for Market Participants

with communication configuration requirements of

One to One over WAN

with quality of service requirements of

Medium data availability
Rapid response times
High data accuracy and high data frequency needed for interactions within the plant for plant maintenance control

with security requirements of

All security requirements are medium high since security breaches could have financial consequences

with data management requirements of

Large database for energy schedules
Requiring timely access
Frequent updates and data exchange across organizational boundaries

with constraints of

No special constraints
Since not many legacy systems or small devices involved
Primary need is the development of methodologies and application tools, which are consistent with evolving market rules

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	2.0	1.0	1.4

COMMENTS:

G-7.3 Market Participants negotiate long term market contracts

The Purpose of *Market Participants negotiate long term market contracts* ***function***

is similar to function (G-7) Long term planning (Years ahead) above.
directly involving
Planners
Generation planners
Transmission planners
Distribution planners
Regulators
Auditors
Regional planning agencies
And Market Participants
performing
Regional
Long term load and capacity planning and coordination of other planners within the region
with key interfaces between
Gen Cos and Scheduling Coordinators
Gen Cos and RTOs/ISOs
Gen Cos and Web Server for Market Participants
with communication configuration requirements of
One to One over WAN
with quality of service requirements of
Medium data availability
Rapid response times
High data accuracy and high data frequency needed for interactions within the plant for plant maintenance control
with security requirements of
All security requirements are medium high since security breaches could have financial consequences
with data management requirements of
Large database for energy schedules
Requiring timely access
Frequent updates and data exchange across organizational boundaries
with constraints of
No special constraints
Since not many legacy systems or small devices involved
Primary need is the development of methodologies and application tools, which are consistent with evolving market rules

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	2.0	1.0	1.4

COMMENTS:

G-7.4 Generation planners plan automated systems, communications, and interfaces in coordination with ISO/RTO and transmission owners

The Purpose of *Generation planners plan automated systems, communications, and interfaces in coordination with ISO/RTO and transmission owners* ***function***

is similar to function ***(G-7) Long term planning (Years ahead)*** ***above.***

directly involving

Planners
Generation planners
Transmission planners
Distribution planners
Regulators
Auditors
Regional planning agencies
And Market Participants

performing

Regional
Long term load and capacity planning and coordination of other planners within the region

with key interfaces between

Gen Cos and Scheduling Coordinators
Gen Cos and RTOs/ISOs
Gen Cos and Web Server for Market Participants

with communication configuration requirements of

One to One over WAN

with quality of service requirements of

Medium data availability
Rapid response times
High data accuracy and high data frequency needed for interactions within the plant for plant maintenance control

with security requirements of

All security requirements are medium high since security breaches could have financial consequences

with data management requirements of

Large database for energy schedules
Requiring timely access
Frequent updates and data exchange across organizational boundaries

with constraints of

No special constraints
Since not many legacy systems or small devices involved
Primary need is the development of methodologies and application tools, which are consistent with evolving market rules

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3***

(highly likely to involve architectural challenges) ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	2.0	1.0	1.4

COMMENTS:

G-7.4.1 For measurement of ancillary services

The Purpose of *For measurement of ancillary services* ***function is similar to function*** ***(G-7.4) Generation planners plan automated systems, communications, and interfaces in coordination with ISO/RTO and transmission owners*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	2.0	1.0	1.4

COMMENTS:

G-7.4.2 For automated volt/var control to automatically execute optimal and/or security constrained power flow

The Purpose of *For automated volt/var control to automatically execute optimal and/or security constrained power flow* ***function is similar to function*** ***(G-7.4) Generation planners plan automated systems, communications, and interfaces in coordination with ISO/RTO and transmission owners*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	2.0	1.0	1.4

COMMENTS:

G-8 Short-term planning (1 month to 1 year)

The Purpose of *Short-term planning (1 month to 1 year)* ***function is to*** ensure that the bulk power system is operated so as to minimize interruptions to the load and to ensure that the overall system remains

intact despite severe challenges due to weather or equipment malfunctions

directly involving

Transmission data
Distribution data
Generation planners
Customers
Regulators
Auditors
Vendors

performing

Short term transmission and distribution facilities and automation planning

with key interfaces between

Gen Cos and Scheduling Coordinators
Gen Cos and RTOs/ISOs
Gen Cos and Web Server for Market Participants

with communication configuration requirements of

One to One over WAN

with quality of service requirements of

Medium high availability needed since have time to re-send
Medium response times
Medium high data accuracy
Re-send data available

with security requirements of

All security requirements are medium high since security breaches could have financial consequences

with data management requirements of

Large database for energy schedules
Requiring timely access
Frequent updates and data exchange across organizational boundaries

with constraints of

No special constraints
Since not many legacy systems or small devices involved
Primary need is the development of methodologies and application tools, which are consistent with evolving market rules

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.6	2.0	2.2	1.4	1.3	1.7

COMMENTS:

G-8.1 Plant equipment maintenance

The Purpose of *Plant equipment maintenance* ***function***
is similar to function ***(G-8) Short-term planning (1 month to 1 year)***
above.
directly involving
Transmission data
Distribution data
Generation planners
Customers
Regulators
Auditors
Vendors
performing
Short term transmission and distribution facilities and automation planning
with key interfaces between
Gen Cos and Scheduling Coordinators
Gen Cos and RTOs/ISOs
Gen Cos and Web Server for Market Participants
with communication configuration requirements of
One to One over WAN
with quality of service requirements of
Medium high availability needed since have time to re-send
Medium response times
Medium high data accuracy
Re-send data available
with security requirements of
All security requirements are medium high since security breaches could have financial consequences
with data management requirements of
Large database for energy schedules
Requiring timely access
Frequent updates and data exchange across organizational boundaries
with constraints of
No special constraints
Since not many legacy systems or small devices involved
Primary need is the development of methodologies and application tools, which are consistent with evolving market rules

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	2.0	2.0	0.0	0.8

COMMENTS:

This function has similar interfaces (and ratings) to function [(G-7) Long term planning (Years ahead)] above.

G-8.2 Update the automation settings

The Purpose of *Update the automation settings* ***function is similar to function [(G-8) Short-term planning (1 month to 1 year)] above.***

directly involving

Transmission data
Distribution data
Generation planners
Customers
Regulators
Auditors
Vendors

performing

Short term transmission and distribution facilities and automation planning

with key interfaces between

Gen Cos and Scheduling Coordinators
Gen Cos and RTOs/ISOs
Gen Cos and Web Server for Market Participants

with communication configuration requirements of

One to One over WAN

with quality of service requirements of

Medium high availability needed since have time to re-send
Medium response times
Medium high data accuracy
Re-send data available

with security requirements of

All security requirements are medium high since security breaches could have financial consequences

with data management requirements of

Large database for energy schedules
Requiring timely access
Frequent updates and data exchange across organizational boundaries

with constraints of

No special constraints
Since not many legacy systems or small devices involved
Primary need is the development of methodologies and application tools, which are consistent with evolving market rules

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	2.0	2.0	0.0	0.8

COMMENTS:
This function has similar interfaces (and ratings) to function [(G-7) Long term planning (Years ahead)] above.

G-8.3 Update the contracts with other market participants

The Purpose of *Update the contracts with other market participants*
function
is similar to function [(G-8) Short-term planning (1 month to 1 year)] above.
directly involving
- Transmission data
- Distribution data
- Generation planners
- Customers
- Regulators
- Auditors
- Vendors

performing
- Short term transmission and distribution facilities and automation planning

with key interfaces between
- Gen Cos and Scheduling Coordinators
- Gen Cos and RTOs/ISOs
- Gen Cos and Web Server for Market Participants

with communication configuration requirements of
- One to One over WAN

with quality of service requirements of
- Medium high availability needed since have time to re-send
- Medium response times
- Medium high data accuracy
- Re-send data available

with security requirements of
- All security requirements are medium high since security breaches could have financial consequences

with data management requirements of
- Large database for energy schedules
- Requiring timely access
- Frequent updates and data exchange across organizational boundaries

with constraints of
- No special constraints
- Since not many legacy systems or small devices involved

Primary need is the development of methodologies and application tools, which are consistent with evolving market rules

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	3.0	0.0	0.0	0.6

COMMENTS:
The following comments were collected during the team rating review:

Security=3 competitive issues with data sharing

The following comments were collected during the peer review:

Frances requested to review and comment

G-9 Operational planning (1 day to 1 month)

The Purpose of** Operational planning (1 day to 1 month) **function is to

Perform congestion management and security analysis on proposed energy schedules
To determine Total Transmission Capacity (TTC)
Available Transmission Capacity (ATC)
Regulated Must Run (RMR) and Locational Marginal Prices (LMP's) for each "location"

directly involving

RTO/ISO scheduler
Other RTO's
Scheduling Coordinators
Other Market Participants
TransCos
GenCos
Regulators
Auditors

performing

TTC
ATC
RMR
LMP calculations

with key interfaces between

Gen Cos and Scheduling Coordinators

Gen Cos and RTOs/ISOs
Gen Cos and Web Server for Market Participants

with communication configuration requirements of

SCADA and One to One over WAN

with quality of service requirements of

High data availability
Rapid response times
High data accuracy and high data frequency needed for interactions within the plant for operational control

with security requirements of

High security in all areas because of fairness requirements with market rules and financial implecations

with data management requirements of

Large database for energy schedules
Requiring timely access
Frequent updates and data exchange across organizational boundaries

with constraints of

No special constraints
Since WAN connectins to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	1.0	2.0	2.0	1.0	1.2

COMMENTS:
The following comments were collected during the team rating review:

Security=2 competitive market issues - data shared across organization boundaries
Data Mgnt=2 Since data obtained from multiple sources
Frances to comment on why she has Qos=2

G-9.1 Short-term equipment outage management

The Purpose of *Short-term equipment outage management* ***function is to*** reduce the number of outages of equipments due to malfunctions or weather

directly involving

RTO/ISO scheduler
Other RTO's
Scheduling Coordinators
Other Market Participants
TransCos

GenCos
Regulators
Auditors

performing

TTC
ATC
RMR
LMP calculations

with key interfaces between

Gen Cos and Scheduling Coordinators
Gen Cos and RTOs/ISOs
Gen Cos and Web Server for Market Participants

with communication configuration requirements of

SCADA and One to One over WAN

with quality of service requirements of

High data availability
Rapid response times
High data accuracy and high data frequency needed for interactions within the plant for operational control

with security requirements of

High security in all areas because of fairness requirements with market rules and financial implecations

with data management requirements of

Large database for energy schedules
Requiring timely access
Frequent updates and data exchange across organizational boundaries

with constraints of

No special constraints
Since WAN connectins to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	1.0	2.0	2.0	1.0	1.2

COMMENTS:

G-9.2 Update short-term bids for energy and ancillary services

The Purpose of *Update short-term bids for energy and ancillary services* ***function***

is similar to function ***(G-9) Operational planning (1 day to 1 month)*** ***above.***

directly involving

RTO/ISO scheduler

Other RTO's
Scheduling Coordinators
Other Market Participants
TransCos
GenCos
Regulators
Auditors

performing

TTC
ATC
RMR
LMP calculations

with key interfaces between

Gen Cos and Scheduling Coordinators
Gen Cos and RTOs/ISOs
Gen Cos and Web Server for Market Participants

with communication configuration requirements of

SCADA and One to One over WAN

with quality of service requirements of

High data availability
Rapid response times
High data accuracy and high data frequency needed for interactions within the plant for operational control

with security requirements of

High security in all areas because of fairness requirements with market rules and financial implecations

with data management requirements of

Large database for energy schedules
Requiring timely access
Frequent updates and data exchange across organizational boundaries

with constraints of

No special constraints
Since WAN connectins to Market Participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	1.0	2.0	2.0	1.0	1.2

COMMENTS:

G-10 Generator equipment maintenance planning

The Purpose of *Generator equipment maintenance planning* ***function is to***

Provide advanced notice of schduled outages
Testing equipment capability for steady state and dynamic modelling

directly involving
RTO/ISO scheduler
Scheduling Coordinators
Other Market Participants
TransCos
GenCos
Regulators
performing
Generator Maintenance and forecasting Down times
with key interfaces between
Gen Cos and Scheduling Coordinators
Gen Cos and RTOs/ISOs
Gen Cos and Web Server for Market Participants
with communication configuration requirements of
SCADA and One to One over WAN
with quality of service requirements of
Medium availability needed since have time to re-send
Medium response times
Medium data accuracy since it will be reviewed over time by many people and systems
Could entail high data volumes but infrequently
with security requirements of
All security requirements are medium high since security breaches could have financial consequences
with data management requirements of
Large database for energy schedules
Requiring timely access
Frequent updates and data exchange across organizational boundaries
with constraints of
Special constraints of Legacy systems used for SCADA
Compute-constrained field devices

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	1.0	0.0	1.0

COMMENTS:
This function has similar interfaces (and ratings) to function (G-6) Real Time Maintenance Control above.

G-10.1 Maintenance staff maintain generation equipment

The Purpose of *Maintenance staff maintain generation equipment*
function
is similar to function ***(G-10) Generator equipment maintenance planning*** ***above.***
directly involving
RTO/ISO scheduler
Scheduling Coordinators
Other Market Participants
TransCos
GenCos
Regulators
performing
Generator Maintenance and forecasting Down times
with key interfaces between
Gen Cos and Scheduling Coordinators
Gen Cos and RTOs/ISOs
Gen Cos and Web Server for Market Participants
with communication configuration requirements of
SCADA and One to One over WAN
with quality of service requirements of
Medium availability needed since have time to re-send
Medium response times
Medium data accuracy since it will be reviewed over time by many people and systems
Could entail high data volumes but infrequently
with security requirements of
All security requirements are medium high since security breaches could have financial consequences
with data management requirements of
Large database for energy schedules
Requiring timely access
Frequent updates and data exchange across organizational boundaries
with constraints of
Special constraints of Legacy systems used for SCADA
Compute-constrained field devices

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	1.0	0.0	1.0

COMMENTS:

G-10.2 Automated system maintenance staff maintains the automated systems, interfaces, communications, and databases

The Purpose of *Automated system maintenance staff maintains the automated systems, interfaces, communications, and databases* ***function is similar to function*** ***(G-10) Generator equipment maintenance planning*** ***above.***

directly involving

RTO/ISO scheduler
Scheduling Coordinators
Other Market Participants
TransCos
GenCos
Regulators

performing

Generator Maintenance and forecasting Down times

with key interfaces between

Gen Cos and Scheduling Coordinators
Gen Cos and RTOs/ISOs
Gen Cos and Web Server for Market Participants

with communication configuration requirements of

SCADA and One to One over WAN

with quality of service requirements of

Medium availability needed since have time to re-send
Medium response times
Medium data accuracy since it will be reviewed over time by many people and systems
Could entail high data volumes but infrequently

with security requirements of

All security requirements are medium high since security breaches could have financial consequences

with data management requirements of

Large database for energy schedules
Requiring timely access
Frequent updates and data exchange across organizational boundaries

with constraints of

Special constraints of Legacy systems used for SCADA
Compute-constrained field devices

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	1.0	0.0	1.0

COMMENTS:

G-11 Construction management planning

The Purpose of *Construction management planning* ***function is to*** perform a technical evaluation of the construction design of a new generating unit or a transmission line to study if it meets the construction standards and feasibility

directly involving

RTO/ISO scheduler
Scheduling Coordinators
Other Market Participants
TransCos
GenCos
Regulators

performing

Construction Management Planning

with key interfaces between

Government Offices and Generation Companies
Government Offices and DisCos

with communication configuration requirements of

One to One over WAN

with quality of service requirements of

Medium availability needed since have time to re-send
Medium response times
Medium data accuracy since it will be reviewed over time by many people and systems
Could entail high data volumes but infrequently

with security requirements of

All security requirements are medium high since security breaches could have financial consequences

with data management requirements of

Large database for energy schedules
Requiring timely access
Frequent updates and data exchange across organizational boundaries

with constraints of

No special constraints
Since not many legacy systems or small devices involved
Primary need is the development of methodologies and application tools, which are consistent with evolving market rules

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average

1.0	1.0	2.0	1.0	0.0	1.0

COMMENTS:
This function has similar interfaces (and ratings) to function (G-6) Real Time Maintenance Control above.

G-11.1 Construction managers manage asset purchases

The Purpose of *Construction managers manage asset purchases* ***function is similar to function (G-11) Construction management planning above.***
directly involving
RTO/ISO scheduler
Scheduling Coordinators
Other Market Participants
TransCos
GenCos
Regulators
performing
Construction Management Planning
with key interfaces between
Government Offices and Generation Companies
Government Offices and DisCos
with communication configuration requirements of
One to One over WAN
with quality of service requirements of
Medium availability needed since have time to re-send
Medium response times
Medium data accuracy since it will be reviewed over time by many people and systems
Could entail high data volumes but infrequently
with security requirements of
All security requirements are medium high since security breaches could have financial consequences
with data management requirements of
Large database for energy schedules
Requiring timely access
Frequent updates and data exchange across organizational boundaries
with constraints of
No special constraints
Since not many legacy systems or small devices involved
Primary need is the development of methodologies and application tools, which are consistent with evolving market rules

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	1.0	0.0	1.0

COMMENTS:

G-11.2 Construction managers plan construction projects

The Purpose of *Construction managers plan construction projects* ***function***

is similar to function ***(G-11) Construction management planning*** ***above.***

directly involving

RTO/ISO scheduler
Scheduling Coordinators
Other Market Participants
TransCos
GenCos
Regulators

performing

Construction Management Planning

with key interfaces between

Government Offices and Generation Companies
Government Offices and DisCos

with communication configuration requirements of

One to One over WAN

with quality of service requirements of

Medium availability needed since have time to re-send
Medium response times
Medium data accuracy since it will be reviewed over time by many people and systems
Could entail high data volumes but infrequently

with security requirements of

All security requirements are medium high since security breaches could have financial consequences

with data management requirements of

Large database for energy schedules
Requiring timely access
Frequent updates and data exchange across organizational boundaries

with constraints of

No special constraints
Since not many legacy systems or small devices involved
Primary need is the development of methodologies and application tools, which are consistent with evolving market rules

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	1.0	0.0	1.0

COMMENTS:

G-11.3 Construction managers manage crew assignments

The Purpose of *Construction managers manage crew assignments* ***function***
is similar to function ***(G-11) Construction management planning*** ***above.***
directly involving
RTO/ISO scheduler
Scheduling Coordinators
Other Market Participants
TransCos
GenCos
Regulators
performing
Construction Management Planning
with key interfaces between
Government Offices and Generation Companies
Government Offices and DisCos
with communication configuration requirements of
One to One over WAN
with quality of service requirements of
Medium availability needed since have time to re-send
Medium response times
Medium data accuracy since it will be reviewed over time by many people and systems
Could entail high data volumes but infrequently
with security requirements of
All security requirements are medium high since security breaches could have financial consequences
with data management requirements of
Large database for energy schedules
Requiring timely access
Frequent updates and data exchange across organizational boundaries
with constraints of
No special constraints
Since not many legacy systems or small devices involved
Primary need is the development of methodologies and application tools, which are consistent with evolving market rules

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	1.0	0.0	1.0

COMMENTS:

G-11.4 Construction personnel provides information for relevant databases

The Purpose of *Construction personnel provides information for relevant databases* ***function***
is similar to function ***(G-11) Construction management planning*** ***above.***
directly involving
RTO/ISO scheduler
Scheduling Coordinators
Other Market Participants
TransCos
GenCos
Regulators
performing
Construction Management Planning
with key interfaces between
Government Offices and Generation Companies
Government Offices and DisCos
with communication configuration requirements of
One to One over WAN
with quality of service requirements of
Medium availability needed since have time to re-send
Medium response times
Medium data accuracy since it will be reviewed over time by many people and systems
Could entail high data volumes but infrequently
with security requirements of
All security requirements are medium high since security breaches could have financial consequences
with data management requirements of
Large database for energy schedules
Requiring timely access
Frequent updates and data exchange across organizational boundaries
with constraints of
No special constraints
Since not many legacy systems or small devices involved
Primary need is the development of methodologies and application tools, which are consistent with evolving market rules

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	1.0	0.0	1.0

COMMENTS:

G-12 Commissioning planning

The Purpose of *Commissioning planning* ***function is to***

perform a technical evaluation of the design of the new plant to study the security, safety and grid interconnection related

Also schedule the Commissioning and evaluate the necessay funds required for the same

directly involving

RTO/ISO scheduler

Scheduling Coordinators

Other Market Participants

TransCos

GenCos

Regulators

performing

Commissioning Planning

with key interfaces between

Government Offices and Generation Companies

Government Offices and DisCos

with communication configuration requirements of

One to One over WAN

with quality of service requirements of

Medium availability needed since have time to re-send

Medium response times

Medium data accuracy since it will be reviewed over time by many people and systems

Could entail high data volumes but infrequently

with security requirements of

All security requirements are medium high since security breaches could have financial consequences

with data management requirements of

Large database for energy schedules

Requiring timely access

Frequent updates and data exchange across organizational boundaries

with constraints of

No special constraints

Since not many legacy systems or small devices involved

Primary need is the development of methodologies and application tools, which are consistent with evolving market rules

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	1.0	0.0	1.0

COMMENTS:
This function has similar interfaces (and ratings) to function [(G-6) Real Time Maintenance Control] above.

G-12.1 example: nuclear

The Purpose of** example: nuclear **function** **is similar to function [(G-12) Commissioning planning] above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	1.0	0.0	1.0

COMMENTS:

G-13 De-commissioning planning

The Purpose of** De-commissioning planning **function** **is to

perform a technical evaluation of the security, safety hazards and grid interconnection related issues associated with the plant

Also schedule the De-Commissioning and evaluate the necessay funds required for the same

directly involving

RTO/ISO scheduler
Scheduling Coordinators
Other Market Participants
TransCos
GenCos
Regulators

performing

De-Commissioning Planning

with key interfaces between

Government Offices and Generation Companies

Government Offices and DisCos

with communication configuration requirements of

One to One over WAN

with quality of service requirements of

Medium availability needed since have time to re-send

Medium response times

Medium data accuracy since it will be reviewed over time by many people and systems

Could entail high data volumes but infrequently

with security requirements of

All security requirements are medium high since security breaches could have financial consequences

with data management requirements of

Large database for energy schedules

Requiring timely access

Frequent updates and data exchange across organizational boundaries

with constraints of

No special constraints

Since not many legacy systems or small devices involved

Primary need is the development of methodologies and application tools, which are consistent with evolving market rules

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	1.0	0.0	1.0

COMMENTS:

This function has similar interfaces (and ratings) to function (G-6) Real Time Maintenance Control above.

G-14 SECURITY (generation specific issues)

The Purpose of *SECURITY (generation specific issues)* ***function is to***

ensure that communications and distributed applications that involve control and communications with remote generating stations are not

The management of the communications security functions need to be able to implement and manage policies from system administrators

directly involving

Users including data comminications and network systems administrators, that must implementsecurity policies over communications with generation sources

performing

security policies that must be able to integrate with third party generation management systems to ensure a consistant level of protection across the

Critical communications should also develop methods of survivable networks that can operate despite successful attacks

with key interfaces between

Government Offices and Generation Companies

Government Offices and DisCos

with communication configuration requirements of

One to One over WAN

with quality of service requirements of

High data availability

Rapid response times

High data accuracy and high data frequency needed for interactions within the plant for operational control

with security requirements of

High security in all areas since security breaches could have severe consequences

with constraints of

No special constraints

Since not many legacy systems or small devices involved

Primary need is the development of methodologies and application tools, which are consistent with evolving market rules

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	3.0	2.0	1.0	1.2

COMMENTS:

G-14.1 Security of nuclear fuel/waste

The Purpose of *Security of nuclear fuel/waste* ***function is to***

Prevent significant adverse impacts from radioactive waste to the current and future public health and safety and the environment

And promote the common defense and security

directly involving

Nuclear Regulatory Commision (NRC)

GenCos

performing

Real time security and survivable operations monitoring

with key interfaces between

Government Offices and Generation Companies

Government Offices and DisCos

with communication configuration requirements of

One to One over WAN

with quality of service requirements of

High data availability

Rapid response times

High data accuracy and high data frequency needed for interactions within the plant for operational control

with security requirements of

High security in all areas since security breaches could have severe consequences

with data management requirements of

Large database requiring continous monitoring of nuclear fuel containment

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	3.0	2.0	2.0	1.8

COMMENTS:

The following comments were collected during the team rating review:

Security=3 should be a 4 - clearly sensitive information

Data Mgmt=2 auditing

Tracking

Constraints=2 issues of capturing/documenting a manual process into an automated system

---

G-14.2 Security from cyber threats

The Purpose of *Security from cyber threats* ***function is to*** ensure that communications and distributed applications that involve control and communications with remote generating stations are not compromised

directly involving

Nuclear Regulatory Commision (NRC)

GenCos

TransCos

DisCos
RTO/ISO
Schedule Coordinators
Market Participants

performing

Real time security and survivable operations monitoring

with key interfaces between

Government Offices and Generation Companies
Government Offices and DisCos

with communication configuration requirements of

One to One over WAN

with quality of service requirements of

High data availability
Rapid response times
High data accuracy and high data frequency needed for interactions within the plant for operational control

with security requirements of

High security in all areas since security breaches could have severe consequences

with data management requirements of

Large database requiring continous monitoring of all communication systems

with constraints of

Needing to integrate over all systems

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	3.0	1.0	1.0	1.8

COMMENTS:
The following comments were collected during the team rating review:

Config=2 must connect with multiple plants and multiple systems
QoS=2 reliable
High-speed delivery of alert notification
Security=3, as message is a security function

G-14.3 Inter-plan shared level of alert

The Purpose of *Inter-plan shared level of alert* ***function is to*** provide a coherent opinion of the security measures required to be adopted within a generating plant and thus being more effective in

implementing it
directly involving
GenCos
performing
Real time security and survivable operations monitoring
with key interfaces between
Government Offices and Generation Companies
Government Offices and DisCos
with communication configuration requirements of
One to One over WAN
with quality of service requirements of
High data availability
Rapid response times
High data accuracy and high data frequency needed for interactions within the plant for operational control
with security requirements of
High security in all areas since security breaches could have severe consequences
with data management requirements of
Small database to annunciate alarms to RTO/ISO and government agencies

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	3.0	1.0	1.0	1.8

COMMENTS:
The following comments were collected during the team rating review:

Config=2 must connect with multiple plants and multiple locations within a plant
QoS=2 reliable
High-speed delivery of alert notification
Security=3, as message is a security function

T - Transmission Operations Domain

- T-1 Long term transmission planning (1 year to 5 years ahead)
  - T-1.1 Long term load forecast
  - T-1.2 Forecast alternatives for generation sources (Probable market conditions)
  - T-1.3 Plan transmission upgrades and additions (participation in ISO/RTO expansion plan)
  - T-1.4 Plan automation of transmission system for SCADA , Equipment Monitoring, and EMS
  - T-1.5 Prepare long-term contracts with Distribution Utilities
    - T-1.5.1 Transmission voltage management
    - T-1.5.2 Distribution reactive power support (power factor) in the D-T interface
    - T-1.5.3 T&D information exchange
  - T-1.6 Prepare emergency response planning, e.g. Ice Storm, Hurricane, Catastrophic outages
  - T-1.7 Ensure hard copies of all schematics, diagrams, relay settings are available
  - T-1.8 Prepare inventory and personnel plans based on neighboring load, tie point capacity, etc
- T-2 Medium-term planning (1 month to 1 year)
  - T-2.1 Forecast annual load
  - T-2.2 Consider probable generation sources
  - T-2.3 Equipment and Line Maintenance
  - T-2.4 Calculate system utilization based on forecast load and nameplate ratings
  - T-2.5 Schedule maintenance operations - time-based
  - T-2.6 Schedule maintenance operations - predictive, based on data and models
  - T-2.7 Schedule equipment replacement - based on age of equipment
  - T-2.8 Schedule equipment replacement - predictive, based on data and models
  - T-2.9 Schedule equipment replacement - based on contingency scenarios
  - T-2.10 Schedule spare distribution, ensure sufficient at each site
  - T-2.11 Revise contracts with Distribution Utilities
- T-3 Operational planning (1 day to 1 month)
  - T-3.1 Short-term load forecast
  - T-3.2 Short-term generation alternatives based on annual maintenance plan and market conditions
  - T-3.3 Planned outage management
  - T-3.4 Operators determine needed transmission outages
  - T-3.5 Planners/operators perform load analysis of substation equipment based on data

---

T-1 Long term transmission planning (1 year to 5 years ahead)

The Purpose of *Long term transmission planning (1 year to 5 years ahead)* ***function is described below...***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.5	1.4	1.9	1.7	2.1	1.7

COMMENTS:
The following comments were collected during the team rating review:

Note: All items rate a 3 for configuration; Many legacy systems with, which to interface

---

T-1.1 Long term load forecast

The Purpose of *Long term load forecast* ***function***
is to schedule long-term transmission system capital expenditures
directly involving
Substation IEDs
EMS/DMS databases
Load estimates
performing
Automatically collecting load data and trending the information to predict future loadings on the transmission system
with key interfaces between
IEDs and EMS/DMS databases; EMS/DMS Databases and load forecasting tools; forecasting tools and engineering
with communication configuration requirements of
WAN connections to the IEDs and LAN connections between the databases and the load forecasting tools and engineering
with quality of service requirements of
Of accuracy of measurement and long term storage of load information
with security requirements of
Information integrity and confidentiality
with data management requirements of
Long term storage
Infrequent updates
And potential data sharing with other sources
with constraints of
Interface with legacy systems and databases

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3***

(highly likely to involve architectural challenges) ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	1.0	1.0	2.0	0.8

COMMENTS:
The following comments were collected during the team rating review:

Constraint=2 connections to many legacy systems will be required; uncertainty, as to where this function will be performed in the future

---

T-1.2 Forecast alternatives for generation sources (Probable market conditions)

The Purpose of *Forecast alternatives for generation sources (Probable market conditions)* ***function***
is to anticipate long term generation needs and to plan back-up generation as may be needed due to loss of planned sources
directly involving
Substation IEDs
EMS/DMS databases
Load estimates
performing
Automatically collection of load data and trending the information to predict future generation needs and to plan alternative sources
with key interfaces between
Substation IEDs and RTUs
A communication system
And EMS/generation scheduling software
with communication configuration requirements of
WAN connections to the IEDs and LAN connections between the databases and the load forecasting tools and engineering
with quality of service requirements of
Of accuracy of measurement and long term storage of load information
with security requirements of
Information integrity and confidentiality
with data management requirements of
Long term storage
Infrequent updates
And potential data sharing with other sources
with constraints of
Interface with legacy systems and databases

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3***

(highly likely to involve architectural challenges) ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	1.0	1.0	2.0	0.8

COMMENTS:
This function has similar interfaces (and ratings) to function (T-1.1) Long term load forecast above.

T-1.3 Plan transmission upgrades and additions (participation in ISO/RTO expansion plan)

The Purpose of *Plan transmission upgrades and additions (participation in ISO/RTO expansion plan)* ***function is to***

Determine
Based on results of long term forecasts
Future transmission system needs

directly involving

Results of the forcast model
System planning engineers
ISO
RTO

performing

Transmission planning for the system

with key interfaces between

System planning results
And Utility
ISO
And RTO planning engineers

with communication configuration requirements of

WAN connections between the results of the planning studies and any and all involved parties

with quality of service requirements of

Data accuracy

with data management requirements of

Periodic updates

with constraints of

Interface with legacy systems and databases

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of	Security	Data	Constraints	Average

	Service		Management		
0.0	0.0	1.0	1.0	2.0	0.8

COMMENTS:
This function has similar interfaces (and ratings) to function (T-1.1) Long term load forecast above.

T-1.4 Plan automation of transmission system for SCADA , Equipment Monitoring, and EMS

The Purpose of *Plan automation of transmission system for SCADA , Equipment Monitoring, and EMS* ***function is to***

Determine
Based on results of long term forecasts
Future transmission system needs

directly involving

Substation IEDs
EMS/DMS databases
Load estimates
Planning engineers

performing

Analysis of requirements

with key interfaces between

Substation IEDs and RTUs
A communication system
And EMS/generation scheduling software

with communication configuration requirements of

WAN connections between the results of the planning studies and any and all involved parties

with quality of service requirements of

Data accuracy

with data management requirements of

Periodic updates

with constraints of

Interface with legacy systems and databases

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	1.0	1.0	2.0	0.8

COMMENTS:

This function has similar interfaces (and ratings) to function (T-1.1) Long term load forecast above.

T-1.5 Prepare long-term contracts with Distribution Utilities

The Purpose of *Prepare long-term contracts with Distribution Utilities* ***function***
is to

Set the operating guidelines for interfacing with distribution companies - especially defining power requirements
Reactive power
And voltage levels

directly involving

The Transmission company and the distribibution companies

performing

Development of long term contracts

with key interfaces between

Transmission companies and distribution companies

with communication configuration requirements of

WAN communications between the parties involved

with quality of service requirements of

Data accuracy

with security requirements of

Information integrity and confidentiality

with data management requirements of

Periodic updates

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	1.0	3.0	1.0	1.0	1.2

COMMENTS:
The following comments were collected during the team rating review:

Security=3 Contract sensitive material - high security

T-1.5.1 Transmission voltage management

The Purpose of *Transmission voltage management* ***function***
is similar to function (T-1.5) Prepare long-term contracts with Distribution Utilities above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	1.0	3.0	1.0	1.0	1.2

COMMENTS:
This function has similar interfaces (and ratings) to function (T-1.5) Prepare long-term contracts with Distribution Utilities above.

T-1.5.2 Distribution reactive power support (power factor) in the D-T interface

The Purpose of** Distribution reactive power support (power factor) in the D-T interface **function
is similar to function (T-1.5) Prepare long-term contracts with Distribution Utilities above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	1.0	3.0	1.0	1.0	1.2

COMMENTS:
This function has similar interfaces (and ratings) to function (T-1.5) Prepare long-term contracts with Distribution Utilities above.

T-1.5.3 T&D information exchange

The Purpose of** T&D information exchange **function
is similar to function (T-1.5) Prepare long-term contracts with Distribution Utilities above.

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	1.0	3.0	1.0	1.0	1.2

COMMENTS:
This function has similar interfaces (and ratings) to function (T-1.5) Prepare long-term contracts with Distribution Utilities above.

T-1.6 Prepare emergency response planning, e.g. Ice Storm, Hurricane, Catastrophic outages

The Purpose of *Prepare emergency response planning, e.g. Ice Storm, Hurricane, Catastrophic outages* ***function***
is to be prepared in case of catastrophic external events
directly involving
System planners
Neigboring utilities
Governmental organizations
Operators
Field crews
performing
Update emergency response plan
with key interfaces between
Planners
Internal and external organizations
with communication configuration requirements of
Much face-to-face communication required
with quality of service requirements of
Must be available across the organization
At many redundant sites
with security requirements of
Confidentiality
with data management requirements of
Crossing organizational boundaries
with constraints of
Legacy paper-based systems; awareness of the plan must be periodically refreshed

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	2.0	2.0	2.0	1.2

COMMENTS:
The following comments were collected during the team rating review:

DataMgmt=2 large amount of data - some of, which may not exist in electronic format; it may take 3-4 years for "as built" drawings to find their way into the main engineering drawings
Constraints=2 no process exists today for this process
Security=2 drawings are sensitive documents

T-1.7 Ensure hard copies of all schematics, diagrams, relay settings are available

The Purpose of *Ensure hard copies of all schematics, diagrams, relay settings are available* ***function***

is to

Permit local access to data vital to recovery
If online access is lost

directly involving

System planners
Operators
Field crews

performing

Distribute up-to-date drawings and settings to each site

with key interfaces between

Planners and remote sites

with communication configuration requirements of

Limited access to many sites

with quality of service requirements of

Data accuracy
Large number of sites

with security requirements of

Data integrity
Authentication

with data management requirements of

Frequent updates; crossing organizational boundaries; large files; long-term storage

with constraints of

Legacy paper-based system for distribution; low bandwidth to many sites; no storage location available at many sites

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	2.0	2.0	2.0	1.2

COMMENTS:

This function has similar interfaces (and ratings) to function (T-1.6) Prepare emergency response planning, e.g. Ice Storm, Hurricane, Catastrophic outages above.

T-1.8 Prepare inventory and personnel plans based on neighboring load, tie point capacity, etc

The Purpose of *Prepare inventory and personnel plans based on neighboring load, tie point capacity, etc* ***function***
is to ensure all parts of the organization are aware of contingency plans for catastrophic events
directly involving
- System planners
- Neigboring utilities
- Governmental organizations
- Operators
- Field crews

performing
- Update inventory
- Shipment schedules
- Emergency procedures
- Personnel role definitions

with key interfaces between
- Planners
- Internal organization
- External organizations

with communication configuration requirements of
- Can use business IT environment

with quality of service requirements of
- Large volumes (must be communicated to all members of the organization)

with security requirements of
- Confidentiality
- Non-repudiation

with data management requirements of
- Crossing organizational boundaries

with constraints of
- Legacy paper-based systems; awareness of the plan must be periodically refreshed

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	3.0	2.0	1.0	1.2

COMMENTS:
The following comments were collected during the team rating review:

Security=3 dependent external organization for information exchange

Constraint=1 legacy process already in place

T-2 Medium-term planning (1 month to 1 year)

The Purpose of *Medium-term planning (1 month to 1 year)* ***function is described below...***

with key interfaces between

Data collection IEDs and the load forcasting SW

with communication configuration requirements of

Automatic detection and configuration of load measuring devices

with quality of service requirements of

Relatively reliable and infrequent updates

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	1.0	1.0	1.0	2.0	1.0

COMMENTS:

The following comments were collected during the team rating review:

Constraints=2 location of implementation may change; line of demarcation is not defined yet

---

T-2.1 Forecast annual load

The Purpose of *Forecast annual load* ***function is to*** gather short term historical load information to form the basis of estimating loading for the coming year

directly involving

Historical data and load forecasting supplement by market data (load bid data provided by load serving entities)

performing

Data collection

Load forcast processing and automatic allocation of required generation resources

with key interfaces between

Database information and the load forecasting SW

with communication configuration requirements of

LAN connection

with quality of service requirements of

Data accuracy

with security requirements of

Data integrity and confidentiality

with data management requirements of
Long term storage
with constraints of
Interface with legacy systems and databases

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	1.0	1.0	1.0	2.0	1.0

COMMENTS:
This function has similar interfaces (and ratings) to function (T-2) Medium-term planning (1 month to 1 year) above.

T-2.2 Consider probable generation sources

The Purpose of *Consider probable generation sources* ***function is to*** gather short term historical load information to form the basis of estimating loading for the coming year
directly involving
Historical data and load forecasting supplement by market data (load bid data provided by load serving entities)
performing
Data collection
Load forcast processing and automatic allocation of required generation resources
with key interfaces between
Database information and the load forecasting SW
with communication configuration requirements of
LAN connection
with quality of service requirements of
Data accuracy
with security requirements of
Data integrity and confidentiality
with data management requirements of
Long term storage
with constraints of
Interface with legacy systems and databases

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average

0.0	1.0	1.0	1.0	2.0	1.0

COMMENTS:
This function has similar interfaces (and ratings) to function (T-2) Medium-term planning (1 month to 1 year) above.

T-2.3 Equipment and Line Maintenance

The Purpose of *Equipment and Line Maintenance* ***function is to***

Schedule maintenance either on a periodic basis or
Through equipment monitoring
On a Just in Time basis

directly involving

Maintenance schedules
Equipment monitoring equipment
And maintenance crews

performing

Periodic or optimized automatic maintenance scheduling

with key interfaces between

Maintenance database
Power equipment
Diagnostic monitoring equipment
And scheduling software

with communication configuration requirements of

Auto detection and configuration and exception based status communication

with quality of service requirements of

Relatively reliable and infrequent updates

with security requirements of

Data integrity and confidentiality

with data management requirements of

Interface with the asset management database

with constraints of

Interface with legacy systems and databases

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	1.0	1.0	1.2

COMMENTS:
The following comments were collected during the team rating review:

Security=2 Access to types and location of spares is sensitive information

T-2.4 Calculate system utilization based on forecast load and nameplate ratings

The Purpose of *Calculate system utilization based on forecast load and nameplate ratings* ***function***

is to provide estimate of the remaining capacity in the system in order to determine where new capacity is needed; prevent overloading and failures; report capacity to regulatory bodies

directly involving

Equipment engineer
Market analysts
Business leaders
Equipment vendors (through specifications)
SCADA/EMS system
Remote devices
Field equipment

performing

Calculate and report utilization; identify weak or overloaded areas requiring attention

with key interfaces between

Equipment engineers and market forecasters; field equipment and forecasting software

with security requirements of

Data integrity
Confidentiality

with data management requirements of

Crossing organizational boundaries

with constraints of

New process in many organizations

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	1.0	2.0	1.2

COMMENTS:

The following comments were collected during the team rating review:

Constraint=2 New process for many organizations

T-2.5 Schedule maintenance operations - time-based

The Purpose of *Schedule maintenance operations - time-based* ***function is to*** prevent failure of equipment while online; meet warranty requirements

directly involving

Equipment engineer

Equipment vendor (usually through specifications)

performing

Update maintenance schedule

with constraints of

Legacy paper-based systems

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	0.0	0.0	0.0	0.0

COMMENTS:

T-2.6 Schedule maintenance operations - predictive, based on data and models

The Purpose of *Schedule maintenance operations - predictive, based on data and models* ***function is to*** predict and prevent failure of equipment while online; optimize usage of equipment

directly involving

Equipment engineer

Operator

SCADA/EMS system

Remote devices

Field equipment

performing

Update maintenance schedule

with key interfaces between

Field devices and predictive maintenance software

with communication configuration requirements of

Most sites slow serial access only

with quality of service requirements of

Frequency low but could be large volumes of data once deployment becomes common

with security requirements of

Data integrity; authentication

with data management requirements of

Large databases; long-term storage

with constraints of

Often no communications system or process in place; sensors in place have low communications capabilities

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	0.0	1.0	2.0	3.0	1.4

COMMENTS:
The following comments were collected during the team rating review:

Data Mgmt=2 large amounts of data
Constraint=3 Predictive maintenance is at an early stage from many points of view: utility awareness
Process and infrastructure deployment
Communications capability of devices

T-2.7 Schedule equipment replacement - based on age of equipment

The Purpose of** Schedule equipment replacement - based on age of equipment **function
is to prevent failure of equipment while online
directly involving
Equipment engineer
performing
Update replacement schedule
with constraints of
Legacy paper-based systems

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	0.0	0.0	0.0	0.0

COMMENTS:

T-2.8 Schedule equipment replacement - predictive, based on data and models

The Purpose of** Schedule equipment replacement - predictive, based on data and models **function
is to predict and prevent failure of equipment while online; optimize usage of equipment
directly involving

Equipment engineer
Operator
SCADA/EMS system
Remote devices
Field equipment

performing

Update replacement schedule

with key interfaces between

Field devices and predictive maintenance software

with communication configuration requirements of

Most sites slow serial access only

with quality of service requirements of

Frequency low but could be large volumes of data once deployment becomes common

with security requirements of

Data integrity; authentication

with data management requirements of

Large databases; long-term storage

with constraints of

Often no communications system or process in place; sensors in place have low communications capabilities

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	0.0	1.0	2.0	3.0	1.4

COMMENTS:

The following comments were collected during the team rating review:

Data Mgmt=2 diverse data sources
Larger data bases
Long term storage
Constraints=3 Predictive maintenance is at an early stage from many points of view: utility awareness
Process and infrastructure deployment
Communications capability of devices

T-2.9 Schedule equipment replacement - based on contingency scenarios

The Purpose of *Schedule equipment replacement - based on contingency scenarios* ***function***

is to prevent failure of equipment while online; prevent cascading failures

by applying worst-case scenarios to the entire system
directly involving
Equipment engineer; emergency planner
performing
Update replacement schedule
with constraints of
Legacy paper-based systems

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	0.0	0.0	0.0	0.0

COMMENTS:

T-2.10 Schedule spare distribution, ensure sufficient at each site

The Purpose of *Schedule spare distribution, ensure sufficient at each site* ***function***
is to ensure quick recovery from unexpected failures
directly involving
Equipment engineer
Equipment vendors
Field crews
performing
Update inventory
Shipment schedules
with data management requirements of
Large databases; timely access; crossing organizational boundaries
with constraints of
Legacy paper-based systems

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	0.0	2.0	2.0	0.8

COMMENTS:
The following comments were collected during the team rating review:

Data Mgmt=2 archiving lots of data
Constraints=2 Automating this process presents challenges - mostly paper based today

T-2.11 Revise contracts with Distribution Utilities

The Purpose of *Revise contracts with Distribution Utilities* ***function is to*** adjust contract goals based upon feedbace from performance to date

directly involving

Transmission companies
Distribution companies
Historical information
Market conditions

performing

Contract evaluation and revision

with key interfaces between

Contracted parties

with communication configuration requirements of

WAN communications between the parties involved

with quality of service requirements of

Data accuracy

with security requirements of

Information integrity and confidentiality

with data management requirements of

Periodic updates

with constraints of

Interface with legacy systems and databases

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	2.0	1.0	1.0	1.2

COMMENTS:

The following comments were collected during the team rating review:

Security=2 contracts are sensitive material

T-3 Operational planning (1 day to 1 month)

The Purpose of *Operational planning (1 day to 1 month)* ***function is described below...***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of	Security	Data	Constraints	Average

	Service		Management		
1.0	0.0	2.0	2.0	2.0	1.4

COMMENTS:
The following comments were collected during the team rating review:

Security=2 many people working with sensitive load data and back and forth data transmission
DB Mgmt=2 working with lots of historical data
Constraints=2 interfacing with multiple legacy databases from multiple utilities

---

The rating for Constraints does not match the comment (=1). -- Peter Sanza - 05 Apr 2003

T-3.1 Short-term load forecast

The Purpose of *Short-term load forecast* ***function is to***

provide operations personnel and market participants with the expected load from 1 day to a month in
The load forecast is used by operations personnel in predicting network conditions and in determining generation needs for meeting load and
The load forecast is used by market participants in determining or predicting bid prices and demand for the current time and future

directly involving

Historical data and load forecasting supplement by market data (load bid data provided by load serving entities)

performing

Accurate load forecast

with key interfaces between

The Market Agents Information System to retrieve load bids from load serving entities
And to the EMS system for use by Network applications
And operational planning tools

with security requirements of

Required permission, that imposed by the market interface

with data management requirements of

Historically archived for reproducibility for billing &accounting
Billing dispute - post the official load forecast to the market information system for use by market participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	0.0	2.0	2.0	2.0	1.4

COMMENTS:
This function has similar interfaces (and ratings) to function (T-3) Operational planning (1 day to 1 month) above.

T-3.2 Short-term generation alternatives based on annual maintenance plan and market conditions

The Purpose of *Short-term generation alternatives based on annual maintenance plan and market conditions* ***function is to***

Operational planning tools provide operations personnel and market participants with information used in determining the best economics for planning maintenance down-

These tools are also used by some market operators to determine who has been selected to participate in the market for each time slice in the operational planning study as well as predicting how they will

For power brokers, a prediction on how much energy will be purchased from them for a particular hour when they have been selected to participate for that hour

directly involving

Market participants to replace no shows in the market (energy
Reserve
Regulation
Voltage support
And possible black start)

performing

Generation supply to meet the needs of market

with key interfaces between

The real-time SCADA database for actual market conditions

And the look ahead schedules for the list of market participants, as well, as other market bids used in determining replacement energy for those participants, that don't meet their awarded commitments

with security requirements of

Security encryption and password protection

with data management requirements of

Historically archived for reproducibility for billing &accounting

Billing dispute - post the official accepted generation bids to the market information system for use by market participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3***

(highly likely to involve architectural challenges) ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	0.0	2.0	2.0	2.0	1.4

COMMENTS:
This function has similar interfaces (and ratings) to function [(T-3) Operational planning (1 day to 1 month)] above.

T-3.3 Planned outage management

The Purpose of *Planned outage management* ***function is to***

Operational planning tools provide operations personnel and market participants with information used in determining the best economics for planning maintenance down-

These tools are also used by some market operators to determine who has been selected to participate in the market for each time slice in the operational planning study as well as predicting how they will

For power brokers, a prediction on how much energy will be purchased from them for a particular hour when they have been selected to participate for that hour

directly involving

Transmission owners and market participants

performing

Market evaluation - determine the chosen market participants based on evaluated price, which is impacted by the topology of the network, as determined by outage management

with key interfaces between

The look-ahead LMP prices and load forecasts used to determine the economics regarding planned outages

with security requirements of

Security encryption and password protection for the input of the data - electrical security of the network would then be determine by the ISO (no voltage or power flow violation)

with data management requirements of

Historically archived outage data

Market participants for risk and bid strategy analysis

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average

1.0	0.0	2.0	2.0	2.0	1.4

COMMENTS:
This function has similar interfaces (and ratings) to function (T-3) Operational planning (1 day to 1 month) above.

T-3.4 Operators determine needed transmission outages

The Purpose of *Operators determine needed transmission outages* ***function is to***

Operational planning tools provide operations personnel and market participants with information regarding the impacts of unplanned transmission outages via short-term planning

Impacts may include changes in energy demand, energy market price, or changes in congestion costs

directly involving

Operators
SCADA real time database
Field RTUs

performing

Real time outage (un-planned)

with key interfaces between

the online EMS system for evaluating and controlling transmission outages as they

Additionally, operations personnel have access to planned outage information obtained from the Market Agents Information System

with security requirements of

Electrical security of the network would then be determined by the ISO (no voltage or power flow violation)

with data management requirements of

Historically archived to reproduce actual condition for billing accounting and billing dispute - post official results for market participants

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	0.0	2.0	2.0	2.0	1.4

COMMENTS:
This function has similar interfaces (and ratings) to function (T-3) Operational planning (1 day to 1 month) above.

T-3.5 Planners/operators perform load analysis of substation equipment based on data

The Purpose of *Planners/operators perform load analysis of substation equipment based on data* ***function***
is to determine which substation equipment can be temporarily overloaded in order to facilitate the planned outage
directly involving
Operator
SCADA/EMS tools
Substation devices
Substation equipment
performing
Retrieve current load; compare to nameplate specs; determine utilization; determine maintenance state of devices based on condition monitoring data; display alternate choices
with key interfaces between
EMS/SCADA and substation devices; possibly EMS and SCADA if they are separate
with communication configuration requirements of
Gather data from multiple substations
with quality of service requirements of
Within seconds
But not necessarily 1 second
with security requirements of
Integrity
Authentication
with data management requirements of
None
with constraints of
Existing sensors are compute-constrained; existing software may not be prepared to take condition monitoring data, as input

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	0.0	0.0	1.0	3.0	1.0

COMMENTS:
The following comments were collected during the team rating review:

Data Mgmt=1 much new data being brought in

Constraint=3 Integrating condition monitoring into a planned outage is a new process in most organizations

---

T-3.6 Operators submit transmission outages and constraints to RTO/ISO

The Purpose of *Operators submit transmission outages and constraints to RTO/ISO* ***function***

is to Operational planning tools such as an Equipment Outage Scheduler or a Transmission Switching Application Scheduler provide operations personnel and the market participants detailed information needed to predict network topology in advance

directly involving

Transmission owners and market participants

performing

Market evaluation - determined the chosen market participants based on evaluated price, which is impacted by the topology of the network, as determined by outage management

with key interfaces between

The RTO/ISO to provide real-time and look-ahead transmission outage information, as well, as real-time and look-ahead device limit information

with security requirements of

Security encryption and password protection for the input of the data - electrical security of the network would then be determined by the ISO (no voltage or power flow violation)

with data management requirements of

Historically archived outage data

Market participants for risk and bid strategy analysis

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	0.0	2.0	2.0	2.0	1.4

COMMENTS:

This function has similar interfaces (and ratings) to function (T-3) Operational planning (1 day to 1 month) above.

T-3.7 Dynamic equipment capacity - change write-up

The Purpose of *Dynamic equipment capacity - change write-up* ***function***

is to acquire nameplate specifications on substation equipment to determine overload capacity

directly involving

Operator
Equipment engineer

performing

Retrieve nameplate data for concerned devices

with key interfaces between

EMS/SCADA and maintenance database

with communication configuration requirements of

N/a

with quality of service requirements of

Within seconds
Possibly minutes

with security requirements of

Integrity
Authentication

with data management requirements of

Large databases of recent condition monitoring analysis; may cross organizational boundaries

with constraints of

New process in many organizations

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	0.0	2.0	3.0	1.6

COMMENTS:

The following comments were collected during the team rating review:

QoS=2 high availability
Data Mgmt=2 long time (50 years) history data
Constraints=3 new applications; new models

T-3.8 Protection engineer, to alter relay settings

The Purpose of *Protection engineer, to alter relay settings* ***function is to*** alter protection settings to compensate for planned outage

directly involving

Operator
Protection engineer

performing

Determine whether protection settings need to be changed; update settings if necessary

with key interfaces between

EMS/SCADA and protection modelling software or protection engineer

with communication configuration requirements of

N/a

with quality of service requirements of

Within seconds

Possibly minutes

with security requirements of

Integrity

Authentication

with data management requirements of

Large databases of settings; may cross organizational boundaries

with constraints of

Existing process is manual or verbal?

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	3.0	2.0	3.0	1.6

COMMENTS:

The following comments were collected during the team rating review:

Security=3 settings should only be issued by an authorized protection engineer

Data Mgmt=2 interface with remote relay database

Constraints=3 Process may not be automated; organization boundaries presently prevent implementation (most managers want someone on site to verify settings); infrastructure does not presently exist

---

T-4 Real-time normal operator actions (Using SCADA/EMS)

The Purpose of *Real-time normal operator actions (Using SCADA/EMS)* ***function***

is to see details below

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	2.0	2.0

COMMENTS:
The following comments were collected during the team rating review:

Config=2 transition from serial to LAN/WAN & variety of media; heterogenious environment
Qos=2 high availability; high accuracy
Security=2 Securing this data over legacy media-and-compute constrained systems may be challenging and controls
Data Mgmt=2 archiving and forensics
Constraints=2 interface with legacy systems

The following comments were collected during the peer review:

Note: these ratings apply on a-z unless specifically noted

T-4.1 SCADA system monitors transmission system

The Purpose of *SCADA system monitors transmission system* ***function is to***

Provide operations personnel with state estimation to validate the quality of the SCADA
Maintains bus load forecast via adaptive update from state estimator solution

directly involving

SCADA
Schedule information

performing

Validate the quality of SCADA telemetry and generate a base case for further network analysis

with key interfaces between

The online EMS system, which contains network applications, that provide state estimation and automatically updates/maintains the historical bus load forecasts

with security requirements of

Telemetry data and scheduled information (load forecast
Accepted generation bids
Outage management schedules)

with data management requirements of

Historical archived state estimate solution - share estimated value with the ISO/RTO

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	1.0	2.0	2.0	1.8

COMMENTS:
This function has similar interfaces (and ratings) to function (T-4) Real-time normal operator actions (Using SCADA/EMS) above.

T-4.2 Monitor plant state (open/close)

The Purpose of *Monitor plant state (open/close)* ***function is to*** Inform operator of current picture of all switch and breaker positions so the operator can take action when failures occur

directly involving
Operator
SCADA/EMS system
Remote IEDs

performing
Display open or closed position

with key interfaces between
SCADA to EMS; SCADA to IEDs

with communication configuration requirements of
Any or none of those listed

with quality of service requirements of
Typically within 1 second; must not lose any changes of state; data timestamped within 1 ms; high volumes due to number of devices monitored

with security requirements of
Information integrity and authenticitiy

with data management requirements of
Frequent updates to historical Sequence of Events log
Distribution of this data is becoming much more widespread
Crossing organizational boundaries

with constraints of
Large number of legacy systems; often compute-constrained or media-constrained

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	1.0	2.0	2.0	1.8

COMMENTS:

This function has similar interfaces (and ratings) to function (T-4.1) SCADA system monitors transmission system above.

T-4.3 Monitor system activity and load (current, voltage, frequency, energy)

The Purpose of *Monitor system activity and load (current, voltage, frequency, energy)* ***function***
is to Inform operator of curent load on any given component of the power system so the operator can re-route traffic intelligently when necessary
directly involving
Operator
SCADA/EMS system
Remote IEDs
performing
Display current load
with key interfaces between
SCADA to EMS; SCADA to IEDs
with communication configuration requirements of
Any or none of those listed
with quality of service requirements of
Typically within 5 seconds; high volumes due to number of devices monitored
with security requirements of
Information integrity and authenticitiy
with data management requirements of
Frequent updates although only recent data is usually of importance
More demand for historical energy data recently
Beginning to cross organizational boundaries
with constraints of
Large number of legacy systems; often compute-constrained or media-constrained

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	1.0	2.0	2.0	1.6

COMMENTS:
This function has similar interfaces (and ratings) to function (T-4.1) SCADA system monitors transmission system above.

T-4.4 Monitor equipment condition (overheat, overload, battery level, capacity)

The Purpose of *Monitor equipment condition (overheat, overload, battery level, capacity)* ***function***
is to Inform operator of current or imminent equipment failures so the operator can re-route power around the failed equipment
directly involving
Operator
SCADA/EMS system
Remote IEDs
performing
Display alarm condition
with key interfaces between
SCADA to EMS; SCADA to IEDs
with communication configuration requirements of
Any or none of those listed
with quality of service requirements of
Within 1 second or sooner; large numbers of devices
with security requirements of
Information integrity and authenticitiy
with data management requirements of
Historical record required
with constraints of
Large number of legacy systems; often compute-constrained or media-constrained

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	1.0	2.0	2.0	1.6

COMMENTS:
This function has similar interfaces (and ratings) to function ***(T-4.3) Monitor system activity and load (current, voltage, frequency, energy) above.***

T-4.5 Monitor environmental (fire, smoke, temperature, sump level) and Monitor security (door alarm, intrusion, cyber attack)

The Purpose of *Monitor environmental (fire, smoke, temperature, sump level) and Monitor security (door alarm, intrusion, cyber attack)* ***function***
is to Inform operator of emergencies so the operator can dispatch help
directly involving
Operator
SCADA/EMS system
Remote IEDs

Field crews
Emergency response teams

performing

Display alarm condition

with key interfaces between

Handling may lead to dispatch of field crews or calling emergency response teams

with communication configuration requirements of

Any or none of those listed

with quality of service requirements of

Within 1 second or sooner; large numbers of devices

with security requirements of

Information integrity and authenticitiy

with data management requirements of

Historical record required

with constraints of

Large number of legacy systems; often compute-constrained or media-constrained

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	1.0	2.0	2.0	1.6

COMMENTS:

This function has similar interfaces (and ratings) to function (T-4.3) Monitor system activity and load (current, voltage, frequency, energy) above.

T-4.6 Monitor security records (audio/video recording)

The Purpose of *Monitor security records (audio/video recording)* ***function is to***

Allow operators or external security agencies to determine, which human being has accessed a given site

And what they are doing

directly involving

Operator

Remote camera/microphone

External security agency

performing

Play audio/video recording of site

with key interfaces between

Must be in a format, that could be provided to police or other external agency

with communication configuration requirements of

Video is a data format not widely distributed yet

with quality of service requirements of

High data volumes

Infrequently

with security requirements of

Confidentiality

Authenticity

And data integrity

with data management requirements of

Large databases

with constraints of

Processes not in place; must be in format suitable for submission to law enforcement

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	2.0	2.0	0.0	2.0

COMMENTS:

The following comments were collected during the team rating review:

Configuration=3 more complexity in routingVideo data

Is not widely distributed yet

But will become more important

QoS=3 high bandwidth required

Data Mgmt=2 potential archiving of video

T-4.7 Operators handle alarms

The Purpose of *Operators handle alarms* ***function is to*** Contingency Analysis and post-contingency analysis remedial action provides the ability to correct problems caused by harmful contingencies caused by outages or changes in generation

directly involving

Result from contingency analysis is analyised by post contingency optimal power flow

performing

Optimization to mitigate harmful contingency

with key interfaces between

the online EMS system which contains network applications that provides real-time and study contingency analysis used in determining harmful

The network applications may then interface to available network optimization applications to determine corrective actions to either remedy harmful contingencies or prevent the harmful contingencies from occurring

with security requirements of

Electrical limit within the network (voltage limit

Line flow limits…)

with data management requirements of

Historical archived recommended and actual controls-control center's operator use recommended control to optimize the network

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	2.0	2.0

COMMENTS:

This function has similar interfaces (and ratings) to function [(T-4) Real-time normal operator actions (Using SCADA/EMS)] above.

T-4.8 Intelligent alarm processing should happen here as well as in (6)

The Purpose of *Intelligent alarm processing should happen here as well as in (6)* ***function***

is to See 6

directly involving

See 6

performing

See 6

with key interfaces between

See 6

with communication configuration requirements of

See 6

with quality of service requirements of

See 6

with security requirements of

See 6

with data management requirements of

See 6

with constraints of

See 6

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	2.0	2.0

COMMENTS:
This function has similar interfaces (and ratings) to function (T-4) Real-time normal operator actions (Using SCADA/EMS) above.

T-4.9 Distribution of alarms to non-operators

***The Purpose of** Distribution of alarms to non-operators **function is to** missing purpose*

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	3.0	2.0	2.0	2.2

COMMENTS:
This function has similar interfaces (and ratings) to function (T-4) Real-time normal operator actions (Using SCADA/EMS) above.

The following comments were collected during the team rating review:

Security=3 authentication for off-site alarm delivery

This function is missing the description. -- Peter Sanza - 05 Apr 2003

T-4.10 overloads and replacement issues to maintenance engineer

The Purpose of** overloads and replacement issues to maintenance engineer **function
***is to** Ensure equipment is replaced either before it fails or when it fails*
directly involving
Operator
Maintenance Engineer
performing
Identify equpment and event
with key interfaces between
SCADA/EMS and maintenance database
with communication configuration requirements of

N/a

with quality of service requirements of

Before work-around solutions are insufficient to compensate for failed equipment

with security requirements of

Authentication

Non-repudiation

with data management requirements of

Updating a large database

with constraints of

Currently a manual process

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	0.0	2.0	2.0	3.0	1.8

COMMENTS:

This function has similar interfaces (and ratings) to function [(T-4) Real-time normal operator actions (Using SCADA/EMS)] above.

The following comments were collected during the team rating review:

Constraints=3 automating manual process

T-4.11 automated work management system

The Purpose of *automated work management system* ***function is to*** Dispatch field crews in an efficient manner with proper records

directly involving

Operator

Work Management System

Field crews

performing

Identify the task to perform

The location

And time and date the change must take place

with key interfaces between

SCADA/EMS and work management system

with communication configuration requirements of

N/a

with security requirements of

Authentication

Non-repudiation

with constraints of

Currently a manual process
If done at all

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	0.0	2.0	0.0	3.0	1.4

COMMENTS:
This function has similar interfaces (and ratings) to function (T-4.10) overloads and replacement issues to maintenance engineer above.

The following comments were collected during the team rating review:

Constraints=3 automating manual process

T-4.12 fault records and SOEs to protection engineers

The Purpose of *fault records and SOEs to protection engineers* ***function is to*** Provide protection engineers with information to analyze root cause of a fault and the performance of the power system in responding to it

directly involving

Operator
IEDs
Protection Engineer

performing

Identify the type of fault
The equipment involved
Supply the SOEs around the time of the fault and waveform captures at the time of the fault

with key interfaces between

SCADA/EMS and protection database

with communication configuration requirements of

N/a

with quality of service requirements of

Before returning substation to normal operating state? Before installing new protection equipment? Large waveform capture files

with security requirements of

Authentication

with data management requirements of

Large volumes of data

with constraints of

Currently a manual process

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	0.0	2.0	2.0	3.0	1.8

COMMENTS:
This function has similar interfaces (and ratings) to function (T-4.10) overloads and replacement issues to maintenance engineer above.

The following comments were collected during the team rating review:

Constraints=3 automating manual process; interfacing w/ legacy devices

---

T-4.13 info to billing dept. re: possible refunds or reliability contract

The Purpose of** info to billing dept. re: possible refunds or reliability contract **function
is to Inform billing department when a failure occurs that could impact revenue
directly involving
Operator
Billing department
Legal department
performing
Contact legal or billing to determine guidelines for event
Compare conditions of event to established guidelines
Update databases with particulars of event if it fits the guidelines
with key interfaces between
SCADA/EMS and billing/legal
with communication configuration requirements of
N/a
with quality of service requirements of
Before deadline for next billing period
Or, as required by contract
with security requirements of
Authentication
Confidentiality
Non-repudiation
with constraints of
Currently a manual process

On a scale of 0** (does not involve significant architectural challenges) **to 3

(highly likely to involve architectural challenges) ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	3.0	1.0	3.0	1.4

COMMENTS:
The following comments were collected during the team rating review:

Security=3 this is the refund cash register - contract admin involved
Constraints=3 not clearly defined process

T-4.14 external security or emergency response teams

The Purpose of *external security or emergency response teams* ***function is to***

Bring police
Security
Fire
EMS
Or other external response teams to the utility site to resolve emergency situations

directly involving

Operator
IEDs
Emergency teams

performing

Identify type of event and location
Inform site of the arrival of team

with key interfaces between

Voice or location data to integrated 911 system?

with communication configuration requirements of

N/a

with quality of service requirements of

Immediate

with security requirements of

Authentication
Confidentiality
Non-repudiation

with constraints of

Currently a manual process

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	1.0	0.0	1.0	1.0

COMMENTS:
The following comments were collected during the team rating review:

QoS=2 urgency of message

T-4.15 Operators perform supervisory control of switching operations

The Purpose of *Operators perform supervisory control of switching operations* ***function***
is to
Manually open / close breakers
Disconnects
And load breaks in order to effect a desired system state

directly involving
Previously generated switching sequence actions (list)
Field personnel
SCADA RTUs
Manually operated switches
performing
The required actions to achieve the desired end system state
with key interfaces between
The system control center
Substation personnel
And field personnel -, as required
with quality of service requirements of
Good phone communications
with data management requirements of
Manually documenting the resulting system state on the system pin board

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	3.0	2.0	2.0	2.4

COMMENTS:
This function has similar interfaces (and ratings) to function (T-4) Real-time normal operator actions (Using SCADA/EMS) above.

The following comments were collected during the team rating review:

QoS=3 control is a critical function
Security=4 avoid undesired control

T-4.16 Manual switching

The Purpose of *Manual switching* ***function is to***

Fault Level Analysis predicts the fault behavior of known, predicted or detected harmful fault cases for operations
Contingency Analysis reports the impacts of relay protection to the network to operations personnel

directly involving

Real-time database
Voltage control SW
Field devices

performing

Fault level analysis- detects harmful fault conditions

with key interfaces between

the online EMS system which contains network applications that provides real-time and study fault level analysis used in determining harmful
Operations personnel then determine whether corrective action should be taken to prevent the conditions where the fault would be harmful

with security requirements of

Fault current limits on all devices

with data management requirements of

Alarm harmful fault condition in real time

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	0.0	0.0	0.0	0.0

COMMENTS:
The following comments were collected during the team rating review:

Human / system interface

T-4.17 Transfer of Authority

The Purpose of *Transfer of Authority* ***function is to*** missing purpose

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	3.0	3.0	3.0	2.6

COMMENTS:
This function has similar interfaces (and ratings) to function [(T-4) Real-time normal operator actions (Using SCADA/EMS)] above.

The following comments were collected during the team rating review:

QoS=2 high availability of function
Security=3 concept of "transfer of authority" during programmed or emergency situations makes authentication critical Data Mgmt=3 data synchronization across multiple systems Constraints=2 automating manual process; legacy interface; implementation issues as to how function is implemented (transfer between masters
message from master to remotes)

T-4.18 Automation system controls voltage, var and power flow based on algorithms, real-time data, and network-linked capacitive and reactive components

The Purpose of *Automation system controls voltage, var and power flow based on algorithms, real-time data, and network-linked capacitive and reactive components* ***function***
is to
Automatically adjust voltage
Vars
And power flow to optimize network efficiency

directly involving
SCADA/EMS and substation IEDs
performing
Adjust tap changers; add/remove capacitive and reactive components
with key interfaces between
SCADA/EMS and substation IEDs
with communication configuration requirements of
WAN/LAN
Remote sites
with quality of service requirements of
Fast response (seconds)

with security requirements of
Authentication
Integrity
Non-repudiation
with data management requirements of
Historical record required
with constraints of
Legacy systems in place; or may not be automated at all

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	3.0	2.0	2.0	2.4

COMMENTS:
This function has similar interfaces (and ratings) to function [(T-4) Real-time normal operator actions (Using SCADA/EMS)] above.

The following comments were collected during the team rating review:

Security=3 control

Why is the rating for QOS rated 2? -- Peter Sanza - 05 Apr 2003

T-4.19 All items listed under 6h could also be performed under Normal operation as normal load management, I.e. "peak shaving" or temporary overloading of equipment due to other manual operations

The Purpose of *All items listed under 6h could also be performed under Normal operation as normal load management, I.e. "peak shaving" or temporary overloading of equipment due to other manual operations*
function
is to See 6c
directly involving
See 6c
performing
See 6c
with key interfaces between
See 6c
with communication configuration requirements of
See 6c
with quality of service requirements of
See 6c
with security requirements of
See 6c

with data management requirements of
See 6c
with constraints of
See 6c

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	3.0	2.0	2.0	2.4

COMMENTS:
This function has similar interfaces (and ratings) to function (T-4.15) Operators perform supervisory control of switching operations above.

T-4.20 Operators changes setup/options of EMS functions
The Purpose of *Operators changes setup/options of EMS functions* ***function is to*** see details below

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	2.0	1.0	1.0	1.0	1.0

COMMENTS:
This function has similar interfaces (and ratings) to function (T-4) Real-time normal operator actions (Using SCADA/EMS) above.

T-4.20.1 Periodicity of real-time sequence/Cold Initiation
The Purpose of *Periodicity of real-time sequence/Cold Initiation* ***function is similar to function (T-4.20) Operators changes setup/options of EMS functions above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	2.0	1.0	1.0	1.0	1.0

COMMENTS:
This function has similar interfaces (and ratings) to function (T-4.21) Operators prepare for storm conditions based on weather data and history and change recloser settings above.

T-4.20.2 Event triggers

The Purpose of *Event triggers* ***function is similar to function (T-4.20) Operators changes setup/options of EMS functions above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	2.0	1.0	1.0	1.0	1.0

COMMENTS:
This function has similar interfaces (and ratings) to function (T-4.21) Operators prepare for storm conditions based on weather data and history and change recloser settings above.

T-4.20.3 Manual initiations

The Purpose of *Manual initiations* ***function is similar to function (T-4.20) Operators changes setup/options of EMS functions above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	2.0	1.0	1.0	1.0	1.0

COMMENTS:
This function has similar interfaces (and ratings) to function (T-4.21) Operators prepare for storm conditions based on weather data and history and change recloser settings above.

T-4.20.4 Contingency list

The Purpose of *Contingency list* ***function is similar to function (T-4.20) Operators changes setup/options of EMS***

functions above.

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	2.0	1.0	1.0	1.0	1.0

COMMENTS:
This function has similar interfaces (and ratings) to function (T-4.21) Operators prepare for storm conditions based on weather data and history and change recloser settings above.

T-4.20.5 Application tuning parameters

The Purpose of *Application tuning parameters* ***function is similar to function (T-4.20) Operators changes setup/options of EMS functions above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	2.0	1.0	1.0	1.0	1.0

COMMENTS:
This function has similar interfaces (and ratings) to function (T-4.21) Operators prepare for storm conditions based on weather data and history and change recloser settings above.

T-4.20.6 Other

The Purpose of *Other* ***function is similar to function (T-4.20) Operators changes setup/options of EMS functions above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	2.0	1.0	1.0	1.0	1.0

COMMENTS:

T-4.21 Operators prepare for storm conditions based on weather data and history and change recloser settings

The Purpose of *Operators prepare for storm conditions based on weather data and history and change recloser settings* ***function***
is to make reclosers less sensitive during storm
directly involving
Operator
SCADA/EMS
Field devices
performing
Change recloser settings
with key interfaces between
SCADA/EMS and recloser
with communication configuration requirements of
WAN/LAN
Lmited access sites
with quality of service requirements of
Availability
Fast response
with security requirements of
Authentication
Confidentiality
Non-repudiation
with data management requirements of
Large numbers of devices
with constraints of
Legacy systems in place; or may not be automated at all

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	3.0	2.0	2.0	2.2

COMMENTS:
This function has similar interfaces (and ratings) to function [(T-4) Real-time normal operator actions (Using SCADA/EMS)] above.

The following comments were collected during the team rating review:

Constraints=3 legacy or no system in place

Why is the rating for Security 3? The rating for Constraints does not match the comments (=3). -- Peter Sanza - 05 Apr 2003

T-4.22 Operators prepare for storm conditions based on weather data and history and change alarm thresholds

The Purpose of *Operators prepare for storm conditions based on weather data and history and change alarm thresholds* ***function***
is to reduce amount of alarm information directed at operator during storm
directly involving
Operator
SCADA/EMS
performing
Change alarm thresholds
with communication configuration requirements of
N/a
with security requirements of
Authentication
Confidentiality
Non-repudiation

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	1.0	2.0	2.0	1.8

COMMENTS:
This function has similar interfaces (and ratings) to function [(T-4) Real-time normal operator actions (Using SCADA/EMS)] above.

The following comments were collected during the team rating review:

Security=1 changing alarm thresholds not, as critical

T-4.23 Prepare for transformer clipping (e.g. Solar wind/Solar Magnetic Disturbance raising ground DC offset)

The Purpose of *Prepare for transformer clipping (e.g. Solar wind/Solar Magnetic Disturbance raising ground DC offset)* ***function***
is to make protection equipment more sensitive to overloads
directly involving
Operator
SCADA/EMS
Field devices
performing

Change protection settings

with key interfaces between

SCADA/EMS and protection devices

with communication configuration requirements of

N/a

with quality of service requirements of

Availability

Fast response

with security requirements of

Authentication

Confidentiality

Non-repudiation

with data management requirements of

Large numbers of devices

with constraints of

May not be able to remotely adjust settings currently

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	3.0	2.0	2.0	2.2

COMMENTS:

This function has similar interfaces (and ratings) to function (T-4) Real-time normal operator actions (Using SCADA/EMS) above.

The following comments were collected during the team rating review:

Security=3 changing settings

Constraints=3 issues changing settings w/ present systems

T-5 Network Analysis (real-time)

The Purpose of *Network Analysis (real-time)* ***function is to*** see details below

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	3.0	2.0	3.0	2.2

COMMENTS:
The following comments were collected during the team rating review:

Qos=2 real time performance
Security=3 exchanging data with other utilities
Data Mgmt=2 large volumes of real time data
Constraints=3 legacy systems and future system performance requirements

---

T-5.1 EMS system performs model update, state estimation, bus load forecast

The Purpose of *EMS system performs model update, state estimation, bus load forecast* ***function***
is to

Provide operations personel with state estimation to validate the quality of the SCADA
Maintains bus load forecast via adaptive update from state estimator solution

directly involving

SCADA
Schedule information

performing

Validate the quality of SCADA telemetry and generate a base case for further network analysis

with key interfaces between

Operations personnel have direct access to the online EMS system, which contains network applications, that provide state estimation and automatically updates/maintains the historical bus load forecasts

with data management requirements of

Historicall archived state estimte solution - share estimated value with the ISO/RTO

with constraints of

Telemetry data and scheuled inforation (load foarcast
Accepted generation bids
Outag management schedules)

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	3.0	2.0	3.0	2.2

COMMENTS:
This function has similar interfaces (and ratings) to function (T-5) Network Analysis (real-time) above.

T-5.2 EMS system performs contingency analysis, recommends preventive and corrective actions

The Purpose of *EMS system performs contingency analysis, recommends preventive and corrective actions* ***function***
is to Contingency Analysis and post-contingency analysis remedial action provides the ability to correct problems caused by harmful contingencies caused by outages/inages or changes in generation
directly involving
Result from contengency analysis is analyised by post contengency optimal power flow
performing
Optimaization to mitigate harmfull contengency
with key interfaces between
Operations personnel and control center planning personnel have direct access to the online EMS system which contains network applications that provides real-time and study contingency analysis used in determining harmful
The network applications may then interface to available network optimization applications to determine corrective actions to either remedy harmful contingencies or prevent the harmful contingencies from occuring
with data management requirements of
Historicall archived recommended and actual controls-control center's operator use recommended control to optimize the network
with constraints of
Electrical limit within the network (voltage limit
Line flow limits…)

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	3.0	2.0	3.0	2.2

COMMENTS:
This function has similar interfaces (and ratings) to function (T-5) Network Analysis (real-time) above.

T-5.3 EMS system performs optimal power flow analysis, recommends optimization actions

The Purpose of *EMS system performs optimal power flow analysis, recommends optimization actions* ***function***

is to

Optimal Powerflow provides operations personel with recommended system changes to correct limit violations while optimizing the system for pre-defined objectives including minimizing fuel cost

Minimixing losses

Minimizing the number of controls moved or minimizing the movement in all available controls

directly involving

EMS database

State estimation SW

Field devices

performing

Optimize the network to eleminate electrial violation and best economics

with key interfaces between

Operations personnel and control center planning personnel have direct access to the online EMS system which contains network applications that provides real-time and study

Economic data for minimum cost optimization is obtained from the Market Agents Information System to retrieve bid prices for energy and consumption as well as which participants can participate in optimizing/controlling the system

with data management requirements of

Historicall archived recommended and actual controls-control center's operator use recommended control to optimize the network

with constraints of

Electrical limit within the network (voltage limit

Line flow limits…)

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	3.0	2.0	3.0	2.2

COMMENTS:

This function has similar interfaces (and ratings) to function (T-5) Network Analysis (real-time) above.

T-5.4 EMS system or planners perform stability study of network

The Purpose of *EMS system or planners perform stability study of network* ***function***
is to determine whether network is operating close to limits of stability
directly involving
Planners
EMS system
Field devices
performing
Gather current load conditions
Fault history
Condition monitoring information
Calculate capacity
Identify potential failure area
Rate netowrk stability
with key interfaces between
Planners
EMS
Fields devices
with communication configuration requirements of
LAN/WAN
with quality of service requirements of
Accuracy
Large volumes
with security requirements of
Integrity
with data management requirements of
Large databases
with constraints of
Heavy computing load; new process for many organizations

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	3.0	2.0	3.0	2.2

COMMENTS:
This function has similar interfaces (and ratings) to function (T-5) Network Analysis (real-time) above.

T-6 Real-time emergency operations (system protection level)

The Purpose of *Real-time emergency operations (system protection level)* ***function***

is to see details below

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	2.0	3.0	2.8

COMMENTS:
The following comments were collected during the team rating review:

Config=3 new topologies required
QoS=3 must always be available; high speed response (less than 20 ms)
Security=3 involves control
Data Mgmt=2 need to capture high speed stream of data
Constraints=3 LARGE legacy base & new SW applications - possible sw agent applications; data consistency across DB and master and remote devices

---

T-6.1 Power System Protection

The Purpose of *Power System Protection* ***function***
is to detect actual and incipient equipment fault conditions
directly involving
Generators
Transformers
Buses
Lines
Reactors
Capacitors
Motors
Etc
performing
Protection functions to correctly determining the faulted section of the power system and isolating only the faulted section
with key interfaces between
The various protective relays and the various protective relays and pilot communication equipment
with communication configuration requirements of
Auto detection of new equipment, auto-configuration of the detected equipment, and auto-verification of device virtual connections (auto-wire check). In addition, communication of performance informance with other individuals and utilities
with quality of service requirements of

Reliability and security

with security requirements of

Data integrity and confidentiality

with data management requirements of

Automatic collection and real time display of fault reports (including fault location)

Alarms (both operational and maintenance)

Oscillography

And sequence of events

And periodic collection of harmonic information

Demand data and other file information

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	2.0	3.0	2.8

COMMENTS:

This function has similar interfaces (and ratings) to function [(T-6) Real-time emergency operations (system protection level)] above.

T-6.2 Emergency Operations performs Under-frequency load/generation shedding

The Purpose of *Emergency Operations performs Under-frequency load/generation shedding* ***function***

is to is to detect under-frequency conditions on the power system and to shed load in an effort to maintain stability of the overall system

directly involving

Under-frequency detection elements

Controllable load

And knowledge of the available load to shed

performing

Dynamic calculations of precisely the amount of load, that needs to be shed and dynamically determining exactly what control elements need to bo operated to meet the desired generation - load balance

with quality of service requirements of

Of accurate measurement of frequency

Dependable determination of the load/generation available/needed to be controlled

And reliable high-speed communication of the resultant decision to multiple locations throughout the power system

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3***

(highly likely to involve architectural challenges) ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	2.0	3.0	2.8

COMMENTS:
This function has similar interfaces (and ratings) to function (T-6) Real-time emergency operations (system protection level) above.

T-6.3 Emergency Operations performs Under-voltage load shedding

The Purpose of *Emergency Operations performs Under-voltage load shedding* ***function***
is to Shed load to balance demand with available generation when voltage reaches a specified threshold
directly involving
Utility engineering staff to determine settings
Planning staff to determine location of device
performing
Shde Load
with key interfaces between
Load Shed Commands to Field Devices
with communication configuration requirements of
LAN
Point-to-Point Standard RTU/IED protocols
with quality of service requirements of
Embedded
High Availability with immediate response times to trigger detection for Underfrequency Relays, for system implementation, trigger by exception and command broadcast
with security requirements of
Standard RTU Protocol Security for System implementation
with data management requirements of
Real-Time Database Editing consistent with Master Station
with constraints of
Legacy Protocols
Communication Bandwidth
Legacy Communication Infrastructure

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	2.0	3.0	2.8

COMMENTS:
This function has similar interfaces (and ratings) to function (T-6) Real-time emergency operations (system protection level) above.

T-6.4 Emergency Operations performs Conditional localized load shedding

The Purpose of *Emergency Operations performs Conditional localized load shedding* ***function***
is to
Shed load to balance demand with available generation based on peak demand periods or other conditions to reduce demand
shedding water heaters, air conditioning units, large non-critical industrial loads, etc

directly involving
Dispatcher
Planning engineering
performing
Shed Load
with key interfaces between
Load Shed Commands to Field Devices
with communication configuration requirements of
LAN
Point-to-Point Standard RTU/IED protocols
Communication to end user (residential
Commercial
And industrial)
with quality of service requirements of
High Availability
with security requirements of
Standard RTU Protocol Security for System implementation
with data management requirements of
Real-Time Database Editing consistent with Master Station
with constraints of
Legacy Protocols
Legacy Communication Infrastructure

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	2.0	3.0	2.8

COMMENTS:

This function has similar interfaces (and ratings) to function (T-6) Real-time emergency operations (system protection level) above.

T-6.5 Recovery from voltage or frequency-based load shedding

The Purpose of *Recovery from voltage or frequency-based load shedding*
function
is to Return system to normal state after load-shedding
directly involving
Dispatcher
Planning engineering
performing
Restore system state
with key interfaces between
LTC Commands to Field Devices
with communication configuration requirements of
LAN
Point-to-Point Standard RTU/IED protocols
with quality of service requirements of
High Availability
with security requirements of
Access control
Authentication
Non-repudiation
with data management requirements of
Timely access
with constraints of
Many legacy systems

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	2.0	3.0	1.0	3.0	2.0

COMMENTS:
This function has similar interfaces (and ratings) to function (T-6) Real-time emergency operations (system protection level) above.

The following comments were collected during the team rating review:

Constraints=3 Legacy protocols

T-6.6 LTC control/blocking

The Purpose of *LTC control/blocking* ***function***
is to Control of transformers Load Tap Changers for control of demand load on a feeder
directly involving
Dispatcher
Planning engineering
performing
Control Voltage/VARs
with key interfaces between
LTC Commands to Field Devices
with communication configuration requirements of
LAN
Point-to-Point Standard RTU/IED protocols
with quality of service requirements of
High Availability
with security requirements of
Standard RTU Protocol Security for System implementation
with data management requirements of
Real-Time Database Editing consistent with Master Station
with constraints of
Legacy Protocols
Legacy Communication Infrastructure

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	2.0	3.0	2.8

COMMENTS:
This function has similar interfaces (and ratings) to function (T-6) Real-time emergency operations (system protection level) above.

T-6.7 Shunt control

The Purpose of *Shunt control* ***function***
is to Control of shunt capacitors/reactors to manage voltage and VARs
directly involving
Dispatcher
Planning engineering
performing
Control Voltage/VARs
with key interfaces between
Capacitor/Reactor Device Commands to Field Devices
with communication configuration requirements of

LAN
Point-to-Point Standard RTU/IED protocols
with quality of service requirements of
High Availability
with security requirements of
Standard RTU Protocol Security for System implementation
with data management requirements of
Real-Time Database Editing consistent with Master Station
with constraints of
Legacy Protocols
Legacy Communication Infrastructure

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	2.0	3.0	2.8

COMMENTS:
This function has similar interfaces (and ratings) to function (T-6) Real-time emergency operations (system protection level) above.

T-6.8 Series compensation control

The Purpose of *Series compensation control* ***function is to***
Activation of series compensation device to control Var and voltage flow
Typically applied to long transmission lines

directly involving
Dispatcher
Planning engineering
performing
Control Voltage/VARs
with key interfaces between
Series Compensators Commands to Field Devices
with communication configuration requirements of
LAN
Point-to-Point Standard RTU/IED protocols
with quality of service requirements of
High Availability
with security requirements of
Standard RTU Protocol Security for System implementation
with data management requirements of

Real-Time Database Editing consistent with Master Station

with constraints of

Legacy Protocols

Legacy Communication Infrastructure

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	2.0	3.0	2.8

COMMENTS:

This function has similar interfaces (and ratings) to function (T-6) Real-time emergency operations (system protection level) above.

T-6.9 System separation detection

The Purpose of *System separation detection* ***function is to*** see Power System Control

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	3.0	2.0	3.0	2.8

COMMENTS:

This function has similar interfaces (and ratings) to function (T-6) Real-time emergency operations (system protection level) above.

T-6.10 Wide area real time instability recovery

The Purpose of *Wide area real time instability recovery* ***function is to*** detect incipient power system instability conditions and implement optimal control actions to maintain system stability

directly involving

Wide area measurements of system the state

Distributed agent decision processing

And distribution of the control solution to the controlled elements in the power system

performing

Power system stability

Generation

And possibly customer loads

with key interfaces between

The substation Phasor Measurement Units (PMU)
The communication network
The decision agents
And the control agents

with communication configuration requirements of

Auto detect and auto configuration of the system devices

with quality of service requirements of

Reliable
High speed (< * 10ms) distribution of synchronized (+/- 1usec) phasor measurements to multiple locations around a power system and ensuing high-speed control decisions to multiple controlled elements around the power system (< * 10ms) ***with security requirements of*** * Information integrity and confidentiality ***with data management requirements of*** * Archiving of historic records and control actions (time tagged +/- 1ms)

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
3.0	3.0	2.0	3.0	3.0	2.8

COMMENTS:
This function has similar interfaces (and ratings) to function [(T-6) Real-time emergency operations (system protection level)] above.

The following comments were collected during the team rating review:

QoS=3 Time critical data delivery; Security=2 No false trips
Data Management=3 continuous HS data stream

T-6.11 Operators manage emergency alarms

The Purpose of *Operators manage emergency alarms* ***function is to*** Presentation of emergency alarm to responsible Operator(s) assigned to manage the specific alarms

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	2.0	2.0

COMMENTS:

This function has similar interfaces (and ratings) to function (T-4) Real-time normal operator actions (Using SCADA/EMS) above.

T-6.12 SCADA/EMS aids operators in locating fault

The Purpose of *SCADA/EMS aids operators in locating fault* ***function is to*** increase speed of restoration by estimating location of fault

directly involving

Operator
SCADA/EMS
Field devices

performing

Display distance to fault and likely direction of fault, as measured by multiple locations

with key interfaces between

SCADA/EMS and field devices; transmission and distribution networks

with communication configuration requirements of

WAN/LAN
Limited access

with quality of service requirements of

Availability
Accuracy
Fast response

with security requirements of

Authentication
Integrity

with data management requirements of

Timely access

with constraints of

Many devices do not gather or calculate this data yet

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	2.0	2.0

COMMENTS:
This function has similar interfaces (and ratings) to function (T-4) Real-time normal operator actions (Using SCADA/EMS) above.

The following comments were collected during the team rating review:

Applications and devices just being deployed now

The following comments were collected during the peer review:

Note: many devices do not support fault location

T-6.13 Operators dispatch field crews for restoration

The Purpose of *Operators dispatch field crews for restoration* ***function is to*** restore faulted line

directly involving

Operator
Field crews
Work management system

performing

Identify task to be done; location of fault

with key interfaces between

SCADA/EMS and work management system

with communication configuration requirements of

WAN/LAN
Mobile

with quality of service requirements of

Availability
Fast response

with security requirements of

Authentication
Non-repudiation
Confidentiality

with data management requirements of

Timely access; may cross organizational boundaries

with constraints of

Currently manual process in many organizations

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	2.0	2.0

COMMENTS:
This function has similar interfaces (and ratings) to function [(T-4) Real-time normal operator actions (Using SCADA/EMS)] above.

The following comments were collected during the team rating review:

Manual process now

T-6.14 SCADA system performs intelligent alarm processing

The Purpose of *SCADA system performs intelligent alarm processing*
function
is to
Evaluate related alarm(s) to determine the true alarm condition
In effect provides for an adaptive and intelligent alarm filter scheme

directly involving
SCADA/EMS
Dispatcher
Emergency crews
performing
Alarm Processing
with key interfaces between
Dispatcher
with communication configuration requirements of
WAN
LAN
with quality of service requirements of
High Availability
Fast Response
High Volume
Event Driven
with security requirements of
User Permission and System Partition (Area of Responsibility)
with data management requirements of
Historical Archiving
with constraints of
System constrained under Alarm Stress conditions

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	2.0	2.0

COMMENTS:
This function has similar interfaces (and ratings) to function (T-4) Real-time normal operator actions (Using SCADA/EMS) above.

T-6.15 Local alarm reduction within substation

The Purpose of *Local alarm reduction within substation* ***function is to***

Limit the alarms being displayed to the operator so the operator takes action on root causes only

Not symptoms

directly involving

Operator

GUI

IEDS within a substation

performing

Suppress alarms

with key interfaces between

Operator GUI; SCADA/EMS and devices within substation

with communication configuration requirements of

Possible LAN

with quality of service requirements of

High Availability

Fast Response

High Volume

Event Driven

with security requirements of

Access control

with data management requirements of

Historical archiving

with constraints of

New process in many organizations

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	2.0	2.0

COMMENTS:

This function has similar interfaces (and ratings) to function [(T-4) Real-time normal operator actions (Using SCADA/EMS)] above.

The following comments were collected during the team rating review:

Software to do this not widely deployed yet

T-6.16 Centralized alarm reduction based on events from multiple substations

The Purpose of *Centralized alarm reduction based on events from multiple substations* ***function***
is to
Limit the alarms being displayed to the operator so the operator takes action on root causes only
Not symptoms

directly involving
Operator
GUI
IEDs and data concentrators from several substations
performing
Suppress alarms
with key interfaces between
Operator GUI; SCADA/EMS and devices in multiple substations
with communication configuration requirements of
WAN
LAN
with quality of service requirements of
High Availability
Fast Response
High Volume
Event Driven
with security requirements of
Access control
with data management requirements of
Historical archiving
with constraints of
New process in many organizations

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	2.0	2.0

COMMENTS:
This function has similar interfaces (and ratings) to function (T-4) Real-time normal operator actions (Using SCADA/EMS) above.

T-6.17 SCADA system performs disturbance monitoring analysis (including fault location)

The Purpose of *SCADA system performs disturbance monitoring analysis (including fault location)* ***function***

is to Monitoring, collection and presentation of selected electrical network parameters prior to, during and following a disturbance period(s). The collected data is used for analysis purposed to determine the electrical network reaction to abnormal conditions

directly involving

SCADA/EMS
Dispatcher
Emergency crews

performing

Alarm Processing

with key interfaces between

Dispatcher

with communication configuration requirements of

WAN
LAN

with quality of service requirements of

High Availability
Fast Response
High Volume
Event Driven

with security requirements of

User Permission and System Partition (Area of Responsibility)

with data management requirements of

Historical Archiving

with constraints of

System constrained under Alarm Stress conditions

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	3.0	2.2

COMMENTS:
This function has similar interfaces (and ratings) to function (T-4) Real-time normal operator actions (Using SCADA/EMS) above.

The following comments were collected during the team rating review:

Constraints=3 does not exist in many systems

T-6.18 SCADA/EMS performs dynamic limit calculations for transformers and breakers based on real time data from equipment monitors

The Purpose of *SCADA/EMS performs dynamic limit calculations for transformers and breakers based on real time data from equipment monitors* ***function***
is to Modification of device limits based on system and environmental conditions
directly involving
SCADA/EMS Dispatcher
Planning and Engineering Staff
performing
System Parameter Processing and Presentation
with key interfaces between
Dispatcher
with communication configuration requirements of
WAN
LAN
with quality of service requirements of
High Availability
Fast Response
High Volume
Event Driven
with security requirements of
User Permission and System Partition (Area of Responsibility)
with data management requirements of
Historical Archiving
with constraints of
System constrained under Alarm Stress conditions

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	3.0	2.2

COMMENTS:
This function has similar interfaces (and ratings) to function (T-6.17) SCADA system performs disturbance monitoring analysis (including fault location) above.

The following comments were collected during the team rating review:

Constraints=3 does not exist in many systems

T-6.19 SCADA/EMS performs pre-arming of fast acting emergency automation

The Purpose of *SCADA/EMS performs pre-arming of fast acting emergency automation* ***function***
is to Provide pre-defined actions to defined contingencies based on present electrical network conditions
directly involving
SCADA/EMS
Dispatcher
Database Administrator
Planning Staff
performing
Limit Calculations
with key interfaces between
Dispatcher
EMS system
And field RTUs
with communication configuration requirements of
WAN
LAN
with quality of service requirements of
High Availability
Fast Response
High Volume
Event Driven
with security requirements of
User Permission and System Partition (Area of Responsibility)
with data management requirements of
Historical Archiving

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	3.0	2.2

COMMENTS:
This function has similar interfaces (and ratings) to function (T-6.17) SCADA system performs disturbance monitoring analysis (including fault location) above.

T-6.20 SCADA/EMS generates signals for emergency support by Distribution Utilities (according to the T&D contracts)

The Purpose of *SCADA/EMS generates signals for emergency support by Distribution Utilities (according to the T&D contracts)* ***function***

is to missing purpose
directly involving
SCADA/EMS
Engineering and Planning Staff
Customer Staff
performing
Determination of Contingency Actions and Activation of the Action for Contingencies defined
with key interfaces between
Closed Loop with SCADA/EMS
RTU
IEDs
with communication configuration requirements of
WAN
LAN
with quality of service requirements of
High Availability
Fast Response
Event Driven
with data management requirements of
Validation of and propagation of predefined actions
with constraints of
Distributed Logic
Communication Bandwidth

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	2.0	2.0

COMMENTS:
This function has similar interfaces (and ratings) to function ***(T-4) Real-time normal operator actions (Using SCADA/EMS)*** ***above.***

This function is missing a purpose statement. -- Peter Sanza - 05 Apr 2003

T-6.21 Emergency voltage and var control for providing dispatchable real and/or reactive loads

The Purpose of *Emergency voltage and var control for providing dispatchable real and/or reactive loads* ***function***
is to Control of resistive loads within the electrical network by voltage and Var adjustments without severely impacting inductive loads

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	2.0	2.0	2.0	2.2

COMMENTS:
This function has similar interfaces (and ratings) to function [(T-4) Real-time normal operator actions (Using SCADA/EMS)] above.

The following comments were collected during the team rating review:

QoS=3 Time critical data delivery

This function is missing most of its description but is similar to function 6.20 -- can they be merged? -- Peter Sanza - 05 Apr 2003

T-6.22 Emergency load re-balancing between T/D substations by feeder reconfiguration

The Purpose of** Emergency load re-balancing between T/D substations by feeder reconfiguration **function
is to Perform control of transformer taps and feeder re-sectionalization to balance three phases or transformer loads
directly involving
SCADA/EMS
Dispatchers
Planning and Engineering Staff
performing
Demand Control
with key interfaces between
EMS and Field Devices
with communication configuration requirements of
LAN
Point-to-Point Standard RTU/IED protocols
with quality of service requirements of
High Availability
with security requirements of
Standard RTU Protocol Security for System implementation
with data management requirements of
Real-Time Database Editing consistent with Master Station
with constraints of
Legacy Protocols
Legacy Communication Infrastructure

On a scale of 0** (does not involve significant architectural challenges) **to 3

(highly likely to involve architectural challenges) ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	2.0	2.0

COMMENTS:
This function has similar interfaces (and ratings) to function [(T-4) Real-time normal operator actions (Using SCADA/EMS)] above.

T-6.23 Activation of interruptible/curtailable load

The Purpose of *Activation of interruptible/curtailable load* ***function is to***

Control of non-essential loads in residential
Commercial or industry properties to minimizing demand loads during normal conditions and peak demand conditions

directly involving
SCADA/EMS
RTUs
IEDs Planning and Engineering Staff

performing
Demand Control for Selective Feeder

with key interfaces between
EMS and Field Devices

with communication configuration requirements of
LAN
Point-to-Point Standard RTU/IED protocols
RTU and IED Peer-to-Peer Communication

with quality of service requirements of
High Availability

with security requirements of
Standard RTU/IED Protocol Security for System implementation

with data management requirements of
Real-Time Database Editing consistent with Master Station
Downloading of Configuration Parameters to the Field Devices

with constraints of
Legacy Protocols
Legacy Communication Infrastructure

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average

2.0	2.0	2.0	2.0	2.0	2.0

COMMENTS:
This function has similar interfaces (and ratings) to function (T-4) Real-time normal operator actions (Using SCADA/EMS) above.

T-6.24 Activation of direct load control

The Purpose of *Activation of direct load control* ***function is to***

The facility to control residential
Commercial and industrial loads remotely

directly involving
SCADA/EMS
Engineering and Planning Staff
Customer Staff

performing
Demand Control

with key interfaces between
EMS and Field Devices

with communication configuration requirements of
LAN
Point-to-Point Standard RTU/IED protocols

with quality of service requirements of
High Availability

with security requirements of
Standard RTU/IED Protocol Security for System implementation

with data management requirements of
Real-Time Database Editing consistent with Master Station
Downloading of Configuration Parameters to the Field Devices

with constraints of
Legacy Protocols
Legacy Communication Infrastructure

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	2.0	2.0

COMMENTS:
This function has similar interfaces (and ratings) to function (T-4) Real-time normal operator actions (Using SCADA/EMS) above.

T-6.25 Activation of distributed resources

The Purpose of *Activation of distributed resources* ***function***
is to Activation of independent power producers to balance demand and available generation
directly involving
SCADA/EMS
Engineering and Planning Staff
Customer Staff
performing
Demand Control
with key interfaces between
EMS and Field Devices
with communication configuration requirements of
LAN
Point-to-Point Standard RTU/IED protocols
with quality of service requirements of
High Availability
with security requirements of
Standard RTU/IED Protocol Security for System implementation
with data management requirements of
Real-Time Database Editing consistent with Master Station
Downloading of Configuration Parameters to the Field Devices
with constraints of
Legacy Protocols
Legacy Communication Infrastructure

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	2.0	2.0

COMMENTS:
This function has similar interfaces (and ratings) to function (T-4) Real-time normal operator actions (Using SCADA/EMS) above.

T-6.26 Activation of other load management functions

The Purpose of *Activation of other load management functions* ***function***
is to Activation of a rotating blackouts to reduce demand for electrical power
directly involving
SCADA/EMS
Engineering and Planning Staff

Independent Power Producer

performing

Generation Control

with key interfaces between

EMS system and Field Devices

with communication configuration requirements of

LAN

Point-to-Point Standard RTU/IED protocols

with quality of service requirements of

High Availability

with security requirements of

Standard RTU/IED Protocol Security for System implementation

with data management requirements of

Real-Time Database Editing consistent with Master Station

Downloading of Configuration Parameters to the Field Devices

with constraints of

Legacy Protocols

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	2.0	2.0

COMMENTS:

This function has similar interfaces (and ratings) to function [(T-4) Real-time normal operator actions (Using SCADA/EMS)] above.

T-6.27 Operators performs system restorations based on system restoration plans prepared (authorized) by operation management

The Purpose of *Operators performs system restorations based on system restoration plans prepared (authorized) by operation management*

function

is to The procedure of restoring the electrical network from a complete or partial power failure without the introduction of other transient or static disturbances

directly involving

SCADA/EMS

Dispatchers

Engineering and Planning Staff

Customer Staff

performing

Demand Control

with key interfaces between

Operators
EMS system
Restoration plan
Field and generator RTUs

with communication configuration requirements of

LAN
Point-to-Point Standard RTU/IED protocols

with quality of service requirements of

High Availability

with security requirements of

Standard RTU/IED Protocol Security for System implementation

with data management requirements of

Real-Time Database Editing consistent with Master Station

with constraints of

Legacy Protocols

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	2.0	2.0	2.0	2.0	2.0

COMMENTS:
This function has similar interfaces (and ratings) to function (T-4) Real-time normal operator actions (Using SCADA/EMS) above.

T-7 Post operations

The Purpose of *Post operations* ***function is to*** see details below

directly involving

SCADA/EMS
Dispatchers
Engineering and Planning Staff
Customer Staff

performing

Electrical Network Restoration

with key interfaces between

Field devices
EMS operation logs
Archival database

with communication configuration requirements of

LAN
Point-to-Point Standard RTU/IED protocols

with quality of service requirements of

High Availability
with security requirements of
Standard RTU/IED Protocol Security for System implementation
with data management requirements of
Real-Time Database Editing consistent with Master Station
with constraints of
Legacy Protocols

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	1.0	1.0	2.0	2.0	1.2

COMMENTS:

T-7.1 All systems archive logs and reports

The Purpose of *All systems archive logs and reports* ***function is to***
Automatically collect
Collate
Archive
And distill all information relating to system disturbances and subsequent system responses (or lack thereof)

directly involving
All protective elements
SCADA RTUs
Fault recorders
Sequence of Event recorders
Fault locators
And condition monitoring equipment
performing
Forensic analysis on power system disturbances
with quality of service requirements of
That no data shall be lost and easily retrievable when desired

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	1.0	1.0	2.0	2.0	1.2

COMMENTS:

This function has similar interfaces (and ratings) to function (T-6.5) Recovery from voltage or frequency-based load shedding above.

The following comments were collected during the team rating review:

Data Mgmt=2 large quantities of data to manage
Constraints=2 new applications to intelligently interpret alarms

---

T-8 Power system equipment maintenance (mobile enabled work force)

The Purpose of *Power system equipment maintenance (mobile enabled work force)* ***function***
is to see details below

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.7	1.1	1.5	1.6	1.7	1.3

COMMENTS:
The following comments were collected during the peer review:

In general - migration to e-enabled mobile work force needs to be expanded

---

T-8.1 Substation and Line Maintenance inlcuding operation blocking

The Purpose of *Substation and Line Maintenance inlcuding operation blocking* ***function***
is to

Transmission Switching Application provides operations personnel with the ability to write and approve switching job orders ahead of time and to implement the switching jobs in real-
The Transmission Switching Application provides basic checks during switching operations to reduce or eliminate switching errors

directly involving

Control center's operators and field crews

performing

Performing actual switching operations

with key interfaces between

Operation control center's personnel
Switching plan documentation
EMS database

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	3.0	2.0	3.0	2.2

COMMENTS:
The following comments were collected during the team rating review:

Config=2 interface into overall communication system
Security=2 safety issues; wireless implementation; role based authentication; non-repudiation
Data Mgmt=2 data sync; data maintenance
Constraints=3 function does not exist in this form

The following comments were collected during the peer review:

---

safety policy needs to be integrated into the operation of this function - if not all similar functions; similar to transfer of authority function previously
Also need to address asset management and asset tracking

T-8.2 Periodic (time-based) maintenance

The Purpose of** Periodic (time-based) maintenance **function is to prevent failure of equipment while online; meet warranty requirements

directly involving
Maintenance database; field crews

performing
Maintain equipment at intervals

with key interfaces between
N/a

with communication configuration requirements of
N/a

with quality of service requirements of
N/a

with security requirements of
N/a

with data management requirements of
N/a

with constraints of
N/a

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	0.0	0.0	0.0	0.0

COMMENTS:

T-8.3 Based on age of equipment

The Purpose of** Based on age of equipment **function
is to prevent failure of equipment while online
directly involving
Maintenance database; field crews
performing
Change maintenance intervals, as equipment ages; replace when nearing end of life
with key interfaces between
N/a
with communication configuration requirements of
N/a
with quality of service requirements of
N/a
with security requirements of
N/a
with data management requirements of
N/a
with constraints of
N/a

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	0.0	0.0	0.0	0.0

COMMENTS:

T-8.4 Based on predictive models driven by real-time data

The Purpose of** Based on predictive models driven by real-time data **function
is to predict and prevent failure of equipment while online; optimize usage of equipment
directly involving

Maintenance database; field crews; SCADA/EMS and IEDs

performing

Maintain equipment when predictive models suggest need; crews examine current condition of equipment when performing maintenance

with key interfaces between

Field crews and equipment condition data in SCADA/EMS

with communication configuration requirements of

WAN/LAN
Moblie
Limited access

with quality of service requirements of

Availability
Accuracy

with security requirements of

Authentication
Integrity
Non-repudiation

with data management requirements of

Large databases
Timely access

with constraints of

Existing sensors are compute-constrained; existing software may not be prepared to take condition monitoring data, as input

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	3.0	2.0	3.0	2.2

COMMENTS:
This function has similar interfaces (and ratings) to function (T-8.1) Substation and Line Maintenance inlcuding operation blocking above.

The following comments were collected during the team rating review:

Config=2 interfaces are different, as communication between remote database and local instantaneous status

---

T-8.5 Maintenance staff maintain transmission lines

The Purpose of *Maintenance staff maintain transmission lines* ***function is to*** missing purpose

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	3.0	2.0	3.0	2.2

COMMENTS:
This function has similar interfaces (and ratings) to function (T-8.1) Substation and Line Maintenance inlcuding operation blocking above.

This function is missing its description. -- Peter Sanza - 05 Apr 2003

T-8.6 Request that operator block reclosing for maintenance purposes

The Purpose of** Request that operator block reclosing for maintenance purposes **function
***is to** prevent injury to maintenance staff*
directly involving
Operators
Field crews
performing
Enable blocking
with key interfaces between
SCADA/EMS and mobile PC
with communication configuration requirements of
Mobile
Remote sites
with quality of service requirements of
Availability
with security requirements of
Authentication
Non-repudiation
with data management requirements of
Timely access
with constraints of
Usually done by voice now; no media in place yet for data transmission

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	3.0	2.0	3.0	2.2

COMMENTS:

This function has similar interfaces (and ratings) to function (T-8.1) Substation and Line Maintenance inlcuding operation blocking above.

The following comments were collected during the team rating review:

New process

T-8.7 Maintenance staff provides information for updating relevant databases

The Purpose of *Maintenance staff provides information for updating relevant databases* ***function***
is to automatically detect changes of device configurations in the field
directly involving
New device configurations and device configuration databases
performing
Auto detection of changes and auto update of database information
with key interfaces between
Device configuration tables and database software
with communication configuration requirements of
Auto configuration of database including auto-detection of new devices and auto detection of device configuration changes
WAN/LAN
Remote sites
Mobile
with quality of service requirements of
Infrequent updates
with security requirements of
Data integrity and confidentiality
with data management requirements of
Automatic interface with the configuration database

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	3.0	2.0	3.0	2.2

COMMENTS:
This function has similar interfaces (and ratings) to function (T-8.1) Substation and Line Maintenance inlcuding operation blocking above.

T-8.8 Maintenance staff refer to substation drawings (online)

The Purpose of *Maintenance staff refer to substation drawings (online?)* ***function***

is to ensure maintenance staff have most up-to-date information before performing work
directly involving
Equipment database
Field crews
performing
Automatic download of drawings to mobile devices
with key interfaces between
Equipment database
Hand-held PCs
with communication configuration requirements of
WAN/LAN
Mobile
Remote sites
with quality of service requirements of
Availability
Accuracy
Infrequent
Large volumes
with security requirements of
Authentication
Confidentialty
Non-repudiation
with data management requirements of
Large databases
with constraints of
Infrastructure not yet in place

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	1.0	3.0	3.0	2.4

COMMENTS:
The following comments were collected during the team rating review:

QoS=3 high volume of data
Data Mgmt=3 more complicated data filesNew
Constraints=2 relatively new process
Config = 2

Why is the rating for Configuration 2? The rating for Constraints does not match the comments (=2). -- Peter Sanza - 05 Apr 2003

T-9 SCADA/EMS Maintenance

The Purpose of *SCADA/EMS Maintenance* ***function is to*** see details below

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	2.0	3.0	3.0	2.6

COMMENTS:
The following comments were collected during the team rating review:

---

config=2 networking multiple sites; working with primary/backup systems at multiple sites
QoS=3 high availability security=2 inter-site communications need to be protected Data Mgmt=3 data sync between sites Constraints=3 legacy to address; new paradigm to address; regulatory issues to address (interface between transcos and gencos)

The following comments were collected during the peer review:

New paradigm of multiple and intersite maintenance

T-9.1 SCADA/EMS personnel updates SCADA/EMS databases

The Purpose of *SCADA/EMS personnel updates SCADA/EMS databases* ***function***
is to
SCADA/EMS
Dispatchers
Engineering and Planning Staff
Database Administrator

directly involving
Database and Display Administration
performing
Database and Display Engineer
Dispatcher
with key interfaces between
LAN
WAN
WEB
with communication configuration requirements of
Maintenance of Database/Display Integrity

And High Volume and Incremental Changes
with quality of service requirements of
Permission and Authentication
with security requirements of
Large Source
And Real-Time Databases
Temporal Database
Batch and Incremental Updates
with data management requirements of
Heterogeneous Data Model

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	2.0	3.0	3.0	2.6

COMMENTS:
This function has similar interfaces (and ratings) to function (T-9) SCADA/EMS Maintenance above.

T-9.2 SCADA/EMS personnel updates EMS applications

The Purpose of *SCADA/EMS personnel updates EMS applications* ***function***
is to
SCADA/EMS
Engineering and Planning Staff
Database Administrator

directly involving
Software Development/Maintenance
performing
Application Engineer
with key interfaces between
LAN
WAN
WEB
with communication configuration requirements of
Application Upgrade
Version Control
with quality of service requirements of
Permission and Authentication
with security requirements of
Update Operational Model

with data management requirements of

New Application
Contractual Constraints

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	2.0	3.0	3.0	2.6

COMMENTS:
This function has similar interfaces (and ratings) to function (T-9) SCADA/EMS Maintenance above.

T-9.3 SCADA/EMS personnel updates operator interfaces

The Purpose of *SCADA/EMS personnel updates operator interfaces* ***function***
is to

SCADA/EMS
Dispatchers
Engineering and Planning Staff
Database Administrator

directly involving

Display Administration

performing

Database and Display Engineer
Dispatcher

with key interfaces between

LAN
WAN
WEB

with communication configuration requirements of

Maintenance of Database/Display Integrity
And High Volume and Incremental Changes

with quality of service requirements of

Permission and Authentication

with security requirements of

Display Update
And Database Update

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	2.0	3.0	3.0	2.6

COMMENTS:
This function has similar interfaces (and ratings) to function (T-9) SCADA/EMS Maintenance above.

T-9.4 SCADA/EMS personnel updates interfaces with other systems

The Purpose of *SCADA/EMS personnel updates interfaces with other systems* ***function***
is to
SCADA/EMS
Engineering and Planning Staff
Database Administrator

directly involving
Configuration personnel
Multiple EMS systems
performing
Database updating
with key interfaces between
LAN
WAN
WEB
with communication configuration requirements of
LAN/WAN between multiple sites
with quality of service requirements of
Permission and Authentication

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	2.0	3.0	3.0	2.6

COMMENTS:
This function has similar interfaces (and ratings) to function (T-9) SCADA/EMS Maintenance above.

T-9.5 SCADA/EMS personnel performs diagnostics of the SCADA/EMS systems

The Purpose of *SCADA/EMS personnel performs diagnostics of the SCADA/EMS systems* ***function***
is to
SCADA/EMS
Engineering Staff

directly involving
Test technichians
EMS software
Test interface
performing
Dispatcher
System Analysis
with key interfaces between
LAN
WAN
WEB
with communication configuration requirements of
WAN/LAN interfaces
with quality of service requirements of
Permission and Authentication

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	3.0	2.0	3.0	3.0	2.6

COMMENTS:
This function has similar interfaces (and ratings) to function (T-9) SCADA/EMS Maintenance above.

T-10 Operator and SCADA/EMS personnel training

The Purpose of *Operator and SCADA/EMS personnel training* ***function is to*** see details below

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	1.0	2.0	2.0	1.0

COMMENTS:
The following comments were collected during the team rating review:

Data Mgmt=2 need to interface with market data
Constraints=2 need to simulate entire market
Security=1 need to make sure, that the simulator is not connected live

---

The following comments were collected during the peer review:

Need to look at this function in Market Ops

T-10.1 Operators and SCADA/EMS personnel perform periodic training by using the Operator Training Simulator

The Purpose of *Operators and SCADA/EMS personnel perform periodic training by using the Operator Training Simulator* ***function is to***

The Dispatcher Training Simulator provides operations personnel with the ability to learn systems operation in an offline

The Dispatcher Training Simulator provides the ability to teach system operators how to handle off-nominal conditions without impacting actual operations

directly involving

DTS and operation's trainees

performing

Operations training

with key interfaces between

Dispatcher's user interface identical to real time EMS UI, as well, as special instructor's displays

with security requirements of

Realistic operating conditions

with data management requirements of

Capture of the real time snap shot from the EMS

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	1.0	2.0	2.0	1.0

COMMENTS:
This function has similar interfaces (and ratings) to function (T-10) Operator and SCADA/EMS personnel training above.

T-10.2 Operators and SCADA/EMS personnel participate in advanced education programs

The Purpose of *Operators and SCADA/EMS personnel participate in advanced education programs* ***function***
is to The Dispatcher Training Simulator provides the ability to have instructor/student sessions in a simulated real environment where the instructor has control of the scenarios under simulation
directly involving
DTS and operation's trainees
performing
Operations training
with key interfaces between
Dispatcher's user interface identical to real time EMS UI, as well, as special instructor's displays
with security requirements of
Realistic operating conditions
with data management requirements of
Capture of the real time snap shot from the EMS

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	1.0	2.0	2.0	1.0

COMMENTS:
This function has similar interfaces (and ratings) to function (T-10) Operator and SCADA/EMS personnel training above.

T-11 Engineering

The Purpose of *Engineering* ***function***
is to
Create the designs necessary to analyze
Build
Test
And operate the infrastructure of the power system

directly involving
Models of the existing and proposed system composition (CIM basec??)
Existing and proposed capital improvements
And drawing

Testing
Commissioning
And monitoring tools

performing

The design of the next generation power system

with key interfaces between

The existing system design
The proposed additions
And the chosen engineering tools

with security requirements of

Confidentiality and data integrity

with data management requirements of

Auto-update of the drawing database on the change of a drawing in the field

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	1.0	2.0	2.0	1.0

COMMENTS:
The following comments were collected during the team rating review:

Data Mgmt=2 shipment of drawing (configuration) to field and automatic update of drawing changes from field into original drawing
Constraints=2 new process

The following comments were collected during the peer review:

It is expected that the substation configuration will be automatically generated from the
Changes in the drawing will automatically change the configuration of the substation equipment and in the EMS databases

---

T-11.1 Protection engineers perform protection engineering

The Purpose of *Protection engineers perform protection engineering* ***function***
is similar to function ***(T-11) Engineering*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	1.0	2.0	2.0	1.0

COMMENTS:
This function has similar interfaces (and ratings) to function (T-11) Engineering above.

T-11.1.1 Duties: base case, fault studies, relay settings, protection coordination, fault analysis

The Purpose of *Duties: base case, fault studies, relay settings, protection coordination, fault analysis* ***function***
is similar to function (T-11.1) Protection engineers perform protection engineering above.

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	1.0	2.0	2.0	1.0

COMMENTS:
This function has similar interfaces (and ratings) to function (T-11) Engineering above.

T-11.1.2 Needs data: line/equipment capacity, relay specs, PT/CT ratios, fault records, SOE data, event info (relay 'targets' - which element picked up)

The Purpose of *Needs data: line/equipment capacity, relay specs, PT/CT ratios, fault records, SOE data, event info (relay 'targets' - which element picked up)* ***function***
is similar to function (T-11.1) Protection engineers perform protection engineering above.

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	1.0	2.0	2.0	1.0

COMMENTS:
This function has similar interfaces (and ratings) to function (T-11) Engineering above.

T-11.2 Substation engineers perform substation engineering

The Purpose of *Substation engineers perform substation engineering* ***function***
is similar to function ***(T-11) Engineering*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	1.0	2.0	2.0	1.0

COMMENTS:
This function has similar interfaces (and ratings) to function ***(T-11) Engineering*** ***above.***

T-11.3 Transmission engineers perform transmission line engineering

The Purpose of *Transmission engineers perform transmission line engineering* ***function***
is similar to function ***(T-11) Engineering*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	1.0	2.0	2.0	1.0

COMMENTS:
This function has similar interfaces (and ratings) to function ***(T-11) Engineering*** ***above.***

T-11.4 Engineering staff provides information for updating relevant databases - from site / online

The Purpose of *Engineering staff provides information for updating relevant databases - from site / online* ***function***
is similar to function ***(T-11) Engineering*** ***above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of	Security	Data	Constraints	Average

	Service		Management		
0.0	0.0	1.0	2.0	2.0	1.0

COMMENTS:
This function has similar interfaces (and ratings) to function (T-11) Engineering above.

T-12 Construction management

The Purpose of *Construction management* ***function is to***

Monitor assets
Construction schedule
And to perform personnel task assignment

directly involving

All previously mentioned entities

performing

Automated management of the described aspects

with key interfaces between

Engineering
Engineering drawings
And testing

with security requirements of

Data integrity

with data management requirements of

hedge against loss (
- off site archival)

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	0.0	0.0	0.0	0.0

COMMENTS:

T-12.1 Construction managers manage asset purchasing

The Purpose of *Construction managers manage asset purchasing* ***function is similar to function (T-12) Construction management above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3***

(highly likely to involve architectural challenges) ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	0.0	0.0	0.0	0.0

COMMENTS:
This function has similar interfaces (and ratings) to function (T-12) Construction management above.

T-12.2 Construction managers plan construction projects

The Purpose of *Construction managers plan construction projects* ***function is similar to function (T-12) Construction management above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	0.0	0.0	0.0	0.0

COMMENTS:
This function has similar interfaces (and ratings) to function (T-12) Construction management above.

T-12.3 Construction managers manage crew assignments

The Purpose of *Construction managers manage crew assignments* ***function is similar to function (T-12) Construction management above.***

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
0.0	0.0	0.0	0.0	0.0	0.0

COMMENTS:
This function has similar interfaces (and ratings) to function (T-12) Construction management above.

T-12.4 Construction personnel provides information for updating relevant databases - from the site / online

The Purpose of *Construction personnel provides information for updating relevant databases - from the site / online* ***function***
is to missing purpose

On a scale of 0 *(does not involve significant architectural challenges)* ***to 3*** *(highly likely to involve architectural challenges)* ***this function was rated as follows:***

Configuration	Quality of Service	Security	Data Management	Constraints	Average
1.0	1.0	1.0	1.0	1.0	1.0

COMMENTS:

This function is missing a description. -- Peter Sanza - 05 Apr 2003

T-12.5 Construction personnel refer to substation drawings (online)

The Purpose of *Construction personnel refer to substation drawings (online?)* ***function***
is to ensure construction crews have most up-to-date information before performing work
directly involving
Equipment database
Field crews
performing
Automatic download of drawings to mobile devices
with key interfaces between
Equipment database
Hand-held PCs
with communication configuration requirements of
WAN/LAN
Mobile
Remote sites
with quality of service requirements of
Availability
Accuracy
Infrequent
Large volumes
with security requirements of
Authentication
Confidentialty
Non-repudiation
with data management requirements of
Large databases
with constraints of
Infrastructure not yet in place

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average
2.0	1.0	2.0	1.0	1.0	1.4

COMMENTS:
The following comments were collected during the team rating review:

Security=2 protect integrity of drawings over wireless comms

T-13 Black Start

The Purpose of** Black Start **function
is to bring the power system back to life after a total system blackout
directly involving
EMS/SCADA Controlers
Generators
Substations RTUs
Distribution controls
performing
Either manual restoration or pre-programmed switching, that will permit the sequenced re-energization of the transmission grid
with key interfaces between
SCADA and all remote nodes
with communication configuration requirements of
One to many/ WAN
with quality of service requirements of
high availability (
- must function on loss of AC power), data integrity
with security requirements of
Information integrity and confidentiality
with data management requirements of
Accessing automatic sequencing logic
with constraints of
Interfacing with legacy systems and future agent based restoration systems

On a scale of 0** (does not involve significant architectural challenges) **to 3** (highly likely to involve architectural challenges) **this function was rated as follows:

Configuration	Quality of Service	Security	Data Management	Constraints	Average

2.0	3.0	2.0	1.0	2.0	2.0

COMMENTS:
The following comments were collected during the team rating review:

Config=2 must reach all controllable substations
QoS=3 contrl and communication system must operate w/ no AC power - high availability
Security=3 must not be able to stop messages fromf arriving
Constraints=2 legacy support

The following comments were collected during the peer review:

Appears in other domains and should be normalized

The rating for Security does not match the comment (=3). -- Peter Sanza - 05 Apr 2003

Federated Systems Management Services

1. Data Management and Technology Planning
    - A. Management of Databases, includes functions such as
    - B. Data Design and Modeling, includes functions such as
    - C. Data Recovery. Includes development and use of automated and manual techniques for
    - D. Data Integrity. Includes development and use of data management techniques for
    - E. Management of Database Operations. Includes development and use of techniques for
    - F. Data mining and retrieval. Includes development and use of techniques for
    - G. Data object modeling. Includes
    - H. New Data and DBMS Technology Planning
2. Security Planning and Management
    - A. Security Requirements Assessment Methodology, including Techniques for determining the types and levels of security required by each asset, prevention techniques, vulnerability assessment, and interdependency analysis
    - B. Security policies and techniques for determining requirements and implementing physical security countermeasures
    - C. Security policies and techniques for determining requirements and implementing cyber security countermeasures
    - D. Intrusion detection, mitigation, and recovery plan and techniques
    - E. Investigation and prosecution of a security attack
    - F. New Security Technology Planning
3. End System/Application Support and Management
    - A. End system and application requirements development. Collect and analyze computation, storage, and management requirements.
    - B. End system technology and architecture/platform planning. Specify appropriate computing, and system management technologies and architectures for applications, middleware, operating systems, and hardware. The task includes establishment and use of IT standards for:
    - C. Installation, deployment and certification of systems and applications
    - D. System Integration
    - E. Real-time system and application monitoring and management for applications, middleware, operating systems, and hardware. This includes development and use of techniques for
    - F. End System/application maintenance (planned and emergency)
    - G. Customer care, help desk and user support
    - H. Business object management. This includes management of SW constructs associated with real world objects such as a circuit breaker or a purchase order. Tasks include:
    - I. Workflow management. This includes design and development of workflow management systems as well as execution of management functions: monitoring, diagnosis and reporting.
    - J. New Communications Technology Planning

4. Network Management
    A. User/business network requirement (QoS, availability, bandwidth, response time) development.
    B. Network technology and architecture/platform planning. It includes establishment and use of new technologies for:
    C. Network design and configuration. The task is to specify the logical network design and configuration that meet the architecture specifications and forecasted network demand growth.
    D. Installation, deployment and certification of networks
    E. Real-time network monitoring and management. This includes establishment and use of IT techniques for
    F. Network element management. This includes
    G. Network engineering. This task includes
    H. Customer care and user support
    I. New Network Technology Planning
5. Telecommunications Network Infrastructure Management
    A. User/business telecommunications and data networking requirement development
    B. Telecommunications Network Infrastructure technology and architecture planning. This includes establishment and use of IT standards for
    C. Telecommunications Network infrastructure installation, deployment and certification
    D. Real-time monitoring and management techniques for
    E. Telecommunications Network Infrastructure management. This task includes:
    F. Telecommunications Network Infrastructure New Technology Planning
6. Business, Financial and User Services
    A. End-User Services -
    B. Business and Financial Services -
    C. Horizontal Services -
7. Architecture, SW, HW design, coding, testing
    A. Establishment of policies for using standard methodologies (RMODP, OMG) for architecture and system design, and development
    B. Requirements development, writing of the specification
    C. Support for development of Requests for Proposals from external vendors
    D. Support for bid evaluations of vendor proposals
    E. Project Implementation support for external system development
    F. In-house system development and modification
    G. Architecture design, SW design development, testing and integration
    H. Development and/or purchase of SW/HW platforms
    I. Determination, purchase, integration and maintenance of Operating systems, component SW, middleware, DBMS, and SW development tools
    J. Management of development teams, project implementation and coordination
    K. Interaction with consultants, vendors and service providers

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The Federated Systems Management Services Domain addresses issues that can be applied to the Power System domain activities to support their information technology

requirements. The word "techniques" implies not only automation but also methodologies and human procedures.

1. Data Management and Technology Planning

The purpose is to meet the required data quality (integrity, accuracy), flexibility, scalability and availability. This task includes management of many large databases, with data exchanges across organizational boundaries, requiring frequent and timely access and updates.

A. Management of Databases, includes functions such as

Capacity planning
Tablespace management
Permissions, access control and quotas

B. Data Design and Modeling, includes functions such as

Indexing
Development and use of object modeling techniques
Data modeling for typical data objects
Data modeling for non standard data such as geographical information system maps, images, video, and oscillographic data

C. Data Recovery. Includes development and use of automated and manual techniques for

Data replication
Management of alternate sources of data
Logging and archiving
Backup, offline storage
Disaster recovery

D. Data Integrity. Includes development and use of data management techniques for

Data synchronization across interfaced systems
Consistency checking, validation and data correction
Handling logs and auditing.
Data cleansing
Data anonymity
Data purging

E. Management of Database Operations. Includes development and use of techniques for

Data editing and updating policies and procedures
ETL Data management ETL (Extract / Translate / Load) operations.
Database population
Report generation and data collection forms
Handling data across organizational boundaries (consistency, integrity)
Data transformation
Database mediation and integration
Development of forms and schedules for providing raw data by other departments (planners, engineering, maintenance, construction, etc.)

Discovery and automated interfacing with non-utility data objects, such as the methodology proposed by ebXML
Storage, retrieval and streaming of video and audio data
Two stage commit and rollback

F. Data mining and retrieval. Includes development and use of techniques for
On Line Transaction Processing (OLTP) which involves real-time processing and retrieval of data and may extend data bases across organizational boundaries.
On Line Analytical Processing (OLAP) which involves retrieval and processing and presentation of data from different points of view.
Sorting/selecting, and retrieving large amounts of historical data
Data warehouse, data mining
Adhoc querying
Knowledge management
Document management

G. Data object modeling. Includes
Developing object models
Instantiating object models
Mapping of instantiated object models
Data self-discovery
Object browsing capabilities
Automated data discovery
Developing data exchange models
Validating object models and instantiations

This appears to be specific to applications. Are these generic "federated" objects such as those that may be used for geospatial representations? Joe
-- Joe Hughes - 24 Apr 2003

H. New Data and DBMS Technology Planning
Investigation, planning, recommendation, implementation and support of new technologies in data modeling, data storage, data retrieval, and data management. Examples include the latest OLAP systems for more efficient data retrieval and presentation, or the storage area networks (SAN) for more efficient distributed data repository and management.

---

2. Security Planning and Management

The purpose is to meet the security requirements of the user community, network, data and applications. Includes policies, techniques, and management for:

Security policies should be prepared in concert with the applications. The applications can be used to help define whats at risk: threats and vulnerabilities, then security policies can be implemented in a way that is appropriate to the application.
-- Joe Hughes - 08 Apr 2003

I suggest that we follow guidelines coming from authoritative sources such as Common Criteria and FIPs guidelines to the extent possible. We face substantial challenges when it comes to Federating security policies and this will probably have to be done by enterprise application. Developing an overall generic approach to security that can then be appropriately developed by application is suggested.
-- Joe Hughes - 24 Apr 2003

A. Security Requirements Assessment Methodology, including Techniques for determining the types and levels of security required by each asset, prevention techniques, vulnerability assessment, and interdependency analysis

Systematically identify critical assets;
For each asset, conduct assessments on attractiveness to attackers, impact of successful attack, and vulnerability to attacks;
carry out critical consequence analyses; and evaluate the public health and safety, economic, and social impacts of infrastructure disruptions
Security Policy management
Development of Security policies
Establish policy for corrective action when vulnerability is discovered.
Assess the likelihood that the vulnerability was exploited
Establish procedures for reporting / communicating vulnerability to get repaired (may involve reporting exposure to regulators).
Establish policies for granting and revoking authority - and determine the duration required to fully implement change.
Security training of employees
Security monitoring of employees
Repercussions for employees for not following security policies
Assess and monitor information exposure to ensure compliance with security policies and procedures
Periodic re-assessment of security requirements

B. Security policies and techniques for determining requirements and implementing physical security countermeasures

Security policies addressing physical security
Access control and staff identification
Locks, guards, fences, guard dogs, lights, etc.
Biometrics, smart card, RFID
Electronic keys and locking devices
Fiber optic vibration sensor, motion sensor and others
Backup and alternative paths
Backup control center
Backup systems and bunker sites
Backup data at physically different sites
Alternative communication paths
Alternative communications media
Alternative communications interfaces
Alarm system (sensors and control panels)

Video surveillance and control system
Motion detection cameras
Video cameras
Digital video recording equipment
Matrix switching and control
Remote video transmission

C. Security policies and techniques for determining requirements and implementing cyber security countermeasures

Assessment of possible countermeasures for each type and level of security vulnerability
Assessment of most cost-effective techniques across groups of assets
Handling of legacy systems and applications in implementing security
Data authentication, integrity, confidentiality
Supervisory computer security and firewalls
Key management and certification
Secure communication architectures and protocols
Secure internet (SSL, IPsec)

D. Intrusion detection, mitigation, and recovery plan and techniques

Intrusion detection methodologies
Integrate and analyze data and information from different sensors, detectors, and other sources to make rapid determinations of the magnitude of an emergency, either physical or cyber and implement contingency plan to reduce the impacts of disruptions on the grid
Spare parts database management
Development and execution of methods for Distributed Denial of Service attacks (DDOS)
Recovery plans
Security management techniques to mitigate impacts during a security attack
Detection of intrusion
Detection of attack
Methods for countering attacks in progress
Methods for ameliorating impact of breach
Security managers respond and mitigate the physical and cyber disruptions
Security management techniques after a security attack
Assessment of damage
Assessment and correction of security vulnerabilities
Determination of legal and financial processes against attackers
Security techniques to collect and distribute threat information

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E. Investigation and prosecution of a security attack

Logging, recording, and audit trails
Security issues for legal procedures

F. New Security Technology Planning

This includes investigation, planning, recommendation, implementation and support of the new security technologies such as distributed denial of service (DDOS) attacks.

3. End System/Application Support and Management

The purpose is to meet the availability, reliability, performance, scalability and economics required by the application and the end systems. Applications include domain, management, financial and business application functions such as data acquisition, control of field devices, RTP calculation, fault analysis, Load Tap Changer calculations in the IED, sensor analog-to-digital conversions, etc. An end system includes HW, Operating System, middleware, application SW, DBMS SW, libraries, components, etc. Examples of end systems are SCADA systems, EMS systems, building automation systems, Market Web servers, planning systems, substation automation systems, Intelligent Electronic Devices (IED), and sensors. Supporting infrastructure includes Middleware, Operating Systems, and Hardware

A. End system and application requirements development. Collect and analyze computation, storage, and management requirements.

B. End system technology and architecture/platform planning. Specify appropriate computing, and system management technologies and architectures for applications, middleware, operating systems, and hardware. The task includes establishment and use of IT standards for:

Inter-application interfacing and communications technologies such as message brokers and RPC oriented infrastructures.
System implementation, validation, and certification
Maintenance of systems
Monitoring systems and applications

C. Installation, deployment and certification of systems and applications

D. System Integration

Application integration (internal)
Integration with eCommerce interfaces (external)

E. Real-time system and application monitoring and management for applications, middleware, operating systems, and hardware. This includes development and use of techniques for

Monitoring the status of systems and applications,
Detection and recovery from failures and performance problems,
Disaster recovery and business continuity,
Logging and recording of status and problems.

F. End System/application maintenance (planned and emergency)

Testing and diagnosis
Technician scheduling and repair
Report generation

G. Customer care, help desk and user support

H. Business object management. This includes management of SW constructs associated with real world objects such as a circuit breaker or a purchase order. Tasks include:
Design and development of business objects and management systems
Monitoring and reporting of status of business objects.

I. Workflow management. This includes design and development of workflow management systems as well as execution of management functions: monitoring, diagnosis and reporting.

J. New Communications Technology Planning
This includes investigation, recommendation, implementation and support for the latest computing technologies such as intelligent agents, latest middleware and platforms.

4. Network Management

This is to meet the communications network accessibility, reliability, availability, resiliency, performance, manageability, and economics requirements of the domain functions. It includes management of routers, switches as well as routing and policy administration. The task includes

A. User/business network requirement (Qo S, availability, bandwidth, response time) development.

B. Network technology and architecture/platform planning. It includes establishment and use of new technologies for:
Network architecture,
Network management
Network signaling and control
Data/payload delivery mechanisms
Implementation, validation, and certification of networks

C. Network design and configuration. The task is to specify the logical network design and configuration that meet the architecture specifications and forecasted network demand growth.

D. Installation, deployment and certification of networks

E. Real-time network monitoring and management. This includes establishment and use of IT techniques for
Monitoring the status of networks
Responding to failures, performance problems, etc.
Logging and recording status and problems
Collecting and analyzing measurements for network reengineering and capacity planning

F. Network element management. This includes

Performance management
Fault management and recovery
Maintenance (planned and emergency),
Testing/diagnostic
Technician scheduling
Repair
Report generation and process management
Disaster recovery/business continuity

G. Network engineering. This task includes
Addressing and routing,
Policy management,
Configuration,
Traffic and Qo S Engineering

H. Customer care and user support

I. New Network Technology Planning
This includes investigation, recommendation, implementation and support of the latest networking technologies, such as multi-protocol label switching (MPLS) for routing, traffic engineering and Qo S, or WIFI for wireless data access, or resilient routing schemes.

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5. Telecommunications Network Infrastructure Management

This task is to meet the requirements for the telecommunications network infrastructure including configuration, accessibility, reliability, availability, resiliency, performance, manageability, and economics required by the domain functions. Examples: management of the leased lines, fiber optic systems, microwave, use of cellular and wireless service providers, Internet and internet service provider, telecommunication service provider, data service provider, etc.

Please refresh.
-- Project.Guest - 10 May 2004

A. User/business telecommunications and data networking requirement development
Service Level Agreements development
Oversight of externally provided telecommunications and networking facilities

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B. Telecommunications Network Infrastructure technology and architecture planning. This includes establishment and use of IT standards for
Communications technologies: SONET, Fiber, microwave, fixed and mobile wireless, Qo S and resilient technologies,
Management technologies.

C. Telecommunications Network infrastructure installation, deployment and certification

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D. Real-time monitoring and management techniques for
Monitoring the status of the telecommunications network infrastructure
Providing resiliency and recovering from failures, performance problems, etc.

E. Telecommunications Network Infrastructure management. This task includes:
Monitoring and measurement for capacity planning
Performance management
Fault management and recovery
Inventory/Asset and order management
Maintenance (planned and emergency)
Testing/diagnostic
Technician scheduling
Repair
Report generation and process management
Disaster recovery/business continuity

F. Telecommunications Network Infrastructure New Technology Planning
This is to investigate, recommend, implement and support latest communications technologies such as dense wavelength division multiplexing (DWDM), or use of more resilient protocols/equipment.

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6. Business, Financial and User Services

These services are independent of domain activities and are provided to people and business functions. They impact network management, security management and data management functions.

A. End-User Services -
Account management : computer and network account, password,
Employee services: home office, remote access,...
Billing for computing use
Trouble shooting : IT helpdesk,
Management of interactive people-people communications: voice, multimedia (MM), video/audio conferencing, traditional and future telecomm services.
Web applications, employee portals
Tools/system maintenance and upgrades (for the operating system, common software: word processing), license management
Email management
Messaging Services (SMS, real-time messaging, audio/text messaging)
Call Center management and support
Planning, implementation and support for new technology, such as new web services, or voice over IP (Vo IP).

B. Business and Financial Services -

Financial analysis and trading
Forecasting
E-business, development and management of portals (b-to-e and e-to-e)
E-commerce
HR services (payroll and personnel)
Special interfaces for Fire/Police/FEMA (automated and manual, systems and procedures)
Backup control center architecture support
IT Asset Management
Customer billing
Non-Repudiation Services
Determine policies and procedures for verification of obligations (Independent third parties may be involved as a escrow service) - e.g. assured time stamps.
Determine exposure and assess ability to verify commitments.

C. Horizontal Services -
Time service
Directory service,
Life cycle service,
Clustering service,
Federation service,
Storage service,
Trading service

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7. Architecture, SW, HW design, coding, testing

Need to manage project teams, coordinate requirements development, assist in management of system specification, request for proposals from external vendors, bid evaluation, internal system development and/or oversight of external system development, develop/enhance systems, communications platforms, services, management systems, etc. It includes:

A. Establishment of policies for using standard methodologies (RMODP, OMG) for architecture and system design, and development

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B. Requirements development, writing of the specification

C. Support for development of Requests for Proposals from external vendors

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D. Support for bid evaluations of vendor proposals

E. Project Implementation support for external system development

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F. In-house system development and modification

G. Architecture design, SW design development, testing and integration

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H. Development and/or purchase of SW/HW platforms

I. Determination, purchase, integration and maintenance of Operating systems, component SW, middleware, DBMS, and SW development tools

J. Management of development teams, project implementation and coordination

K. Interaction with consultants, vendors and service providers

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