
Power System Function Summary Report

Consumer

1 Automatic meter reading (AMR)

a. Meter Data Management Agent (MDMA) reads meters with handheld/mobile technologies

Purpose	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 process. 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.
Actors	MDMAs (DisCos, Energy Services Provider-ESPs, GenCos, Scheduling Coordinators, etc), Customers, Meters.
Function	retrieve meter data traveling around meters locations
Interfaces	MDMAs and meters MDMAs and Settlement System
Configuration	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.
Quality	Medium availability (can be read later), data accuracy high (billing purposes), data frequency is low.
Security	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.
Rating	1.4

Consumer

1 Automatic meter reading (AMR)

b. MDMA reads industrial and/or commercial meters with fixed AMR technology

<i>Purpose</i>	permit company to improve the billing process, make it more cost effective, more comfortable to the clients, reduce probability of error in the reading process. To reduce utility company operating costs. It also permits to stream line the settlement system, making it faster and more transparent.
<i>Actors</i>	MDMAs (DisCos, Energy Services Provider-ESPs, GenCos, Scheduling Coordinators, etc), Customers, Meters.
<i>Function</i>	retrieve meter data
<i>Interfaces</i>	MDMAs and meters MDMAs and Settlement System
<i>Configuration</i>	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.
<i>Quality</i>	Medium availability, data accuracy high (billing purposes), data frequency is low.
<i>Security</i>	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.
<i>Rating</i>	2.6

Consumer

1 Automatic meter reading (AMR)

c. MDMA reads residential meters with fixed AMR technology

<i>Purpose</i>	permit company to improve the billing process, make it more cost effective, more comfortable to the clients, reduce probability of error in the reading process. To reduce utility company operating costs. It also permits to stream line the settlement system, making it faster and more transparent.
<i>Actors</i>	MDMAs (DisCos, Energy Services Provider-ESPs, GenCos, Scheduling Coordinators, etc), Customers, Meters,
<i>Function</i>	retrieve meter data
<i>Interfaces</i>	MDMAs and meters MDMAs and Settlement System
<i>Configuration</i>	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.
<i>Quality</i>	Medium availability, data accuracy high (billing purposes), data frequency is low.
<i>Security</i>	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.
<i>Rating</i>	2.4

Consumer

1 Automatic meter reading (AMR)

d. MDMA provides individual and aggregated meter readings to market settlements, DisCos, and/or TransCos

Purpose	permit to stream line the settlement system, making it faster and more transparent. It permit customers to know accurately their load profile, helping then to select the most suited tariff scheme. It permit DisCos and TransCos to perform energy and power balances to use for billing purposes, planning purposes. To reduce risk when signing settlements to both parties (now the load profile is more certain)
Actors	MDMAs (DisCos, Energy Services Provider-ESPs, GenCos, Scheduling Coordinators (if they exist), etc), Customers, Meters. ISO/RTOs, TransCos, Settlement System, Historical Records, , Meters, Billing System, Accounting System, ESP-SCADA/EMS
Function	provide final energy data and reporting to support billing and settlement processes
Interfaces	MDMAs and Settlement System ESP SCADA/EMS and Settlement System ESP SCADA/EMS and Historical Records
Configuration	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.
Quality	Medium availability, data accuracy high (billing purposes), data frequency is low. High volume of data between MDMA and settlement system
Security	Confidentiality (normal) and high security level to allow proper settlement and market processes.
Rating	1.4

Consumer

1 Automatic meter reading (AMR)

e. MDMA or DisCo provides individual energy usage and billing to customers

Purpose	permit to make more transparent the billing process. It permit customers to know accurately their load profile, helping then to select the most suited tariff scheme. In market where small customer chose Energy provider it helps to reduce risk when signing settlements (now the load profile is more certain)
Actors	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
Function	provide final energy data and reporting to support billing processes
Interfaces	MDMAs and Settlement System ESP SCADA/EMS and Settlement System ESP SCADA/EMS and Historical Records
Configuration	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.
Quality	Medium availability, data accuracy high (billing purposes), data frequency is low.
Security	Confidentiality (normal) and high security level to allow proper billing process.
Rating	1.4

Consumer

1 Automatic meter reading (AMR)

f. Prepay metering

<i>Purpose</i>	allow clients a better control of their energy costs, eliminate the reading process and its costs, and reduce working capital of the energy provider
<i>Actors</i>	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
<i>Function</i>	meters provide energy already paid (through cards for example), MDMA compute energy usage. * Here I assuming a prepaid scheme that require connection with MDMA or ESP.
<i>Interfaces</i>	ESP SCADA/EMS and Settlement System
<i>Configuration</i>	One to one between ESP SCADA/EMS and Settlement System over WAN
<i>Quality</i>	Medium availability, data accuracy high, low data frequency.
<i>Security</i>	High security level and confidentiality to keep private individual energy consumption and also to avoid tampering u other source of error.
<i>Rating</i>	1.4

Consumer

1 Automatic meter reading (AMR)

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

<i>Purpose</i>	use the economies and cost reductions that bring the common (or shared) use of one metering system with other services (water, gas., telephone, etc) .
<i>Actors</i>	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 Providers. In a aggregate way it involves also ISO/RTOs, TransCos, Settlement System, Historical Records, ESP-SCADA/EMS
<i>Function</i>	retrieve meter data from different services (electricity, gas, etc)
<i>Interfaces</i>	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
<i>Configuration</i>	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.
<i>Quality</i>	Medium availability, data accuracy high, data frequency is low because it is not frequently read
<i>Security</i>	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.
<i>Rating</i>	2.6

Consumer

1 Automatic meter reading (AMR)

h. Sub-metering -- customer bill disaggregation and rental space allocations

Purpose provide customers options of disaggregation of their bills allowing them to distribute the energy cost properly among their users

Actors MDMA's, Customers, Meters, Billing System.

Function provide final energy data and reporting to support disaggregated billing process

Interfaces MDMA's and meters ESP-Billing system

Configuration One* to many between MDMA's and meters over WAN One to one between ESP and Billing system *One in case on one MDMA, many in case of many MDMA's.

Quality Medium availability, data accuracy medium, low data frequency.

Security High security level and confidentiality.

Rating 1.4

Consumer

1 Automatic meter reading (AMR)

i. Non-intrusive load monitoring -- deducing load contributions by monitoring aggregate consumption changes

Purpose 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

Actors MDMA's, Customers, Meters, Load Monitoring Software and Equipment.

Function monitor load, diagnostic faults and estimate unknown loads

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

Configuration 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 MDMA's.

Quality High availability, data accuracy medium, high data frequency.

Security Medium security level and confidentiality.

Rating 1.2

Consumer

1 Automatic meter reading (AMR)

j. Outage detection

<i>Purpose</i>	Narrow down location of broken/misoperating power system infrastructure
<i>Actors</i>	MDMAs, Customers, Meters, Historical Records, ESP-SCADA/EMS,
<i>Function</i>	identify meters without power or non-responsive to infer affected equipment location
<i>Interfaces</i>	ESP SCADA/EMS and Settlement System ESP SCADA/EMS and Historical Records
<i>Configuration</i>	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.
<i>Quality</i>	High availability, data accuracy medium, high data frequency.
<i>Security</i>	Medium security level
<i>Rating</i>	1.4

Consumer

2 Customer Management

a. ESP interfaces with customers to provide tamper detection, load profiles, etc. services to DisCos

<i>Purpose</i>	Provide ESP/DisCo with necessary tamper protection, load profile, and other basic customer management services
<i>Actors</i>	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
<i>Function</i>	basic management of customer meter, connection point
<i>Interfaces</i>	MDMAs and meters MDMAs and Settlement System
<i>Configuration</i>	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.
<i>Quality</i>	Medium availability, data accuracy high, data frequency is low because it is not frequently read
<i>Security</i>	High security level and confidentiality to keep private individual energy consumption and also to avoid tampering u other source of error.
<i>Rating</i>	1.6

Consumer

2 Customer Management

b. ESP provides connect, disconnect, energy usage and billing information, etc. to customers

<i>Purpose</i>	Provide ESP/DisCo with necessary tamper protection, load profile, and other basic customer management services
<i>Actors</i>	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
<i>Function</i>	basic management of customer meter, connection point
<i>Interfaces</i>	MDMAs and meters MDMAs and Settlement System
<i>Configuration</i>	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.
<i>Quality</i>	Medium availability, data accuracy high, data frequency is low because it is not frequently read
<i>Security</i>	High security level and confidentiality to keep private individual energy consumption and also to avoid tampering u other source of error. Higher security due to connect/disconnect capability - life safety issue.
<i>Rating</i>	1.8

Consumer

2 Customer Management

c. ESP provides DisCo with information for updating relevant databases

Purpose	permit to stream line the settlement system, making it faster and more transparent. It permit customers to know accurately their load profile, helping then to select the most suited tariff scheme. It permit DisCos and TransCos to perform energy and power balances to use for billing purposes, planning purposes. To reduce risk when signing settlements to both parties (now the load profile is more certain)
Actors	MDMAs (DisCos, Energy Services Provider-ESPs, GenCos, Scheduling Coordinators (if they exist), etc), Customers, Meters. ISO/RTOs, TransCos, Settlement System, Historical Records, , Meters, Billing System, Accounting System, ESP-SCADA/EMS
Function	provide final energy data and reporting to support billing and settlement processes
Interfaces	MDMAs and Settlement System ESP SCADA/EMS and Settlement System ESP SCADA/EMS and Historical Records
Configuration	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.
Quality	Medium availability, data accuracy high (billing purposes), data frequency is low. High volume of data between MDMA and settlement system
Security	Confidentiality (normal) and high security level to allow proper settlement and market processes.
Rating	1.4

Consumer

3 Customer trouble call management

a. General

Purpose	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).
Actors	Energy Services Providers ESPs, Customers, Distribution Operations and Distributed Resources, Historical Records
Function	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
Interfaces	Customer and ESPs / DisCos ESPs / DisCos and Quality of Service Management Program
Configuration	One* to many between ESPs/DisCos and Customers over Phone, Internet u other media. One to one between ESPs/DisCos and Quality of Service Management Program. *One in case on one ESPs/DisCos.
Quality	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.
Security	Medium security requirement
Rating	1

Consumer

3 Customer trouble call management

b. Customer reports trouble and trouble ticket is generated (see Call Center Management and Support under Information Management Domain)

Purpose	permit to inform the company about a trouble with a customer in order to start working on solve that.
Actors	Energy Services Providers ESPs, Customers, Distribution Operations, Historical Records
Function	Customers notify ESPs / DisCos, ESPs / DisCos generate trouble ticket
Interfaces	Customer and ESPs / DisCos ESPs / DisCos and Quality of Service Management Program
Configuration	One* to many between ESPs/DisCos and Customers over Phone, Internet u other media. One to one between ESPs/DisCos and Quality of Service Management Program. *One in case on one ESPs/DisCos.
Quality	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.
Security	Medium security requirement
Rating	0

Consumer

3 Customer trouble call management

c. Trouble ticket is used by outage management function (see Distribution Operations)

<i>Purpose</i>	obtain all the data about the fault to solve it as fast as possible.
<i>Actors</i>	ESPs, Customers, Distribution Operations, Historical Records
<i>Function</i>	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
<i>Interfaces</i>	ESPs / DisCos and Quality of Service Management Program
<i>Configuration</i>	One* to many between ESPs/DisCos and Customers over Phone, Internet u other media. *One in case on one ESPs/DisCos. One to many between ESPs/DisCos and crew
<i>Quality</i>	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.
<i>Security</i>	High security requirement to keep a clean Quality of service management program
<i>Rating</i>	0

Consumer

3 Customer trouble call management

d. Trouble ticket is used for statistical analysis (see Distribution Operations)

<i>Purpose</i>	keep updated the outage statistics to compute quality indexes, pay fines or compensate (if the regulatory scheme consider that)., plan network improvements
<i>Actors</i>	ESPs, Customers, Distribution Operations, Historical Records
<i>Function</i>	ESPs / DisCos update statistics
<i>Interfaces</i>	ESPs / DisCos and Quality of Service Management Program ESPs / DisCos and Historical Records
<i>Configuration</i>	One to one between ESPs/DisCos and Quality of Service Management Program One to one between ESPs/DisCos and Historical Records
<i>Quality</i>	High availability to keep an accurate record of outages, failures, etc.
<i>Security</i>	High security requirement to keep an accurate record of outages, failures, etc.
<i>Rating</i>	0

Consumer

4 Real-time Pricing (RTP)

a. ESP issues updated RTP schedules for subscribing customers

Purpose	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 signal. This service shall not be limited to energy services. 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.
Actors	Market Operations, Energy Services Providers, Customers, Distribution Operations, Transmission Operations, and Distributed Resources.
Function	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-time. This includes scheduling and metering not only energy but of ancillary services as well.
Interfaces	ESPs and Market Operations (DisCo, RTO, TransCo) ESPs and Customer Building Automation systems
Configuration	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.
Quality	High availability of RTP data, Timeliness of RTP data,
Security	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 system. See Energy Scheduling and DR Management for additional requirements.
Rating	2

Consumer

4 Real-time Pricing (RTP)

b. Customer EMS manages energy usage based on RTP

Purpose Manage energy usage based on pricing signals

Actors ESP RTP calculation engine/database, customer user interface, customer EMS

Function load control, process, and staff scheduling

Interfaces Customer Building Automation systems to End Devices

Configuration Multicast of load and generation control commands within buildings, campuses, and wider areas

Quality High availability of control commands and monitored information

Security High security due to control of end devices

Rating 2.8

Consumer

5 Load management

a. General

<i>Purpose</i>	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.
<i>Actors</i>	Energy Services Providers, Customers, Distribution Operations and Distributed Resources
<i>Function</i>	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.
<i>Interfaces</i>	Energy Services Providers / DisCos to Customer Controllable Load/Equipment Energy Services Providers to Distribution Operation (crew)
<i>Configuration</i>	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)
<i>Quality</i>	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.
<i>Security</i>	High security requirements to avoid undesirable disconnections in customers loads
<i>Rating</i>	0

Consumer

5 Load management

b. ESP applies direct load control measures - residential

<i>Purpose</i>	Allow company to reduce load and in that way the installed capacity required making the system safer under contingencies
<i>Actors</i>	Energy Services Providers, Customers, Customer Controllable Load/Equipment, Distribution Operations and Distributed Resources
<i>Function</i>	managing controllable loads (Ex: radio controlled A/C system, heaters, etc) and applying curtailment/interruptions/load shedding schemes
<i>Interfaces</i>	Energy Services Providers / DisCos to Customer Controllable Load/Equipment Energy Services Providers to Distribution Operation (crew)
<i>Configuration</i>	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)
<i>Quality</i>	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.
<i>Security</i>	High security requirements to avoid undesirable disconnections in customers loads
<i>Rating</i>	2.2

Consumer

5 Load management

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

Purpose permit devices to request limited amount of power for emergency/housekeeping functionality without fee or billing agreement in place

Actors ESP, customers, individual load equipment

Function load control based on equipment type, load requirements, customer class and location

Interfaces ESP, customer databases, billing systems, payment history, individual load equipment

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

Quality

Security High security requirements to avoid undesirable disconnections in customers loads

Rating 2

Consumer

6 Building/Home Energy Management Services

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

Purpose see item 14

Actors

Function

Interfaces

Configuration

Quality

Security

Rating 0

Consumer

6 Building/Home Energy Management Services

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

<i>Purpose</i>	provide energy management expertise and supervision to customer purchased energy management equipment
<i>Actors</i>	Service provider, contractor, customer, customer facility, tenant
<i>Function</i>	load survey, analysis, equipment advice and planning, installation contracting assistance, monitoring of alarms, dispatching, customer gui gateway
<i>Interfaces</i>	Service provider, contractor, customer, customer facility, tenant
<i>Configuration</i>	: 1. Sensor configuration information 2. Setpoints for alarms / alerts 3. Subsystem control algorithm selection
<i>Quality</i>	limits of communications to user interface and supervisory control and monitoring (not direct control), medium-high availability, multiparty simultaneous access
<i>Security</i>	privacy, confidentiality, authentication
<i>Rating</i>	1.4

Consumer

6 Building/Home Energy Management Services

c. Customer status/control of building environment locally and/or remotely by modifying parameters

<i>Purpose</i>	provide secure access to customer site through managed network
<i>Actors</i>	Service provider, customer, service providers gateway, installation/service personnel
<i>Function</i>	gateway services between data access protocols and "web browser", management of security relationship with customer site
<i>Interfaces</i>	Service provider, customer, service providers gateway
<i>Configuration</i>	: 1. Customer premise layout and sensor network 2. Supervisory control over ems and security system 3. Reporting options
<i>Quality</i>	reliable delivery of messages, propagation delays of acceptable remote user interface (less than 1 sec?)
<i>Security</i>	privacy, confidentiality, authentication of user, security management protocols, non-repudiation of customer initiated actions
<i>Rating</i>	1.6

Consumer

6 Building/Home Energy Management Services

d. Customer EMS bids into power market for dynamic load profile

<i>Purpose</i>	provide dynamic optimization of customer energy cost through interaction with power markets
<i>Actors</i>	Service provider, customer, customer facility management system, power market, customer meter
<i>Function</i>	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
<i>Interfaces</i>	Service provider, customer, customer facility management system, power exchange, customer meter
<i>Configuration</i>	: 1. Bid pool mutual agreements 2. Contract with market participants 3. Association with revenue meter
<i>Quality</i>	reliable delivery of messages, can tolerate relatively large propagation delays (minutes..hours?)
<i>Security</i>	privacy, confidentiality, authentication of user, participation in external security regime, non-repudiation of customer initiated actions
<i>Rating</i>	2.2

Consumer

6 Building/Home Energy Management Services

e. Customer EMS tracks billing

<i>Purpose</i>	provide dynamic access to premise revenue meter to guide facility management
<i>Actors</i>	Service provider, customer, customer facility management system, power market, customer meter
<i>Function</i>	retrieval of current consumption, bill to date, pricing forecasts, historic performance data, power quality events
<i>Interfaces</i>	Service provider, customer, customer facility management system, power market, customer meter
<i>Configuration</i>	: 1. Meter access information 2. Customer identification information 3. Access rights / limitations for customer access
<i>Quality</i>	reliable delivery of messages
<i>Security</i>	privacy, confidentiality, authentication of user, security management protocols, role based access control to isolate user permissions to view/read / change information
<i>Rating</i>	1.6

Consumer

6 Building/Home Energy Management Services

f. Offsite premise management

Purpose	provide remote access and monitoring to remote sites
Actors	Service provider, customer, service providers gateway, customer security system police, fire, emergency personnel, installation/service
Function	data verification and validation, gateway services between data access protocols and notification recipients, management of security relationship with customer site
Interfaces	Service provider, customer, service providers gateway, customer security system police, fire, emergency personnel, installation/service
Configuration	: 1. Customer premise layout and sensor network 2. Reporting options 3. Sensor confirmation tree
Quality	reliable delivery of messages, propagation delays of acceptable notification delay (~20 sec?), relatively infrequent access (ie mostly idle)
Security	privacy, confidentiality, authentication of user, security management protocols
Rating	1.6

Consumer

6 Building/Home Energy Management Services

g. Building VAR Control

<i>Purpose</i>	dynamically adjust the power factor of the load in a building
<i>Actors</i>	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
<i>Function</i>	on/off control or linear control of power factor compensation in a facility
<i>Interfaces</i>	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
<i>Configuration</i>	one to one and many to many
<i>Quality</i>	relatively high-speed data communications (sub-second) and high accuracy
<i>Security</i>	authentication and access control for interface between various energy control systems
<i>Rating</i>	1.4

Consumer

7 Weather

a. General

<i>Purpose</i>	provide access to real-time and historical weather data
<i>Actors</i>	national weather service, third party providers, automated weather stations, customer equipment, automated warning systems
<i>Function</i>	on-line analysis, event correlation, storm track prediction, impact prediction
<i>Interfaces</i>	customer service, crew dispatch, operations
<i>Configuration</i>	sensor connectivity over disparate networks, internet, serial interface, satellite, publish/subscribe model, event triggers, warning levels
<i>Quality</i>	reliable delivery of messages, real time data, propagation delays of seconds OK
<i>Security</i>	Data from third parties subject to licensing restrictions so data must be secured to prevent unauthorized use, anti-spoofing
<i>Rating</i>	0

Consumer

7 Weather

b. Lightning and severe weather alert notification

<i>Purpose</i>	provide access to real-time and historical weather data
<i>Actors</i>	national weather service, third party providers, automated weather stations, customer equipment, automated warning systems
<i>Function</i>	on-line analysis, event correlation, storm track prediction, impact prediction
<i>Interfaces</i>	customer service, crew dispatch, operations
<i>Configuration</i>	sensor connectivity over disparate networks, internet, serial interface, satellite, publish/subscribe model, event triggers, warning levels
<i>Quality</i>	reliable delivery of messages, real time data, propagation delays of seconds OK
<i>Security</i>	Data from third parties subject to licensing restrictions so data must be secured to prevent unauthorized use, anti-spoofing
<i>Rating</i>	1.2

Consumer

7 Weather

c. Weather to consumer

<i>Purpose</i>	provide access to real-time and historical weather data
<i>Actors</i>	national weather service, third party providers, automated weather stations, customer equipment, automated warning systems
<i>Function</i>	on-line analysis, event correlation, storm track prediction, impact prediction
<i>Interfaces</i>	customer service, crew dispatch, operations
<i>Configuration</i>	sensor connectivity over disparate networks, internet, serial interface, satellite, publish/subscribe model, event triggers, warning levels
<i>Quality</i>	reliable delivery of messages, real time data, propagation delays of seconds OK
<i>Security</i>	Data from third parties subject to licensing restrictions so data must be secured to prevent unauthorized use, anti-spoofing
<i>Rating</i>	0.6

Consumer

7 Weather

d. Weather from consumer

<i>Purpose</i>	gather weather information from customer owned sensors
<i>Actors</i>	national weather service, third party providers, automated weather stations, customer equipment, automated warning systems
<i>Function</i>	on-line analysis, event correlation, storm track prediction, impact prediction
<i>Interfaces</i>	customer service, crew dispatch, operations
<i>Configuration</i>	sensor connectivity over disparate networks, internet, serial interface, satellite, publish/subscribe model, event triggers, warning levels
<i>Quality</i>	reliable delivery of messages, real time data, propogation delays of seconds OK
<i>Security</i>	Data from third parties subject to licensing restrictions so data must be secured to prevent unauthorized use, anti-spoofing
<i>Rating</i>	1.2

Consumer

8 Third party services

a. Contractor use of utility gateway and communications

<i>Purpose</i>	provide managed access to customer premise network for third party contracting organizations
<i>Actors</i>	Service provider, contractor, customer, customer facility, tenant
<i>Function</i>	gateway between gui applications at contractor site and customer sited equipment, persistent logging and retrieval of notification events
<i>Interfaces</i>	Service provider, contractor, customer, customer facility, tenant
<i>Configuration</i>	: 1. Sensor configuration information 2. Setpoints for alarms / alerts 3. Subsystem content models
<i>Quality</i>	reliable delivery of messages, propagation delays of acceptable remote user interface (less than 1 sec?)
<i>Security</i>	privacy, confidentiality, authentication of user, security management protocols, role based access control to isolate independent contractors from each others authorized accesses
<i>Rating</i>	1.6

Consumer

9 Power Quality

a. Notify customer of current PQ information

<i>Purpose</i>	notify customer of supply system power quality conditions in real time and provide information for coordination with facility equipment
<i>Actors</i>	distribution operations, customers, marketing
<i>Function</i>	power quality performance monitoring and reporting in real time
<i>Interfaces</i>	distribution operations and customer facility managers; distribution power quality reporting system and customer system equipment
<i>Configuration</i>	distribution system power quality monitoring system and interfaces to customer systems
<i>Quality</i>	accurate, fast reporting of power quality conditions cor coordination with customer systems
<i>Security</i>	confidentiality, authentication of user, security management protocols
<i>Rating</i>	2

Consumer

9 Power Quality

b. Implement power quality contracts

<i>Purpose</i>	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 constraints provide reporting, evaluation, and billing functions for power quality and custom power contracts
<i>Actors</i>	marketing, customers
<i>Function</i>	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
<i>Interfaces</i>	marketing and customers
<i>Configuration</i>	report formats for PQ contracts
<i>Quality</i>	accurate reports based on contract conditions
<i>Security</i>	confidentiality, authentication of user, security management protocols
<i>Rating</i>	1.8

Consumer

9 Power Quality

c. Coordinate with power conditioning equipment and process equipment to improve performance

Purpose coordinate the operation of power conditioning equipment and critical loads with actual system power quality conditions

Actors distribution operations, customers, marketing

Function direct coordination with customer equipment to facilitate optimum response to actual power quality conditions

Interfaces system pq reporting system, customer power conditioning and critical equipment

Configuration control functions available in customer equipment in response to power quality conditions

Quality reliable communication between the distribution pq system and actual customer equipment controls

Security security management protocols

Rating 1.8

Consumer

9 Power Quality

d. Improve power quality through data acquisition and supervisory control

<i>Purpose</i>	coordinate with customer systems to improve power quality being supplied in real time (e.g. capacitor switching to reduce harmonics, system reconfiguration to improve voltage control, etc.)
<i>Actors</i>	distribution operations, industrial control and automation systems, capacitor bank controllers, tap changer controllers
<i>Function</i>	system control functions to improve power quality
<i>Interfaces</i>	power quality reporting system and distribution automation system
<i>Configuration</i>	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
<i>Quality</i>	reliable reporting of PQ conditions, equipment configuration status, and interface to DA system for implementation of PQ improvement actions
<i>Security</i>	confidentiality, authentication of user, security management protocols
<i>Rating</i>	1.8

Consumer

9 Power Quality

e. Prioritize system improvements based on reliability and PQ levels being supplied to customers

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

Actors distribution planning

Function prioritizing of system improvements

Interfaces power quality reporting system and distribution system design options

Configuration report specification and delivery

Quality reliable availability of reports (web-based) per specifications

Security confidentiality, authentication of user, security management protocols

Rating 1.6

Consumer

10 Electric Vehicle / home co-gen

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

Purpose 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

Actors Service provider, ev, eStation, customer

Function 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

Interfaces Service provider, ev, eStation, customer

Configuration : 1. Customer account 2. eStation account 3. Customer authentication means

Quality reliable delivery of messages, propagation delays of several seconds is tolerable

Security privacy, confidentiality, authentication of user, security management protocols, non-repudiation of customer initiated actions

Rating 1.6

Consumer

10 Electric Vehicle / home co-gen

b. EV as generator: permit EV generator to emit power into power grid

Purpose support the occasional use of an EV as an emergency generator or power producer. Fuel cells could be a source of energy here. It also could help to reduce peak power (and in this way reduce the energy/power bills).

Actors Service provider, ev, eStation, customer

Function 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

Interfaces Service provider, ev, eStation, customer

Configuration : 1. Customer account 2. eStation account 3. Customer authentication means

Quality reliable delivery of messages, propagation delays of several seconds is tolerable

Security privacy, confidentiality, authentication of user, security management protocols, non-repudiation of customer initiated actions

Rating 1.6

Consumer

11 Energy efficiency monitoring

a. Appliance performance monitoring

<i>Purpose</i>	provide advanced analysis to customer sited sensor data to achieve proactive maintenance and performance analysis
<i>Actors</i>	Service provider, customer, customer facility, tenant
<i>Function</i>	data acquisition, appliance signature analysis (non-intrusive appliance load monitoring) simulated operation modeling, predictive maintenance algorithmic analysis, historical trend logging and event recording
<i>Interfaces</i>	Service provider, customer, customer facility, tenant
<i>Configuration</i>	: 1. Sensor configuration information 2. Setpoints for alarms / alerts 3. Algorithm selection
<i>Quality</i>	reliable delivery of messages, minimal demands on performance
<i>Security</i>	privacy, confidentiality, authentication
<i>Rating</i>	0

Consumer

11 Energy efficiency monitoring

b. Fault detection and diagnostics

Purpose not unique use case, part of above .

Actors

Function

Interfaces

Configuration

Quality

Security

Rating 0

Consumer

12 Indoor Air Quality

a. Monitoring of sensors

Purpose support performance requirements for indoor air quality and facilitate conflict resolution in disputes related to air quality in buildings

Actors Service provider, customer, customer facility, tenant

Function monitoring of sensors, sending signals for local environmental conditions (outside air quality), journalling of IAQ measurements

Interfaces Service provider, customer, customer facility, tenant

Configuration : 1. Sensor configuration information 2. Setpoints for alarms / alerts

Quality reliable delivery of messages, minimal demands on performance

Security privacy, confidentiality, non-repudiation, authentication

Rating 1.4

Consumer

13 ISP services to customer

a. Reselling of bandwidth to conventional communication service providers (including telephone, TV, and ISP)

Purpose sell excess communications capacity/dark fiber of DisCo to third parties

Actors ESP, DisCo, customer, telephone company, ISP's, other third parties

Function ancillary communications and data services direct to customers through previously established communications media

Interfaces ESP, DisCo, customer, telephone company, ISP's, other third parties

Configuration many and varied - internet, telephony, complex addressing issues

Quality wide range of requirements depending on particular ancillary services provided

Security wide range of requirements depending on particular ancillary services provided

Rating 2

Consumer

14 Third party Service Support

a. Homes security services - owner managed

<i>Purpose</i>	provide secure access to customer site through managed network
<i>Actors</i>	Service provider, customer, service providers gateway, installation/service personnel
<i>Function</i>	data verification and validation, gateway services between data access protocols and "web browser", management of security relationship with customer site
<i>Interfaces</i>	Service provider, customer, service providers gateway
<i>Configuration</i>	: 1. Customer premise layout and sensor network 2. Supervisory control over security system 3. Reporting options
<i>Quality</i>	reliable delivery of messages, propagation delays of acceptable remote user interface (less than 1 sec?)
<i>Security</i>	privacy, confidentiality, authentication of user, security management protocols
<i>Rating</i>	1.6

Consumer

14 Third party Service Support

b. Home health (patient monitoring / health emergency alarm)

Purpose	provide reliable monitoring services for home health care emergencies
Actors	Service provider, customer, service providers gateway, physician, emergency personnel, installer/service personnel
Function	data verification and validation, gateway services between data access protocols and "web browser", management of security relationship with customer site, dispatching of emergency personnel
Interfaces	gateway, service provider, installer/service, personnel, customer, customers information distribution list
Configuration	: 1. Customer information 2. Sensor list 3. Reporting options 4. Performance requirements
Quality	reliable delivery of messages, propagation delays of acceptable minimal impact ot injured persons (seconds?)
Security	privacy, confidentiality, authentication of user, security management protocols
Rating	2

Consumer

14 Third party Service Support

c. Alarm qualification

Purpose	provide false alarm filtering and data validation of customer alarm system
Actors	Service provider, customer, service providers gateway, customer security system police, fire, emergency personnel, installation/service
Function	data verification and validation, gateway services between data access protocols and notification recipients, management of security relationship with customer site
Interfaces	Service provider, customer, service providers gateway, customer security system police, fire, emergency personnel, installation/service
Configuration	: 1. Customer premise layout and sensor network 2. Reporting options 3. Sensor confirmation tree
Quality	reliable delivery of messages, propagation delays of acceptable notification delay (~20 sec?)
Security	privacy, confidentiality, authentication of user, security management protocols
Rating	1.6

Consumer

14 Third party Service Support

d. Remote video surveillance -- monitoring of home "web cams"

<i>Purpose</i>	provide video gateway services for customer sited web cams
<i>Actors</i>	Service provider, customer, service providers gateway, customer camera installation/service
<i>Function</i>	access control of video stream, optional encryption of images, storage and retrieval of recordings
<i>Interfaces</i>	Service provider, customer, service providers gateway, customer camera(s) installation/service
<i>Configuration</i>	: 1. Customer premise layout and camera locations 2. Reporting options 3. Storage options
<i>Quality</i>	video buffering to provide customer contiguous viewing
<i>Security</i>	privacy, confidentiality, authentication of user, security management protocols
<i>Rating</i>	1.8

Consumer

14 Third party Service Support

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

<i>Purpose</i>	provide for the annunciation and routing of alarm messages
<i>Actors</i>	Service provider, customer, service providers gateway, customer security system police, fire, emergency personnel, installation/service
<i>Function</i>	annunciation of emergency conditions, validation and verification of alarm data and sensor quality, dispatch of emergency personnel
<i>Interfaces</i>	Service provider, customer, service providers gateway, customer security system police, fire, emergency personnel, plumber, electrician, cable guy, installation/service
<i>Configuration</i>	: 1. Customer premise layout and sensor network 2. Reporting options 3. Sensor confirmation tree
<i>Quality</i>	reliable delivery of messages, propagation delays of acceptable notification delay (~20 sec?)
<i>Security</i>	privacy, confidentiality, authentication of user, security management protocols
<i>Rating</i>	1.4

Consumer

15 Transmission and Distribution Operations Support

a. Detecting light outages in street lights.

<i>Purpose</i>	Detect street light outages
<i>Actors</i>	street lights, ESP, DisCo
<i>Function</i>	street light asset management
<i>Interfaces</i>	street lights, ESP, DisCo
<i>Configuration</i>	low cost, low bandwidth, high point count, power line carrier
<i>Quality</i>	eventual delivery of messages with no significant time constrain
<i>Security</i>	little or none
<i>Rating</i>	0.8

Consumer

15 Transmission and Distribution Operations Support

b. Downed Conductor / Power Outage region detection

<i>Purpose</i>	Narrow down location of broken/misoperating power system infrastructure
<i>Actors</i>	MDMAs, Customers, Meters, Historical Records, ESP-SCADA/EMS,
<i>Function</i>	identify meters without power or non-responsive to infer affected equipment location
<i>Interfaces</i>	ESP SCADA/EMS and Settlement System ESP SCADA/EMS and Historical Records
<i>Configuration</i>	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.
<i>Quality</i>	High availability, data accuracy medium, high data frequency.
<i>Security</i>	Medium security level
<i>Rating</i>	1.4

Consumer

16 R factor

a. Calculation of home R factor

<i>Purpose</i>	Dynamically calculate the heating "R" factor of a home
<i>Actors</i>	home energy controller, interior temperature sensors, external temperature sensors, solar sensors, and wind sensors
<i>Function</i>	calculation of a homes heat loss given the input values from the sensors
<i>Interfaces</i>	all sensors and the home energy controller and the home energy controller and third party service providers
<i>Configuration</i>	many to one
<i>Quality</i>	
<i>Security</i>	
<i>Rating</i>	0.4