Real-Time Pricing (RTP) Top Level

1 Descriptions of Function

All prior work (intellectual property of the company or individual) or proprietary (non-publicly available) work should be so noted.

1.1 Function Name

Name of Function

Real-Time Pricing (RTP) – Top Level

1.2 Function ID

IECSA identification number of the function

C-4

1.3 Brief Description

Describe briefly the scope, objectives, and rationale of the Function.

The purpose of the Real-Time Pricing Enterprise Activity is to implement and manage a full scale distributed computing system that integrates key industry operations and permits customers 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), received from an Energy Services Provider who acts as an intermediary to the Market Operations. Customers can also provide their forecasted loads and generation into the Market Operations (possibly through the Energy Services Provider (ESP) as an aggregator) as energy schedules and ancillary bids/offers. For operators of the power distribution system, Real-Time Pricing provides a mechanism for potentially significant changes in aggregated load based on sharing cost drivers with the customer in an elective supervisory control scheme.

1.4 Narrative

A complete narrative of the Function from a Domain Expert's point of view, describing what occurs when, why, how, and under what conditions. This will be a separate document, but will act as the basis for identifying the Steps in Section 2.

A typical day-in-the-life scenario is as follows (note that the discussion is marked up with numbers that are used later in the analysis to derive requirements from the scenario):

In the historical energy supply system, the time-based analysis of customer consumption of energy was cost prohibitive. Yet, the actual cost of providing energy is substantially time and load dependent. The regulated utility was the great averaging factor for these variable costs. Today, modern electronics and communications make it cost effective to apply a more accurate allocation of costs and usages of energy. Real-time pricing is a market mechanism to provide for dynamic feedback control and pricing of energy based on genuine costs.

(1)Periodically, the regional transmission operator/independent system operator (Regional System Operator) market operations system (or other market entity, depending upon the market design) forecasts power system conditions for a specific period, say the next 24 hours, based on energy schedules and prices already submitted, ancillary services available, weather conditions, day of the week, scheduled outage information from transmission and distribution operations, and real-time information from transmission and distribution operations, etc.

(2)From these forecasts, an RTP Calculation function develops tables of load versus price for each "power system node" and for each "settlement" period (e.g. each hour). These tables are the **Base RTP data**. The purpose of this computation is to accurately forecast the cost of providing energy during the period.
(3)These Base RTP tables are made available to all subscribers of this information (depending upon market rules), typically by being uploaded to a MarketInterfaceServer.

(4)The Energy Services Provider (ESP) obtains the Base RTP data tables from the MarketInterfaceServer, and uses them to develop **Customer-specific RTP rate tables**. These calculations are based on contractual agreements between the ESP and the different types of customers it serves. For example, a large industrial customer that can curtail large loads during peak hours will get a different rate than a small commercial customer with less ability to modify its load. (5)The ESP sends these Customer-specific RTP rate tables to each of the customers it serves, using different mechanisms: fax, email, or direct data channels (e.g. dial-up telephone or AMR system).

(6)The customer's Building Automation System (CustomerBuildingAutomationSystem) optimizes its loads and distributed energy resources (DER), based on the customer-specific rate table it receives, the load requirements and constraints, and any DER requirements, capabilities, and constraints. The CustomerBuildingAutomationSystem understands the nature and opportunity for altering consumption based on economic and comfort drivers, and, the physical dynamics of the specific customer premises. (7)The CustomerBuildingAutomationSystem then issues (or updates existing) schedules and other control mechanisms for loads and for DER generation. These control actions may be automatically implemented or may be reviewed and changed by the customer.
(8)The Customer's CustomerBuildingAutomationSystem may then send generation schedules to the DER management system for it to implement during each "settlement" period.

(9)The CustomerBuildingAutomationSystem system uses the site-optimized algorithms to forecast its load and DER generation. It also determines what additional ancillary services it could offer, such as increased DER generation or emergency load reduction, and calculates what bid prices to offer these ancillary services at.
(10)The CustomerBuildingAutomationSystem then submits these energy schedules and ancillary services bids to the ESP (or Scheduling Coordinator, depending upon market structure), as input to the Regional System Operator market operations.

(11)The ESP aggregates (or leaves as individual information) the energy schedules and ancillary service bids, and submits them to the market operations. These will affect the next iteration of RTP calculations.

(12a)As each "settlement" period is reached or during each period as optimal, the CustomerBuildingAutomationSystem issues load control commands to the end devices (setting levels, cycling, turning on/off, etc.). The DER management system controls the DER devices according to the DER schedule.

(12b)The distribution operations systems monitor any larger DER devices to ensure power quality constraints are met, and to help manage emergency situations (detailed in the Advanced Distribution Automation Use Case). (12c)Load and generation deviations, as well as initiation of ancillary services which have been requested by the market operations, are handled according to normal market operations procedures (as detailed in the Market Operations Use Case).

[13]In the post "settlement" period (as shown in the MeterDevice Reading Use Case), customer load and generation meters are read by MeterDataManagementAgent (MDMAs) and passed to the market operations settlement systems (as shown in the Market Operations Use Case). The availability of fine-grained load profile information (for example, measurements integrated for each 15 minute period of consumption during the billing period), allows for accurate application of the agreed upon tariff.

[14] External regulators and auditors review the RTP base and customer-specific tables to ensure compliance with market rules.

A systems and network administrator manages the communications networks, connected equipment (common environment), in addition to any distributed applications within the security domain defined by this domain template. The administrator also manages the life-cycle of all the equipment and distributed computing applications within this domain. The administrator is supported by advanced systems management functions that are designed into intelligent equipment.

1.5 Actor (Stakeholder) Roles

Describe all the people (their job), systems, databases, organizations, and devices involved in or affected by the Function (e.g. operators, system administrators, technicians, end users, service personnel, executives, SCADA system, real-time database, RTO, RTU, Intelligent Electronic Device, power system). Typically, these actors are logically grouped by organization or functional boundaries or just for collaboration purpose of this use case. We need to identify these groupings and their relevant roles and understand the constituency. The same actor could play different roles in different Functions, but only one role in one Function. If the same actor (e.g. the same person) does play multiple roles in one Function, list these different actor-roles as separate rows.

Grouping(Community)	***Group Description***
Top Level Actors	High-level actors who have significant stake on the RTP Top Level function.

Grouping(Community)		*Group Description*
Actor Role Name	***Actor Type (person, device, system etc.)***	***Role Description***
Regional System Operator	Organization	Organizations responsible for maintaining transmission system reliability and ensuring open access of the grid to all market participants. Regional System Operator responsibilities include: transmission planning, real-time system operation, and market monitoring and management.
Market Timer	Timer	Timer to trigger application execution at specific times of the day, week, month, etc
MarketInterface Server	Server	Stores, manages and secures information flows between Market Operations in utilities and Market Participants
EnergyServiceProvider	System	Receives the base RTP tables and calculates customer-specific RTP tables
CustomerBuildingAutomationSystem	System	Receives customer-specific RTP values and optimizes load and DER generation. Also submits energy schedules, ancillary services bids/offers, and implements load control in real time.
CustomerLoad	Power equipment	Equipment that will be controlled according to the Load Schedule
Forecast Timer	Timer	Timer to initiate the submittal of Customer load forecasts and ancillary services bids/offers
DERDevice	Power equipment	Equipment that will be managed according to the DER Schedule
DERManagementSystem	System	System that implements schedules received from the Customer's EMS or other sources (see DER functions)

Grouping(Community)		*Group Description*
TransmissionSystemOperator	System	Provides power system configuration and real-time data to market operations
TransmissionSystem	Power equipment	Transmission power system equipment
TransmissionSCADASystem	System	System that provides forecast and real-time transmission information to the market operations system
DistributionManagementSystem	System	Provides real-time data to market operations and monitors (larger) DER devices
DistributionSystem	Power equipment	Distribution power system equipment
SCADASystem	System	System that monitors DER as well as providing forecast and real-time distribution information to the market operations system
MeterDevice	Devices	Collects energy and demand data per time period
CustomerCommunicationPortal	Devices	Enables and Manages communications between Access Networks and In-Building Networks/Equipment
Intelligent End-Use Equipment	Devices	Receives control and/or price signals from Consumer CustomerBuildingAutomationSystem or CustomerCommunicationPortal
MeterDataManagementAgent	Person	Reads customer loads and generation meters

Grouping(Community)		*Group Description*
Regulators and AuditingPersonnel	Person	Review the RTP base and customer-specific tables to ensure compliance with market rules
RTPSystemAdministator	System	Manages overall RTP environment including network and systems (applications and equipment) management, security policy management and enforcement, and life-cycle management
A/S Services application	Service	Application that manage the ancillary services
RTPBaseCalculator	Service	Application determines the desired load based on power system constraints, operational costs, market conditions, etc. Function then calculates the base RTP table as part of market operations
Customer	Organization	
CustomerBuildingAutomationSystem optimization application	Service	CustomerBuildingAutomationSystem Optimization application optimizes loads and DER generation, based on requirements, constraints, and RTP rates
Distribution monitoring system		
EnergyScheduler		

Grouping(Community)		*Group Description*
EnergySchedule Database		
RTPCalculator		
Generation bid/offers application		
HistoricLoadForecastDatabase		
MeterDevice		
LoadForecaster		
SettlementSystem		
RTPDatabase		
Transmission monitoring system		
WeatherService		
DERScheduleDatabase		

Grouping(Community)		*Group Description*
LoadSchedule		
Everyone		
BaseRTPDatabase		
PX rate administrator		

Replicate this table for each logic group.

1.6 Information exchanged

Describe any information exchanged in this template.

Information Object Name	*Information Object Description*
Energy Schedules	Energy schedules submitted to Market Operations
Aggregated Energy Schedules	Aggregated energy schedules from multiple sources
Base RTP Data Tables	Tables of prices versus loads and times for each power system node, which consist of a matrix of: • Nodes • Settlement periods • Loads • Base prices

Information Object Name	*Information Object Description*
Transmission Outage and Constraint Data	Data containing transmission outage and constraint information
Distribution Outage and Constraint Data	Data containing distribution outage and constraint information
Customer-specific RTP rate tables	Tables of prices versus loads and times for the specific customer
Load Schedule	Schedule for Customer Load equipment: turning on and off, cycling, and/or level of load
DER Schedule	Schedule for DER devices: turning on/off, setting generation levels, setting mode of operation
Customer load forecasts	Forecasts of customer loads
Customer Ancillary Services Bids/Offers	Bids and/or offers for the customer to provide ancillary services to the market
Aggregated CustomerLoad	Aggregated load forecasts from multiple customers
Loads Forecast	Load forecasts, based on different inputs and possible market scenarios
Weather Forecasts	Weather forecasts
Ancillary Services Bids/Offers	Ancillary Services bids and offers submitted to Market Operations
Aggregated Customer A/S Bids/Offers	Aggregated ancillary services bids/offers from multiple customers

Information Object Name	*Information Object Description*
TransmissionSystem Data	Transmission power system data, including scheduled outages, transmission constraints, and real-time information
DistributionSystem Data	Distribution power system data, including scheduled outages, distribution constraints, and real-time information
Real-time Monitoring and Control Data	Status, settings, deferrable energy requirements, automated on/off commands, automated settings, pricing information (RTP)
DER Data	Status and settings, etc.
Real-time Power Systems Operations Data	Loads, generation, A/S, etc.
Revenue MeterMeterDevice Data	Energy and demand data per time period Including kVa (true rms),
Power Quality Data	PQ Data (premium power)
Device Communications Management Data	Meta data from equipment for configuring of system functions (capabilities, functions, limitations)
Device Management Data	Data for management of remote equipment, including self diagnostics,
Network Management Data	Data for management of access network functions: ISO classifications plus additional as appropriate
Security Management Data	Data necessary for the management of security functions including implementation of security policies across the security domain.

Information Object Name	*Information Object Description*
Portal Management Data	Data for management and administration of portal technologies; access control, security management

1.7 Activities/Services

Describe or list the activities and services involved in this Function (in the context of this Function). An activity or service can be provided by a computer system, a set of applications, or manual procedures. These activities/services should be described at an appropriate level, with the understanding that sub-activities and services should be described if they are important for operational issues, automation needs, and implementation reasons. Other sub-activities/services could be left for later analysis.

Activity/Service Name	*Activities/Services Provided*
Load forecast function	Function uses transmission and distribution information, energy schedules, weather, and past history to forecast loads
Weather forecast function	Function uses data to estimate probable weather temperatures, etc.
RTPBaseCalculator function	Function determines the desired load based on power system constraints, operational costs, market conditions, etc. Function then calculates the base RTP table as part of market operations
ESP Specific RTPCalculator	Function that uses the base RTP value to calculate customer-specific RTPs, based on their tariffs
Customer's CustomerBuildingAutomationSystem Optimization function	System that uses the customer-specific RTP table to determine the optimal load schedules and DER generation schedules (if that is available)
Customer CustomerBuildingAutomationSystem forecast customer energy schedules and ancillary services	Function that submits energy schedules and ancillary service bids/offers to market operations

Activity/Service Name	*Activities/Services Provided*
function	
ESP energy aggregation function	Function that aggregates load information from multiple customers and manages the submittal to the market operations system
ESP ancillary services aggregation function	Function that aggregates ancillary service bids/offers and manages the submittal to the market operations system
Market operations energy services function	Function that captures and analyzes energy schedules to ensure all power system constraints are met
Market operations ancillary services function	Function that captures offers/bids of ancillary services and categorizes them for use during the "settlement" period

1.8 Contracts/Regulations

Identify any overall (human-initiated) contracts, regulations, policies, financial considerations, engineering constraints, pollution constraints, and other environmental quality issues that affect the design and requirements of the Function.

Contract/Regulation	*Impact of Contract/Regulation on Function*
Utility operations	FERC and state regulators oversee utility operations
Market tariffs Management	Will vary for different market environments and different customer RTP contracts with ESPs
Customer RTP contracts with ESPs	Drives technology and security requirements
Network and Systems Management Policies	Manages network and communications resources including administering service agreements for Quality of Service and management priorities
Security Policy Management	Enforces and enables specific security functions and requirements in all relevant equipment and

Contract/Regulation	*Impact of Contract/Regulation on Function*
	applications

Policy	*From Actor*	*May*	*Shall Not*	*Shall*	*Description (verb)*	*To Actor*
Pricing info	EnergyServiceProvider or Regional System Operator or PX rate administrator			X	ESP or ISO/RTO or PX rate administrator :Provide pricing information as per the properties contained in the defined customer tariff and ensure priced delivered to customer is correct	Customer
Security and compliance	ENERGYSERVICEPROVIDER or RTPSystemAdministator			X	Meet security requirements and ensure compliance with all critical information in tariffs, laws and policies must be auditable	Customer
Add-ons	ENERGYSERVICEPROVIDER	X			Make add-ons to real-time prices that vary, based on type of customer or tariff	Customer
Technology utilization	ENERGYSERVICEPROVIDER	X			Utilize different methodologies and technologies for providing pricing information, depending upon type and location of customer, market tariffs, customer tariffs, corporate decisions, financial considerations and security policies	Customer
Delivery	ENERGYSERVICEPROVIDER	X			Undertake delivery of RFP data via reasonable variations in implementation approaches through robust system designs	Customer
Data receipt	Customer	X			Decide not to receive the RTP data	ENERGYSERVICEPROVIDER
Sensitive data	Everyone		X		Sensitive information must not be accessible by unauthorized entities and must not be prevented from being accessed by authorized entities	Everyone
Equipment	Everyone		X		Changes that are variations in delivery methods must not require field equipment changeouts	Everyone

Constraint	*Type*	*Description*	*Applies to*
Laws of physics	Environmental	Laws of physics for power system operations	All
Technology	Environmental	Technology constraints for providing real-time pricing information to all customers with RTP as part of their customer tariffs	All
Security	Environmental	Security policies and technologies must be established and used to address all security needs at the appropriate/contracted levels	All

2 Step by Step Analysis of Function

Describe steps that implement the function. If there is more than one set of steps that are relevant, make a copy of the following section grouping (Preconditions and Assumptions, Steps normal sequence, and Steps alternate or exceptional sequence, Post conditions)

2.1 Steps to implement function

Name of this sequence.

2.1.1 Preconditions and Assumptions

Describe conditions that must exist prior to the initiation of the Function, such as prior state of the actors and activities

Identify any assumptions, such as what systems already exist, what contractual relations exist, and what configurations of systems are probably in place

Identify any initial states of information exchanged in the steps in the next section. For example, if a purchase order is exchanged in an activity, its precondition to the activity might be 'filled in but unapproved'.

Actor/System/Information/Contract	***Preconditions or Assumptions***
Market operations	Market tariffs have been developed and implemented to support real-time pricing
Transmission/distribution operations	Normal power system operations where some customers have contracted to receive and respond to RTP signals
Customer building automation	These customers have Building Automation Systems (CustomerBuildingAutomationSystem) in place to calculate optimal load patterns and DER patterns, based on parameters set by customers and on the RTP values

2.1.2 Steps – Normal Sequence

Describe the normal sequence of events, focusing on steps that identify new types of information or new information exchanges or new interface issues to address. Should the sequence require detailed steps that are also used by other functions, consider creating a new "sub" function, then referring to that "subroutine" in this function. Remember that the focus should be less on the algorithms of the applications and more on the interactions and information flows between "entities", e.g. people, systems, applications, data bases, etc. There should be a direct link between the narrative and these steps.

The numbering of the sequence steps conveys the order and concurrency and iteration of the steps occur. Using a Dewey Decimal scheme, each level of nested procedure call is separated by a dot '.'. Within a level, the sequence number comprises an optional letter and an integer number. The letter specifies a concurrent sequence within the next higher level; all letter sequences are concurrent with other letter sequences. The number specifies the sequencing of messages in a given letter sequence. The absence of a letter is treated as a default 'main sequence' in parallel with the lettered sequences.

Sequence 1:

```
1.1 - Do step 1
1.2A.1 - In parallel to activity 2 B do step 1
1.2A.2 - In parallel to activity 2 B do step 2
1.2B.1 - In parallel to activity 2 A do step 1
1.2B.2 - In parallel to activity 2 A do step 2
1.3 - Do step 3
1.3.1 - nested step 3.1
1.3.2 - nested step 3.2
```

Sequence 2:

```
2.1 - Do step 1
2.2 – Do step 2
```

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECSA Environments
#	*Triggering event? Identify the name of the event.*[1]	*What other actors are primarily responsible for the Process/Activity? Actors are defined in section1.5.*	*Label that would appear in a process diagram. Use action verbs when naming activity.*	*Describe the actions that take place in active and present tense. The step should be a descriptive noun/verb phrase that portrays an outline summary of the step. "If …Then…Else" scenarios can be captured as multiple Actions or as separate steps.*	*What other actors are primarily responsible for Producing the information? Actors are defined in section1.5.*	*What other actors are primarily responsible for Receiving the information? Actors are defined in section1.5.* *(Note – May leave blank if same as Primary Actor)*	*Name of the information object. Information objects are defined in section 1.6*	*Elaborate architectural issues using attached spreadsheet. Use this column to elaborate details that aren't captured in the spreadsheet.*	*Reference the applicable IECSA Environment containing this data exchange. Only one environment per step.*
1.1	Market Timer initiates the forecast of power system conditions	Market Timer	System Forecast	Forecast power system conditions for the next "settlement" periods	EnergyScheduleDatabase A/S Services application TransmissionSCADASystem system SCADASystem system WeatherService HistoricLoadForecastDatabase	LoadForecaster	Energy schedules, Ancillary services bids/offers, Transmission outage and constraint data, Distribution outage and constraint data, Weather forecasts, Historical forecast data and parameters	- APIs needed between databases and application - Inter utility communications must be supported - Existing weather protocol and weather format must be used	Control Center / Corporations

[1] Note – A triggering event is not necessary if the completion of the prior step – leads to the transition of the following step.

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECSA Environments
1.2	Market Timer initiates the calculation of Base RTP tables	Market Timer	Base RTP Calculation	Calculate a table of RTP values for each "settlement" period and for different loads at different "power system nodes"	LoadForecaster	RTPBaseCalculator	Forecasts of loads and generation at each node	API needed	RTOs / Market Participants
1.3	Market Timer initiates the posting of Base RTP data for ESPs	Market Timer	Base RTP Posting	RTPBaseCalculator posts Base RTP tables on MarketInterfaceServer Server for ESPs to access/download	RTPBaseCalculator	MarketInterface Server Server	Base RTP data tables	Upload to MarketInterfaceServer Server	RTOs / Market Participants
1.4	Base RTP table updates become available on MarketInterfaceServer Server	MarketInterfaceServer Server	Base RTP Download	RTPCalculator application receives information on Base Real-Time Prices and calculates the customer-specific RTP tables for different categories of customers	MarketInterfaceServer Server	RTPCalculator	Base RTP data tables	Download from MarketInterfaceServer Server Security is major concern	RTOs / Market Participants
1.5	ESP calculates customer-specific RTP tables	ENERGYSERVICEPROVIDER	Customer RTP Calculation	ESPs issue customer-specific RTP rate tables to appropriate contracted customers	RTPCalculator	CustomerBuildingAutomationSystem Systems (CustomerBuildingAutomationSystem) optimization application	Customer-specific RTP rate tables which consist of a matrix of: Nodes Settlement periods Loads Customer rates	Multi-cast over WAN from ESP to many customer sites (could be fax, email, telephone, or Internet) Security is a major concern	Customer / ESP
1.6	CustomerBuildingAutomationSystem implements a secure session, receives RTP rate tables and acknowledges	Customer CustomerBuilding AutomationSystem	Customer RTP Receipt	CustomerBuildingAutomationSystem Optimization application optimizes loads and DER generation, based on requirements, constraints, and RTP rates	Customer CustomerBuilding AutomationSystem optimization application	LoadSchedule, DERScheduleDatabase	Load schedule DER generation schedule	DB APIs	DER Monitoring and Control

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECSA Environments
1.7	Customers may review schedules	Customer CustomerBuilding AutomationSystem	Customer RTP Review	Issues schedules for review	Customer CustomerBuilding AutomationSystem optimization application	Customer	LoadSchedule DERScheduleDatabase	User interface	User Interface
1.8	CustomerBuildingAutomationSystem issues schedules	Customer CustomerBuilding AutomationSystem	Schedule Generation	CustomerBuildingAutomationSystem updates schedules based on any Customer input	Customer CustomerBuilding AutomationSystem optimization application	LoadSchedule, DERScheduleDatabase	LoadSchedule DERScheduleDatabase	DB API	Intra-Customer Site
1.9	Customer Load Forecast and Ancillary Services bids/offers	Customer CustomerBuilding AutomationSystem	Customer Load Forecast	Calculate and update customer load forecasts and generation bids and/or offers	Forecast timer	Customer load forecast and generation bid/offers application	Customer load forecasts Ancillary services bids and/or offers	DB API	Intra-Customer Site
1.10	Submittal of Load Forecasts and A/S bids/offers	Customer CustomerBuilding AutomationSystem	Load and A/S Bid Submittal	Submit customer load forecasts and ancillary services bids and/or offers to the EPS for aggregation into the market	Customer load forecast and generation bid/offers application	ESP Aggregator applications	Customer load forecasts Ancillary services bids and/or offers	Communication channel between Customers and ESPs, requiring high security	Customer / ESP
1.11	Aggregate loads and A/S	ENERGYSERVICEPROVIDER	Aggregate Loads	Submit aggregated loads as energy schedules Submit A/S bids and/or offers	ESP Aggregator applications	EnergyScheduler and A/S Services application	Aggregated energy schedules Aggregated A/S bids and/or offers	*As in Market Participants interface to Market Operations Use Case*	RTOs / Market Participants

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECSA Environments
1.12a	Real-time monitoring and control	Customer CustomerBuilding AutomationSystem	Monitoring and Control	CustomerBuildingAutomationSystem monitors current status, settings, and deferrable energy requirements of loads Based on current and projected future prices, current status of loads, and taking into account the customer needs and priorities, the CustomerBuildingAutomationSystem issues control commands to simple loads or forwards pricing to advanced end-use equipment.	Customer loads, CustomerBuilding AutomationSystem	CustomerBuildingAutomationSystem, Customer loads	Real-time monitoring and control data Status Settings Deferrable energy requirements Automated on/off commands Automated settings Pricing information (RTP)	Monitoring and control of remote end equipment requires high availability and probably is media and/or compute constrained	Lower Security DAC
1.12b	Monitor DER	DERDevice	DER Monitoring	Monitor DER devices for power system reliability reasons	DERDevice	Distribution monitoring system	DER data	Communications channel between distribution utility and DER location	DER Monitoring and Control
1.12c	Real-time power system operations	T&D Operations System	Power System Operations	Collect data to be used for settlements	Transmission monitoring system and Distribution monitoring system	SettlementSystem	Real-time power systems operations data Loads Generation A/S	*Details in Market Operations Use Case*	RTOs / Market Participants
1.13	Loads are metered	MeterDevice	Load Metering	Loads are metered per time period, possibly by load as well as whole building	MeterDevice	MeterDevice Data Management Agent (MDMA)	Meter data Load identity Energy and demand data per time period	*Details in MeterDevice Reading of electric meters Use Case*	Customer / ESP

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECSA Environments
1.14	Auditing	AuditingPersonnel	Auditing	Validate compliance with market rules	BaseRTPDatabase, Customer-RTPDatabase	Regulators, AuditingPersonnel	Base RTP data Customer-specific RTP rate tables	*Details in Regulation/Auditing Use Case*	Control Center / Corporations

2.1.3 Steps – Alternative / Exception Sequences

Describe any alternative or exception sequences that may be required that deviate from the normal course of activities. Note instructions are found in previous table.

#	Event	Primary Actor	Name of Process/Activity	Description of Process/Activity	Information Producer	Information Receiver	Name of Info Exchanged	Additional Notes	IECSA Environments

2.1.4 Post-conditions and Significant Results

Describe conditions that must exist at the conclusion of the Function. Identify significant items similar to that in the preconditions section.

Describe any significant results from the Function

Actor/Activity	***Post-conditions Description and Results***
All	On-going, normal operations

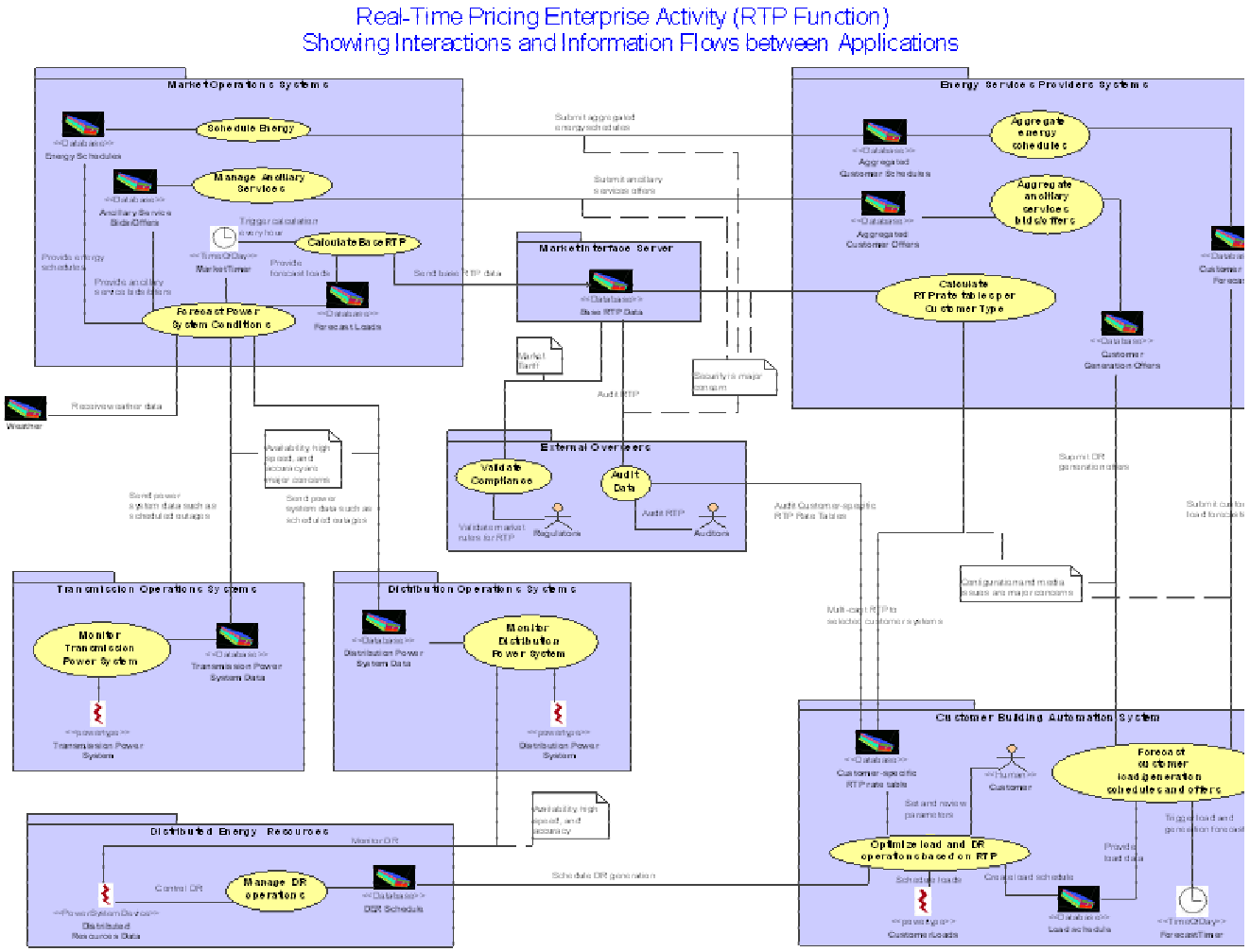
2.2 Architectural Issues in Interactions

Elaborate on all architectural issues in each of the steps outlined in each of the sequences above. Reference the Step by number..

Microsoft Excel Worksheet

2.3 Diagram

For clarification, draw (by hand, by Power Point, by UML diagram) the interactions, identifying the Steps where possible.



3 Auxiliary Issues

3.1 References and contacts

Documents and individuals or organizations used as background to the function described; other functions referenced by this function, or acting as "sub" functions; or other documentation that clarifies the requirements or activities described. All prior work (intellectual property of the company or individual) or proprietary (non-publicly available) work must be so noted.

ID	Title or contact	Reference or contact information
[1]	General	Market energy schedule submittals, market ancillary services bid/offer submittals, transmission monitoring and control, distribution monitoring and control, advanced distribution automation, management of DER devices, meter reading, and market settlement processes have additional functionality described elsewhere.
[2]	Metering, communications and computing for price-responsive demand programs	Eric Hirst and Brendan Kirby, Electric Light & Power August, 2001
[3]	Donna Pratt	Neenan and Associates

3.2 Action Item List

As the function is developed, identify issues that still need clarification, resolution, or other notice taken of them. This can act as an Action Item list.

ID	Description	Status
[1]	Discuss comment RZ6	Disagreement over comment

[2]		

3.3 Revision History

For reference and tracking purposes, indicate who worked on describing this function, and what aspect they undertook.

No	Date	Author	Description
1	1/30/2004	Jeff Lamoree	Updated based on team comments

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