

RTP – Customer’s BAS Optimization

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

Customer’s BAS Optimization

1.2 Function ID

IECSA identification number of the function

C-4, C-6, C-6.4

1.3 Brief Description

The RTP system provides the RTP schedule through email, pager, bulletin board or direct transfer. The RTP operator at for the customer must enter the schedule into the building automation software (BAS) and perform the necessary optimization activities to implement the RTP goals. Note that EMS or Energy Management System is often used interchangeably with BAS.

1.4 Narrative

The Energy Services Provider (EnergyServiceProvider) obtains the Base RTP data tables from the Market Interface Server, and uses them to develop Customer-specific RTP rate tables. These calculations are based on contractual agreements between the EnergyServiceProvider 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. The EnergyServiceProvider 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).

The customer’s Building Automation System (BAS) 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 BAS understands the nature and opportunity for altering consumption based on economic and comfort drivers, and, the physical dynamics of the specific customer premises. The BAS 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. The Customer's BAS may then send generation schedules to the DER management system for it to implement during each "settlement" period. Note that the BAS may be a human as apposed to a software system.

The BAS 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. The BAS then submits these energy schedules and ancillary services bids to the EnergyServiceProvider (or SchedulingCoordinator, depending upon market structure), as input to the RTO/ISO market operations.

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.

<i>Grouping (Community) '</i>		<i>Group Description</i>
Energy Service Provider (EnergyServiceProvider)		Sells energy and energy services to the customer
<i>Actor Name</i>	<i>Actor Type (person, device, system etc.)</i>	<i>Actor Description</i>
RTPCalculator	System	Calculates customer specific RTP rates for current and future rate intervals. This actor is subject of a separate use case.
SchedulingCoordinator	System	Receives energy schedule and ancillary bids from customers BAS/EMS and forwards to RTO/ISO for input to market operations

<i>Grouping (Community)'</i>		<i>Group Description</i>
Energy Service Provider (EnergyServiceProvider)		Sells energy and energy services to the customer
<i>Actor Name</i>	<i>Actor Type (person, device, system etc.)</i>	<i>Actor Description</i>
EnergyServiceProvider	System	Sells energy and energy services to the customer -- actor

<i>Grouping (Community)'</i>		<i>Group Description</i>
RTP Subscribing Customer		End use customers who subscribe to RTP rates and have load control capability, either automatic or manual.
<i>Actor Name</i>	<i>Actor Type (person, device, system etc.)</i>	<i>Actor Description</i>
Customer	Person	Receives the RTP signals and inputs those signals into the BAS, validates BAS optimization, bids proposals and actions.
CustomerBuildingAutomationSystem	System	Building Control System, Either a digital system or the Customer manually implements.

1.6 Information exchanged

Describe any information exchanged in this template.

<i>Information Object Name</i>	<i>Information Object Description</i>
RTP rates	Customer Day-Ahead or Hour-Ahead Real-Time Prices
Load deferment and DER schedules	Optimized load and DER schedule from the CustomerBuildingAutomationSystem
Energy / ancillary services bids	Customer bids into the Energy and/or Ancillary Services Market

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.

<i>Activity/Service Name</i>	<i>Activities/Services Provided</i>
RTPCalculator	Calculates customer specific RTP rates for current and future rate intervals. This activity is described in detail in a separate template.
Customer CustomerBuildingAutomationSystem	Calculates the optimum combination of load reductions, deferrals and generation to meet the objective of the customer and RTP contracts and signals.

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.

<i>Contract/Regulation</i>	<i>Impact of Contract/Regulation on Function</i>
RTP Tariffs	Dictates the conditions and limits and tariff of the RTP contract that can be entered with customer.

<i>Contract/Regulation</i>	<i>Impact of Contract/Regulation on Function</i>
RTP Contract	Dictates the price and response windows that will be applied to the Customer's energy usage
Market Rules	Dictates the rules and procedures for bidding into the Energy and Ancillary Services markets

<i>Policy</i>	<i>From Actor</i>	<i>May</i>	<i>Shall Not</i>	<i>Shall</i>	<i>Description (verb)</i>	<i>To Actor</i>
ProvideEnergy	EnergyServiceProvider			X	Provide power on demand	Customer
Adjust load schedule	Customer	X			Reduce or adjust load schedule to optimize energy costs given RPT for the interval.	EnergyServiceProvider
Energy / ancillary services bids	Customer	X			Bid Energy or ancillary services into the market	EnergyServiceProvider or market operator

<i>Constraint</i>	<i>Type</i>	<i>Description</i>	<i>Applies to</i>
Laws of physics		Laws of physics for power system operations	All
Technology		Technology constraints for providing real-time pricing information to all customers with RTP as part of their customer tariffs	All
Security		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'.

<i>Actor/System/Information/Contract</i>	<i>Preconditions or Assumptions</i>
RTP contract	RTP contract is in place between EnergyServiceProvider and customer.
Base RTP tables	Base RTP tables have been calculated and transmitted to EnergyServiceProvider for customer specific RTP rates based on contract.
Customer	Has procedures and/or systems in place to implement load optimizations based on RTP signals sent from EnergyServiceProvider.

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 section0.	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 section0.	What other actors are primarily responsible for Receiving the information? Actors are defined in section0. (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	Timer or Notification of new rates available	Customer	Customer processes RTP schedule	The customer receives and processes the RTP schedule for the next period. This could be by accessing a web page or reading email.	EnergyService eProvider	Customer	RTP rates		Customer / ESP
1.2	Receipt of new rates	Customer	Customer Enters data into BAS	The customer enters the RTP schedule for the next period into the BAS.	Customer	CustomerBuildingAutomationSystem	RTP rates		Intra-Customer Site
1.3 A.1	Entry of new rates	CustomerBuildingAutomationSystem	Load Optimizations based on RTP	CustomerBuildingAutomationSystem optimizes projected loads, deferrable load and DER based on requirements, constraints and RTP rates.	CustomerBuildingAutomationSystem	Customer	Load deferment and DER schedules		Intra-Customer Site

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
1.3 A.2	BAS optimizations complete	Customer	Customer Review of BAS optimizations	Customer reviews the load schedule and approves based on external criteria	Customer	Customer	Load deferment and DER schedules		Intra-Customer Site
1.3 A.3	Load deferment and DER schedules approved	Customer	Implement Load and DER schedules	The customer now implements the approved load and der schedules either manually or enabling the schedule in the BAS.	Customer		Load deferment and DER schedules		Intra-Customer Site
1.3 B.1		CustomerBuildingAutomationSystem	Energy / ancillary services bids	Customer BAS evaluates bids into energy and ancillary services.	CustomerBuildingAutomationSystem	Customer	Energy / ancillary services bids		Intra-Customer Site
1.3 B.2	BAS optimizations complete	Customer	Customer review of energy and ancillary services bids	Customer reviews the proposed bids into energy and ancillary services markets, verifying availability and bid data.	Customer	Customer	Energy / ancillary services bids		Intra-Customer Site
1.3 B.3	Review of energy and ancillary services bid	Customer	Transmit Bids to EnergyServiceProvider	Customer, having approved the energy and or ancillary bids, transmits those bids to the EnergyServiceProvider or market operator	Customer	EnergyServiceProvider	Energy / ancillary services bids		Customer / ESP

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

<i>Actor/Activity</i>	<i>Post-conditions Description and Results</i>
Load and DER schedules	Schedules for load and DER for the RTP period are approved and implemented
Energy / ancillary services bids	Bids are transmitted to the EnergyServiceProvider or market operator. These bids are not accepted at this point. A separate use case for acceptance and implementation can be found elsewhere.

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]		
[2]		

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]		
[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
0.	12/17/2003	Jack King	Transferred from old template.
0.9	2/27/2004	Jack King	Updated based on comments, completed issues spreadsheet