

RTP – Base RTP Calculation Function

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

RTP – Base RTP Calculation Function

1.2 Function ID

IECSA identification number of the function

C-4

1.3 Brief Description

Base 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.

1.4 Narrative

The RTP Base calculations are performed by the Market Operations actor after the Load Forecast function is complete to calculate the costs of delivering energy to customers during each of the settlement periods (usually 1 hour intervals) in the horizon of the calculations. These calculations are usually performed on a day-ahead basis so the information can be processed, transmitted to ESPs and finally to the RTP customer in time for action. RTP can be calculated or modified on an hourly basis if marginal cost warrant and customers are willing to subscribe and respond to such a service.

The base calculation require from the LoadForecaster as well as costs information from a variety of sources. These costs include the fuel and variable costs associated with the generation unit that will serve incremental load, adjustments for line losses, a risk adders,

and congestion fees. There is concerted effort in the industry to improve the speed and accuracy of the calculations for more timely and accurate pricing.

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, IED, 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>
Market Operators		Forecasts loads, determines optimal loads, and initiates process to determine tables of Base RTP values for the next hours and days
<i>Actor Name</i>	<i>Actor Type (person, device, system etc.)</i>	<i>Actor Description</i>
LoadForecaster	System	Provides the forecast for load across the system for the evaluation period at each node of the system.
RTPBaseCalculator	System	This function
MarginalEnergyCost	Data	Marginal energy costs for system
MarketInterfaceServer	System	Provides access to market information to ESPs and other market participants.

<i>Grouping (Community)</i>		<i>Group Description</i>
Energy Service Providers		Forecasts loads, determines optimal loads, and initiates process to determine tables of Base RTP values for the next hours and days
<i>Actor Name</i>	<i>Actor Type (person, device, system etc.)</i>	<i>Actor Description</i>
RTPCalculator	System	Receives the base RTP calculations and calculates rates for specific RTP customers. See “Customer Specific RTP Calculation” use cases.

1.6 Information exchanged

Describe any information exchanged in this template.

<i>Information Object Name</i>	<i>Information Object Description</i>
Forecasted system loads	System load predictions for the intervals covered by the RTP rate calculations.
MarginalEnergyCost	Table of marginal energy costs for the power system.
Base RTP rates table	Table of costs to deliver energy to pre-defined nodes throughout the power system for intervals in the RTP calculations.

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>
Load Forecasting	Provides the accurate estimates of load at various points throughout the system in the settlement intervals for the period of the RTP schedule. This function is described in detail in separate use cases.
RTPCalculator	Calculates customer specific RTP rates for current and future rate intervals. This service is described in detail in a separate use cases.

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.
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>
Provide RTP Base Rates	MarketInterfaceServer			X	Provide regular and continuous RTP base rates for ESP to calculate RTP customer rates	RTPCalculator

<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>
Market Operations	Has calculated load forecast and marginal energy prices.

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
#	<i>Triggering event? Identify the name of the event.¹</i>	<i>What other actors are primarily responsible for the Process/Activity? Actors are defined in section0.</i>	<i>Label that would appear in a process diagram. Use action verbs when naming activity.</i>	<i>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.</i>	<i>What other actors are primarily responsible for Producing the information? Actors are defined in section0.</i>	<i>What other actors are primarily responsible for Receiving the information? Actors are defined in section0.</i> <i>(Note – May leave blank if same as Primary Actor)</i>	<i>Name of the information object. Information objects are defined in section 1.6</i>	<i>Elaborate architectural issues using attached spreadsheet. Use this column to elaborate details that aren't captured in the spreadsheet.</i>	<i>Reference the applicable IECSA Environment containing this data exchange. Only one environment per step.</i>
1.1	Market Timer initiates the calculation of Base RTP tables	LoadForecaster	Base RTP Calculator	Calculate a table of RTP values for each "settlement" period and for different loads at different "power system nodes"	LoadForecaster	RTPBaseCalculator	Load Forecast and marginal energy costs		RTOs / Market Participants
1.2	Market Timer initiates the posting of Base RTP data for ESPs	Base RTP Calculator	MarketInterfaceServer	Base RTP Calculator posts Base RTP tables on MarketInterfaceServer for ESPs to access/download	RTPBaseCalculator	MarketInterfaceServer	Base RTP rates table		Control Centers / ESPs
1.3	Timer initiates ESP RTP Calculations	RTPCalculator	ESP Customer RTP rate calculations	ESP RTP system polls market interface server for updates to RTP base calculations. If new data is available, it is downloaded and ESP Customer Rate Calculatons	MarketInterfaceServer	RTPCalculator	Base RTP rates table		Control Centers / ESPs

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

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
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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>
Market Operations	Calculated and made available the current RTP base rates.

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. Double click on the embedded excel file – record the changes and save the excel file (this updates the embedded attachment).



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
1.0	1/19/04	Jack King	Converted from old template, completed architectural interactions.

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