EDS
DRAFT Resource Registration Guide for Transitioning to the Nodal Market
v0.08

Revision History

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1.0 Summary of Resource Registration Guide

This document is a guide to completing Resource Asset Registration with ERCOT in accordance with Section 16 of the ERCOT protocols. The Resource Asset Registration Form (RARF) is the next generation of the existing zonal Generation Asset Registration Form (GARF) and replacing the Load Asset Registration Form (LARF). Historically, the GARF, along with other documents, has been used for Resource Entities (RE) to provide information necessary to setup a Resource within ERCOT's systems, including registration, market operations, power operations, and commercial operations.

As ERCOT is preparing for the nodal market, the nodal RARF has been designed to collect as much information as possible from a resource in a single document. The RARF effort currently underway has two key objectives:

Objective 1 – Obtain new nodal data elements and confirm existing modeling data on file

In moving to a nodal market, there are new requirements regarding the amount of data required of Resources and TSP/DSPs to ensure ERCOT has the most accurate network model, as well as an accurate representation of the capabilities and constraints of Resources.

Rather than releasing an incremental nodal GARF to only add new nodal data elements, it was determined that full Resource registration would be a critical part of contributing to the success of the nodal market.

A new Network Model Management System (NMMS) is being brought online in coordination with multiple other systems for the nodal market in effectively evaluating and dispatching ERCOT resources.

The Market Management System (MMS) also has additional requirements for resource parameters to transition to complete resource specific dispatch. This is especially relevant for the complete dispatch to combined cycle resources. The RARF document is the means for resource owners to provide initial resource parameters in accordance with Section 3 of the Nodal Market Protocols for which a subset of these parameters may subsequently be updated by the resource's QSE via an API/XML interface.

Objective 2 – Consolidation of Forms

Historically there have been multiple forms to register a resource:

- Interconnection Request/Procedure
- Generation Data Form Spreadsheet
- Generation Asset Registration Form (GARF)
- Dynamic/PTI Model Forms
- Surveys for Client Relations/Alternative Fuel/Combined Cycle/Modeling information

Although the RARF will not create a single form, ERCOT is consolidating as many forms as possible into a single electronic format to serve as a common point of communication for information on Resources.

The current version of the RARF being released reflects the combination of:

- Zonal GARF and applicable addenda
- Generation Data Form Spreadsheet
- Combined Cycle Survey
- Portions of the Alternative Fuel Survey
- Additional network model data requests

Upon obtaining the RARFs from Resource Entities, ERCOT plans to keep the RARFs in a central repository so the files can be tracked and easily accessed by all ERCOT departments, as well as communicated back to the Resource Entity upon request.

2.0 Structure of Resource Asset Registration Form (RARF)

2.1 Tabs

To minimize data entry and the number of forms, the RARF is contains eight major sections:

1. Instruction Tab – contains general direction on completion and submitting RARF
2. Glossary Tab – contains details of definitions for the data elements being requested in the RARF
3. General Information Tab – contains general information about the physical address and site of the Resource(s) being registered in the RARF.
4. Generation Tab – form to be completed only by conventional Generation Resources that are not Load, Wind, Combined Cycle, or Block Load Transfer
5. Combined-Cycle Tab – form for Generation Resources that are interconnected by sharing a common steam turbine(s), which are specially modeled in ERCOT systems to reflect the interdependencies of dispatching the units as a logical train.
6. Wind Tab – form for Generation Resources registering Wind Turbines/Farms
7. Load Resources – form for registering Load Resources (both Controllable and non-Controllable Load Resources)
8. Block Load Transfers – not available in this version as the Block Load Transfers (BLT) are not being re-registered for nodal, but the BLT registration form will be part of the RARF.

For each Resource site, the RE will need to submit a RARF. One RARF should contain all the Generation Resources for each site. Additional RARFs are needed if there are more than 3 Combined Cycle Trains or 18 Generators at a single site. Please note the worksheet limit for Load Resources is 12 and is grouped by Resource Entity.

ERCOT programmatically imports the data from the RARFs to a repository, so modifying the rows/columns (including insertion and deletion of the rows) can result in data import errors. Please do not modify the format of the sheets.

2.2 Colors

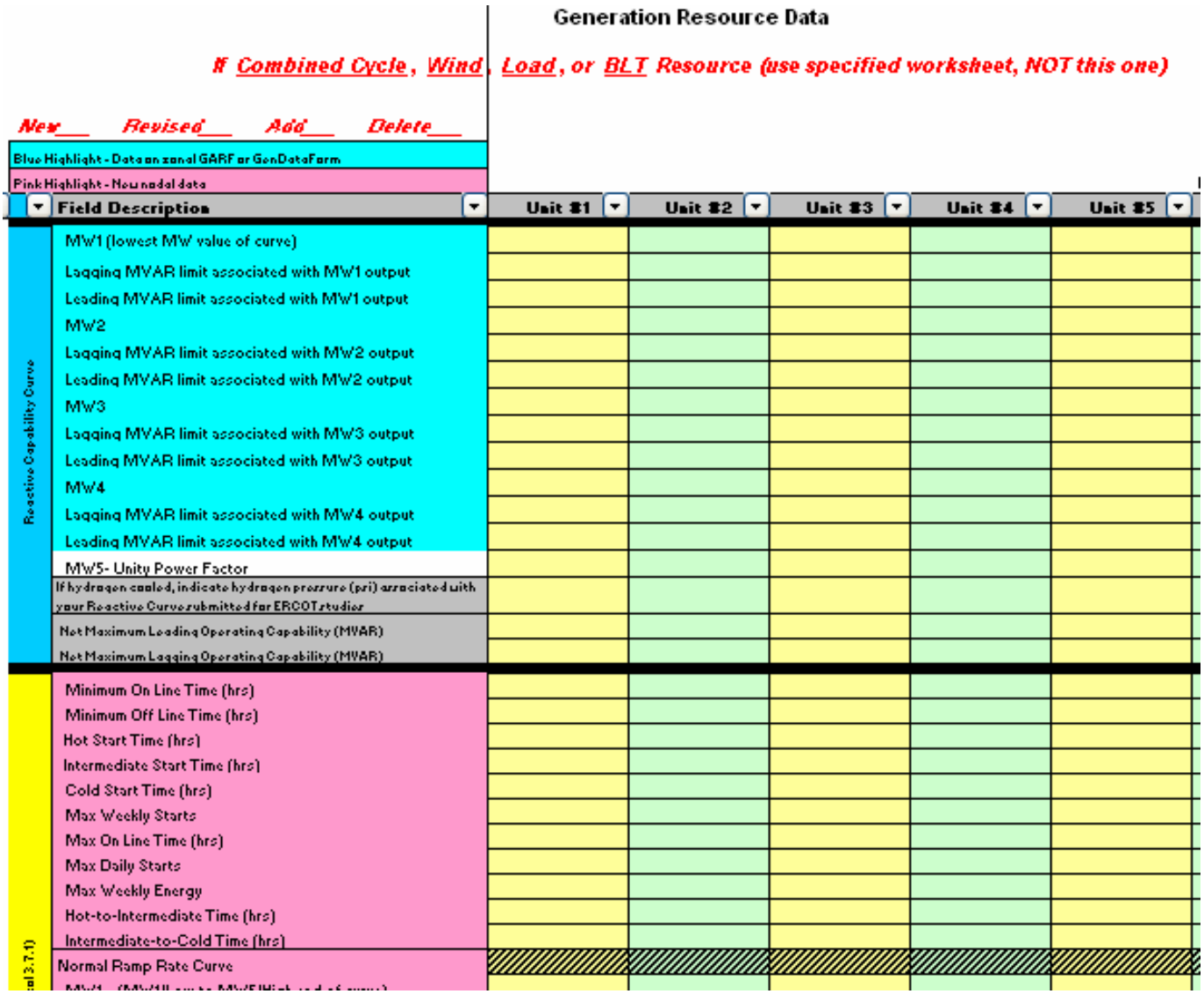
There are many colors used in the RARF, most of which are just to highlight different sections or tabs. However, there are some key definitions to the data requests. Figure 2-1, below, is a snapshot that shows the colors.

- Field descriptions highlighted in PINK reflect new data that is needed for the nodal market.
- Field descriptions highlighted in BLUE identify data elements that have previously been asked for on the GARF or LARF. To assist the RE in filling these fields out, ERCOT distributed the zonal GARF and LARF with the first RARF request.

- Field descriptions highlighted in GREY reflect planning and dynamics data that is not due with the November 9, 2007 submittal, but will need to be submitted prior to December 31, 2007.

- Field descriptions that are not colored are requests for data that is needed but cannot be directly tied to the old GARF, but are needed by ERCOT. This data would have been submitted on another Zonal form, such as the Generation Data Forms spreadsheet.

Figure 2-1: Snapshot of a RARF highlighting the colors



2.3 Quick Find

ERCOT has included fields to assist the RE in determining the data needed and the submittal date associated with the data. The left column of each Resource spreadsheet (B) contains a subset of data needed by ERCOT by due date. Figure 2-2 shows a snapshot of this feature.

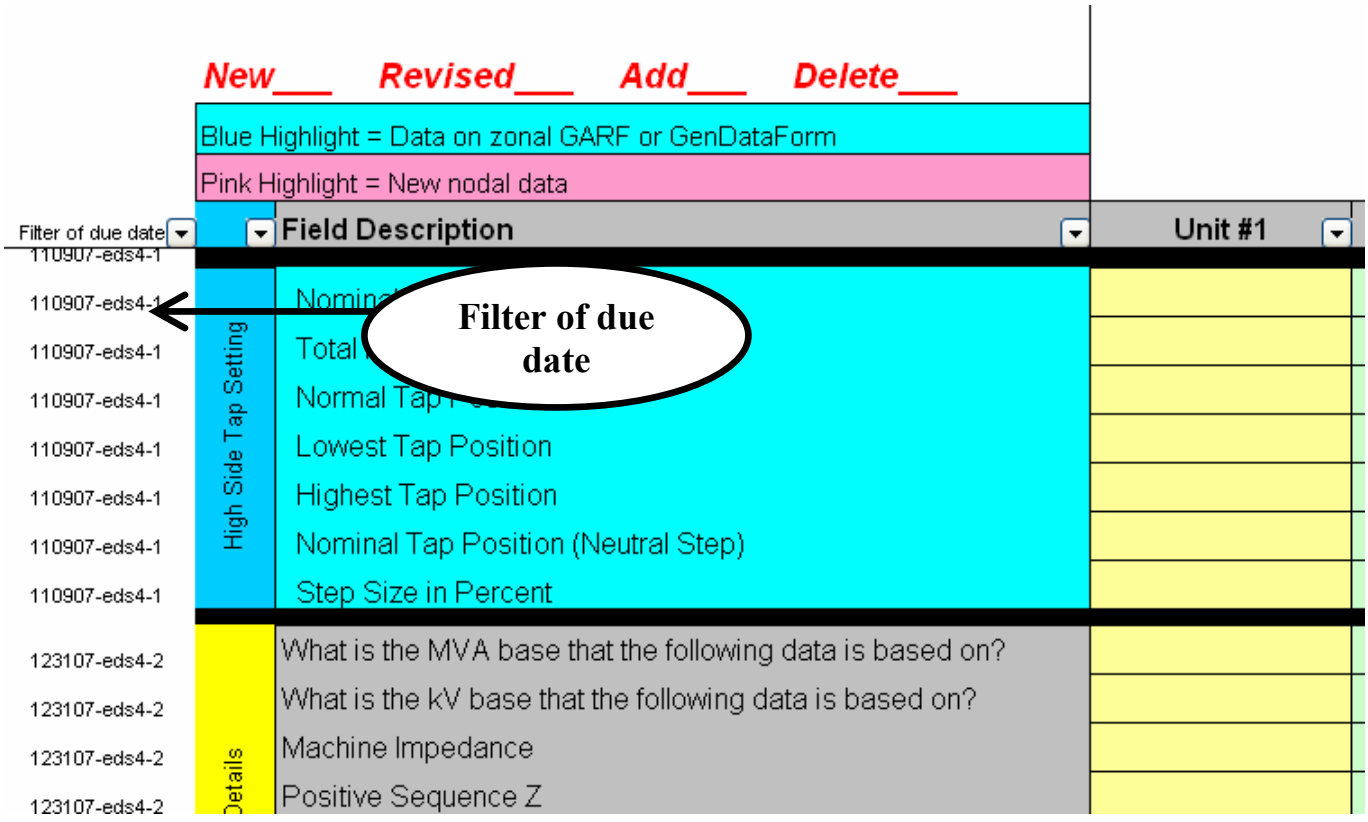
Filter of due date	Due to ERCOT
090407-eds3-1	Please ensure all data is filled out.
110907-eds4-1	Please submit this information before November 9, 2007.
123107-eds4-2	Please submit this information before December 31, 2007. ERCOT will request this data in November.

The best way to check the data by due date is to use the "find" feature of Excel (Ctrl F). Enter the date or the EDS string that you are interested in.

For your information, there are two hidden columns –one contains information that ERCOT uses to map the data to our database, and the other is empty. Also, the worksheets are locked.

If you do not see the "Filter of due date" column, please contact your account manager for assistance.

Figure 2-2: Snapshot of a RARF highlighting "Filter of due date" field



2.4 Glossary

For questions about what ERCOT is asking for, the RARF contains a glossary tab. It is still a draft, but it provides a list of requested fields and a corresponding definition/explanation of the requested information for most fields in the workbook. The glossary has been improved to contain a column that identifies the tab the data is being requested on (i.e. Generation, Combined Cycle, Wind, or Load). The glossary is also separated by sections which correspond to the sections on the different tabs, see Figure 2-3. A snapshot of the glossary is provided in Figure 2-4.

Figure 2-3: Snapshot of a RARF to show sections

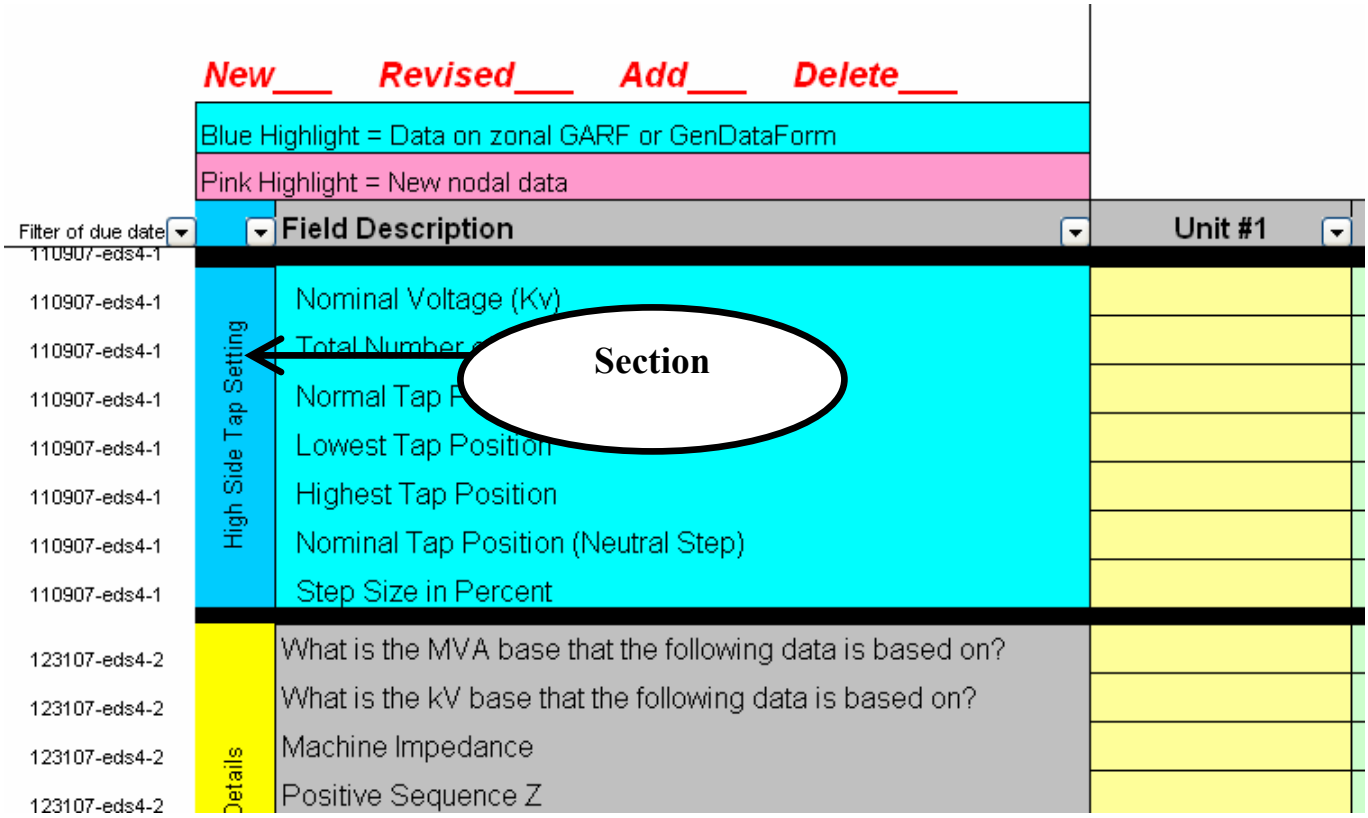
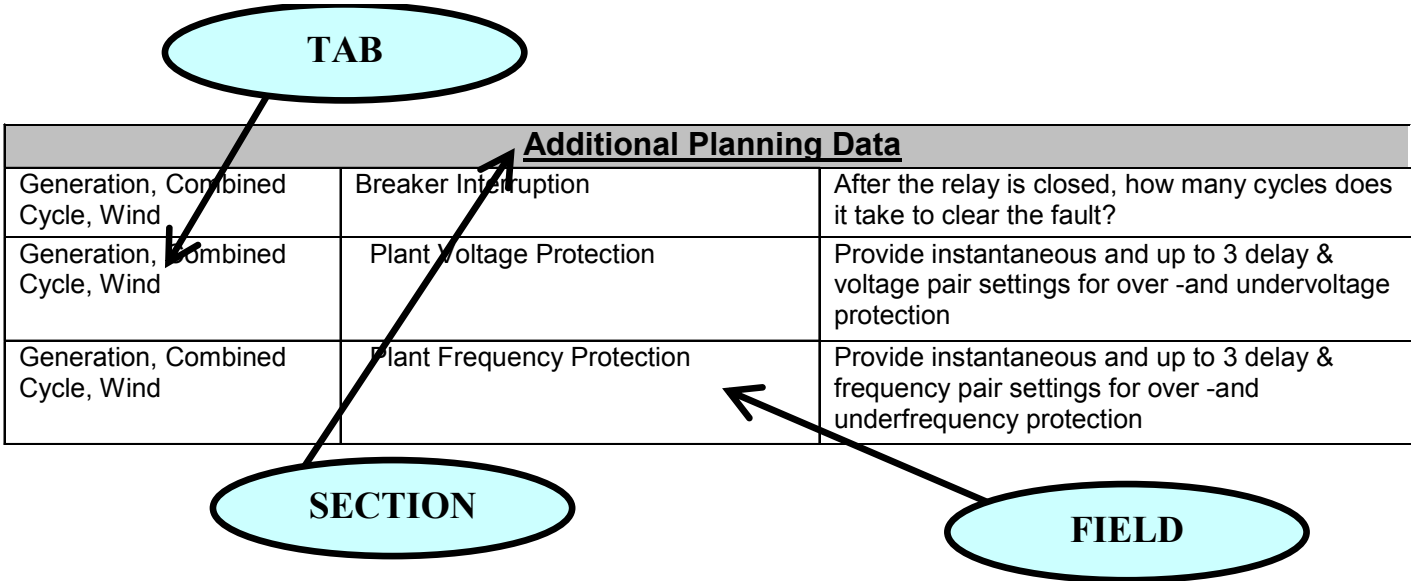


Figure 2-4: Snapshot of a RARF Glossary



Additional Planning Data		
Generation, Combined Cycle, Wind	Breaker Interruption	After the relay is closed, how many cycles does it take to clear the fault?
Generation, Combined Cycle, Wind	Plant Voltage Protection	Provide instantaneous and up to 3 delay & voltage pair settings for over -and undervoltage protection
Generation, Combined Cycle, Wind	Plant Frequency Protection	Provide instantaneous and up to 3 delay & frequency pair settings for over -and underfrequency protection

2.5 Plan for December 31 Submittal

The RARF due on December 31 should have all fields complete. ERCOT is keeping all the submitted data plus corrections made during testing. All Resources that have kept up with submittals and testing will have a pre-populated RARF to review and submit a as a certified RARF through the TML Service Request process in 2008.

3.0 General Information Tab

This tab is designed to contain the site-specific information. All REs are to complete this tab to ensure correct site data is applied to specific units.

Load Resources only need to fill out the Resource Entity, Authorized Rep, and Primary Contact as shown in Figure 3-1. The rest of the site information for Load Resources is located on the Load Resources tab.

Figure 3-1: Snapshot of RE and contact information section of General Information tab

Date Form Completed:	
Resource Entity Submitting Form:	
Resource Entity DUNS #:	

Authorized Representative	
Signature:	Not applicable for this version
Printed Name:	
Title:	
Phone Number:	
E-mail Address:	
Fax Number:	

Primary Contact	
Printed Name:	
Title:	
Phone Number:	
E-mail Address:	
Fax Number:	

All Generation Resources need to fill out all areas on this tab, shown above in Figure 3-1 and below in Figure 3-2. Items such as Station Code are determined by ERCOT in order to align with ERCOT systems.

Site Info (For Load Resources and Block Load Transfers, skip this section as this is repeated in individual entries on worksheet)	
Resource Site Name:	
Resource Site Code:	
Street Address:	
City:	
State:	
County:	
Site In-Service Date:	
Site Stop Service Date:	
Congestion Management Zone for 2003:	
Resource owned by NOIE? (Y/N):	
Is Resource behind a NOIE Settlement Meter Point? (Y,N):	
TDSP Providing Service To Resource:	
TDSP DUNS Number:	
ESI-ID (if answer to row 54 above is "No"):	
ERCOT Read (Y or N):	
Number of EPS Primary meters:	
Gen. Load Splitting (Y or N):	

Figure 3-2: Snapshot of Site Info off of General Information tab

4.0 Generation Resources Tab for Conventional Generation

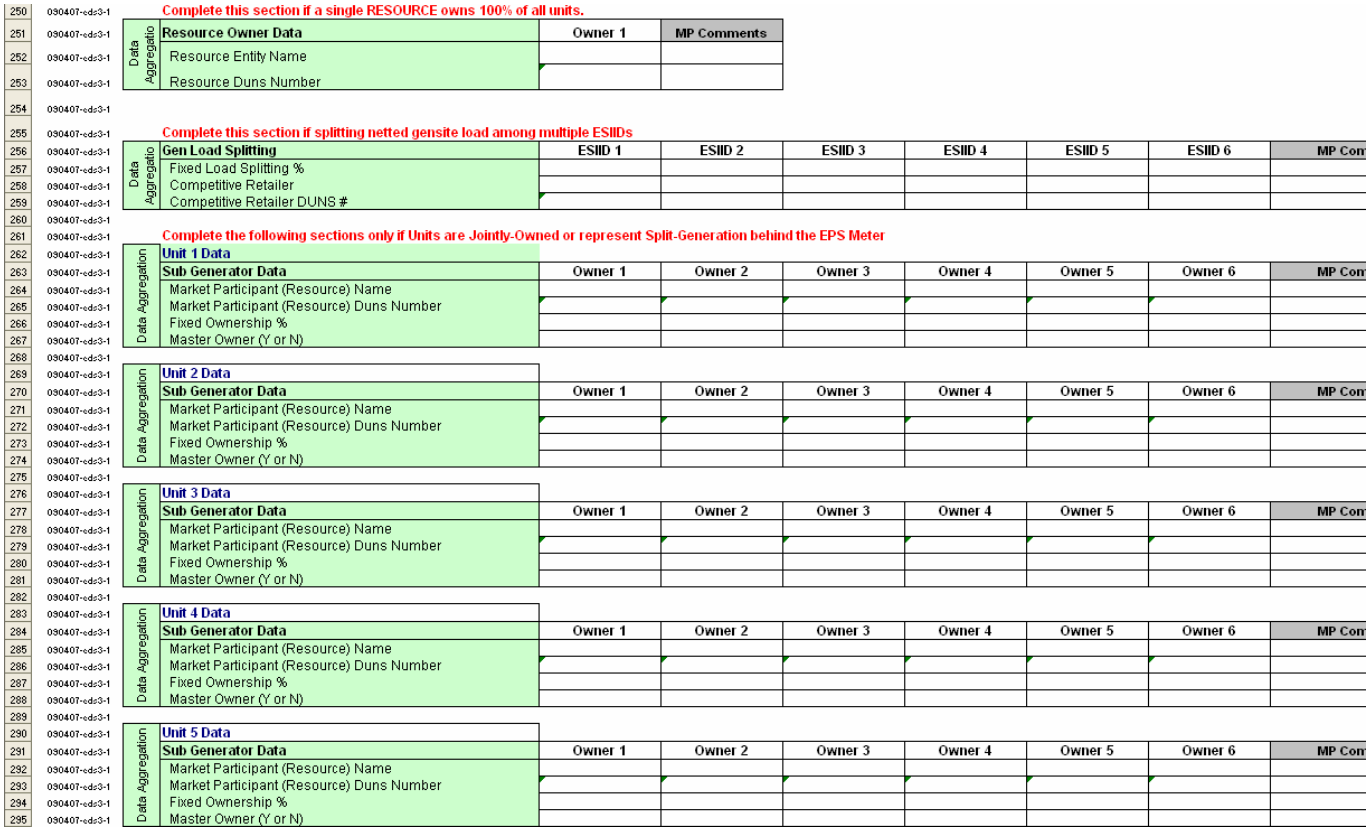
Generation Resource Entities with conventional generation (i.e. not Combined Cycle or Wind) should select the "Generation 1-6" tab and fill out all fields. The Gen 7-12 and Gen 13-18 tabs are only included if there are more than 6 conventional generation units at one site. Combined-Cycle and Wind resources should not use the Conventional Generation tab, but should instead use either the Combined-Cycle or Wind tabs, respectively.

Figure 4-1: Snapshot of Generator Unit Information section of Generation tab

		Pink Highlight = New nodal data						If you have more than 6 units,
Filter of due dat		Field Description	Unit #1	Unit #2	Unit #3	Unit #4	Unit #5	Unit #6	MP
030407-cds3-1	Generator Unit Information	Unit Name							
030407-cds3-1		Unit Code/Mnemonic							
030407-cds3-1		Unit Start Date							
110307-cds4-1		Unit End Date							
030407-cds3-1		Physical Unit Type							
110307-cds4-1		Primary Fuel Type							
110307-cds4-1		Secondary Fuel Type							
110307-cds4-1		Fuel Transportation Type							
110307-cds4-1		Renewable (Y/N)							
110307-cds4-1		Renewable/Offset							
030407-cds3-1		Resource Category							
030407-cds3-1		High Reasonability Limit (Max Net MW level)							
030407-cds3-1		Low Reasonability Limit (Min Net MW level)							
030407-cds3-1		High Reasonability Ramp Rate Limit (Max ramp MW/min)							
030407-cds3-1		Low Reasonability Ramp Rate Limit (Min ramp MW/min)							
030407-cds3-1		Qualifying Facility (Yes or No?)							
110307-cds4-1		Seasonal Net Max Sustainable MW Rating- Spring							
110307-cds4-1		Seasonal Net Min Sustainable MW Rating- Spring							
110307-cds4-1		Seasonal Net Max Emergency MW Rating- Spring							
110307-cds4-1		Seasonal Net Min Emergency MW Rating- Spring							
110307-cds4-1		Seasonal Net Max Sustainable MW Rating- Summer							
110307-cds4-1		Seasonal Net Min Sustainable MW Rating- Summer							
110307-cds4-1		Seasonal Net Max Emergency MW Rating- Summer							
110307-cds4-1		Seasonal Net Min Emergency MW Rating- Summer							
110307-cds4-1		Seasonal Net Max Sustainable MW Rating- Fall							
110307-cds4-1		Seasonal Net Min Sustainable MW Rating- Fall							
110307-cds4-1		Seasonal Net Max Emergency MW Rating- Fall							
110307-cds4-1		Seasonal Net Min Emergency MW Rating- Fall							
110307-cds4-1		Seasonal Net Max Sustainable MW Rating- Winter							
110307-cds4-1		Seasonal Net Min Sustainable MW Rating- Winter							
110307-cds4-1		Seasonal Net Max Emergency MW Rating- Winter							
110307-cds4-1		Seasonal Net Min Emergency MW Rating- Winter							
030407-cds3-1		Name Plate Rating (MVA)							
110307-cds4-1		Rating (MW)							
110307-cds4-1		Rating (MVA)							
110307-cds4-1		Unit kV							

Ownership information should also be complete. This section is found at the bottom of the Generation tab.

Figure 4-2: Snapshot of Ownership section of the Generation tab.



Complete this section if a single RESOURCE owns 100% of all units.

Data Aggregatio	Resource Owner Data	Owner 1	MP Comments
	Resource Entity Name		
	Resource Duns Number		

Complete this section if splitting netted gensite load among multiple ESIIDs

Data Aggregatio	Gen Load Splitting	ESIID 1	ESIID 2	ESIID 3	ESIID 4	ESIID 5	ESIID 6	MP Con
	Fixed Load Splitting %							
	Competitive Retailer							
	Competitive Retailer DUNS #							

Complete the following sections only if Units are Jointly-Owned or represent Split-Generation behind the EPS Meter

Unit 1 Data

Data Aggregation	Sub Generator Data	Owner 1	Owner 2	Owner 3	Owner 4	Owner 5	Owner 6	MP Con
	Market Participant (Resource) Name							
	Market Participant (Resource) Duns Number							
	Fixed Ownership %							
	Master Owner (Y or N)							

Unit 2 Data

Data Aggregation	Sub Generator Data	Owner 1	Owner 2	Owner 3	Owner 4	Owner 5	Owner 6	MP Con
	Market Participant (Resource) Name							
	Market Participant (Resource) Duns Number							
	Fixed Ownership %							
	Master Owner (Y or N)							

Unit 3 Data

Data Aggregation	Sub Generator Data	Owner 1	Owner 2	Owner 3	Owner 4	Owner 5	Owner 6	MP Con
	Market Participant (Resource) Name							
	Market Participant (Resource) Duns Number							
	Fixed Ownership %							
	Master Owner (Y or N)							

Unit 4 Data

Data Aggregation	Sub Generator Data	Owner 1	Owner 2	Owner 3	Owner 4	Owner 5	Owner 6	MP Con
	Market Participant (Resource) Name							
	Market Participant (Resource) Duns Number							
	Fixed Ownership %							
	Master Owner (Y or N)							

Unit 5 Data

Data Aggregation	Sub Generator Data	Owner 1	Owner 2	Owner 3	Owner 4	Owner 5	Owner 6	MP Con
	Market Participant (Resource) Name							
	Market Participant (Resource) Duns Number							
	Fixed Ownership %							
	Master Owner (Y or N)							

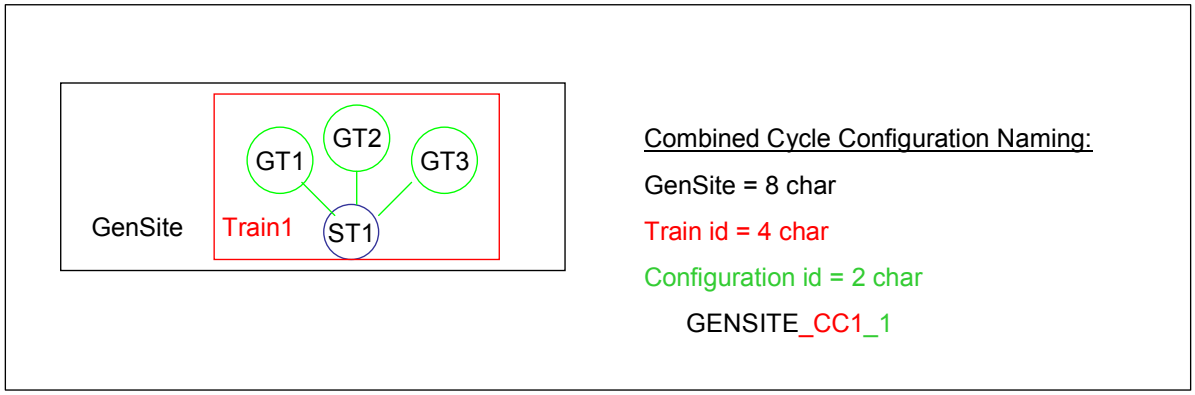
5.0 Combined Cycle Resources Tab

Generation Resource Entities with combined cycle generation units should select the "Combined Cycle Train 1" tab and fill out all fields. If there are multiple trains, then a separate tab (CC Train 2, CC Train 3) needs to be completed for each train. If there are more than three trains at one site, please submit an additional RARF.

In the Nodal system, combined-cycle resources will not be registered in ERCOT systems as jointly owned/split generation. These resources will be modeled either as individual units with multiple owners or combined-cycle with one owner.

A combined cycle train included Generation Resources that are interconnected by sharing a common steam turbine(s). These resources are specially modeled in ERCOT systems to reflect the interdependencies of dispatching the units as a logical train. Naming of the units, trains, and configurations will be done by ERCOT. The general naming convention is shown in figure 5-1.

Figure 5-1: CC Train and Configuration Naming



Combined Cycle (CC) resources can submit different configurations on the RARF. Currently, the CC configuration limit is set by the number of units in the train. A CC train with 3 units would be able to submit 3 operating configurations. For more information on Combined Cycles, please reference the CC whitepaper *White Paper - Combined Cycle v1.0,* located at http://nodal.ercot.com/readiness/rq/documents/index.html.

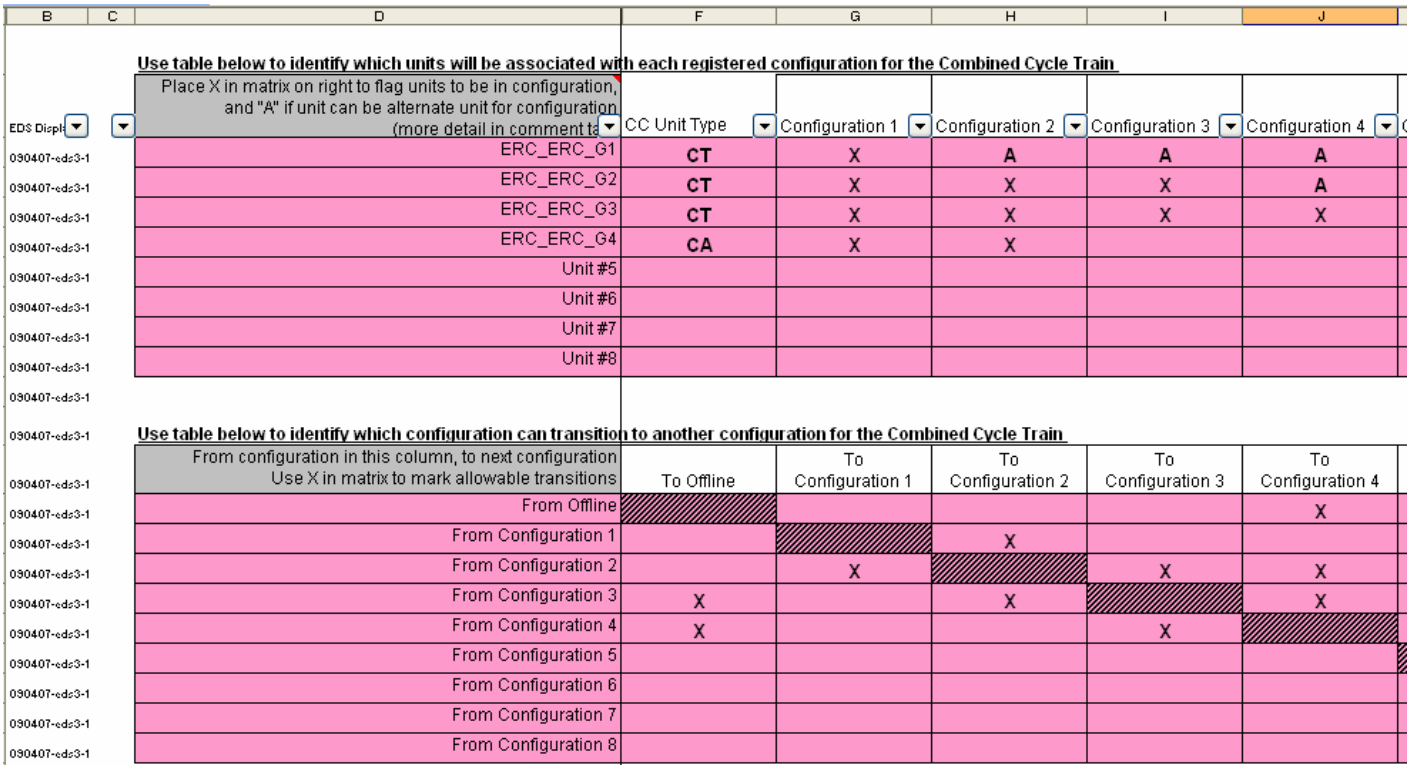
Instead of duct burners or other optional CC augmentations being modeled as a separate unit, limits on the RARF should include these options and should address reductions to these limits in the Current Operating Plan (COP). In the RARF, ERCOT needs to know if these optional features exist, so they are Y/N questions. See Figure 5-2 for CC train information. The names are assigned by ERCOT in accordance with ERCOT systems.

Figure 5-2: Combined Cycle

Field Description	CombCycle Train
Name of Combined Cycle Train	CC1
Mnemonic for Combined Cycle Train	ERC_CC1
Unit Start Date	1/1/2001
Unit End Date	2090
Fuel Transportation Type	PL
Resource Category	Combined Cycle > 90 MW*
Qualifying Facility (Y/N)?	N
Is train augmented with Duct Burner(s)?	Y
Is train augmented with Evap Cooler(s)?	N
Is train augmented with Chiller(s)?	N
Other augmentation (place in comments)?	N

Figure 5-3 shows the configuration section for a CC unit. This unit has three combustion turbines and one steam turbine. Looking at the first section in this example, Configuration 1 shows all units operational. Configuration 2 shows three units operational (with one alternate). Configuration 3 shows two units (and one alternate) operational. The second section in Figure 5-3 shows potential transitions from one configuration to another.

Figure 5-3: Snapshot of Combined Cycle Configuration



Use table below to identify which units will be associated with each registered configuration for the Combined Cycle Train

EDS DispH	Place X in matrix on right to flag units to be in configuration, and "A" if unit can be alternate unit for configuration (more detail in comment ta	CC Unit Type	Configuration 1	Configuration 2	Configuration 3	Configuration 4
090407-eds3-1	ERC_ERC_G1	CT	X	A	A	A
090407-eds3-1	ERC_ERC_G2	CT	X	X	X	A
090407-eds3-1	ERC_ERC_G3	CT	X	X	X	X
090407-eds3-1	ERC_ERC_G4	CA	X	X		
090407-eds3-1	Unit #5					
090407-eds3-1	Unit #6					
090407-eds3-1	Unit #7					
090407-eds3-1	Unit #8					

Use table below to identify which configuration can transition to another configuration for the Combined Cycle Train

From configuration in this column, to next configuration Use X in matrix to mark allowable transitions	To Offline	To Configuration 1	To Configuration 2	To Configuration 3	To Configuration 4
From Offline					X
From Configuration 1			X		
From Configuration 2		X		X	X
From Configuration 3	X		X		X
From Configuration 4	X			X	
From Configuration 5					
From Configuration 6					
From Configuration 7					
From Configuration 8					

Each unit of a CC train needs to have its individual unit parameters entered into the RARF. Samples of these are shown in Figure 5-4. Data such as seasonal ratings and ramp rates are also needed for each configuration to the right of the unit data.

Figure 5-4: Snapshot of Combined Cycle Unit Data

		Field Description	Unit #1	Unit #2	Unit #3	Unit #4	Unit #5	Unit #6	Unit #7	Unit #8	Config 1	Confi
	Generator Unit Information	Unit Name	ERC_G1	ERC_G2	ERC_G3	ERC_G4						
		Unit Code/Mnemonic	ERC_ERC_G1	ERC_ERC_G2	ERC_ERC_G3	ERC_ERC_G4						
		Unit Start Date	3/1/1982	3/1/1982	3/1/2005	3/1/1982						
		Unit End Date										
		Physical Unit Type	CT	CT	CT	CA						
		Primary Fuel Type	MTE	MTE		STM						
		Secondary Fuel Type	X	X	NA	NA						
		High Reasonability Limit (Max Net MW level)	85	85	100	90					250	200
		Low Reasonability Limit (Min Net MW level)	30	30	15	30					0	0
		High Reasonability Ramp Rate Limit (Max ramp MW/min)	4	4	4	4					10	8
		Low Reasonability Ramp Rate Limit (Min ramp MW/min)	0	0	0	0					0	0
		Seasonal Net Max Sustainable MW Rating- Spring										
		Seasonal Net Min Sustainable MW Rating- Spring										
		Seasonal Net Max Emergency MW Rating- Spring										
		Seasonal Net Min Emergency MW Rating- Spring										
		Seasonal Net Max Sustainable MW Rating- Summer										
		Seasonal Net Min Sustainable MW Rating- Summer										
		Seasonal Net Max Emergency MW Rating- Summer										
		Seasonal Net Min Emergency MW Rating- Summer										
		Seasonal Net Max Sustainable MW Rating- Fall										
		Seasonal Net Min Sustainable MW Rating- Fall										
		Seasonal Net Max Emergency MW Rating- Fall										
		Seasonal Net Min Emergency MW Rating- Fall										
		Seasonal Net Max Sustainable MW Rating- Winter										
		Seasonal Net Min Sustainable MW Rating- Winter										
		Seasonal Net Max Emergency MW Rating- Winter										
		Seasonal Net Min Emergency MW Rating- Winter										
		Name Plate Rating (MVA)	115.75	115.75	90.875	96						
		Rating (MW)	74	74	89.17	80						
		Rating (MVAR)	30	30	55.71	30						
		Unit KV										
	GenForm.xls)	Private Network (Y or N)	Y	Y	Y	Y						
		Average Amount of Self-Serve private load (MW)	235	235	235	235						
		Expected Typical Private Network Net Interchange (MW)										
		Private Network Gross Unit Capability (MVAR)										
		If Unit trips, does Load trip?	N	N	N	N						

6.0 Wind Resources Tab

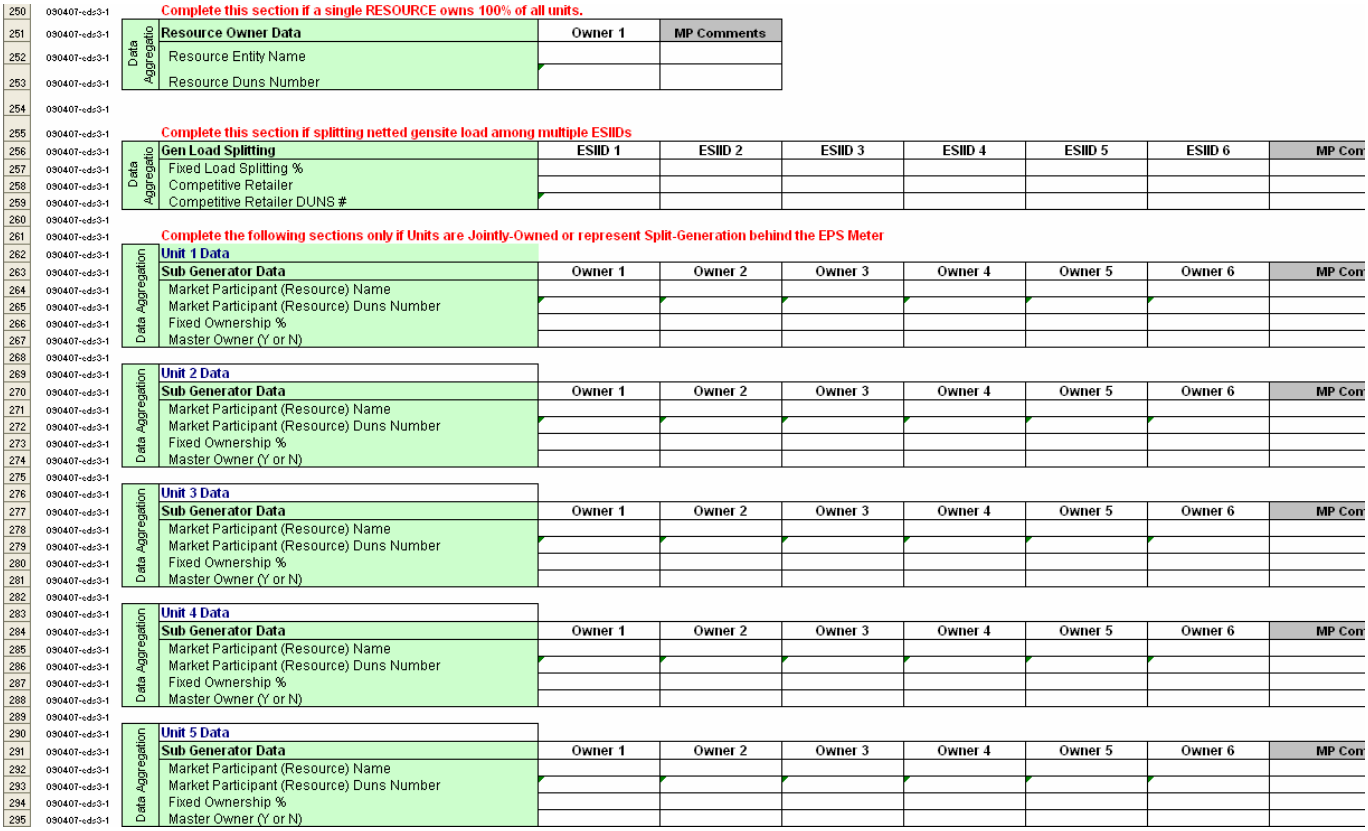
Wind Generation Resources should select the "Wind" tab and fill out all fields. If there are more than six units, please submit an additional RARF.

Figure 6-1: Snapshot of Generation Unit Information of the Wind tab

Generator Unit Information	Field Description	Unit #1	Unit #2	Unit #3
	Unit Name			
	Unit Code			
	Unit Start Date			
	Unit End Date			
	Physical Unit Type			
	Renewable (Y/N)			
	Renewable/Offset			
	Resource Category			
	High Reasonability Limit (Max MW level)			
	Low Reasonability Limit (Min MW level)			
	High Reasonability Ramp Rate Limit (Max ramp MW/min)			
	Low Reasonability Ramp Rate Limit (Min ramp MW/min)			
	Latitude of center of Wind Farm (decimal degrees)			
	Longitude of center of Wind Farm (decimal degrees)			
	Total Number of Turbines			
	Please provide # Turbines by Equipment Type			
	Group 1- Type of Turbines (Manufacturer/Model)			
	Group 1- Number of this type of Turbine			
	Group 2- Type of Turbines (Manufacturer/Model)			
	Group 2- Number of this type of Turbine			
	Group 3- Type of Turbines (Manufacturer/Model)			
	Group 3- Number of this type of Turbine			
	Group 4- Type of Turbines (Manufacturer/Model)			
	Group 4- Number of this type of Turbine			
	Group 5- Type of Turbines (Manufacturer/Model)			
	Group 5- Number of this type of Turbine			
	Average Height above ground of Turbine Hub (meters)			
	Latitude of Meteorological Tower (decimal degrees)			
	Longitude of Meteorological Tower (decimal degrees)			
	Height of Meteorological Tower Instrumentation (meters)			
	Include Manufacturer's Curve (Capability Curve)			
	Eligible for McCamey Flowgate Rights (MCFRIs)?			
	Qualifying Facility (Yes or No?)			
	Seasonal Net Max Sustainable MW Rating- Spring			
	Seasonal Net Min Sustainable MW Rating- Spring			
	Seasonal Net Max Emergency MW Rating- Spring			
	Seasonal Net Min Emergency MW Rating- Spring			
	Seasonal Net Max Sustainable MW Rating- Summer			
	Seasonal Net Min Sustainable MW Rating- Summer			
	Seasonal Net Max Emergency MW Rating- Summer			
	Seasonal Net Min Emergency MW Rating- Summer			
	Seasonal Net Max Sustainable MW Rating- Fall			
	Seasonal Net Min Sustainable MW Rating- Fall			
	Seasonal Net Max Emergency MW Rating- Fall			
	Seasonal Net Min Emergency MW Rating- Fall			
	Seasonal Net Max Sustainable MW Rating- Winter			
	Seasonal Net Min Sustainable MW Rating- Winter			
	Seasonal Net Max Emergency MW Rating- Winter			
	Seasonal Net Min Emergency MW Rating- Winter			

Ownership information should also be complete. This section is found at the bottom of the wind tab.

Figure 6-2: Snapshot of Ownership section of the Wind tab.



250	090407-eds3-1		Complete this section if a single RESOURCE owns 100% of all units.							
251	090407-eds3-1	Data Aggregatio	Resource Owner Data	Owner 1	MP Comments					
252	090407-eds3-1		Resource Entity Name							
253	090407-eds3-1		Resource Duns Number							
254	090407-eds3-1									
255	090407-eds3-1		Complete this section if splitting netted gensite load among multiple ESIIDs							
256	090407-eds3-1	Data Aggregatio	Gen Load Splitting	ESIID 1	ESIID 2	ESIID 3	ESIID 4	ESIID 5	ESIID 6	MP Com
257	090407-eds3-1		Fixed Load Splitting %							
258	090407-eds3-1		Competitive Retailer							
259	090407-eds3-1		Competitive Retailer DUNS #							
260	090407-eds3-1									
261	090407-eds3-1		Complete the following sections only if Units are Jointly-Owned or represent Split-Generation behind the EPS Meter							
262	090407-eds3-1	Data Aggregation	Unit 1 Data							
263	090407-eds3-1		Sub Generator Data	Owner 1	Owner 2	Owner 3	Owner 4	Owner 5	Owner 6	MP Com
264	090407-eds3-1		Market Participant (Resource) Name							
265	090407-eds3-1		Market Participant (Resource) Duns Number							
266	090407-eds3-1		Fixed Ownership %							
267	090407-eds3-1		Master Owner (Y or N)							
268	090407-eds3-1									
269	090407-eds3-1	Data Aggregation	Unit 2 Data							
270	090407-eds3-1		Sub Generator Data	Owner 1	Owner 2	Owner 3	Owner 4	Owner 5	Owner 6	MP Com
271	090407-eds3-1		Market Participant (Resource) Name							
272	090407-eds3-1		Market Participant (Resource) Duns Number							
273	090407-eds3-1		Fixed Ownership %							
274	090407-eds3-1		Master Owner (Y or N)							
275	090407-eds3-1									
276	090407-eds3-1	Data Aggregation	Unit 3 Data							
277	090407-eds3-1		Sub Generator Data	Owner 1	Owner 2	Owner 3	Owner 4	Owner 5	Owner 6	MP Com
278	090407-eds3-1		Market Participant (Resource) Name							
279	090407-eds3-1		Market Participant (Resource) Duns Number							
280	090407-eds3-1		Fixed Ownership %							
281	090407-eds3-1		Master Owner (Y or N)							
282	090407-eds3-1									
283	090407-eds3-1	Data Aggregation	Unit 4 Data							
284	090407-eds3-1		Sub Generator Data	Owner 1	Owner 2	Owner 3	Owner 4	Owner 5	Owner 6	MP Com
285	090407-eds3-1		Market Participant (Resource) Name							
286	090407-eds3-1		Market Participant (Resource) Duns Number							
287	090407-eds3-1		Fixed Ownership %							
288	090407-eds3-1		Master Owner (Y or N)							
289	090407-eds3-1									
290	090407-eds3-1	Data Aggregation	Unit 5 Data							
291	090407-eds3-1		Sub Generator Data	Owner 1	Owner 2	Owner 3	Owner 4	Owner 5	Owner 6	MP Com
292	090407-eds3-1		Market Participant (Resource) Name							
293	090407-eds3-1		Market Participant (Resource) Duns Number							
294	090407-eds3-1		Fixed Ownership %							
295	090407-eds3-1		Master Owner (Y or N)							

7.0 Load Resources Tab

Resource Entities with Load Resources should select the "Load Resources" tab and fill out all fields. If there are more than 12 load points, please submit an additional RARF.

Figure 7-1: Snapshot of Load Resource tab

		Field Description	Load Point #1	Load Point #2	Load P
		New___ Revised___ Add___ Delete___			
		Blue Highlight = Data on zonal GARF			
		Pink Highlight = New nodal data			
ED		Field Description	Load Point #1	Load Point #2	Load P
eds3-1	Load Resource Information	Name of End Use Customer			
eds3-1		Common Name for Load Resource			
		Physical Street Address for point of Delivery (POD)			
		Name of City for Point of Delivery (POD)			
eds3-1		Is Load Netted From Generation at ERCOT Read Gensite? (Y/N)			
eds3-1		Is Load Behind a NOIE Settlement Meter Point? (Y/N)			
eds3-1		Load Resource Type (CLR/UFR/Interruptible)			
		If CLR, will CLR be Dynamically Scheduling? (Y/N)			
eds3-1		Dispatch Asset Code (provided by ERCOT)			
eds3-1		Load Resource Effective Date			
		Load Resource Expiration Date			
eds3-1		Substation Name for POD			
eds3-1		Substation Code for POD			
eds3-1		ESIID Station Name			
eds3-1		ESIID Station Code			
eds3-1		Transmission Bus POD (PTI Bus No)			
		Voltage Level of Telemetered load(s)			
		Meter Reading Entity (TDSP)			
		Meter Reading Entity Duns Number			
eds3-1		QSE Name			
eds3-1		QSE Duns Number			
		ESI-ID assigned to meter			
		Wholesale Delivery Point? (Y/N)			
		Notice Requirements to Interrupt			
		High Set Under-frequency Relay Setting (Hz)			
		Load Resource Control Device (Control Technology / Interruptible Switch / Circuit Breaker)			
eds3-1		If CLR, ability to operate as a UFR type Resource? (Y/N)			
		ERCOT Load Zone			
		Maximum POD Total Load			
		Summer (Interruptible MW)			
		Winter (Interruptible MW)			
eds3-1		High Reasonability Limit (Max MW level)			
eds3-1		Low Reasonability Limit (Min MW level)			
eds3-1		CLR High Reasonability Ramp Rate Limit (Max ramp MW/min)			
eds3-1		CLR Low Reasonability Ramp Rate Limit (Min ramp MW/min)			

8.0 Private Networks

Private Use Networks that are not running in a combined cycle configuration shall register individual units rather than aggregating those units. To register individual units, the "Generation X-X" tabs should be utilized. For Private-Use Networks that are CC, the Combined Cyle-Train1/2/3 tabs should be used.

Additional data is required of Private Networks – most of which is due in December. See Figure 8-1 for a snapshot of the particular Private Network information that is needed in addition to the Generation and/or Combined Cycle tabs. ERCOT will be working with Private Networks to ensure the units are defined appropriately.

Figure 8-1: Information for Private Networks Only

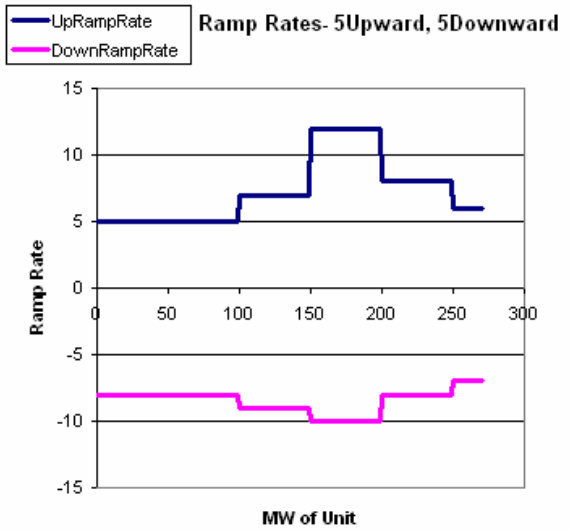
Private Network Section (previously on GenForm.)	
	Private Network (Y or N)
	Average Amount of Self-Serve private load (MW)
	Expected Typical Private Network Net Interchange (MW)
	Private Network Gross Unit Capability (MW)
	If Unit trips, does Load trip?
	If yes, approximate MW of Load that will trip?
	Load Characteristics:
	--Large Motor, percent of total MW load
	-Small Motor, percent of total MW load
	-Resistive (Heating) Load, percent of total MW load
	-Discharge Lighting, percent of total MW load
	-Other, percent of total MW load
	--Large Motor, percent of total MVAR load
	-Small Motor, percent of total MVAR load
	-Resistive (Heating) Load, percent of total MVAR load
	-Discharge Lighting, percent of total MVAR load
	-Other, percent of total MVAR load

9.0 Ramp Rates

Ramp rates are initially submitted in the RARF. QSEs will be able to update the ramp rates in Market Management System (MMS). These ramp rates will be in the up and down directions and passed from MMS to Energy Management System (EMS) to be used in the Resource Limit Calculator (RLC). Please note these ramp rates are treated as step functions rather than being interpolated into a curve. All ramp rate values, including downward rates, should be entered in the RARF as positive values.

Figure 9-1: Ramp Rate Example

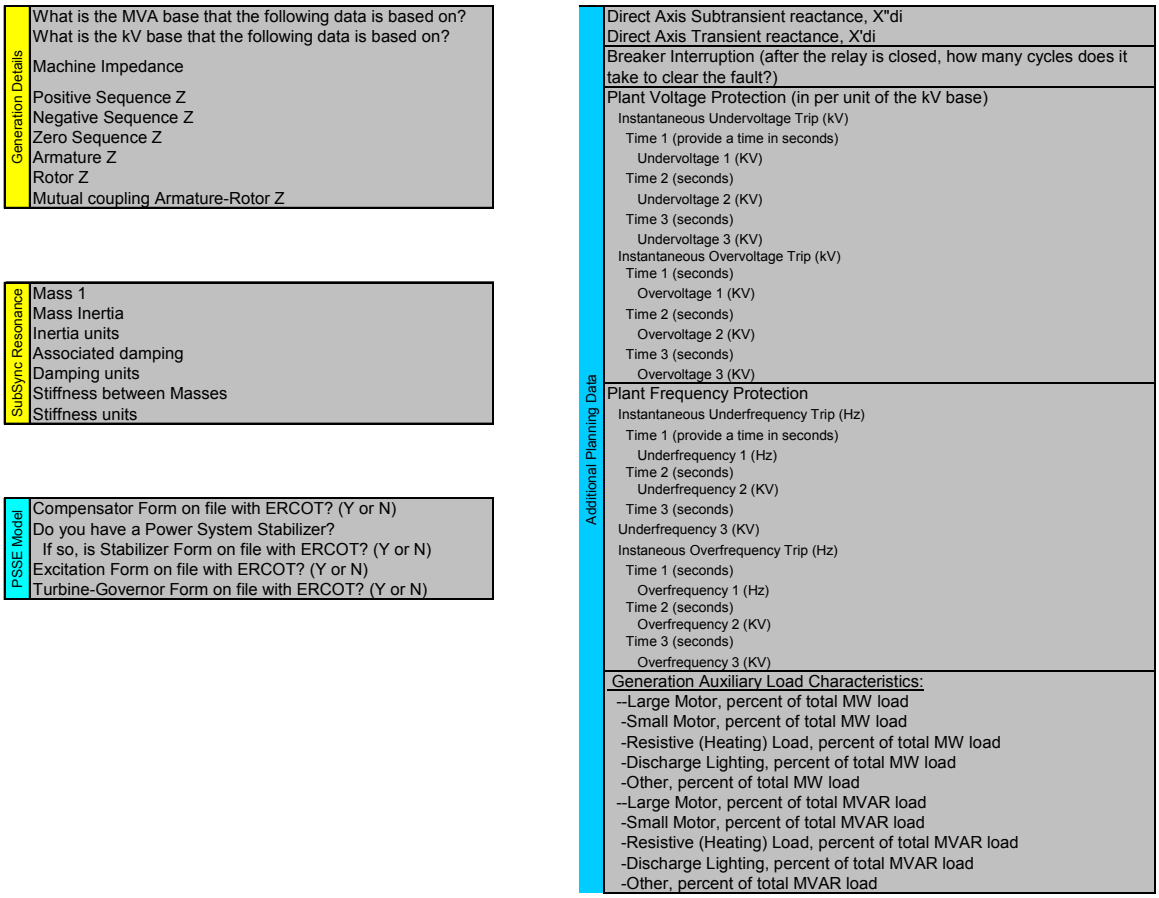
Normal Ramp Rate Curve	
MW1 (MW1/Low to MW5/High end of curve)	50
Upward RampRate1 (MW/minute)	5
Downward RampRate1 (MW/minute)	8
MW2	100
Upward RampRate2 (MW/minute)	7
Downward RampRate2 (MW/minute)	9
MW3	150
Upward RampRate3 (MW/minute)	12
Downward RampRate3 (MW/minute)	10
MW4	200
Upward RampRate4 (MW/minute)	8
Downward RampRate4 (MW/minute)	8
MW5	250
Upward RampRate5 (MW/minute)	6
Downward RampRate5 (MW/minute)	7
Emergency Ramp Rate Curve	



10.0 Planning and Modeling Data

For all Generation Resource, ERCOT is requesting additional planning data in gray to be submitted by December 31, 2007. ERCOT has included all known data requirements in the current RARF. Additional data may be requested, most likely as an addendum. All data will be submitted to the RE in a final form in 2008 for final review and to be signed by the Authorized Representative.

Figure 10-1: Some of the additional planning data



11.0 D-Curve

The Reactive Capability Curve, also known as the D-curve, represents the operating limits of the generator. ERCOT is asking for nine points of information, as well as copies of the curves, in order to recreate the curve. Figure 11-1 contains a sample of a D-curve. Figure 11-2 contains a possible entry into the RARF from this D-curve.

Please note: the positive VARs are "lagging" and the negative VARs are "leading". When entering this information in the RARF, please use positive and negative numbers as shown in the example in Figure 11-2.

Figure 11-1: Sample D-curve

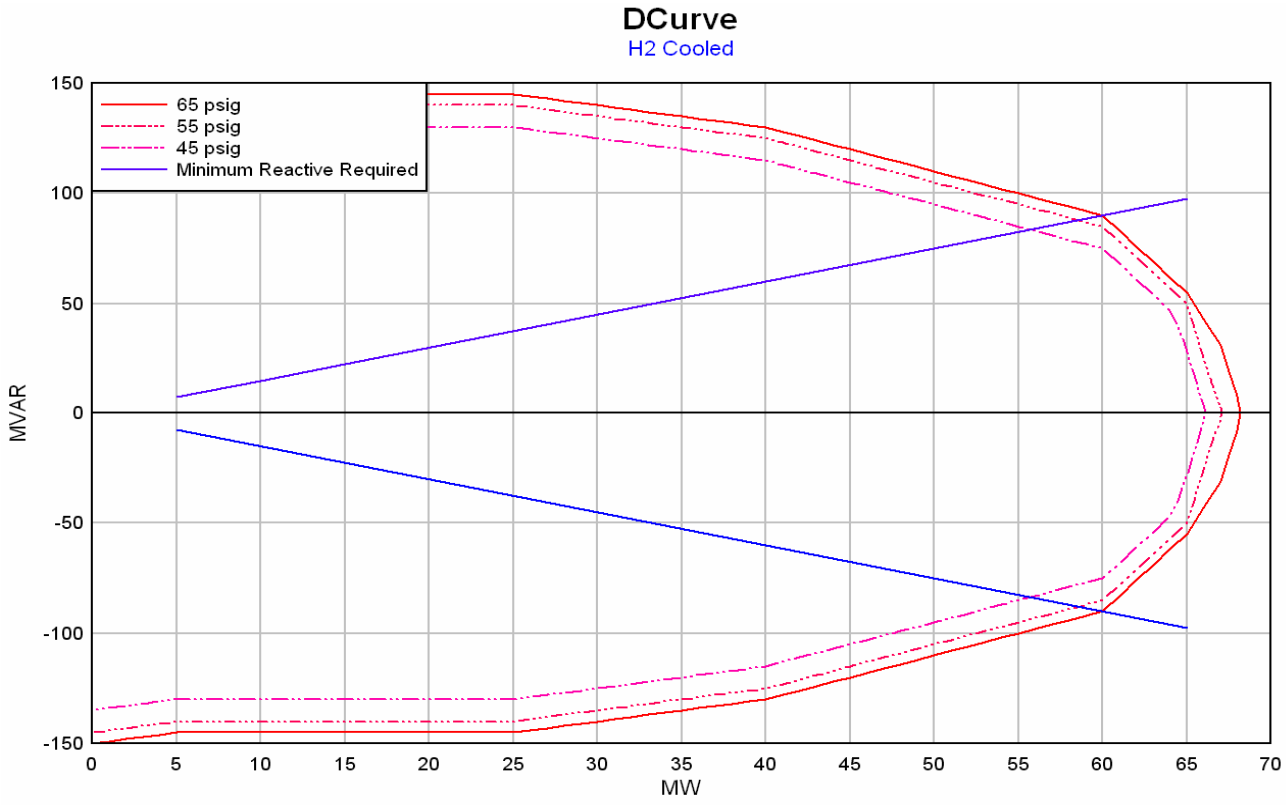


Figure 11-2: Sample RARF entry

Field Description	Unit #1
MW1 *(lowest MW value of curve – minimum operating MW output)*	18
Lagging MVAR limit associated with MW1 output	145
Leading MVAR limit associated with MW1 output	-145
MW2 *(midpoint (50%) between MW1 and MW5)*	38
Lagging MVAR limit associated with MW2 output	130
Leading MVAR limit associated with MW2 output	-130
MW3 *(seventy-fifth percentile (75%) between MW1 and MW5)*	48
Lagging MVAR limit associated with MW3 output	115
Leading MVAR limit associated with MW3 output	-115
MW4 *(between MW3 and MW 5 - breakpoint of curve)*	60
Lagging MVAR limit associated with MW4 output	80
Leading MVAR limit associated with MW4 output	-80
MW5- Unity Power Factor	68
If hydrogen cooled, indicate hydrogen pressure (psi) associated with your Reactive Curve submitted for ERCOT studies	65

12.0 Transformer

Much of the step-up transformer information is available in the ERCOT Branch Data file, which is available from the secure Operations and System Planning Data website, in the Operations Model folder. Please be aware this is a very, very large file.

For Wind Generation, this form requires only step-up transformers to the ERCOT transmission lines at 60kV or above.

The Transformer name is in the ERCOT Branch Data file. The information is requested in per-unit. In order to calculate per-unit data, the MVA and KV base must be known. The per-unit data should be calculated with a 100MVA base, and the KV base needs to be submitted. Additional information on the Conductance, Susceptance and MVA ratings can be found in the Glossary (see the Appendix).

N/W Model Transformer Data	
	Step-Up Transformer Name (all data in 100MVA base) (if multiple transformers, attach supporting data)
	Provide kV Base
	High Voltage Limit (no-load ~~tap~~)
	Low Voltage Limit (no-load ~~tap~~)
	Series Resistance
	Series Reactance
	Shunt Magnetizing Conductance
	Shunt Magnetizing Susceptance
	Normal Rating MVA
	Emergency Rating MVA
	Loadshed Rating MVA
	Load Tap Changer (Y/N)

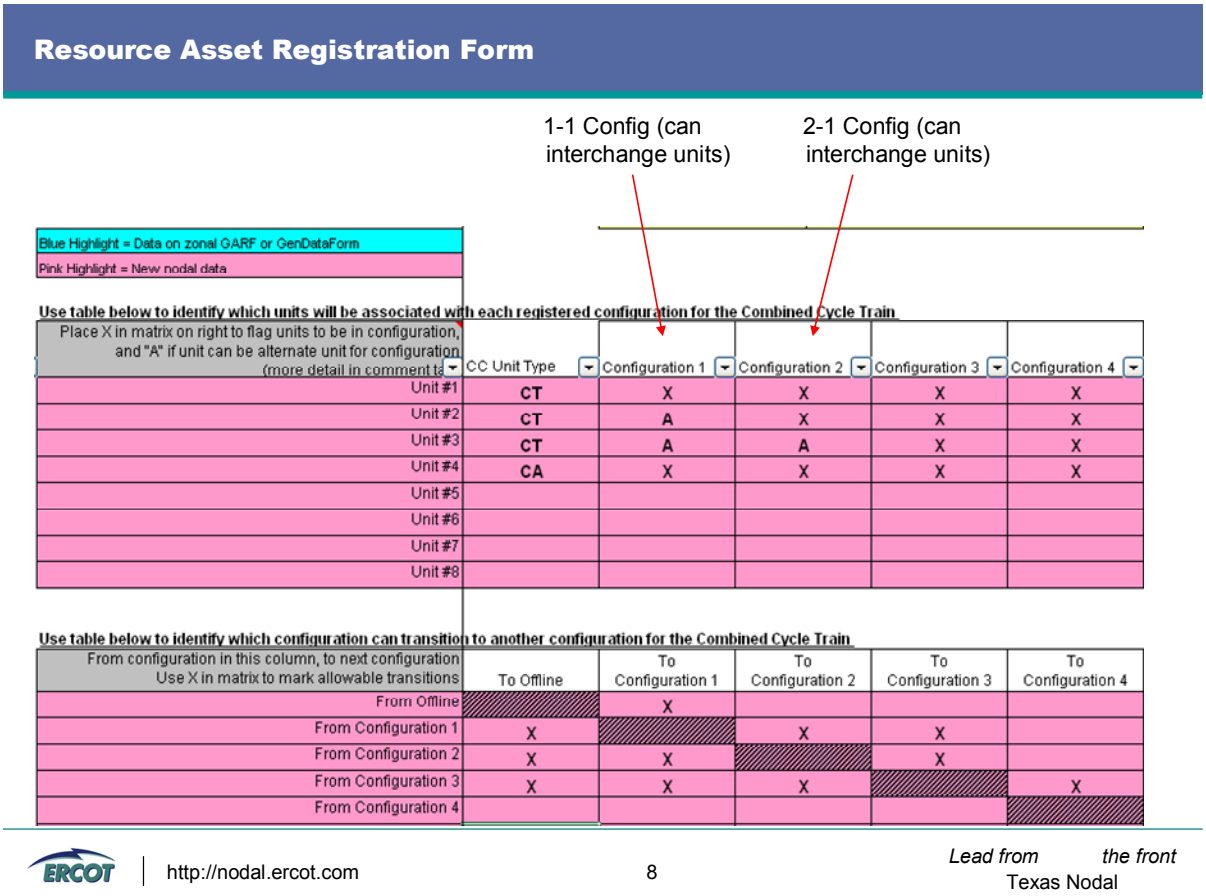
Transformers typically only have a Load Tap Changer on one side of the unit. In this case, please enter the values for the side of the transformer with the LTC – either High Side (high voltage side) or Low Side (low voltage side). Please leave blank or use N/A for any transformers without LTC and for the side that doesn't have an LTC.

Low Side Tap Setting	Nominal Voltage (Kv)
	Total Number of Tap Positions
	Normal Tap Position
	Lowest Tap Position
	Highest Tap Position
	Nominal Tap Position (Neutral Step)
	Step Size in Percent
High Side Tap Setting	Nominal Voltage (Kv)
	Total Number of Tap Positions
	Normal Tap Position
	Lowest Tap Position
	Highest Tap Position
	Nominal Tap Position (Neutral Step)
	Step Size in Percent

13.0 Appendix

13.1 Combined Cycle Configuration Example

Instructions: Place X in matrix on right to flag units to be in configuration, and "A" if unit can be alternate unit for configuration. Alternate units must be of the same Unit Type as one of the selected "X" units.



Alternate Unit Example: CC1 – Limited Flexibility of Train

In the form below the alternate designation "A" has been used to indicate that specific units can be substituted for others. However, configurations 1, 2, and 3 all result in the same configuration since the alternate unit can substitute for any other GT units. The ST can never be an "A" as there is no other unit of the same type on this train. Note – for clarity purposes, this example does not use actual RARF unit types.

	CC Unit Type	Configuration 1	Configuration 2	Configuration 3	Configuration 4	Configuration 5
Plant_GT1	**GT**	**X**	**X**	**A**	**X**	
Plant_GT2	**GT**	**X**	**A**	**X**	**X**	
Plant_GT3	**GT**	**A**	**X**	**X**	**X**	
Plant_ST1	**ST**	**X**	**X**	**X**	**X**	
Unit 5						

This information translates to the following:

CC Name	Config	Unit 1	Unit 2	Unit 3	Unit 4
Plant_CC1_1	1	Plant_GT1	Plant_GT2	Plant_ST1	
Plant_CC1_1	1 (alt)	Plant_GT1	Plant_GT3	Plant_ST1	
Plant_CC1_1	1 (alt)	Plant_GT2	Plant_GT3	Plant_ST1	
Plant_CC1_2	2	Plant_GT1	Plant_GT3	Plant_ST1	
Plant_CC1_2	2 (alt)	Plant_GT1	Plant_GT2	Plant_ST1	
Plant_CC1_2	2 (alt)	Plant_GT2	Plant_GT3	Plant_ST1	
Plant_CC1_3	3	Plant_GT2	Plant_GT3	Plant_ST1	
Plant_CC1_3	3 (alt)	Plant_GT1	Plant_GT3	Plant_ST1	
Plant_CC1_3	3 (alt)	Plant_GT1	Plant_GT2	Plant_ST1	
Plant_CC1_4	4	Plant_GT1	Plant_GT2	Plant_GT3	Plant_ST1

When Train 1, Configuration 2 is in use (Plant_CC1_2), there will be three units in service – two gas turbines and one steam. If Train 1, Configuration 4 is in use (Plant_CC1_4), all four units will be in service. In this case, Configuration 1, 2, and 3 are essentially the same.

Alternate Unit Example: CC1 – Broad Flexibility of Train

Since the number of configurations that can be used is limited to the number of physical units, the first example will limit the flexibility of the unit. A better use of alternatives is outlined below. This allows many more combinations out of the four configurations allowed for these four units.

	CC Unit Type	Configuration 1	Configuration 2	Configuration 3	Configuration 4	Configuration 5
Plant_GT1	**GT**	**X**	**X**	**X**	**X**	
Plant_GT2	**GT**	**A**	**X**	**X**	**X**	
Plant_GT3	**GT**	**A**	**A**	**X**	**X**	
Plant_ST1	**ST**	**X**	**X**	**X**		
Unit 5						

This information translates to the following:

CC Name	Config	Unit 1	Unit 2	Unit 3	Unit 4
Plant_CC1_1	1	Plant_GT1	Plant_ST1		
Plant_CC1_1	1 (alt)	Plant_GT2	Plant_ST1		
Plant_CC1_1	1 (alt)	Plant_GT3	Plant_ST1		
Plant_CC1_2	2	Plant_GT1	Plant_GT3	Plant_ST1	
Plant_CC1_2	2 (alt)	Plant_GT1	Plant_GT2	Plant_ST1	
Plant_CC1_2	2 (alt)	Plant_GT2	Plant_GT3	Plant_ST1	
Plant_CC1_3	3	Plant_GT1	Plant_GT2	Plant_GT3	Plant_ST1
Plant_CC1_4	4	Plant_GT1	Plant_GT2	Plant_GT3	

This combination of configurations gives the Resource the ability to operate two, three, or four units.

13.2 Additional Information

The following documents are available through the Registration and Qualification area of the Readiness Center on the ERCOT Nodal website at http://nodal.ercot.com/readiness/rq/documents/index.html.

- Private Use Network Example
- White Paper - Combined Cycle v1.0
- White Paper - Split Generation Resource Modeling v1.0
- White Paper - Seasonal Temperature Hydrogen Pressure v0.09 (v1.0 should be available soon)

13.3 Questions and Answers

General RARF Questions

What does the color coding mean in the RARF?

Please reference section 2.2 of the Resource Registration Guide located under the Registration and Qualifications documents section of the Readiness Center website.

For nodal purposes are resource entities required to submit an updated Resource Asset Registration Form (RARF) for mothballed generation resources?

For transitioning to the Nodal market, ERCOT will require Resource Entities to submit an updated Resource Asset Registration Form (RARF) for all Resources, including Mothballed Generation Resources.

How will market participants submit data in the current operating plan (COP) against what is registered?

Registration data in the Resource Asset Registration Form (RARF) will be used within the Market Management System (MMS) to establish and enforce the resource name and reasonability limits. The data submitted within the current operating plan (COP) (by the QSE) will need to be aligned with the naming of the resource and within the reasonability limits (provided by the resource entity in the RARF), specifically high/low reasonability limits.

Is a single shaft unit considered combined cycle or a single generation unit?

A combustion turbine and steam turbine on a single shaft are considered to be a single generation unit.

Should a co-generation site use the "Combined Cycle" tab on the RARF?

Yes, if the co-generation resource is currently registered as a Resource Category of Combined Cycle then the resource will need to be represented on the 'Combined Cycle' tab of the nodal resource asset registration form (RARF).

We have a combined cycle unit that sits outside of ERCOT. However, we have a private line that starts at the generation site and ties into ERCOT. In the RARF, would ERCOT consider this a private network? If so, how would we fill out the value for Net Interchange MW since the net interchange MW will vary based on the dispatch of the generation.

No, this is not considered a private network. ERCOT will be requesting the information for the tie line into the ERCOT Grid, as well as other components that are not currently modeled in ERCOT, in order to ensure the model is accurate.

On the Combined Cycle tab in the RARF, what should be the Primary Fuel Type for the steamer? Can I select WH (Waste Heat) from the drop-down box?

Please use WH (Waste Heat). The Glossary will be updated to reflect WH as Waste heat (residual steam).

The Glossary definitions of the Rating (MW) and Rating (MVA) are the same and confusing. Can you define more clearly?

The RARF asks for three ratings in the Generator Unit Information section as follows:

- Name Plate Rating (MVA) –the nameplate MVA Rating of the unit at its rated Power Factor
- Rating (MW) – the MW of the unit at its rated Power Factor
- Rating (MVAR) – the MVAR of the unit at its rated Power Factor

On the minimum Notice time if a 0 is entered does that mean they won't be given the 10 min window to deploy?

This parameter applies to Load Resources. Per the Nodal Protocols 3.7.1, please enter the pre-interruption notice requirement in minutes for the Load Resource. This should correlate to the type of service the Load Resource is registered as:

- CLR or UFR = Instantaneous – please enter 0 or Instantaneous on the RARF
- CLD = 10 min
- ILD = 30 min

Some EDS 4 RARFs, specifically Line 44 of the Generation tabs and Line 60 of the Wind tabs, have a typing error (saying MVA instead of MVAR) which has caused some confusion.

How does ERCOT plan to insert the RARF form data into its internal systems – manually or automated?

ERCOT is working to define this process. Currently the RARF spreadsheets are being loaded electronically by a manually-run process into multiple systems. The need and benefits of an automated system to manage the resource data – entry as well as distribution to Nodal systems – is being developed.

Will the MP have an opportunity to validate the data AFTER input into ERCOT's internal systems? This would ensure that in the end, the data we provide is actually what resides in the market systems.

Resource Entities will receive a final version of the RARF to certify/sign-off. This will be an export of the data on file through the RARF process, and the opportunity for all Resources to ensure all data is correct prior to submitting a certified copy. In addition, ERCOT is currently implementing process controls on the data to ensure all systems are getting the data from the same source.

Will ERCOT appoint a particular naming convention for combined cycle units when filling out the RARF for private networks?

Yes. The resource asset registration forms (RARF) are pre-populated with the mnemonic for resource entities (RE) already in the zonal program. While the network mnemonic will not change going into the nodal program, the naming convention for combined cycle configurations is new. The convention will be developed as ERCOT works through preparation for early delivery system (EDS) testing and communicated back to resource owners and qualified scheduling entities (QSE's). If a unit has not been previously registered with ERCOT, the mnemonic field should remain empty and a new mnemonic will be assigned by ERCOT.

Can you reference the Nodal Protocols where it gives combined cycle units the opportunity to register as a single resource?

There is no protocol reference stating a CC must register as a CC or otherwise. The definition in Protocol Section 2 defines a Combined-Cycle Configuration to be "Any combination in which a combined-cycle power block can be operated as a separate Resource. Each possible configuration operated as a separate Resource has a distinct set of operating parameters, physical constraints, and Energy Offer Curve." The CC owner has the option of registering the CC site as combined cycle or as separate units. However, registering the CC as a train will improve modeling and dispatch.

Does "Private Network" exclude auxiliary/house power in generating stations?

Yes. Please include all auxiliary/house power in generating stations in the Additional Planning Data section under "Generation Auxiliary Load".

On the 'General Information' Tab, can you clarify the question "Is Resource behind a NOIE Settlement Meter Point? We have EPS Meters for our generators and we are a NOIE, so we should respond in the affirmative?

Yes, intent of the question is to confirm the RE has EPS Meters for NOIE generator(s).

Will combined cycle resources have to fill out any fields on the "Generation" tab?

No. The intent is for "Generation", "Combined Cycle", and "Wind" and "Load Resource" tabs to be stand-alone registration documents.

What is a "Qualifying Facility"?

Per ERCOT Protocol Section 2, a Qualifying Facility (QF) is defined as a qualifying cogeneration facility or qualifying small power production facility under regulatory qualification criteria as defined in PURPA, 16 USC 796 (18) (B) and 796 (17) (C).

Planning Questions

Can you give some detail as to what you are looking for when you ask us to "Provide kV Base?

The KV Base is needed to identify the base voltage used in the per unit calculations associated with the transformer data. Electrical systems are often modeled on a per unit basis. In order to make per unit calculations useful to ERCOT, the base for MVA and KV must be disclosed. For the step-up transformer, ERCOT has requested that the MVA base is 100MVA. Since the MVA base is given, the resource needs to provide the kV Base in the RARF.

What do we do if we have more than one step-up transformer per unit?

Attach additional transformer information with the RARF submittal.

In the Network Model Transformer Data section, I'm confused as to what you desire in the Low Voltage Limit and High Voltage Limit fields. On the Generator Data forms there is mention of limits regarding the Windings however in our WebEx meeting last Thursday it was stated that we

were not collecting Winding information. If I look at a Generator Data form on the "Gen step-up_tranf" tab I see a request for High and Low limits on lines 18 and 19 which refer to the Windings data. However the majority of the data requested on the RARF on lines 126 to 137 seems to refer to the "Net Model Transf Data" tab on the Generator Data form as best I can tell.

The High Voltage Limit and the Low Voltage Limits for the transformers should be the no-load ratings. On the EDS 4 RARF, these fields are labeled as:

High Voltage Limit (no-load tap)
Low Voltage Limit (no-load tap)

These should read:

High Voltage Limit (no-load)
Low Voltage Limit (no-load)

Where will the transformer names be found/listed/available on the RARF?

Existing transformer names and PTI bus numbers can be found in the ERCOT Branch Data spreadsheet available in the Operations and System Planning secure area of the ERCOT website in the Operations Model data folder. Existing REs should have and use the transformer names on their current GARF. The primary intent is that the name adheres to the naming conventions specified for that field in the GARF (and the RARF). For new REs, the transformer name results can be obtained by one of several methods: The transmission operator dictates the name, the RE determines the name, the transmission and distribution service provider (TDSP) and RE work together to determine a name.

What is the definition of large motor? Over 1,000 HP, or what size? Or by voltage such as 13.8 KV motor? 480 V motor? What is the definition of small motor? such as less than 10 HP or what size? Or by voltage?

As a suggestion, split the motors by voltage. Further defined, anything connected to 2400/4160V and higher would be considered large motors. Anything connected below that voltage level would be considered small. This definition should improve accuracy and reduce time, as the motors information could be gathered and summarized beginning with the electrical connection. ERCOT would appreciate comments on this method, as a clear definition needs to be made in order to be consistent across resources.

We also need to know what type of accuracy they are looking for when we provide this information. There is a considerable amount of effort that would be necessary to get better than plus and minus 5%.

Please do your best at filling out this data with a reasonable amount of effort. If the information is incorrect, the models will be incorrect.

We need a better definition of what is being asked for in the Generation Details Section labeled as "Mutual coupling Armature-Rotor Z". This appears to be asking for the mutual inductance between the stator and the rotor in the generator. To my knowledge, this information was not provided from the original OEMs. If the mutual inductance is what is being asked for, is it safe to assume that what is needed is any one stator phase value and that the rotor position would be to maximize that particular inductance value?

This section came from the Generation Data Forms *Detailed Gen Info-by unit* tab for Transient Stability Analysis. ERCOT is looking for the machine impedances in R + jX form. The three pieces of information should be provided together. Alternatively, the Zeq could be submitted in the first row of that section in lieu of the individual impedance components.

Will ERCOT be updating their site with all the new manufactures model sheets? Where can we get copies of the latest model sheets?

PTI Dynamic Models can be found in the Generation Project Interconnection Information folder on the Operations and System Planning secure website at: http://www.ercot.com/tmaps/ListMaps.cfm?GroupID=50. In addition, some models can be found on ERCOT.com at: http://www.ercot.com/gridinfo/generation/index.html

Does ERCOT want the Manufacturer's power curve added as a separate tab to this document?

Please include Capability Curve as a separate document.

On the Generation tab (Generation Auxiliary Load Characteristics) there is no field to place the Generation Aux Load value that the data underneath this value represents. Do you plan to insert a data field for Generation Auxiliary Load on the next RARF version?

Yes, we do plan to ask for this. Please feel free to make applicable notes in the comments section of the RARF as a reminder for the next submittal.

Do we need to be including the alarms and operator's guides for manual trip times in this section or is it OK to omit any information based on the fact that these are not automatic trips?

If there are no automatic trips, please enter N/A and use the comments section to the right to document why.

When filling out the RARF, if we have multiple voltage trip settings, one at a higher voltage as a back-up to another, which one do you want?

The most current version of the RARF has space available to report multiple voltage and frequency trip settings.

As we reviewed the Generator Data Sheets while updating the RARF's for EDS 4, we noticed that the Generator Data sheets included the impedance of the neutral grounding transformer circuit in the generator Zero Sequence Impedance blank (this is on line 160 on the Generation tab). Does ERCOT want the generator Zero Sequence impedance of just the generator windings, or do they want the generator and the neutral grounding transformer impedance in this blank?

This section came from the Generation Data Forms *Detailed Gen Info-by unit* tab for Transient Stability Analysis. ERCOT is looking for generator impedances in R + jX form. The impedance should include the machine impedance plus neutral grounding impedance (if any).

What is Armature Z? Is this the leakage reactance? What is Rotor Z? What is Mutual coupling Armature-Rotor Z?

The Armature impedance would also be the Stator impedance. These three components (Armature, Rotor, and Mutual Coupling of Armature and Rotor) would be used to calculate the equivalent impedance for the unit, Zeq.

Machine Impedance is the same as Positive Sequence?

Machine Impedance (Z) row should be the Zeq, if available.

What rating is used for "Net Maximum Leading Operating Capability (MVAR)" and "Net Maximum Lagging Operating Capability (MVAR)"?

Please submit the Maximum Leading and Lagging Operating Capability in MVAR that the unit is able to provide – independent of MW.

Does ERCOT want the Manufacturer's power curve added as a separate tab to this document?

Please include Capability Curve as a separate document.

For "Net Maximum Leading Operating Capability (MVAR)" and "Net Maximum Lagging Operating Capability (MVAR)", what is "Net"?

Net is Generation less Auxiliary load.

The section covering SubSync Resonance is asking for some information that is unavailable. We have mass and inertia information on the Generator rotor/exciter and we have this same type of information on the turbine but we do not have the individual turbine rotating component (LP, HP, IP etc.) or between the generator rotor and exciter rotating elements. Also, we do not have any information on damping or stiffness on any of these items. If this information is necessary, it will require performing a study by the original OEMs and will come at a considerable cost per unit.

The studies using this information are not completed often right now, but will become more common capacitor compensation is used in series on long transmission lines. The studies focus on the units at either end of the lines compensated with the series capacitors to ensure the resonance from these lines won't excite critical frequencies in the machines in the area at the end of these lines. Owners of theses units will be interested in these studies to prevent equipment damage. ERCOT will accept minimal information in these fields at this time, but as series compensation is installed on our grid, this information will become necessary and critical to system performance.

Reasonability Limits and Reasonability Ramp Rates Questions

What are the High/Low Reasonability Limits?

An "Out-of-Bounds" value chosen by RE and used by ERCOT to alarm/reject data exceeding the value per Nodal Protocol 3.7.1. This value is used to validate data submitted to ERCOT (Alarms, ICCP, COP). Any submittals such as a High Sustainable Limit in the COP that exceeds the High Reasonability Limit will be rejected by ERCOT systems.

For private network, what are the High/Low Reasonability Limits?

The Highest and Lowest amount of power that could be injected into the ERCOT grid from that unit, depending on unit capabilities and swing of the industrial load behind the fence. Even if on a private network, ERCOT requests registration of the limits of the resource, not the net injection.

For Reasonability MW limits on a CC plant - the last unit for a CC plant is a steamer unit and the highest MW it can produce is based on the number of GT's that are running. Thus for the high and low reasonability limits per unit - should the high represent the total MW that can be produced when ALL units are on or per GT?

The reasonability limits should be set for each unit, as well as each configuration and should span the abilities of the unit *or* configuration – lowest to highest. So the answer to your question regarding the steamer, the low limit would be the steamer output with only one 1 CT running and the high would be the steamer with all CTs running.

For the low reasonability limit - should this be the lowest it can run when all GT's are running or just one GT is running?

As in the previous question, the low reasonability limit for the steamer would be when running with just one CT.

Different turbines of our combined cycle unit have different minimum loads depending on which configuration is operating. How do you want this expressed when filling out the RARF?

The Reasonability limits and Sustainable / Emergency MW ratings should be filled out for each unit as well as each configuration.

What is the definition of Low Reasonability Ramp Rate Limit (Min ramp MW/min)?

ERCOT needs the max downward possible ramp rate from the resource under any circumstances in order to be able to validate data (not used for dispatch).

Does the "Low Reasonability Limit" exclude the period of time when a unit is coming on line and getting to minimum load?

Just before a unit synchronizes, it could be at negative load, and it could be below minimal operational load for some time beyond that. The Low Reasonability Limit should reflect the lowest limit after it is synchronized.

For Seasonal Net Max Sustainable MW Rating, we are using the PMAX (nameplate rating) of the wind park. Are we interpreting this request for information correctly?

Yes, this would be a value for PMAX and is used for planning studies. In addition, the data is used 4.4.9.4.1 Mitigated Offer Cap in calculating the capacity factor of the resource.

What if the Emergency MW and Sustainable MW ratings are the same?

These values can be the same. If this is the case, fill in the same values for corresponding fields.

Resource Parameter Questions

General Comments: The Resource Parameters are initially provided by the Resource Entities in the RARF and updated by the QSE via a MMS screen on an as-needed basis. The changes can be made seasonally, and additional changes can be made to address operational issues. For all changes made to the resource parameters by a QSE, a reason is to be provided by the QSE that will be monitored and reviewed by the Independent Market Monitor (after the fact).

Does ERCOT want per day or per year data for the "Minimum On/Off Line Time (hrs)" and "Max On Line Time (hrs)"?

Minimum online and offline time is defined in the Protocols 3.7.1.1(1). This information should be in whole hours. Min Online time represents the minimum number of consecutive hours the Resource must be On-Line before being shut down. Min Offline time is the minimum number of consecutive hours the Resource must be Off-Line before being restarted.

When filling out these values for baseload units, please make appropriate assumptions. For example, when a unit comes online and needs to be taken offline, what is the minimum time online before it could be taken offline? And once it is offline, what is the minimum time it would have to remain offline before it could be brought back on?

For Wind Generation Resources, please leave blank or use N/A.

For Load Resources, the information is required per Nodal Protocols and detailed in 3.7.1.2.

What data does ERCOT look for in "Max Weekly Energy"?

Max Weekly Energy would be the maximum energy a unit can produce during a seven-day window, in MWh and would be considered as a constraint by the RUC program in the selection of resources. If you are not aware of special production limits, you may not have any. An example of a limitation could be production limited in order to meet for environmental requirements.

For 'Maximum Weekly Energy' on the RARF form, do you want this based on a seasonal rating? If so, which season?

This should not be seasonal – but it is a field that the QSE can update in the MMS with supporting information.

What is maximum Weekly Energy, specifically for a base load unit?

For a base load unit, enter the energy for a week (24x7). This is required per Nodal Protocols 3.7.1. This value will be updated by QSE through the MMS.

For base-load units that we do not intend for frequent starts, how is that filled in on the RARF for the "maximum daily and weekly starts"?

The maximum starts are to be used as a constraint in RUC for an evaluation in the case that a unit can be brought online by RUC. If the unit were to be (although rare) offline and available to ERCOT for procurement by RUC, this value on the RARF would be the proper constraint to reflect the maximum number of starts for the resource. So the Resource should provide a whole number value.

How should we answer the resource parameter questions for wind resources for the following parameters?

Minimum On-Line Time
Minimum Off-Line Time
Hot Start Time
Intermediate Start Time
Cold Start Time
Max Weekly Starts
Max On-Line Time
Max Daily Starts
Max Weekly Energy
Hot to Intermediate Time
Intermediate to Cold Time

For wind resources only, please leave blank or use N/A

Can you input the min interruption and restoration times in minutes or hours? If hours, can you show a fraction of say .25 for 15 min?

RUC Commitment is hourly, so the values should be in whole hours.

For the Max Weekly Starts, can you show a fraction? I.e. if once every 2 weeks is desired, can you insert a 0.5?

This value, along with the others in this section of the RARF, should only be in whole numbers over a seven day (1-week evaluation period). A fraction or a number representing any period other than the seven day window is not appropriate.

We have CT's that are able to be utilized in normal mode (startup in roughly 20 min's) and in a quick start mode (startup roughly in 12 min's). On some of the Resource Parameters, if we use whole numbers we are not representing the resource accurately. Do we still use whole numbers for these types of resources?

Yes, please use whole numbers as the Resource Parameter section that references start times is used primarily for the Reliability Unit Commitment process, which is hourly.

For the first MW block down ramp rate - will this be interpreted as the down ramp to go from the LSL (MW1) to breaker open or from MW 2 down to MW 1? Subsequently, for the HSL (MW 5) what is the up ramp rate supposed to represent? Is it supposed to be the ramp from HSL to Emergency MW?

There is an example of the ramp rate entry as part of the RARF Guide, which can be found in the readiness center website under Registration and Qualification documents. The ramp rates associated with MW 1 will be the ramp rates from zero until MW 2. The ramp rates associated with MW 2 will span the range between MW 2 and MW 3. This continues through MW 5. The ramp rates associated with MW 5 will span from MW 5 through infinity.

Please note that not all rates need to be utilized. If this is the case, the last MW filled in will go through infinity. If there is only one rate, all that is needed is MW 1 and the associated ramp rates. The Nodal systems will know this goes from zero to infinity. Dispatch of units utilizing the ramp rates (Resource Limit Calculator) will respect the HSL/LSL of the Resource.

What is the definition of ranges for "hot", "intermediate", and "cold" starts and cool-downs. And where in those temperature ranges should the turbine starts and ends be?

Hot conditions vary unit by unit, so this question is difficult to answer. Also, this information can be updated by the QSE through the MMS if found to be inappropriate. Some general thoughts, but not requirements, are that conditions for a steam unit can be *hot* through an overnight shutdown and conditions often reflect a unit as *cold* after a two or three day shutdown. Intermediate would then be a Resource that has recently been online and for which neither hot nor cold conditions are applicable.

It appears that the form asks for the input of MW loads and the ramp rate between any two loads. If that is correct, why is there the same number of loads as ramps on the form? Shouldn't there be one less ramp?

REs can provide up to 5 points (pairs) of up ramp rates and down ramp rates for each MW value. Each point represents a ramp rate value that extends horizontally to the next MW point where it stair-steps to the next MW value. The very first and very last ramp rates will extend to zero and infinity. Please see the RARF guide for an example of ramp rates, which can be found in the readiness center website under Registration and Qualification documents.

We have broken the ramp rates for some of our units into five pieces. Would we then need six loads? Should I insert another row for the sixth load?

ERCOT systems will only accept 5 pairs. Please do not insert or delete rows or columns from the RARF, as this negatively affects automatically loading data.

Does ERCOT want the ramp rate for conditions of a zero wind speed (zero generation) to the highest wind speed on the manufacturer's curve (nameplate capacity)?

ERCOT desires the highest possible ramp rate from the resource under any circumstances in order to be able to validate data (not used for dispatch).

For the "Normal Ramp Rate Curve" on the "Combined Cycle" tab, does ERCOT expect to see the ramp rate from LSL to HSL or the ramp rate in the start-up period?

ERCOT desires the ramp rate curve at Low Reasonability Limit (LRL) to the High Reasonability Limit (HRL).

For Ramp Rate Curves, the ramp rate varies in different operational scenarios, such as winter, summer etc. What does "Normal" mean?

ERCOT desires the ramp rate curve from the Low Sustainable Limit (LSL) to the High Sustainable Limit (HSL) and can be entered in 5-pairs (at different MW levels). If there are significant changes in operational conditions (derating, unplanned outages, seasonal configuration changes) the ramp rate curves can be updated with the QSE providing a reason code- but this should be only a few times per year.