



RESOURCE ASSET REGISTRATION FORM WORKSHOP

**Generation Resources – Non-Wind, Non-CC
March 10, 2008**

ANTITRUST ADMONITION

ERCOT strictly prohibits market participants and their employees, who are participating in ERCOT activities, from using their participation in ERCOT activities as a forum for engaging in practices or communications that violate antitrust laws. The ERCOT Board has approved [Guidelines for Members](#) of ERCOT Committees, subcommittees, and working Groups to be reviewed and followed by each market participant attending ERCOT meetings. If you have not received a copy of these Guidelines, please take one now, review it at this time, and remember your ongoing obligation to comply with all applicable laws, including antitrust laws.



NEW FORM - SAMPLE

NEW RARF

- **Tabs are by subject**
 - Generator Unit Information is on a separate tab than Reactive Capability Curves
- **Uses hyperlinks to move between tabs**
 - Each worksheet has a link to “Return to Map”
- **Will define which tab is needed for Resource type.**
- **Will provide references to the “New RARF” Guide and applicable Nodal Protocols**
- **Each field will be defined in the RARF or in a glossary**
- **Watch “ResourceRegistration” emails for details on submittal changes, file postings, schedule updates, etc.**

NEW RARF – MAP AND NAVIGATION

Worksheets included in this form:	Used by:	Links to Worksheet Tab:	RARF Guide / Protocol Reference	% Complete
Instructions	All Generation and Load Resources	Instructions	RARF Guide: Section X	0%
Spreadsheet Map (this page)	All Generation and Load Resources	Map (this page)	RARF Guide: Section X	0%
General Information	All Generation and Load Resources	General Information - ALL	RARF Guide: Section X	0%
Unit Information	All Generation Resources except Wind or CC	Unit Info - GEN	RARF Guide: Section X	0%
	All Combined Cycle Resources	Unit and Train Info - CC		0%
	All Wind Resources	Unit Info - WIND		0%
Resource Parameters	All Generation Resources	Resource Parameters - ALL	RARF Guide: Section X	0%
Operational Resource Parameters	All Generation Resources	Operational Resource Parameters - ALL	RARF Guide: Section X Nodal Protocols 3.7.1	0%
Reactive Capability	All Generation Resources except Wind	Reactive Capability - GEN, CC	RARF Guide: Section X	0%
	All Wind Resources	Reactive Capability - WIND		0%
GSU Transformer	All Generation Resources	GSU Transformer - ALL	RARF Guide: Section X	0%
Private Use Network	All Private Use Networks	Private Network - PUN	RARF Guide: Section X	0%
Generation Owned Transmission Assets	All Generation Resources	Generation Owned Transmission Assets - ALL	RARF Guide: Section X	0%
Ownership	All Generation Resources except CC	Ownership - GEN, WIND	RARF Guide: Section X	0%
	All Combined Cycle Resources	Ownership - CC		0%
Combined Cycle Configuration Details	All Combined Cycle Resources - Train 1	Configurations - CC1	RARF Guide: Section X	0%
		Transitions - CC1		0%
	All Combined Cycle Resources - Train 2	Configurations - CC2		0%
		Transitions - CC2		0%
	All Combined Cycle Resources - Train 3	Configurations - CC3		0%
		Transitions - CC3		0%
Planning	All Generation Resources except Wind	Planning - GEN, CC	RARF Guide: Section X	0%
	All Wind Resources	Planning - WIND		0%
	All Generation Resources	Protection - ALL		0%
	All Generation Resources except Wind	Subsynchronous Resonance - GEN, CC		0%
Load Resource Information	All Load Resources	Load Resource Information	RARF Guide: Section X	0%
Load Resource Parameters	All Load Resources	Load Resource Parameters		0%

NEW RARF – REACTIVE CAPABILITY CURVE SAMPLE

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[RETURN TO MAP](#)

Reactive Capability Curve

This worksheet tab applies to all non-wind Generation Resources. This information applies to UNITS.

Please complete this section and select RETURN (Cell C1)

Field Description	Notes	Labels	Unit 1	Unit 2	Unit 3
Unit Code	Pre-populate				
MW1	Lowest MW of curve	MW			
Lagging MVAR limit associated with MW1 output		MVAR			
Leading MVAR limit associated with MW1 output	Enter as positive number	MVAR			
MW2		MW			
Lagging MVAR limit associated with MW2 output		MVAR			
Leading MVAR limit associated with MW2 output	Enter as positive number	MVAR			
MW3		MW			
Lagging MVAR limit associated with MW3 output		MVAR			
Leading MVAR limit associated with MW3 output	Enter as positive number	MVAR			
MW4		MW			
Lagging MVAR limit associated with MW4 output		MVAR			
Leading MVAR limit associated with MW4 output	Enter as positive number	MVAR			
MW5 - Unity Power Factor		MW			
If hydrogen cooled, indicate hydrogen pressure (psi) associated with your Reactive Curve		PSI			
Net Maximum Leading Operating Capability (MVAR)	Independent of MW	MVAR			
Net Maximum Lagging Operating Capability (MVAR)	Independent of MW	MVAR			

NEW RARF – UNIT INFORMATION SAMPLE

ERCOT Confidential		RETURN TO MAP				
Unit Information Tab						
<i>This worksheet tab applies to all non-wind, non-combined cycle generation resources. This information is UNIT specific for all non-Wind and non-CC.</i>						
<i>Please complete this section and select RETURN (Cell C1)</i>						
	Field Description	Notes	Labels	Unit 1	Unit 2	Unit 3
Generator Unit Information	Unit Name	To be determined jointly with ERCOT.				
	Unit Code/Mnemonic	To be determined jointly with ERCOT. It is a combination of the site name and a unit name.				
	PUC Registration Number					
	ERCOT Interconnection Project Number	For new units				
	NERC Number					
	Unit Start Date	MM/DD/YYYY Format		<i>format</i>		
	Unit End Date	MM/DD/YYYY Format		<i>format</i>		
	Physical Unit Type			<i>dropdown</i>		
	Primary Fuel Type			<i>dropdown</i>		
	Secondary Fuel Type			<i>dropdown</i>		
	Fuel Transportation Type			<i>dropdown</i>		
	Renewable	Yes or No		<i>dropdown</i>		
	Renewable/Offset			<i>dropdown</i>		
	Resource Category			<i>dropdown</i>		
	Qualifying facility			<i>dropdown</i>		
	Name Plate Rating			MVA		
Name Plate Real Power Rating			MW			
Name Plate Reactive Power Rating			MVAR			
Turbine Rating	MW rating of Turbine if different (larger or smaller) than Generator.		MW			
Unit Generating Voltage			KV			



GENERAL INFORMATION AND OWNERSHIP

GENERAL INFORMATION

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

- **Submittal Information**
 - Date format shall be MM/DD/YYYY
 - Resource Entity name must match ERCOT's record
 - DUNS number is either a 9 digit or 13 digit number
- **Resource Entity Authorized Representative**
 - As registered with ERCOT
 - Responsible for submission of RARF to ERCOT
- **Primary Contact**
 - Site or facility contact for Generation Resources
 - Resource Entity contact for Load Resources
 - May be Authorized Representative

GENERAL INFORMATION

- **Site info for Generation Resources**
 - This section does not apply to Load Resources or Block Load Transfers
 - Resource Site Name/Code to be determined jointly with ERCOT
 - Site In-Service Date is the date when plant was commissioned
 - Indicate CMZ where Resource is located. Not applicable to Load Resources
 - Indicate if Resource is owned by a NOIE and metered
 - List TDSP where Resource's GSU Transformer is tied
 - Confirm metering scheme and quantity

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:
ESH-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):

OWNERSHIP

- **Ownership section of the RARF documents who controls the output of the facility (represents the power to ERCOT)**
- **Split Generation Resources**
 - Generation Resources other than Combined Cycle facilities be registered with multiple Resource Entities representing the output of the facility
 - To operate as a Combined Cycle Plant, the facility cannot be a Split Generation Resource
 - The Master Owner of a Split Generation facility is responsible for registration documentation
- **Load Splitting**
 - Applies to facilities with multiple Retail Electric Providers

Unit 1 Data		
Sub Generator Data	Owner 1	Owner 2
Market Participant (Resource) Name		
Market Participant (Resource) Duns Number		
Fixed Ownership %		
Master Owner (Y or N)		



GENERATOR UNIT INFORMATION

GENERATOR UNIT INFORMATION

Unit Name
Unit Code/Mnemonic
Unit Start Date
Unit End Date
Physical Unit Type
Primary Fuel Type
Secondary Fuel Type
Fuel Transportation Type
Renewable (Y/N)
Renewable/Offset
Resource Category
Qualifying Facility (Yes or No?)

- **All Generation Resources will have to fill out a Generator Unit Information Tab**
 - Resource Unit Name & Code to be determined jointly with ERCOT
 - Start Date and End Date should be formatted MM/DD/YY

GENERATOR UNIT INFORMATION

- **Physical Unit Type** – used for Reporting and Settlement Purposes
 - **CA** = Combined Cycle steam part (includes steam part of integrated coal gasification combined cycle)
 - **CC** = Combined Cycle total unit (use only for plants/generators that are in planning stage, for which specific generator details cannot be provided)
 - **CE** = Compressed air energy storage
 - **CS** = Combined Cycle single shaft (combustion turbine and steam turbine share a single generator)
 - **CT** = Combined Cycle combustion turbine part (includes combustion turbine part of integrated coal gasification Combined Cycle)
 - **FC** = Fuel Cell
 - **GT** = Combustion (gas) turbine (includes jet engine design)
 - **HY** = Hydraulic turbine (includes turbines associated with delivery of water by pipeline)
 - **IC** = Internal combustion (diesel, piston) engine
 - **NA** = Unknown at this time (planned units only)
 - **OT** = Other
 - **PS** = Hydraulic Turbine - Reversible (pumped storage)
 - **PV** = Photovoltaic
 - **ST** = Steam Turbine including nuclear, geothermal and solar. Does not include combined cycle.

GENERATOR UNIT INFORMATION

- **Fuel Type (Primary & Secondary)**– used for Reporting and Settlement Purposes

- **AB** = Agriculture Byproducts (biogases, straw, energy crops)
- **BFG** = Blast-Furnace Gas
- **BIT** = Bituminous Coal
- **BL** = Black liquor
- **DFO** = Distillate Fuel Oil (diesel, No1 fuel oil, No 2 fuel oil, No 4 fuel oil)
- **GEO** = Geothermal
- **JF** = Jet Fuel
- **KER** = Kerosene
- **LFG** = Landfill Gas
- **LIG** = Lignite
- **MSW** = Municipal Solid Waste (refuse)
- **NA** = Not Applicable
- **NG** = Natural Gas
- **NUC** = Nuclear (uranium, plutonium, thorium)
- **OBG** = Other - Biomass Gas (methane, digester gas)
- **OBL** = Other - Biomass Liquids (ethanol, fish oil, waste alcohol, other gases)
- **OBS** = Other - Biomass Solids (animal manure/waster, medical waste, paper pellets, paper derived fuel)
- **OG** = Other - Gas (butane, coal processes, coke-oven coal, methanol, refinery gas)
- **OO** = Other - Oil (butane, crude, liquid byproducts, oil waste, propane)
- **OTH** = Other (batteries, chemicals, hydrogen pitch sulfur, misc technologies)
- **PC** = Petroleum Coke
- **PG** = Propane
- **RFO** = Residual Fuel Oil (No. 5 and No. 6 fuel oil)
- **STM** = Steam from other units **(NEW)**
- **SLW** = Sludge Waste
- **SUB** = Sub-bituminous Coal
- **SUN** = Solar (photovoltaic, thermal)
- **T** = Tidal **(NEW)**
- **TDF** = Tires
- **WAT** = Water (conventional, pumped storage)
- **WDL** = Wood/Wood Waste - Liquids (red liquor, sludge wood spent sulfite liquor, other liquors)
- **WDS** = Wood/Wood Waste - Solids (peat, railroad ties, utility poles, wood chips, other solids)
- **WH** = Waste heat
- **WND** = Wind
- **WOC** = Waste / Other Coal

GENERATOR UNIT INFORMATION

- **Fuel Transportation Type – used for Reporting and Settlement Purposes**
 - CV = Conveyor
 - PL = Pipeline
 - RR = Railroad
 - TK = Truck
 - NA = Not Applicable

- **Is Unit Renewable/Offset? – used for Reporting and REC purposes**
 - RN = Renewable
 - OS = Renewable Offset
 - NA = Not Applicable

GENERATOR UNIT INFORMATION

- **Resource Category – used for Settlement Purposes**
 - Nuclear
 - Hydro
 - Coal and Lignite
 - Combined Cycle \leq 90 MW
 - Combined Cycle $>$ 90 MW
 - Gas Steam - Supercritical Boiler
 - Gas Steam - Reheat Boiler
 - Gas Steam - Non-reheat or Boiler without air-preheater
 - Simple Cycle \leq 90 MW
 - Simple Cycle $>$ 90 MW
 - Diesel
 - Renewable (Wind, Solar, Wave, Fuel Cells)

GENERATOR UNIT INFORMATION

- **A Renewable Energy Credit (REC) or Offset represents one MWH of renewable energy from an existing facility that may be used in place of a REC to meet renewable energy requirement. See Substantive Rule 25.173(c) (10).**
- **See Protocol Section 14.9 to determine if the unit is a certified Renewable Energy Credit (REC) Generator Resource or a certified offset generator.**
- **Qualifying Facility**
 - A qualifying co-generation facility or qualifying small power production facility under regulatory qualification criteria as defined in PURPA, 16 USC §796(18)(B) and §796(17)(C).

GENERATOR UNIT INFORMATION

- **High Reasonability Ramp Rate Limit (HRL)**
 - An "Out-of-Bounds" maximum MW value chosen by RE and used by ERCOT to alarm/reject data exceeding this value.
- **Low Reasonability Ramp Rate Limit (LRL)**
 - An "Out-of-Bounds" minimum MW value chosen by RE and used by ERCOT to alarm/reject data exceeding this value.

High Reasonability Limit (Max Net MW level)
Low Reasonability Limit (Min Net MW level)
High Reasonability Ramp Rate Limit (Max ramp MW/min)
Low Reasonability Ramp Rate Limit (Min ramp MW/min)

- **High Reasonability Ramp Rate Limit (HRRRL)**
 - An "Out-of-Bounds" maximum MW/minute value chosen by RE and used by ERCOT to alarm/reject data exceeding this value.
- **Low Reasonability Ramp Rate Limit (LRRRL)**
 - An "Out-of-Bounds" minimum MW/minute value chosen by RE and used by ERCOT to alarm/reject data exceeding this value.

GENERATOR UNIT INFORMATION

- **Values that are submitted by QSE outside of the LRL and HRL range will be rejected by the ERCOT system**
- **Example:**
 - HRL = 150 MW
 - On COP, QSE submitted High Sustainable Limit HSL = 160 MW
 - ERCOT will not accept this HSL value
 - ERCOT will notify QSE of the rejection

GENERATOR UNIT INFORMATION

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

- **Seasonal Net Max Sustainable MW Rating:**
 - Maximum sustained net energy production capability of the Resource.
 - There will be 4 values representing MW output in Spring, Summer, Fall, and Winter
- **Seasonal Net Min Sustainable MW Rating:**
 - Minimum sustained net energy production capability of the Resource.
 - There will be 4 values representing MW output in Spring, Summer, Fall, and Winter

GENERATOR UNIT INFORMATION

- **Seasonal Net Max Emergency MW Rating:**
 - Limit established by the QSE describing the maximum temporary unsustainable energy production capability of the Resource.
 - This limit must be achievable for a time stated by the QSE, but not less than 30 minutes.
 - There will be 4 values representing MW output in Spring, Summer, Fall, and Winter
- **Seasonal Net Min Emergency MW Rating:**
 - Limit established by the QSE describing the minimum temporary unsustainable energy production capability of the Resource.
 - This limit must be achievable for a time stated by the QSE, but not less than 30 minutes.
 - There will be 4 values representing MW output in Spring, Summer, Fall, and Winter

GENERATOR UNIT INFORMATION

Name Plate Rating (MVA)
Rating (MW)
Rating (MVAR)
Turbine Rating (MW)
Unit kV

- **Name Plate Rating**
 - Name Plate Rating (MVA) = nameplate MVA Rating of the unit at its rated Power Factor
 - Rating (MW) = MW output of the unit at its rated Power Factor
 - Rating (MVAR) = MVAR output of the unit at its rated Power Factor
 - Turbine Rating (MW) = Rating of the Turbine in MW
 - Unit kV is the name plate terminal voltage in kV (kilovolts). This value is typically from 11 kV to 34.5 kV.
- **Please note the nameplate ratings should correspond to a nameplate power factor. MVA rating will not be lower than either the MW or MVAR rating.**
- **Having both the generator and the turbine ratings will give consistency to the model, ensuring we know the generator capabilities as well as turbine limitations**

GENERATOR UNIT INFORMATION – FAQ

- **What are the seasonal sustainable and emergency ratings?**
 - PMAX
 - Net = Generation less Auxiliary
 - Also the data is used 4.4.9.4.1 Mitigated Offer Cap in calculating the capacity factor of the resource.
- **How are these used by Nodal systems?**
 - This information is used in 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.

GENERATOR UNIT INFORMATION – FAQ

- **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 exceed the High Reasonability Limit will be rejected by ERCOT systems.

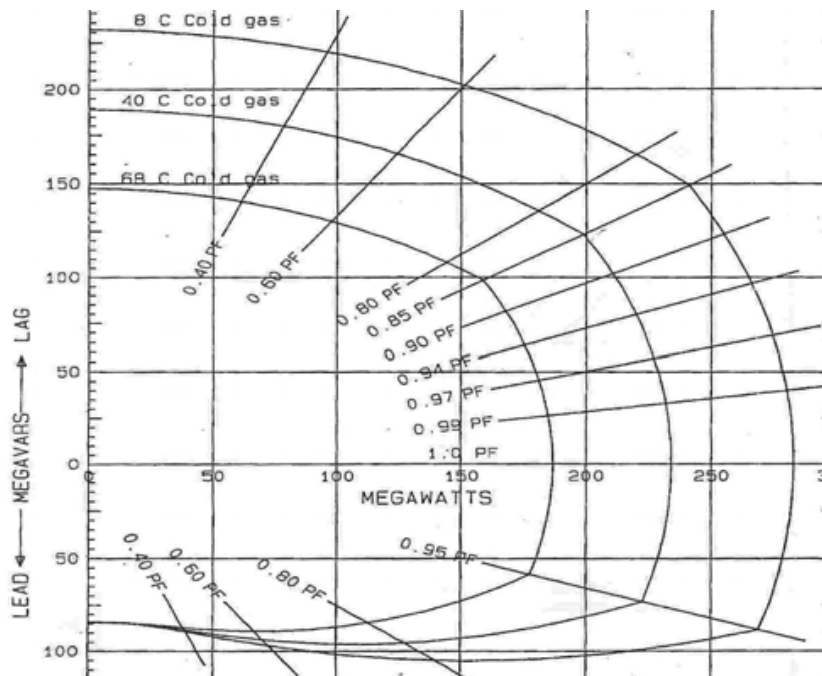


REACTIVE CAPABILITY CURVES

REACTIVE CAPABILITY CURVES

- **Reactive Capability is the ability of a Generator unit to supply/absorb Reactive Power (MVAR) to the grid continuously for a given MW operating value without damaging the unit.**
- **Reactive Power is required to control voltages under normal and emergency situations in order to prevent voltage collapse of the grid.**
- **RE shall conduct reactive capacity qualification tests to verify maximum leading and lagging reactive capability of all Generation Resources required to provide VSS.**
- **Reactive Capability tests are performed on initial qualification and at a minimum of once every two years as required by ERCOT.**

REACTIVE CAPABILITY CURVES



- Figure on the left shows a typical Reactive Capability Curve or D-Curve of a Generator unit
- X-axis is MW and Y-axis is MVAR
- Values above the x-axis (positive VARs) are “LAGGING” MVARs
- Values below the x-axis (negative VARs) are “LEADING” MVARs
- Straight lines correspond to different power factor (PF) values
- RE will supply D-Curves for their Generator units to ERCOT

REACTIVE CAPABILITY CURVES

- 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 in order to build the curve
- Use positive (lagging MVAR) and negative numbers (leading MVAR) as shown to the right
- If Hydrogen cooled, indicate pressure of Hydrogen in psi
- Supply 5 increasing MW values of Operating Real Power
 - MW1 (LRL), MW2, MW3, MW4, & MW5 (unity)

Field Description	Unit #1
MW1 (<i>lowest MW value of curve – minimum operating MW output</i>)	18
Lagging MVAR limit associated with MW1 output	145
Leading MVAR limit associated with MW1 output	-145
MW2 (<i>midpoint (50%) between MW1 and MW5</i>)	38
Lagging MVAR limit associated with MW2 output	130
Leading MVAR limit associated with MW2 output	-130
MW3 (<i>seventy-fifth percentile (75%) between MW1 and MW5</i>)	48
Lagging MVAR limit associated with MW3 output	115
Leading MVAR limit associated with MW3 output	-115
MW4 (<i>between MW3 and MW 5 - breakpoint of curve</i>)	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

REACTIVE CAPABILITY CURVES

- **Lagging MVAR for MW1**
 - On the D-Curve, draw a vertical line from the x-axis (MW1 value) and extend upward until it intersects the curve. From this intersection, draw a horizontal line extending to the y-axis. This point on the y-axis is the Lagging MVAR for MW1.
- **Leading MVAR for MW1**
 - On the D-Curve, draw a vertical line from the x-axis (MW1 value) and extend downward until it intersects the curve. Then, draw a horizontal line extending to the y-axis. This point on the y-axis is the Leading MVAR for MW1.

MW1 (lowest MW value of curve)
Lagging MVAR limit associated with MW1 output
Leading MVAR limit associated with MW1 output
MW2
Lagging MVAR limit associated with MW2 output
Leading MVAR limit associated with MW2 output
MW3
Lagging MVAR limit associated with MW3 output
Leading MVAR limit associated with MW3 output
MW4
Lagging MVAR limit associated with MW4 output
Leading MVAR limit associated with MW4 output
MW5- Unity Power Factor
If hydrogen cooled, indicate hydrogen pressure (psi) associated with your Reactive Curve submitted for ERCOT studies
Net Maximum Leading Operating Capability (MVAR)
Net Maximum Lagging Operating Capability (MVAR)

REACTIVE CAPABILITY CURVES

- Lagging MVAR for MW2**
 - On the D-Curve, draw a vertical line from the x-axis (MW2 value) and extend upward until it intersects the curve. From this intersection, draw a horizontal line extending to the y-axis. This point on the y-axis is the Lagging MVAR for MW2.
- Leading MVAR for MW2**
 - On the D-Curve, draw a vertical line from the x-axis (MW2 value) and extend downward until it intersects the curve. Then, draw a horizontal line extending to the y-axis. This point on the y-axis is the Leading MVAR for MW2.

MW1 (lowest MW value of curve)
Lagging MVAR limit associated with MW1 output
Leading MVAR limit associated with MW1 output
MW2
Lagging MVAR limit associated with MW2 output
Leading MVAR limit associated with MW2 output
MW3
Lagging MVAR limit associated with MW3 output
Leading MVAR limit associated with MW3 output
MW4
Lagging MVAR limit associated with MW4 output
Leading MVAR limit associated with MW4 output
MW5- Unity Power Factor
If hydrogen cooled, indicate hydrogen pressure (psi) associated with your Reactive Curve submitted for ERCOT studies
Net Maximum Leading Operating Capability (MVAR)
Net Maximum Lagging Operating Capability (MVAR)

REACTIVE CAPABILITY CURVE

- **Lagging MVAR for MW3**
 - On the D-Curve, draw a vertical line from the x-axis (MW3 value) and extend upward until it intersects the curve. From this intersection, draw a horizontal line extending to the y-axis. This point on the y-axis is the Lagging MVAR for MW3.

- **Leading MVAR for MW3**
 - On the D-Curve, draw a vertical line from the x-axis (MW3 value) and extend downward until it intersects the curve. Then, draw a horizontal line extending to the y-axis. This point on the y-axis is the Leading MVAR for MW3.

MW1 (lowest MW value of curve)
Lagging MVAR limit associated with MW1 output
Leading MVAR limit associated with MW1 output
MW2
Lagging MVAR limit associated with MW2 output
Leading MVAR limit associated with MW2 output
MW3
Lagging MVAR limit associated with MW3 output
Leading MVAR limit associated with MW3 output
MW4
Lagging MVAR limit associated with MW4 output
Leading MVAR limit associated with MW4 output
MW5- Unity Power Factor
If hydrogen cooled, indicate hydrogen pressure (psi) associated with your Reactive Curve submitted for ERCOT studies
Net Maximum Leading Operating Capability (MVAR)
Net Maximum Lagging Operating Capability (MVAR)

REACTIVE CAPABILITY CURVES

- Lagging MVAR for MW4**
 - On the D-Curve, draw a vertical line from the x-axis (MW4 value) and extend upward until it intersects the curve. From this intersection, draw a horizontal line extending to the y-axis. This point on the y-axis is the Lagging MVAR for MW4.
- Leading MVAR for MW4**
 - On the D-Curve, draw a vertical line from the x-axis (MW4 value) and extend downward until it intersects the curve. Then, draw a horizontal line extending to the y-axis. This point on the y-axis is the Leading MVAR for MW4.

MW1 (lowest MW value of curve)
Lagging MVAR limit associated with MW1 output
Leading MVAR limit associated with MW1 output
MW2
Lagging MVAR limit associated with MW2 output
Leading MVAR limit associated with MW2 output
MW3
Lagging MVAR limit associated with MW3 output
Leading MVAR limit associated with MW3 output
MW4
Lagging MVAR limit associated with MW4 output
Leading MVAR limit associated with MW4 output
MW5- Unity Power Factor
If hydrogen cooled, indicate hydrogen pressure (psi) associated with your Reactive Curve submitted for ERCOT studies
Net Maximum Leading Operating Capability (MVAR)
Net Maximum Lagging Operating Capability (MVAR)

REACTIVE CAPABILITY CURVES

- **MW5 – Unity Power Factor**
 - Maximum value of Real Power MW at 1.0 PF. For MW5, Reactive Power (both Lagging & Leading) is zero.

- **Net Maximum Leading Operating Capability (MVAR)**
 - Maximum Leading Reactive Power output of the unit independent of Real Power output

- **Net Maximum Lagging Operating Capability (MVAR)**
 - Maximum Lagging Reactive Power output of the unit independent of Real Power output

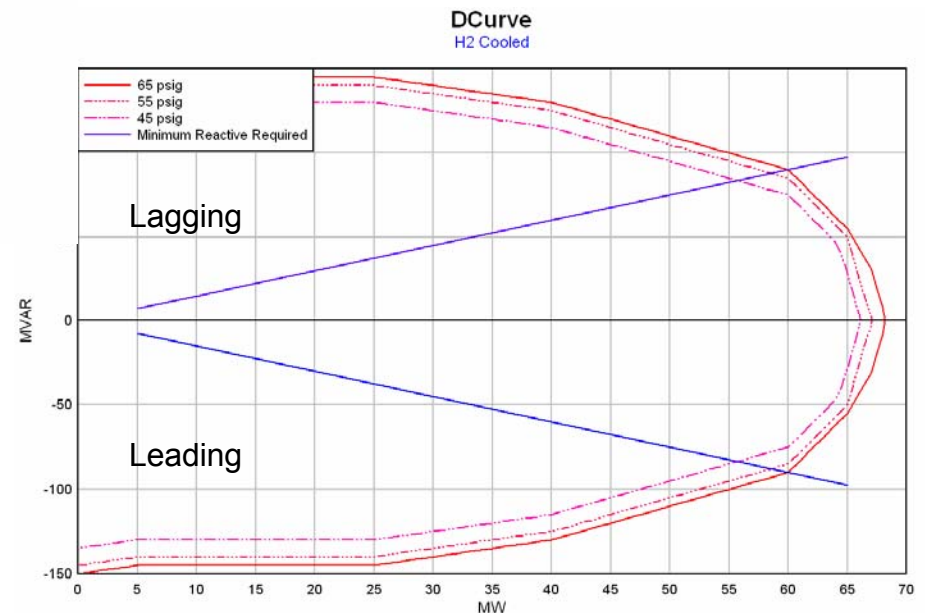
MW1 (lowest MW value of curve)
Lagging MVAR limit associated with MW1 output
Leading MVAR limit associated with MW1 output
MW2
Lagging MVAR limit associated with MW2 output
Leading MVAR limit associated with MW2 output
MW3
Lagging MVAR limit associated with MW3 output
Leading MVAR limit associated with MW3 output
MW4
Lagging MVAR limit associated with MW4 output
Leading MVAR limit associated with MW4 output
MW5- Unity Power Factor
If hydrogen cooled, indicate hydrogen pressure (psi) associated with your Reactive Curve submitted for ERCOT studies
Net Maximum Leading Operating Capability (MVAR)
Net Maximum Lagging Operating Capability (MVAR)

REACTIVE CAPABILITY CURVES

- Sample input data table

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

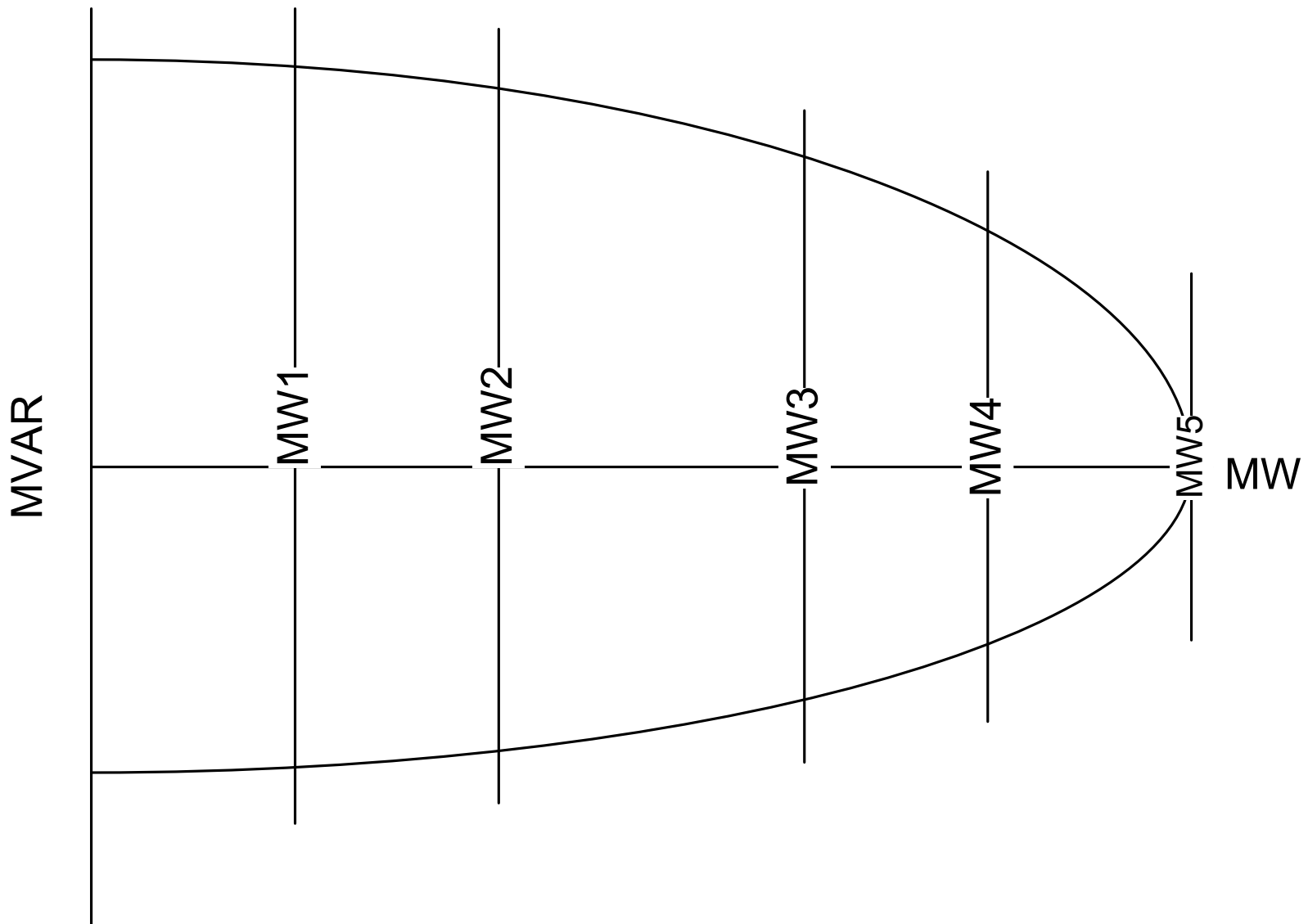
- Sample D-Curve used to create the data used in the table on left



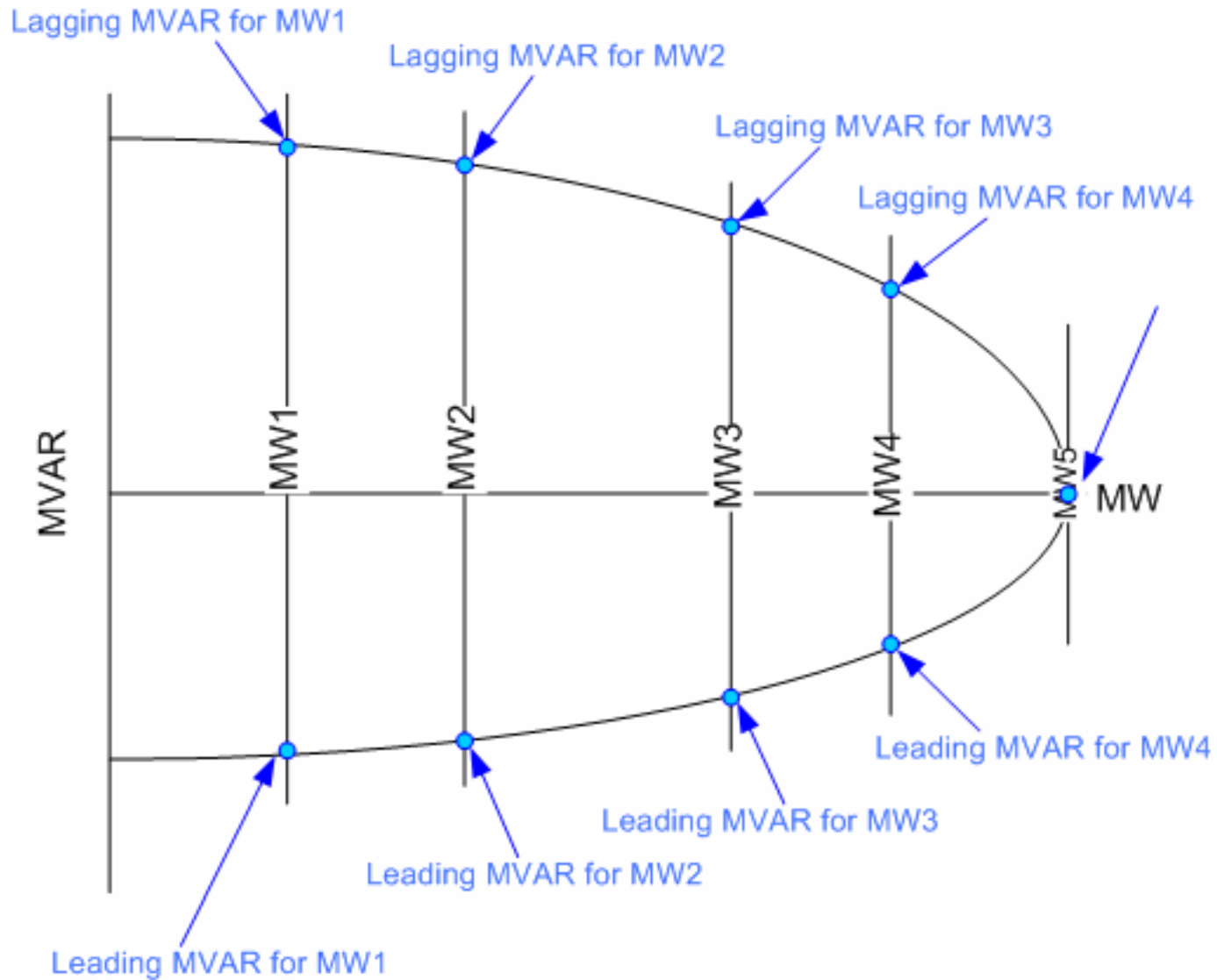
REACTIVE CAPABILITY CURVES – FAQ

- **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.

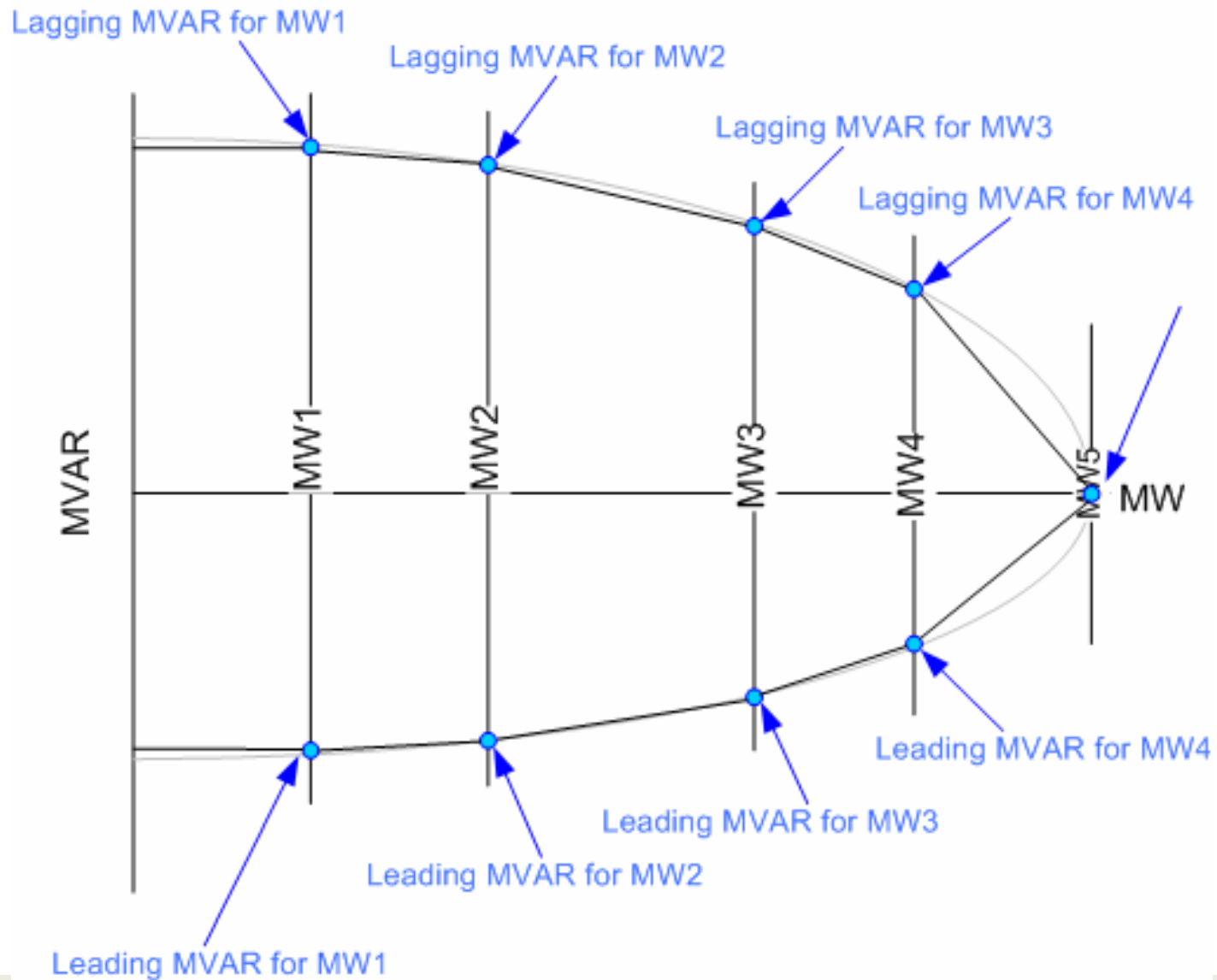
REACTIVE CAPABILITY CURVE – HOW TO



REACTIVE CAPABILITY CURVE – HOW TO



REACTIVE CAPABILITY CURVE – HOW TO





OPERATIONAL RESOURCE PARAMETERS

OPERATIONAL RESOURCE PARAMETERS

- **Minimum On-Line Time (Hrs)**
 - Minimum number of consecutive hours a Resource must be On-Line before being shut down. Field was previously called Minimum Up Time on zonal GARF.

- **Minimum Off-Line Time (Hrs)**
 - Minimum number of consecutive hours a Resource must be Off-Line before being restarted. Field was previously called Minimum Down Time on zonal GARF.

- **Hot Start Time (Hrs)**
 - Time, in hours, from the ERCOT notice to the Resource breaker-closing, for a Resource in its hot-temperature state.

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

OPERATIONAL RESOURCE PARAMETERS

- **Intermediate Start Time (Hrs)**
 - Time interval, in hours, from the ERCOT notice to the Resource breaker-closing, for a Resource in its intermediate temperature state.
- **Cold Start Time (Hrs)**
 - Time interval, in hours, from the ERCOT notice to the Resource breaker-closing, for a Resource in its cold-temperature state.
- **Max Weekly Starts**
 - The maximum number of times a Resource can be started in seven consecutive days under normal operating conditions.

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

OPERATIONAL RESOURCE PARAMETERS

- **Max On Line Time (Hrs)**
 - Maximum number of consecutive hours a Resource can run before it needs to be shut down.
- **Max Daily Starts**
 - Maximum number of times a Resource can be started in a 24 hour period under normal operating conditions.
- **Max Weekly Energy**
 - Maximum amount of energy, in MWh, a Resource can produce in seven consecutive days.

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

OPERATIONAL RESOURCE PARAMETERS

- **Ramp Rate Curve data will be entered for both Normal and Emergency Operations**
 - Ramp rates are initially submitted in the RARF
 - QSEs will be able to update the ramp rates in Market Management System (MMS)
- **Ramp rates will be in the up and down directions**
- **Ramp rate curves are step functions**
- **Ten segments/steps to RR curve **NEW!!****

Ramp Rate Curve

MW1 (MW1/Low to MW5/High end of curve)
Upward RampRate1 (MW/minute)
Downward RampRate1 (MW/minute) positive number
MW2
Upward RampRate2 (MW/minute)
Downward RampRate2 (MW/minute)
MW3
Upward RampRate3 (MW/minute)
Downward RampRate3 (MW/minute)
MW4
Upward RampRate4 (MW/minute)
Downward RampRate4 (MW/minute)
MW5
Upward RampRate5 (MW/minute)
Downward RampRate5 (MW/minute)

OPERATIONAL RESOURCE PARAMETERS

- All ramp rate values, including downward rates, should be entered in the RARF as positive values
- Ramp Rates and curves are critical and must be provided for every unit
- In the case of Combined Cycle facilities, Ramp Rates curves are needed for every configuration
- The values in the RARF are used to build the Ramp Rate step curves

Ramp Rate Curve

MW1 (MW1/Low to MW5/High end of curve)
Upward RampRate1 (MW/minute)
Downward RampRate1 (MW/minute) positive number
MW2
Upward RampRate2 (MW/minute)
Downward RampRate2 (MW/minute)
MW3
Upward RampRate3 (MW/minute)
Downward RampRate3 (MW/minute)
MW4
Upward RampRate4 (MW/minute)
Downward RampRate4 (MW/minute)
MW5
Upward RampRate5 (MW/minute)
Downward RampRate5 (MW/minute)

OPERATIONAL RESOURCE PARAMETERS

- **Ramp Rate Curves are not tools to restrain the operating range of the unit or configuration**
- **Ramp Rate Curves are extended down to zero and up to infinity.**
 - Realistically, the curves are limited to LRL and HRL.
 - Further operating restrictions are done as part of the COP and telemetry
- **Ramp Rates should not be zero or negative**
- **For ranges where the resource has to be manually ramped; the up and down ramp rate should be a MW rate at which, if requested, the resource can be manually ramped to within a 5 minute period**

Ramp Rate Curve

MW1 (MW1/Low to MW5/High end of curve)
Upward RampRate1 (MW/minute)
Downward RampRate1 (MW/minute) positive number
MW2
Upward RampRate2 (MW/minute)
Downward RampRate2 (MW/minute)
MW3
Upward RampRate3 (MW/minute)
Downward RampRate3 (MW/minute)
MW4
Upward RampRate4 (MW/minute)
Downward RampRate4 (MW/minute)
MW5
Upward RampRate5 (MW/minute)
Downward RampRate5 (MW/minute)

OPERATIONAL RESOURCE PARAMETERS

- **Decimal values are acceptable**
 - At this time, EDS testing is rounding these values. This issue is being resolved
- **If there is only one ramp rate, then only one MW value needs to be filled in**
- **If not all five MW values are used, use only MW1 through MWx as needed**
 - For example, if there are three rates, then use MW1, MW2, and MW3.

Ramp Rate Curve

MW1 (MW1/Low to MW5/High end of curve)
Upward RampRate1 (MW/minute)
Downward RampRate1 (MW/minute) positive number
MW2
Upward RampRate2 (MW/minute)
Downward RampRate2 (MW/minute)
MW3
Upward RampRate3 (MW/minute)
Downward RampRate3 (MW/minute)
MW4
Upward RampRate4 (MW/minute)
Downward RampRate4 (MW/minute)
MW5
Upward RampRate5 (MW/minute)
Downward RampRate5 (MW/minute)

OPERATIONAL RESOURCE PARAMETERS

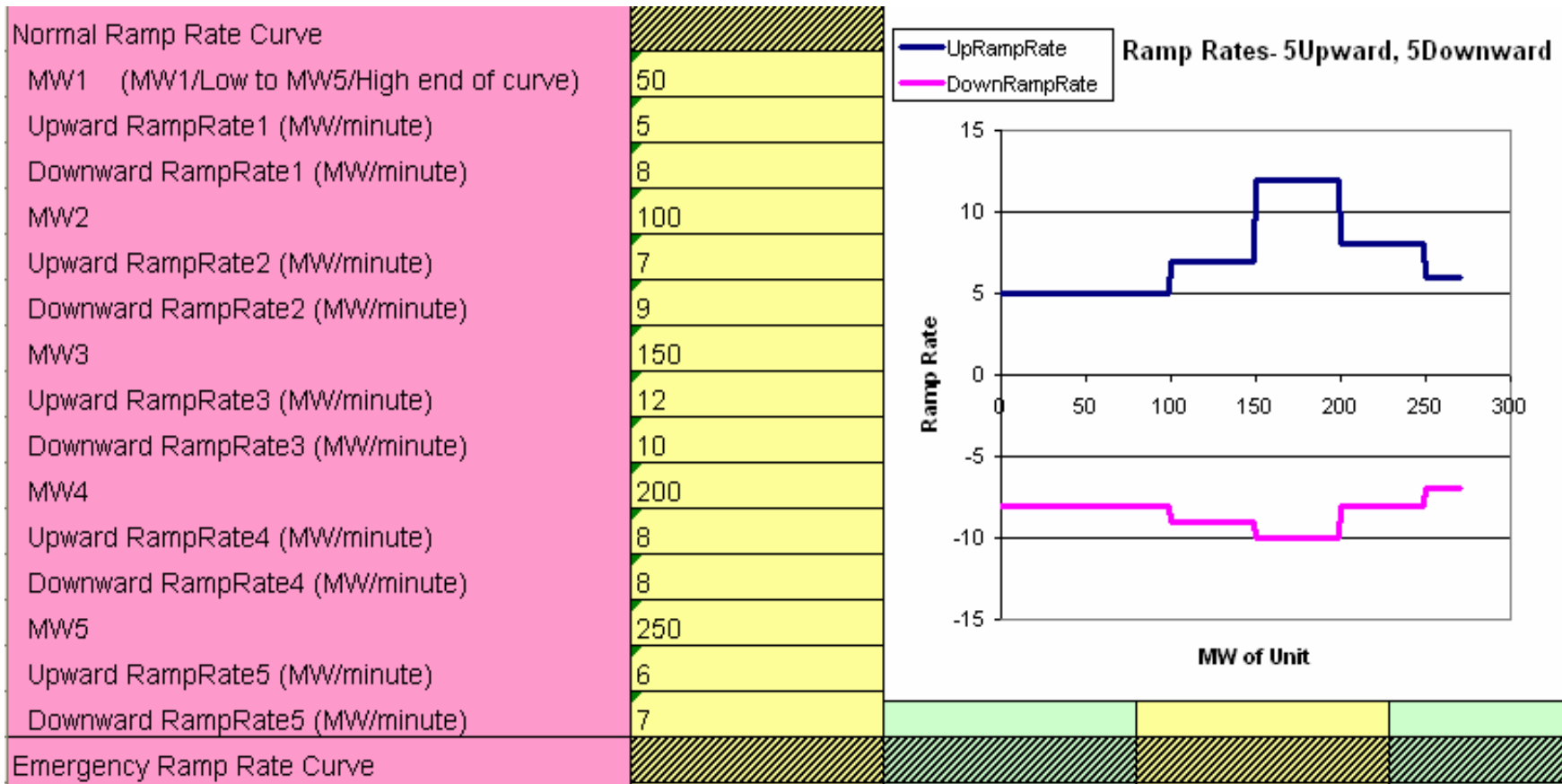
- The table below further defines the Ramp Rates. It also may help to sketch your curves to ensure the submitted data is accurate.

Ramp Rate Curve: The rate of change in MW per minute of a Resource, specified by the QSE to ERCOT by up to 10 segments, each segment represents a single MW per minute value (across the capacity of the Resource) that describe the available rate of change in output for the given range (between HRL and LRL) of output of a Resource.

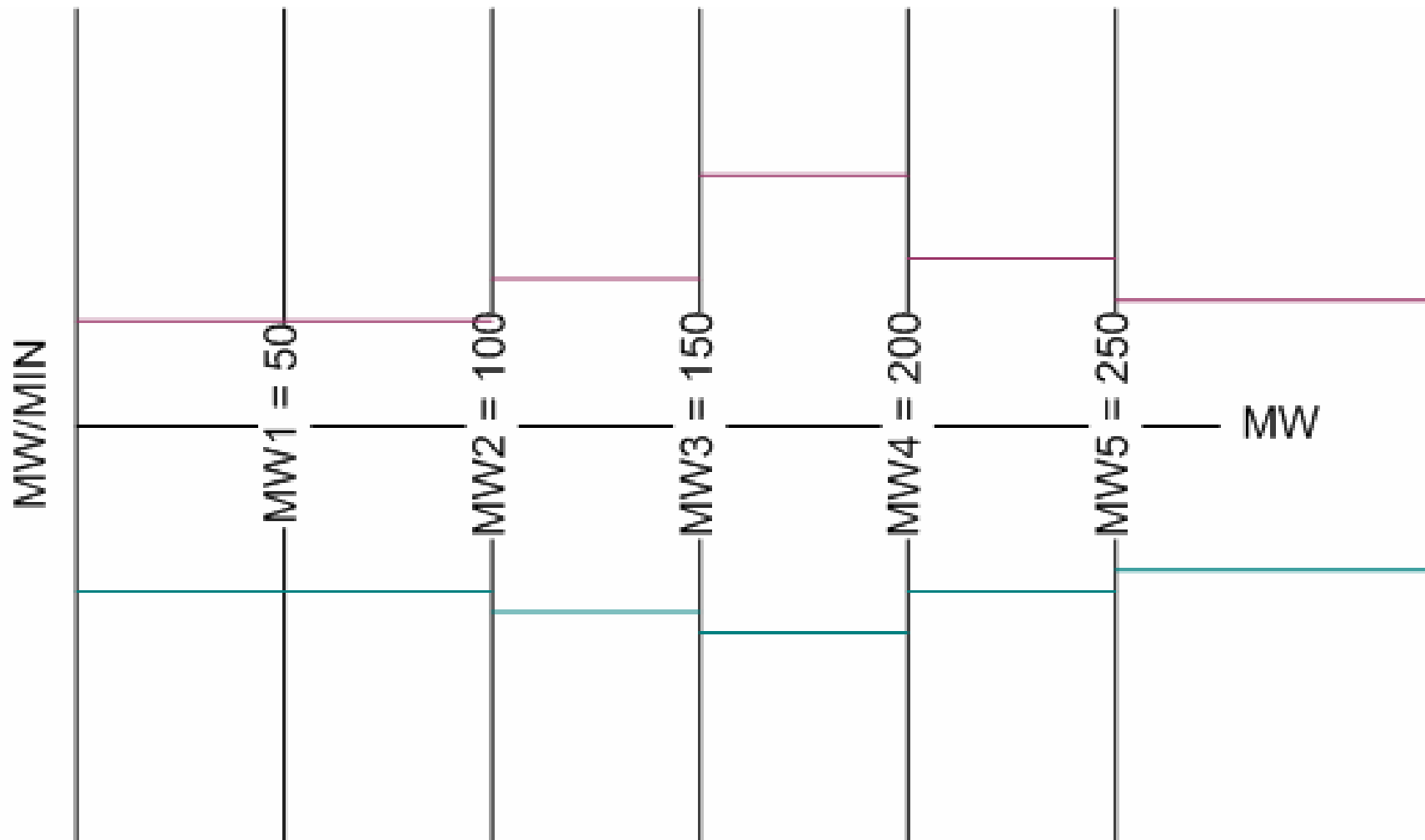
Ramp Rate Curve	
MW1 (MW1/Low to MW5/High end of curve)	<i>Covers all MW values between LRL and MW2</i>
Upward RampRate1 (MW/minute)	The upward rate of change in MW/minute for any MW value between LRL to MW2
Downward RampRate1 (MW/minute) positive number	The downward rate of change in MW/minute for any MW value between LRL and MW2
MW2	<i>Covers all MW values between MW2 and MW3</i>
Upward RampRate2 (MW/minute)	The upward rate of change in MW/minute for any MW value between MW2 and MW3
Downward RampRate2 (MW/minute)	The downward rate of change in MW/minute for any MW value between MW2 and MW3
MW3	<i>Covers all MW values between MW3 and MW4</i>
Upward RampRate3 (MW/minute)	The upward rate of change in MW/minute for any MW value between MW3 and MW4
Downward RampRate3 (MW/minute)	The downward rate of change in MW/minute for any MW value between MW3 and MW4
MW4	<i>Covers all MW values between MW4 and MW5</i>
Upward RampRate4 (MW/minute)	The upward rate of change in MW/minute for any MW value between MW4 and MW5
Downward RampRate4 (MW/minute)	The downward rate of change in MW/minute for any MW value between MW4 and MW5
MW5	<i>Covers all MW values between MW5 and HRL</i>
Upward RampRate5 (MW/minute)	The upward rate of change in MW/minute for any MW value between MW5 and HRL
Downward RampRate5 (MW/minute)	The downward rate of change in MW/minute for any MW value between MW5 and HRL

OPERATIONAL RESOURCE PARAMETERS

- SAMPLE RAMP RATE TABLE AND RAMP RATE CURVE**

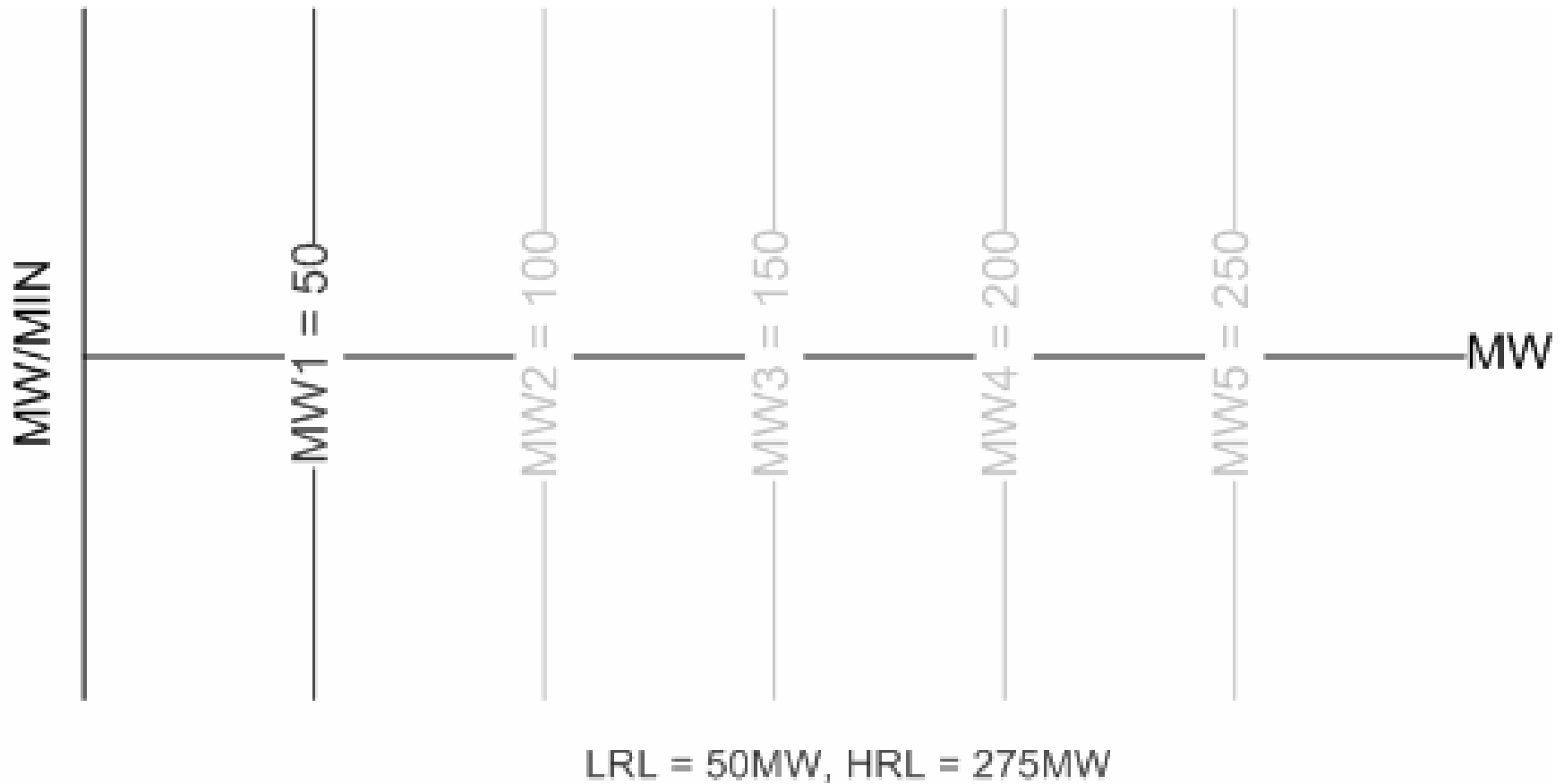


RAMP RATE CURVE – HOW TO

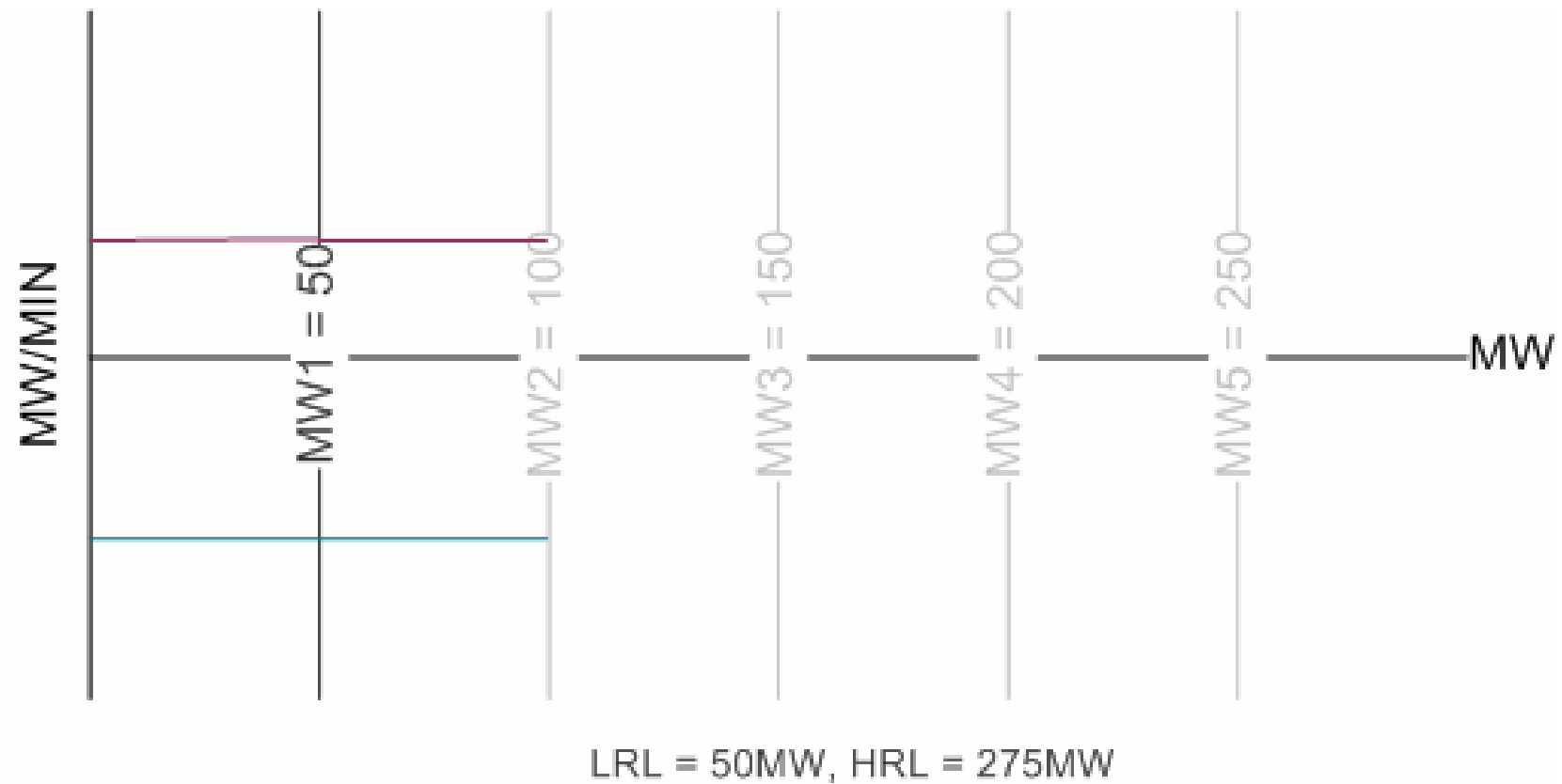


LRL = 50MW, HRL = 275MW

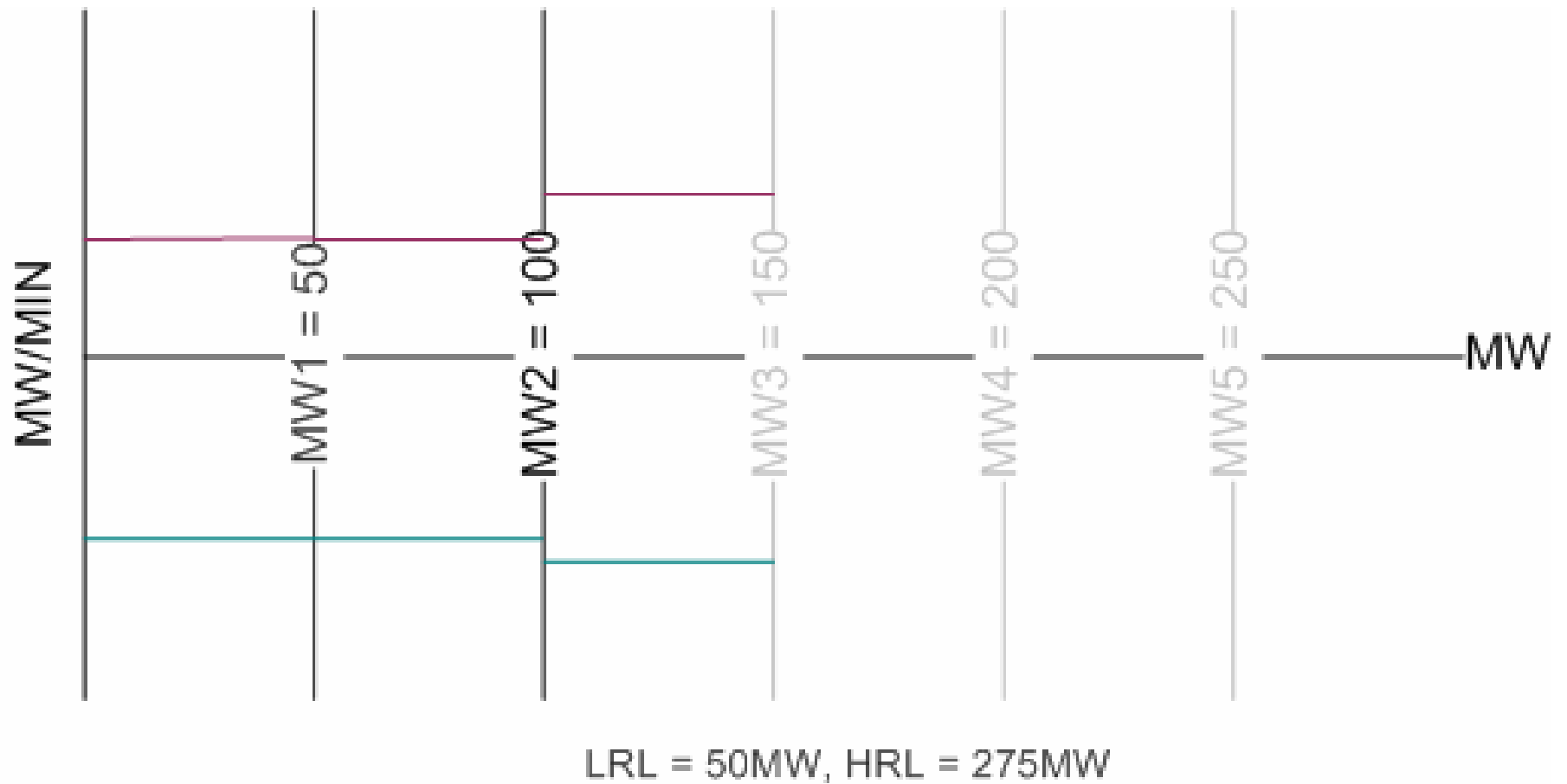
RAMP RATE CURVE – HOW TO



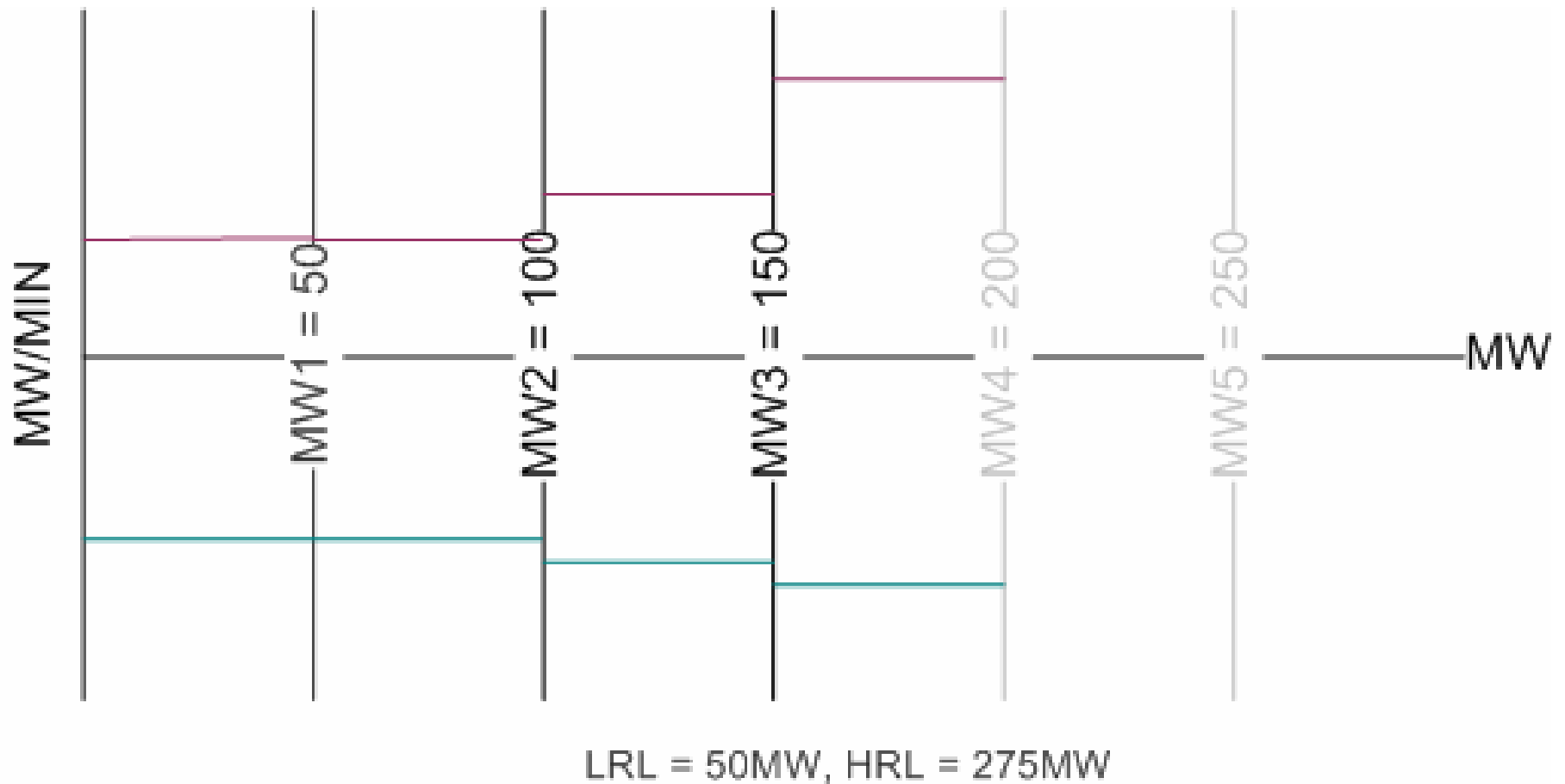
RAMP RATE CURVE – HOW TO



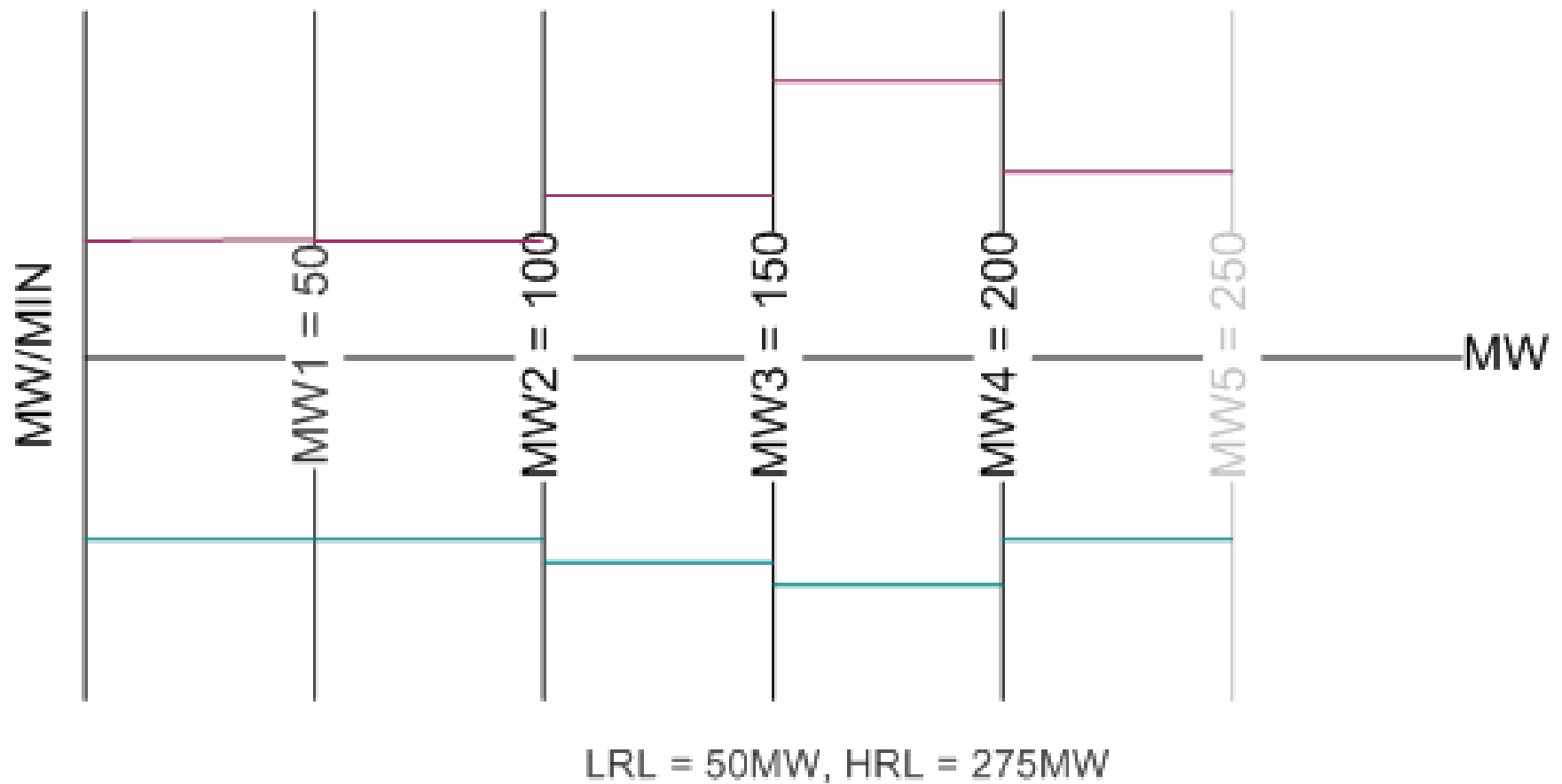
RAMP RATE CURVE – HOW TO



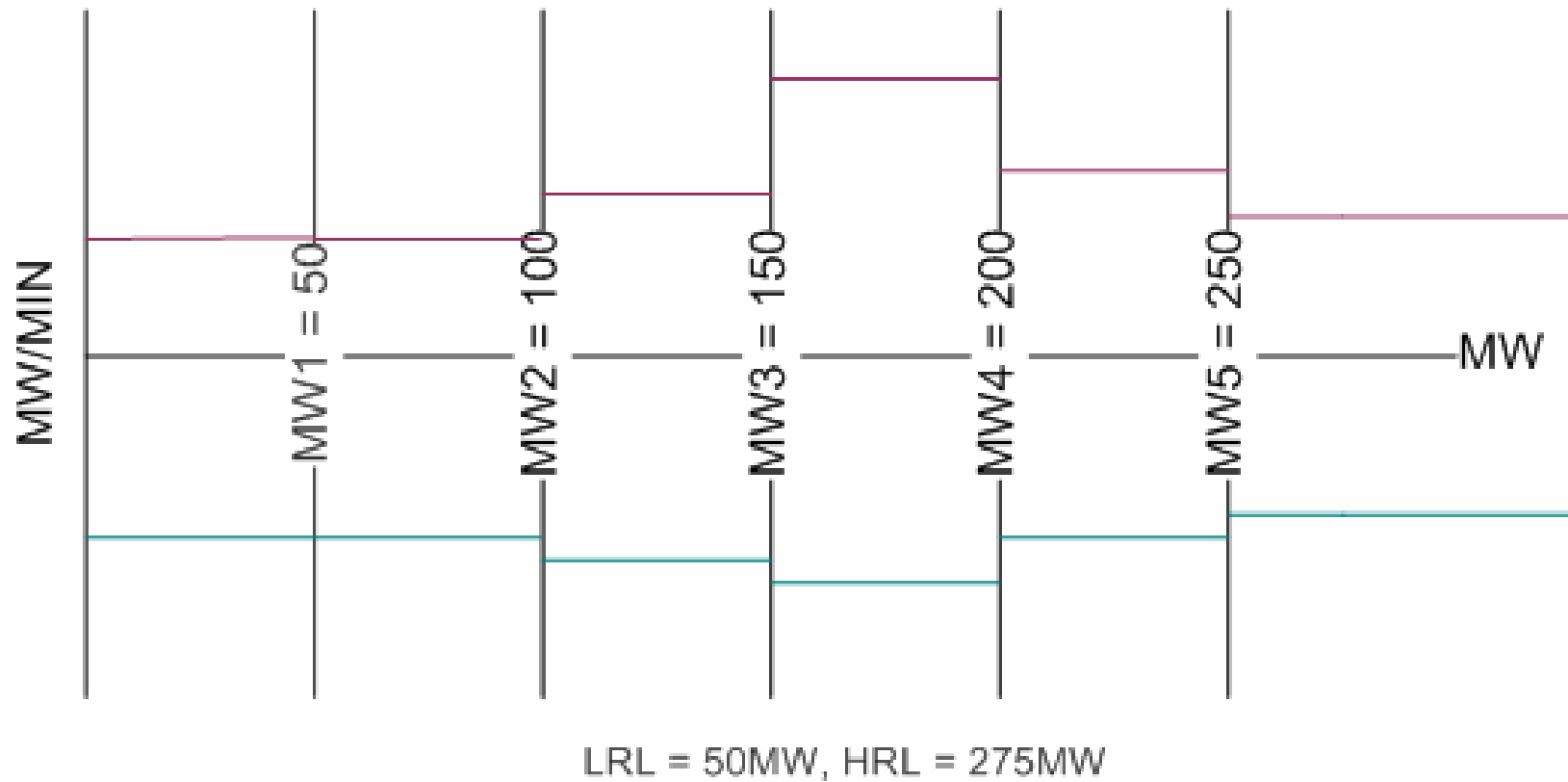
RAMP RATE CURVE – HOW TO



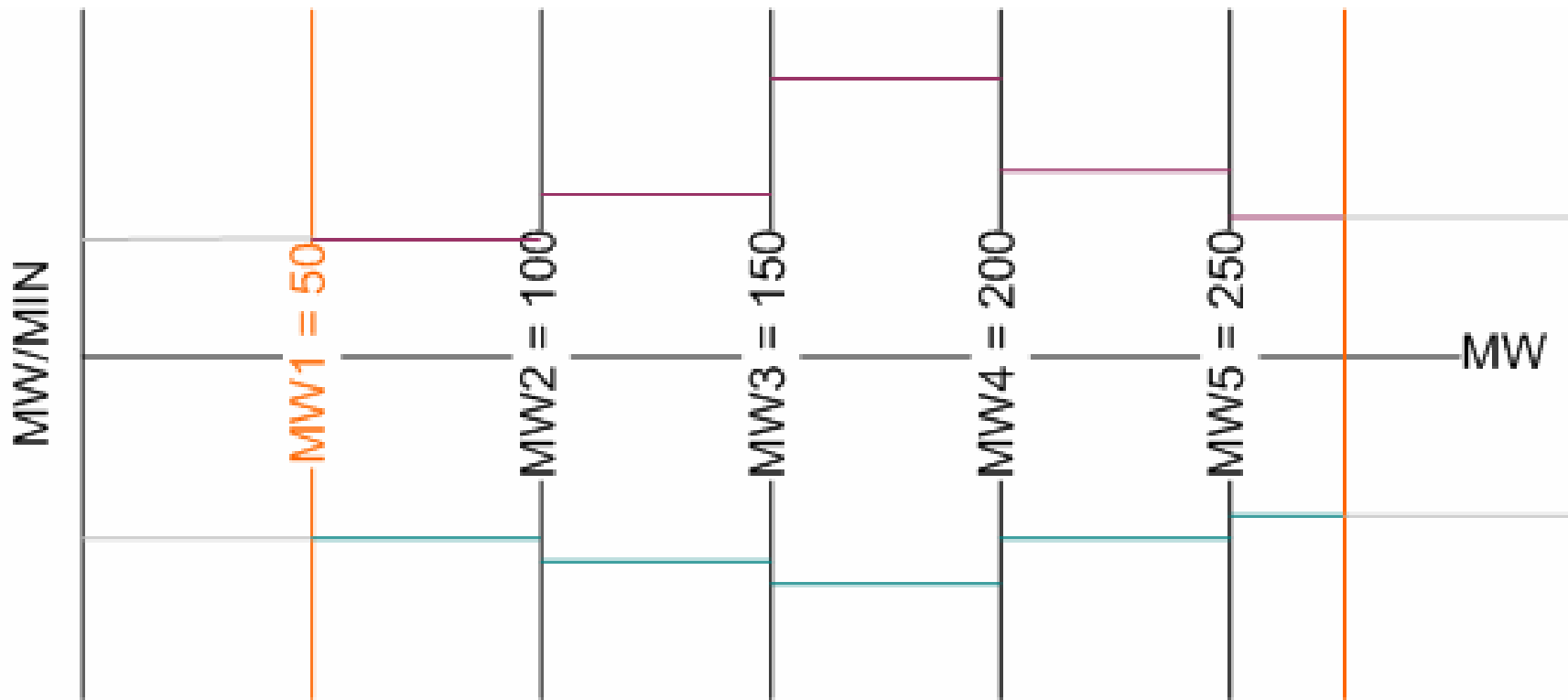
RAMP RATE CURVE – HOW TO



RAMP RATE CURVE – HOW TO



RAMP RATE CURVE – HOW TO



LRL = 50MW, HRL = 275MW

OPERATIONAL RESOURCE PARAMETERS – FAQ

- **What if there are multiple breakers?**
 - Provide time from initiating start to the last breaker to close in achieving the registered configuration.
- **If I enter zero as minimum online time, will I get startup costs if I am pulled offline before I close the breaker?**
 - Enter a **1** to ensure you run.

OPERATIONAL RESOURCE PARAMETERS – FAQ

- **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.

OPERATIONAL RESOURCE PARAMETERS – FAQ

- **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.

OPERATIONAL RESOURCE PARAMETERS – FAQ

- **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 right 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.

OPERATIONAL RESOURCE PARAMETERS – FAQ

- **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.

OPERATIONAL RESOURCE PARAMETERS – FAQ

- **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 sets. Please do not insert or delete rows or columns from the RARF, as this negatively affects automatically loading data.
- **For the "Normal Ramp Rate Curve", 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).

OPERATIONAL RESOURCE PARAMETERS – FAQ

- **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.

OPERATIONAL RESOURCE PARAMETERS – FAQ

- **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 base load 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.

OPERATIONAL RESOURCE PARAMETERS – FAQ

- **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.

OPERATIONAL RESOURCE PARAMETERS – FAQ

- **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.



Network Model Data

NETWORK MODEL DATA – GSU

- **kV Base**
 - Reference value for the Line-to-Line voltage of the transformer expressed in kV (kilovolts).

- **High Voltage Limit (no-load)**
 - Line-to-line voltage, in kV, on the high side (transmission side) of transformer when there is no load (i.e. breaker is open).

- **Low Voltage Limit (no-load)**
 - Line-to-line voltage, in kV, on the low side (generator side) of transformer when there is no load (i.e. breaker is open).

Step-Up Transformer Name (all data in 100MVA base)
(if multiple transformers, attach supporting data)

Provide kV Base

High Voltage Limit (no-load)

Low Voltage Limit (no-load)

High Voltage Connection (Delta/Wye)

Low Voltage Connection (Delta/Wye)

Series Resistance

Series Reactance

Shunt Magnetizing Conductance

Shunt Magnetizing Susceptance

Normal Rating MVA

Emergency Rating MVA

Loadshed Rating MVA

Load Tap Changer (Y/N)

NETWORK MODEL DATA – GSU

- **High Voltage Connection (Delta/Wye)**
 - Transformer winding connection on the high side of the transformer

- **Low Voltage Connection (Delta/Wye)**
 - Transformer winding connection on the low side transformer

Step-Up Transformer Name (all data in 100MVA base)
(if multiple transformers, attach supporting data)

Provide kV Base

High Voltage Limit (no-load)

Low Voltage Limit (no-load)

High Voltage Connection (Delta/Wye)

Low Voltage Connection (Delta/Wye)

Series Resistance

Series Reactance

Shunt Magnetizing Conductance

Shunt Magnetizing Susceptance

Normal Rating MVA

Emergency Rating MVA

Loadshed Rating MVA

Load Tap Changer (Y/N)

NETWORK MODEL DATA – GSU

- **Series Resistance (R1)**
 - Determined by “short-circuit test” where the low-voltage side is short-circuited and enough voltage is applied on high-voltage terminals to circulate rated current.
 - This is the winding resistance per phase (p.u.).

- **Series Reactance (X1)**
 - Determined by “short-circuit test” where the low-voltage side is short-circuited and enough voltage is applied on high-voltage terminals to circulate rated current.
 - This is the winding reactance per phase (p.u.).

- **Series Impedance, $Z1 = R1 + jX1$**

Step-Up Transformer Name (all data in 100MVA base)
(if multiple transformers, attach supporting data)

Provide kV Base

High Voltage Limit (no-load)

Low Voltage Limit (no-load)

High Voltage Connection (Delta/Wye)

Low Voltage Connection (Delta/Wye)

Series Resistance

Series Reactance

Shunt Magnetizing Conductance

Shunt Magnetizing Susceptance

Normal Rating MVA

Emergency Rating MVA

Loadshed Rating MVA

Load Tap Changer (Y/N)

NETWORK MODEL DATA – GSU

- Shunt Magnetizing Conductance (G_c) in p.u.**
 - Calculated using an “open-circuit test” where rated voltage is applied to the low-voltage terminal, and power input and currents are measured.
 - Part of the magnetizing admittance, $Y = G_c - jB_m$ per phase
- Shunt Magnetizing Susceptance (B_m) in p.u.**
 - Calculated using an “open-circuit test” where rated voltage is applied to the low-voltage terminal, and power input and currents are measured.
 - Part of the magnetizing admittance, $Y = G_c - jB_m$ per phase

Step-Up Transformer Name (all data in 100MVA base)
(if multiple transformers, attach supporting data)

Provide kV Base

High Voltage Limit (no-load)

Low Voltage Limit (no-load)

High Voltage Connection (Delta/Wye)

Low Voltage Connection (Delta/Wye)

Series Resistance

Series Reactance

Shunt Magnetizing Conductance

Shunt Magnetizing Susceptance

Normal Rating MVA

Emergency Rating MVA

Loadshed Rating MVA

Load Tap Changer (Y/N)

NETWORK MODEL DATA

- **Normal Rating MVA**
 - Represents the continuous MVA rating of Transmission Facility (including substation terminal equipment in series with a conductor or transformer) at the applicable ambient temperature.
 - Transmission Facility can operate at this rating indefinitely without damage, or violation of National Electrical Safety Code (NESC) clearances.

- **Example:**
 - Normal rating MVA of 345 kV line = **400 MVA @ 80 °F** ambient temp. (Continuous Rating)

Step-Up Transformer Name (all data in 100MVA base)
(if multiple transformers, attach supporting data)

Provide kV Base

High Voltage Limit (no-load)

Low Voltage Limit (no-load)

High Voltage Connection (Delta/Wye)

Low Voltage Connection (Delta/Wye)

Series Resistance

Series Reactance

Shunt Magnetizing Conductance

Shunt Magnetizing Susceptance

Normal Rating MVA

Emergency Rating MVA

Loadshed Rating MVA

Load Tap Changer (Y/N)

NETWORK MODEL DATA – GSU

- **Emergency Rating MVA**
 - Represents the two (2) hour MVA rating of a Transmission Facility (including substation terminal equipment in series with a conductor or transformer) at the applicable ambient temperature.
 - The Transmission Facility can operate at this rating for two (2) hours without violation of NESC clearances or equipment failure.
- **Loadshed Rating MVA**
 - The Transmission Facility can operate at this rating for fifteen minutes without violation of NESC clearances or equipment failure.

Step-Up Transformer Name (all data in 100MVA base)
(if multiple transformers, attach supporting data)

Provide kV Base

High Voltage Limit (no-load)

Low Voltage Limit (no-load)

High Voltage Connection (Delta/Wye)

Low Voltage Connection (Delta/Wye)

Series Resistance

Series Reactance

Shunt Magnetizing Conductance

Shunt Magnetizing Susceptance

Normal Rating MVA

Emergency Rating MVA

Loadshed Rating MVA

Load Tap Changer (Y/N)

NETWORK MODEL DATA – GSU TAP CHANGER

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

- **Complete only section that applies to transformer**
 - Low side is Generator side
 - High side is Transmission side
- **Nominal Voltage is design voltage in KV**
- **Use positions**
 - Typically 1 through 5 or -16 to 16

NETWORK MODEL DATA – GSU FAQ

- **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.
 - 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.

NETWORK MODEL DATA – GSU FAQ

- **What do we do if we have more than one step-up transformer per unit?**
 - Attach additional transformer information with the RARF submittal.
 - The “New RARF” will revisit this, allowing transformers to be registered, and then assigned to appropriate units
- **What do we do if we have multiple units for one step-up transformer?**
 - Enter the transformer information once, and put a reference in the “transformer name” row for the other units.
 - This will also be resolved in the “New RARF”

NETWORK MODEL DATA – GSU FAQ

- **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. Even if the MVA Base is given, the resource needs to provide the kV Base in the RARF.
 - Use “Line-to-Line Voltage” kV Base for uniformity

NETWORK MODEL DATA – GSU FAQ

- **In the Network Model Transformer Data section, what is needed in the Low Voltage Limit and High Voltage Limit fields?**
 - 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)
 - For example, the per-unit nominal voltage is 1.0, the no-load limits could be 1.1.

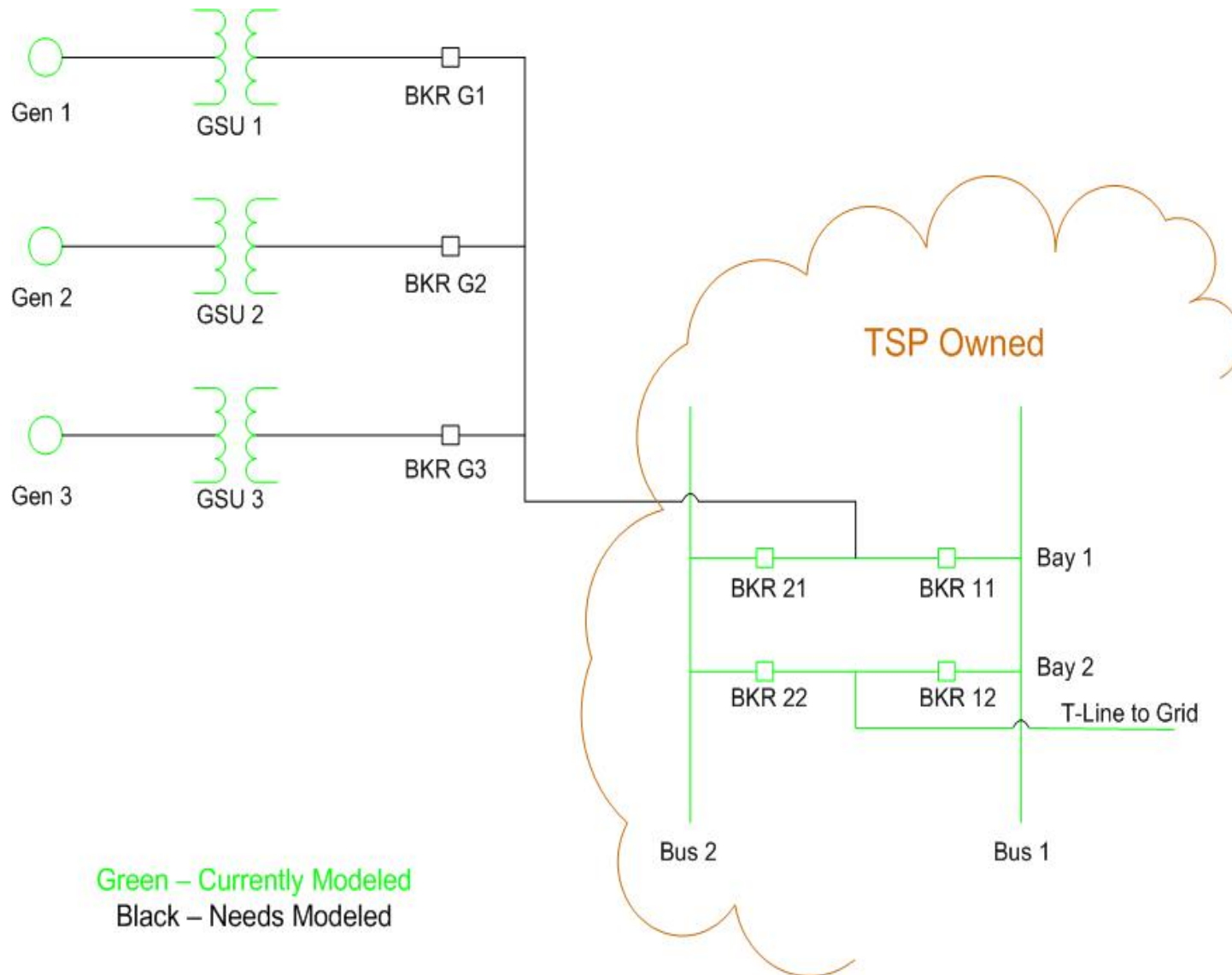
NETWORK MODEL DATA – GSU FAQ

- **Where can I find existing transformer information?**
 - 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.
- **Where do I find the transformer name?**
 - 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 (Line-to-Line Voltage) KV Base needs to be submitted. Additional information on the Conductance, Susceptance and MVA ratings can be found in the Glossary (see the Appendix).

NETWORK MODEL DATA – ADDITIONAL ASSETS

- **Applies to ALL generation resources**
- **Used to complete the model of the transmission system**
 - Capture lines and equipment other than the generator and step-up transformer that are owned and/or operated by the generation resource and not part of the operations of the TSP.
 - This information is needed for the ERCOT system model, and is required per the Nodal Protocols in section 3.10.7.
 - Examples include the transmission line to reach the first TSP-modeled substation or a capacitor bank in service between the generator and the TSP switching device.
- **Another resource for existing PTI model information includes the ERCOT Branch Data zip file found in the Operations and System Planning (OSP) secure website**
 - To login or to register for access for the OSP website, please go to <http://oldercot.ercot.com/tmaps/login.cfm>
 - Once a user is logged in, select the folder “Operations Model Data” then select the zip file for ERCOT Branch Data.

NETWORK MODEL DATA – ADDITIONAL ASSETS



NETWORK MODEL DATA – ADDITIONAL ASSETS

LINE (any length)		Notes	Line 1	Line 2
Status (ADD, DEL, CHANGE)		Select ADD, DEL, or CHG where ADD = Addition; DEL = Deletion; CHG = Change		
	If this is a change, is it for a change in Impedance and/or Ratings?	Only answer this question if CHG was selected above. Please select Impedance, Ratings, or Both.		
ERCOT LINE NAME		RE to work with TSP to define a name using the established naming convention. The Line Name is checked for uniqueness by ERCOT.		
Line Voltage Level kV		Enter line voltage value in KV.		
TSP Name		Identify TSP at point of interconnection to ERCOT grid.		
To TSP Owned Station	ERCOT Station Code Mnemonic (TSP owned)	Enter ERCOT Station Code at point of interconnection to ERCOT Grid. RE to verify with TSP		
	Switching Device Name(s)	Enter switching device names at point of interconnection. RE to verify with TSP.		
	Bus Number (PTI Bus Number)	Enter PTI Bus Number at point of interconnection. RE to verify with TSP.		
	Station Weather Zone	Enter Weather Zone for the station at the point of interconnection. RE to verify with TSP.		
From RE Station	ERCOT Station Code Mnemonic (RE owned)	Enter ERCOT Station Code at point of interconnection to ERCOT Grid. RE to verify with TSP		
	Switching Device Name(s)	Enter switching device names (identified below).		
	Bus Number (PTI Bus Number)	Enter PTI Bus Number (identified below).		
	Station Weather Zone	Enter Weather Zone for the station.		
Resistance in p.u.		Enter the resistance for this line in per-unit using a 100MVA base.		
Reactance in p.u.		Enter the reactance for this line in per-unit using a 100MVA base.		
Charging Susceptance in p.u.		Enter the charging susceptance for this line in per-unit using a 100MVA base.		
Continuous Rating (MVA)		Enter the continuous rating in MVA.		
2-hr Emergency Rating (MVA)		Enter the 2 hour emergency rating in MVA.		
15-min Rating (MVA)		Enter the 15 minute emergency rating in MVA.		
Has an ICCP Service Request been submitted?		Verify that an ICCP Service Request been submitted for all related ICCP points.		
Comments		Enter RE comments (if any).		

NETWORK MODEL DATA – ADDITIONAL ASSETS

BREAKER or SWITCH		Notes	Device 1	Device 2
Status (ADD, DEL, CHANGE)		Select ADD, DEL, or CHG where ADD = Addition; DEL = Deletion; CHG = Change		
Switch Name		Enter switch name.		
Device Status		State whether this device is NO (normally open) or NC (normally closed)		
Voltage Level KV		Enter nameplate value in KV.		
PTI Bus Number		Enter PTI Bus Number. Assigned by TSP if not already assigned.		
Will this station will have or has a Voltage reading?		Identify if the voltage reading via SCADA/ICCP exists or will exist.		
	If yes, what is the PTI Bus Number where the voltage is read.	If the answer above is Y, Identify the PTI Bus number where the voltage will be read.		
Has an ICCP Service Request been submitted?		Verify that an ICCP Service Request been submitted for all switching device points.		
Comments		Enter RE comments (if any).		
CAPACITOR or REACTOR		Notes	Device 1	Device 2
Status (ADD, DEL, CHANGE)		Select ADD, DEL, or CHG where ADD = Addition; DEL = Deletion; CHG = Change		
Capacitor or Reactor (C/R)		Select CAP or REACT where CAP = Capacitor and REACT = Reactor		
Device Name		Enter the device name. Work with TSP and ERCOT if questions exist on the naming convention.		
Nominal MVAR		Enter nameplate value in MVAR.		
Voltage Level KV		Enter nameplate value in KV.		
PTI Bus Number		Enter PTI bus number. If not already assigned, work with TSP to get number assigned.		
Switching device number(s) that this reactive device is directly connected to		Verify with TSP.		
Has an ICCP Service Request been submitted?		Verify that an ICCP Service Request been submitted for all related ICCP points.		
Comments		Enter RE comments (if any).		

NETWORK MODEL DATA – ADDITIONAL ASSETS

- **ERCOT Branch Data can assist with filling this out**
 - Found in Operations Model Data folder on secure Operations and System Planning Website
 - <http://oldercot.ercot.com/tmaps/login.cfm>
- **TSP will be familiar with naming conventions and may be able to provide assistance**
- **Additional questions should be directed to NodalMarketTransition@ercot.com who will redirect to ERCOT Network Modeling**

NETWORK MODEL DATA – ADDITIONAL ASSETS FAQ

- **The breaker ownership used to be the TSP and now is part of the generation company. Who should report this information?**
 - The entity that owns/represents the breaker should report it.
 - If the TSP previously provided the information to ERCOT, it should be available in the ERCOT Branch Data file.
 - The generation entity should validate/verify the information if the current model is the source.



PLANNING DATA

PLANNING DATA

- **Identify the MVA base for the generator unit data**
 - Typically, this is 100 MVA (3-phase) but not always. Check OEM data.
- **Identify the KV base for the generator unit data**
 - Typically, this is the Line-to-Line Terminal Voltage
 - Example: Nameplate rating of Generator is 300 MVA, 13.8 kV, use kV base = 13.8 kV
- **Impedances should be provided in per unit of the machine base identified in this section.**

What is the MVA base that the following data is based on?

What is the kV base that the following data is based on?

Machine Impedance

Positive Sequence Z

Negative Sequence Z

Zero Sequence Z

Armature Z

Rotor Z

Mutual coupling Armature-Rotor Z

PLANNING DATA

Direct Axis Subtransient reactance, X''di
Direct Axis Transient reactance, X'di
Breaker Interruption (after the relay is closed, how many cycles does it take to clear the fault?)
Plant Voltage Protection
Instantaneous Undervoltage Trip (kV)
Time 1 (provide a time in seconds)
Undervoltage 1 (kV)
Time 2 (seconds)
Undervoltage 2 (kV)
Time 3 (seconds)
Undervoltage 3 (kV)
Instantaneous Overvoltage Trip (kV)
Time 1 (seconds)
Overvoltage 1 (kV)
Time 2 (seconds)
Overvoltage 2 (kV)
Time 3 (seconds)
Overvoltage 3 (kV)
Plant Frequency Protection
Instantaneous Underfrequency Trip (Hz)
Time 1 (provide a time in seconds)
Underfrequency 1 (Hz)
Time 2 (seconds)
Underfrequency 2 (Hz)
Time 3 (seconds)
Underfrequency 3 (Hz)
Instantaneous Overfrequency Trip (Hz)
Time 1 (seconds)
Overfrequency 1 (Hz)
Time 2 (seconds)
Overfrequency 2 (Hz)
Time 3 (seconds)
Overfrequency 3 (Hz)

- **Identify time for breaker clear fault**
- **Identify generator protection**
 - Voltage
 - Frequency
 - Instantaneous and up to three settings

PLANNING DATA

Direct Axis Subtransient reactance, X''_{di}
Direct Axis Transient reactance, X'_{di}
Breaker Interruption (after the relay is closed, how many cycles does it take to clear the fault?)
Plant Voltage Protection
Instantaneous Undervoltage Trip (kV)
Time 1 (provide a time in seconds)
Undervoltage 1 (kV)
Time 2 (seconds)
Undervoltage 2 (kV)
Time 3 (seconds)
Undervoltage 3 (kV)
Instantaneous Overvoltage Trip (kV)
Time 1 (seconds)
Overvoltage 1 (kV)
Time 2 (seconds)
Overvoltage 2 (kV)
Time 3 (seconds)
Overvoltage 3 (kV)
Plant Frequency Protection
Instantaneous Underfrequency Trip (Hz)
Time 1 (provide a time in seconds)
Underfrequency 1 (Hz)
Time 2 (seconds)
Underfrequency 2 (Hz)
Time 3 (seconds)
Underfrequency 3 (Hz)
Instantaneous Overfrequency Trip (Hz)
Time 1 (seconds)
Overfrequency 1 (Hz)
Time 2 (seconds)
Overfrequency 2 (Hz)
Time 3 (seconds)
Overfrequency 3 (Hz)

- **Direct Axis Subtransient Reactance, X''_{di}**
 - In per unit on Machine MVA base
 - Reactance determined from the ratio of an initial reduced voltage open circuit condition and the currents from the three-phase fault at the machine terminals at the rated frequency.
 - Initial open circuit voltage is adjusted so the rated current is obtained. The impedance is determined from the currents during the first few cycles
- **Direct Axis Transient Reactance, X'_{di}**
 - In per unit on Machine MVA base
 - Reactance determined from the ratio of an initial reduced voltage open circuit condition and the currents from the three-phase fault at the machine terminals at the rated frequency
 - Initial open circuit voltage is adjusted so the rated current is obtained. The initial high decrement currents during the first few cycles are neglected
- $X''_{di} < X'_{di} < X_{di}$
 - Direct Axis Subtransient Reactance is less than the Transient Reactance

PLANNING DATA

Auxiliary Load:

- Motors, lighting, pumps, etc.

- **Identify the total real aux load (MW)**
- **Identify the total reactive aux load (MVAR)**
- **Identify the load characteristics by MW and MVAR, in percentage of auxiliary load**

Generation Auxiliary Load Characteristics:

Total Auxiliary Load (MW)

Total Auxiliary Load (MVAR)

--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

-Discharge Lighting, percent of total MVAR load

-Other, percent of total MVAR load

PRIVATE NETWORK INFORMATION - SITE

- **Load Characteristics PN load**
 - Definition of large and small motor
 - By voltage
 - Connected 2400/4160V and above are large
 - Connected below 2400/4160V are small
- **Percentages of MW should add up to 100%**
- **Percentages of MVAR should add up to 100%**
- **Load characteristics of generator auxiliary load are not assumed to be the same as the load characteristics of the private networks.**
- **Give most information with a reasonable amount of effort**
 - Guesses and inaccuracies cause model to be inaccurate

PLANNING DATA

Mass 1
Mass Inertia
Inertia units
Associated damping
Damping units
Stiffness between Masses
Stiffness units
Mass 2
Mass Inertia
Inertia units
Associated damping
Damping units
Stiffness between Masses
Stiffness units

- **Subsynchronous Resonance information needed when in-line capacitance is used**
- **Machines at either end of the transmission line would need to be studied**
- **Not needed until transmission lines are proposed**

Mass Identifier	Identification of the masses- HP, IP, LP1, LP2, EXC, etc.
Mass Inertia	H-value. The inertia constant of each mass, either in MW, MVA, or lbm.ft ²
Inertia units	MW, MVA, or lbm.ft ²
Associated damping	The damping associated with each mass either in pu torque/pu speed deviation, or lbf.ft.sec/rad
Damping units	pu torque/pu speed or lbf.ft.sec/rad
Stiffness between Masses	The stiffness (spring constant) between each two mass, either in pu torque/rad, or lbf.ft/rad (Coupling)
Stiffness units	pu torque/rad or lbf.ft/rad

PLANNING DATA

- **Forms available online**
- **Over/under excitation forms are new**
- **Used for dynamic models**

Generator Form on file with ERCOT? (Y or N)	Select Y or N. ERCOT will work with you to find an answer if it is not readily available.
Turbine-Governor Form on file with ERCOT? (Y or N)	Select Y or N. A possible source of information include previously signed GARF. This is provided for reference. To correct/enter this field, please use the RARF.
Excitation Form on file with ERCOT? (Y or N)	Select Y or N. A possible source of information include previously signed GARF. This is provided for reference. To correct/enter this field, please use the RARF.
Do you have a Power System Stabilizer?	Select Y or N. A possible source of information include previously signed GARF. This is provided for reference. To correct/enter this field, please use the RARF.
If so, is Stabilizer Form on file with ERCOT? (Y or N)	Select Y or N. A possible source of information include previously signed GARF. This is provided for reference. To correct/enter this field, please use the RARF.
Compensator Form on file with ERCOT? (Y or N)	Select Y or N. A possible source of information include previously signed GARF. This is provided for reference. To correct/enter this field, please use the RARF.
Do you have a Over Excitation Limiter?	Select Y or N.
If so, is Over Excitation Limiter Form on file with ERCOT? (Y or N)	Select Y or N. ERCOT will work with you to find an answer if it is not readily available.
Do you have a Under Excitation Limiter?	Select Y or N.
If so, is Under Excitation Limiter Form on file with ERCOT? (Y or N)	Select Y or N. ERCOT will work with you to find an answer if it is not readily available.

PLANNING DATA – FAQ

- **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?**
 - The impedance should include the machine impedance plus neutral grounding impedance (if any).
 - 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.

PLANNING DATA – FAQ

- **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.**
 - The three pieces of information – Armature, Rotor, Mutual Coupling – should be provided together.
 - Alternatively, the Z_{eq} could be submitted in the first row of this section in lieu of the individual impedance components.
 - 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.

- **What is Armature Z? 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) are used to calculate an equivalent impedance for the unit, Z_{eq} .
- **Is Machine Impedance the same as Positive Sequence?**
 - Machine Impedance (Z) row should be the Z_{eq} if available.

PLANNING DATA – FAQ

- **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.
- **Breaker Interruption Time (RARF) – What breaker is being referred to?**
 - The breaker that protects the generator

PLANNING DATA – FAQ

- **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.
- **My Turbine Rating is a curve. The output is based on steam inlet temp. What value do I fill in?**
 - This should be gross, the maximum MW the turbine is designed for.

PLANNING DATA – FAQ

- **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 as 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 these 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.

PLANNING DATA – FAQ

- **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>
 - ERCOT's standard models are obtained from PSSE manuals
 - Non-standard models, typically new generator designs, will have to be generated and submitted by the resource



Private Network Information

PRIVATE NETWORK INFORMATION

- **Please note that we are asking for gross totals as well as net values for the specific rows. A simple check would be to follow the equation below:**
- **Net Interchange = Gross Capability – Self Serve Load**

PRIVATE NETWORK INFORMATION - SITE

Private Network (Y or N)	Enter as Y or N
Average Amount of Self-Serve private load (MW)	Site Total MW Load (also remains on RARF where load is allocated to each unit).
Average Amount of Self-Serve private reactive load (MVAR)	Site Total MVAR Load (also new field on Gen/CC tab to allocate to each unit).
Expected Typical Private Network Net Interchange (MW)	Enter as MW - typical net interchange for the site. Positive values indicate net generator on grid. Negative values indicate net load on grid.
Expected Typical Private Network Net Reactive Interchange (MVAR)	Enter as MVAR - typical net interchange for the site. Positive values indicate net generator on grid. Negative values indicate net load on grid.
Private Network Gross Unit Capability (MW)	Total generation capability of all the private network generators at the site in MW.
Private Network Gross Unit Reactive Capability (MVAR)	Total reactive capability of all the private network generators at the site in MVAR.
Load Characteristics:	
--Large Motor, percent of total MW load	Defined by electrical connection of 4160V and up. Enter as a percentage of total MW Load (Average Amount of Self-Serve private load MW)
-Small Motor, percent of total MW load	Defined as electrically connected at voltage less than 2400/4160V. Enter as a percentage of total MW Load (Average Amount of Self-Serve private load MW)
-Resistive (Heating) Load, percent of total MW load	Enter as a percentage of total MW Load (Average Amount of Self-Serve private load MW)
-Discharge Lighting, percent of total MW load	Enter as a percentage of total MW Load (Average Amount of Self-Serve private load MW)
-Other, percent of total MW load	Enter as a percentage of total MW Load (Average Amount of Self-Serve private load MW). The Large Motor, Small Motor, Resistive, Discharge Lighting, and Other should total 100% of the Total MW Load.
--Large Motor, percent of total MVAR load	Defined by electrical connection of 4160V and up. Enter as a percentage of total MVAR Load (Average Amount of Self-Serve private reactive load MVAR)
-Small Motor, percent of total MVAR load	Defined as electrically connected at voltage less than 2400/4160V. Enter as a percentage of total MVAR Load (Average Amount of Self-Serve private reactive load MVAR)
-Discharge Lighting, percent of total MVAR load	Enter as a percentage of total MVAR Load (Average Amount of Self-Serve private reactive load MVAR)
-Other, percent of total MVAR load	Enter as a percentage of total MVAR Load (Average Amount of Self-Serve private reactive load MVAR). The Large Motor, Small Motor, Discharge Lighting, and Other should total 100% of the Total MVAR Load.

PRIVATE NETWORK INFORMATION - SITE

- **Load Characteristics PN load**
 - Definition of large and small motor
 - By voltage
 - Connected 2400/4160V and above are large
 - Connected below 2400/4160V are small
- **Percentages of MW should add up to 100%**
- **Percentages of MVAR should add up to 100%**
- **Load characteristics of generator auxiliary load are not assumed to be the same as the load characteristics of the private networks.**
- **Give most information with a reasonable amount of effort**
 - Guesses and inaccuracies cause model to be inaccurate

PRIVATE NETWORK INFORMATION - UNIT

- **Gross Gen, Load, Net Interchange**
 - MW and MVAR by *unit*
 - All units should sum to total for site
- **Load trip**
 - Identify if load trips when unit trips
 - Identify percentage of load (as allocated to that unit) that will trip

Average Amount of Self-Serve private load (MW)
Average Amount of Self-Serve private reactive load (MVAR)
Expected Typical Private Network Net Interchange (MW)
Expected Typical Private Network Net Reactive Interchange (MVAR)
Private Network Gross Unit Capability (MW)
Private Network Gross Unit Reactive Capability (MVAR)
If Generation trips, does Load trip?
If yes, approximate percentage of Load that will trip?

PRIVATE-USE NETWORK – FAQ

- **Our units are dual-grid (i.e. outside of ERCOT). Are we a private network?**
 - 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
- **Does "Private Network" exclude auxiliary/house power in generating stations?**
 - Yes. Please include all auxiliary/house power in generating stations separately in the Additional Planning Data section under “Generation Auxiliary Load”.
- **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.