Generation Initial Training Program

Day-Ahead Energy Market

PJM State & Member Training Dept.

Objectives

Students will be able to:

- Identify the process and procedures for participating in the Day-Ahead Market

Markets Gateway Introduction

Uses of Markets Gateway

- PJM Markets Gateway is the system that PJM Market Participants use to participate in the Day-Ahead Energy Market, Synchronized Reserve Market, and Regulation Market
- Market Participants can use PJM Markets Gateway to prepare and submit:
  - Generation offers
  - Synchronized reserve offers
  - Virtual offers/bids
  - Regulation offers
  - Demand bids
  - Load response bids
  - Enter bilateral regulation and reserve transactions
  - Review public and private Day-Ahead Energy and Ancillary Services market results

Interfacing with Markets Gateway

- **Web-based Interactions:** access is provided through a series of web-based interactive displays, which are accessible through the internet

- **XML-formatted File Exchange:** input and output files that are posted or downloaded, using the market user interface (MUI) or another participant-created application

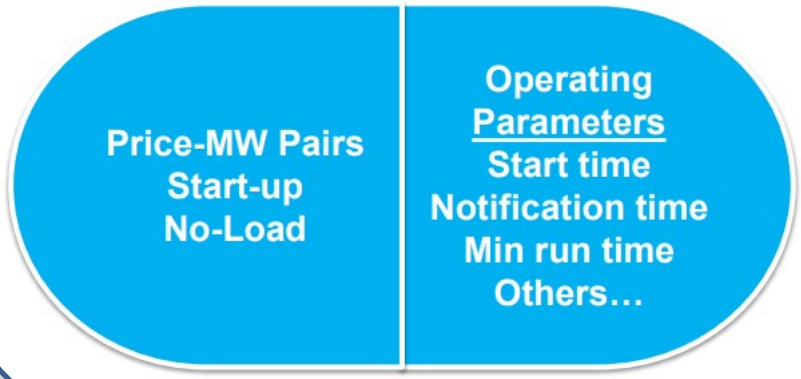
PJM Day-Ahead Market

Capacity Resource Requirements

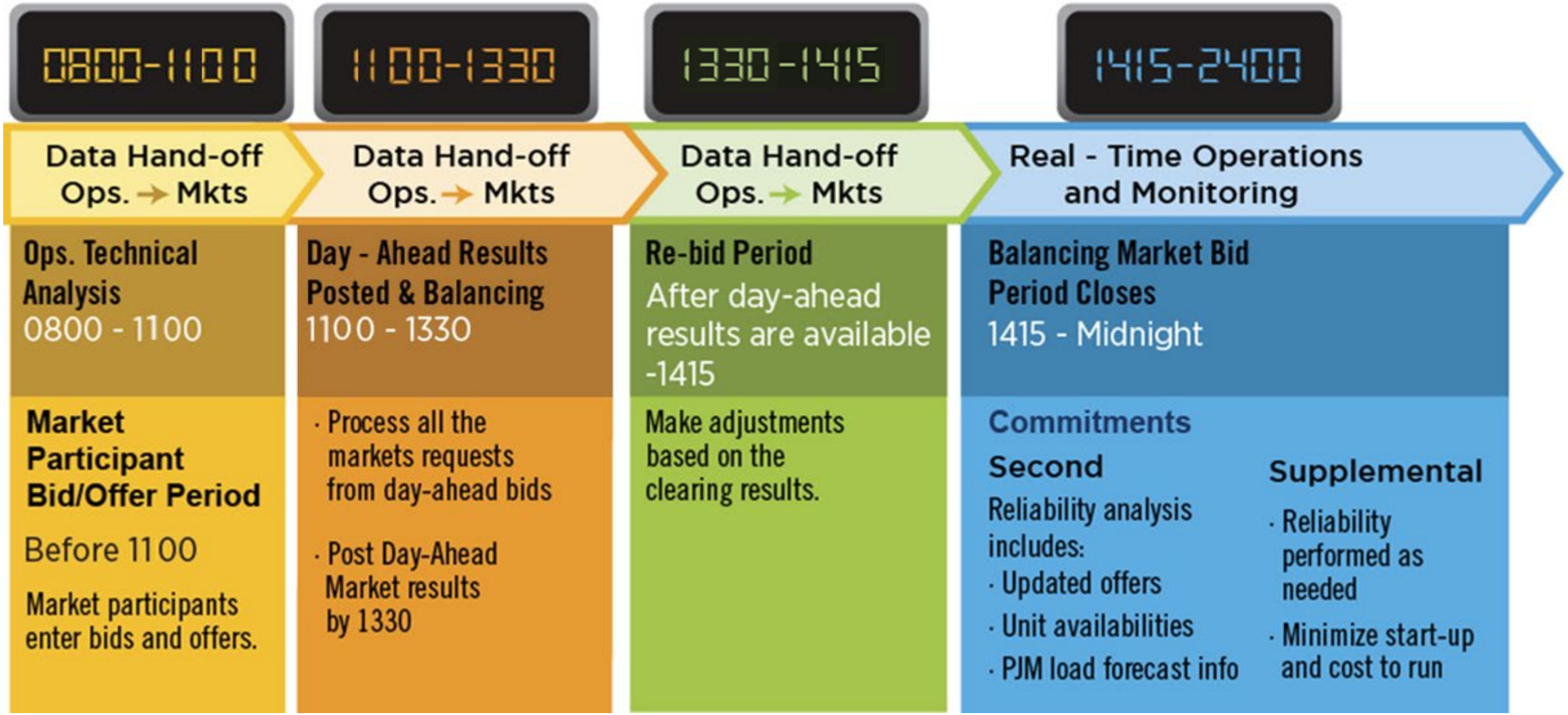
- Any generator that is a PJM generation capacity resource that has an RPM Resource Commitment:
  - Must submit an offer schedule into the Day-ahead Market even if it is self-scheduled or unavailable due to outage
  - Generation capacity resources shall submit:
    - A schedule of availability for the next seven days
    - May submit non-binding offer prices for the days beyond the next Operating Day
- The set of offer data last submitted for each generation capacity resource
  - Shall remain in effect for each day until specifically superseded by subsequent offers

ENERGY OFFERS INCLUDE…

1. Economic components
   - Price-MW pairs *(incremental curve)*
   - Start-up
   - No-load
2. Operating parameters
   - Notification time
   - Startup time
   - Minimum run time



PJM Markets Timeline



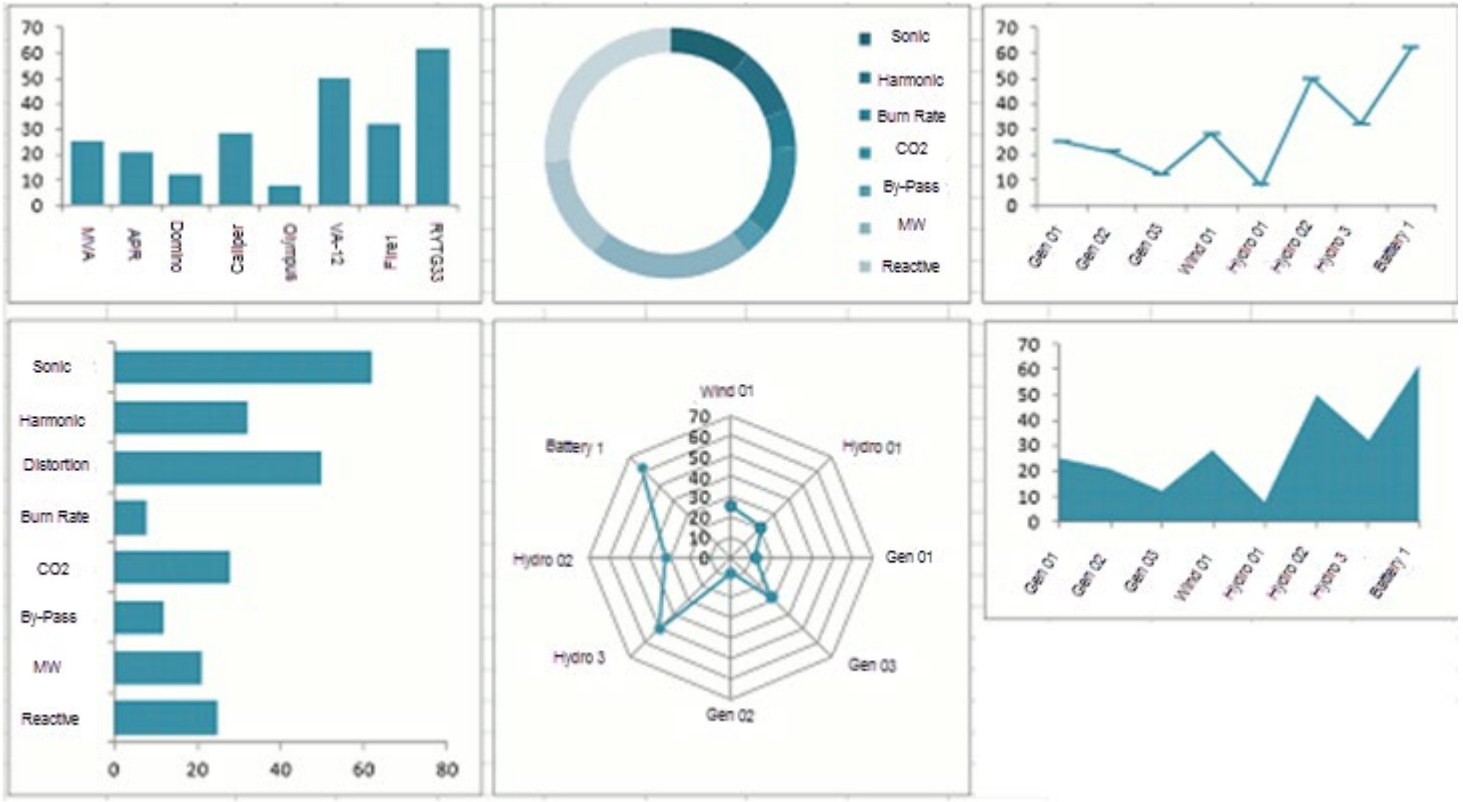
Intraday Updates to Energy Offers

- Generation offers can be updated after the Reliability Run is complete, starting at 18:30 up to 65 minutes prior to operating hour
- Potential Updates to Offers include:
  - Price component of the Offer Segment
  - No load and Startup Costs
  - Notification Time
  - Min Run Time
  - Switch to Cost Schedule

Unit Parameters

Unit Parameters

- Each generator has different characteristics that it submits to PJM along with their energy offer that are based on:
  - cost
  - price
  - time
  - physical parameters



Unit Parameters

- Generators can be cost-based or price-based and determined for each new unit or new unit ownership
    - Cost (per cost development guidelines)
    - Price (per participants offer strategy)

Type Offer/Schedule	Economic Component	Operating Parameters
Cost-based (PLS)	Limited to Cost + 10%	Must be at least as flexible as PLS
Price-based (PLS)	• Capped @ $1000/MWh unless **Cost** exceeds that • May be higher or lower than **Cost**-based offer	Must be at least as flexible as PLS
Price-based (Non-PLS)		Does not need to conform to PLS

Limitations are enforced at the time of offer submission

Energy Market Offer Cap: Cost-Based Offers

- **For the purposes of setting LMP**, all offers are capped at $2,000/MWh
  - Cost-based offers above $2000/MWh will not be eligible to set LMP
- Generation resources with demonstrated costs above $2,000/MWh can recover those costs through make-whole payments
  - The 10% adder will not apply to costs above $2,000/MWh
- Participants wishing to enter cost-based offers above $2,000/MWh will need to contact the Markets Hotline for assistance
  - Cost-based offers above $2,000/MWh will be considered in merit order for dispatch purposes

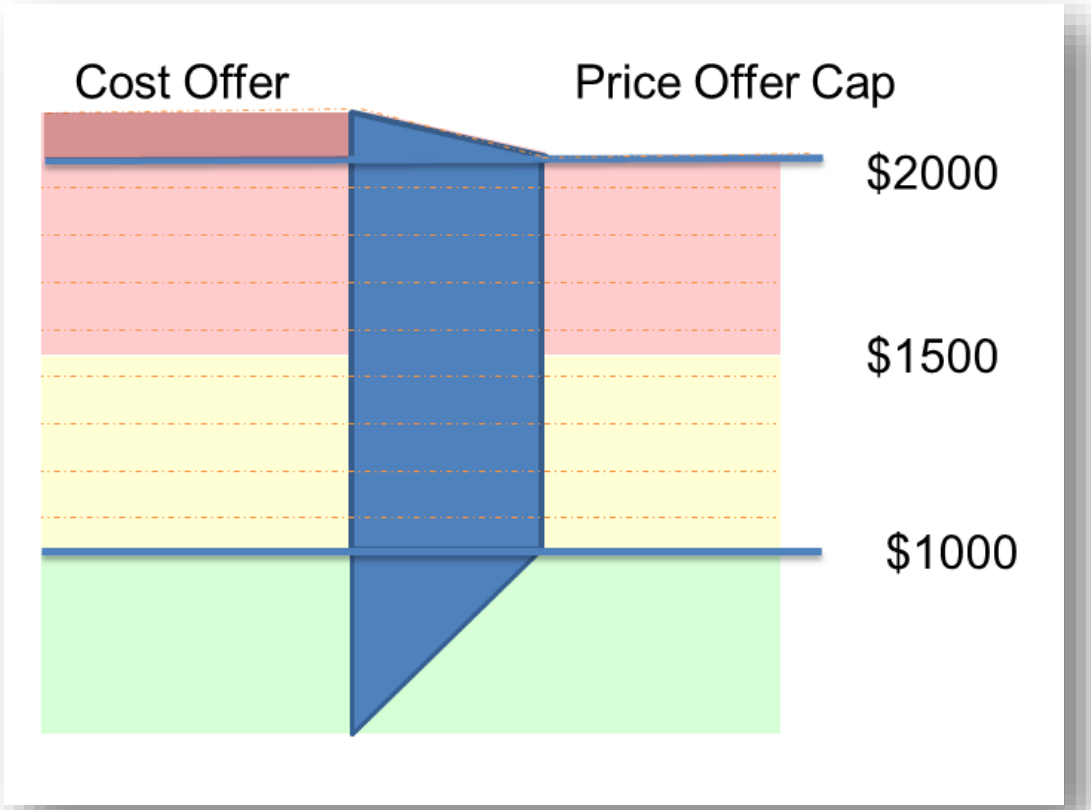
Energy Market Offer Cap: Price-Based Offers

- Price-based offers will be capped at the lower of $2,000/MWh or the corresponding cost-based offer when costs are above $1,000/MWh
  - Remain capped at $1,000/MWh when the corresponding cost-based offers are at or below $1,000/MWh

Example

If a unit's cost offer is:

- $1500, the price offer can be no higher than $1500
- $800, the price offer can be no higher than $1000
- $2200, the price offer can be no higher than $2000



Notification and Startup Times

The following information can be changed on the Schedule Detail page:

Notification Times:
The time interval in hours, between PJM notification and the start sequence of a generating unit that is currently in one of three temperature states

- **Hot Notification Time**
- **Inter Notification Time**
- **Cold Notification Time**

Startup Times:
The time interval, measured in hours, from the actual unit start sequence to the breaker close for a generating unit in one of the three temperature states

- **Hot Startup Time**
- **Inter Startup Time**
- **Cold Startup Time**

Start Costs for Price-Based Units

1. Price-based units choosing price-based start-up and no-load costs can only change them twice per year effective for two six month periods
   - Entered on Unit Detail page
2. Price-based units have the option to submit cost-based start-up and no-load costs on a daily basis
   - Entered on Schedule Detail page
   - Must stay as cost-based start-up and no-load costs for the entire 6-month period
   - Choice between using cost-based or price-based start up and no-load fees can be made twice a year

Bi-annual Periods for *Price Based* Start Costs

Period	Period Covers:	Submit By:
1	April 1st to September 30th	11:00 Hours March 31st
2	October 1st to March 31st	11:00 Hours September 30th

If a priced based unit chooses the price-based start-up and no-load fees option, the decision cannot be changed until the next open enrollment period takes place

Use Start Costs

- The generation owner determines whether PJM should use the startup and no load information for their unit (price-based or cost-based) on a daily basis
- This is accomplished by marking the Use Startup No Load switch available and unavailable on the ***Schedule Detail*** web page

Unit Parameters in Markets Gateway

Unit

- Unit Status
- Resource Type
- MW Operating Limits
- Ramp Rates
- Solar and Wind Forecasts

Schedule

- Schedule Types and Selection
- Offer Curves
- MW Operating Limits
- Startup & No-Load
- Startup/No-Load switch
- Startup and Notification times
- Min and Max Data
- Condenser Data

Hourly Updates

- Commit Status
- MW Operating Limits

Subject to Lockout

- Price component of the Offer Segment
- No load and Startup Costs
- Notification Time
- Min Run Time
- Switch to Cost Schedule

Unit Detail

Unit default values are entered on the page

- **Emergency Max (MW):** The MW energy level at which the operating company operates the generating unit once PJM requests Maximum Emergency Generation
  - This represents the highest short-term MW level a generating unit can produce and may require extraordinary procedures to produce the desired output
- **Economic Max (MW):** The highest unrestricted level of energy, in MW, that the operating company operates the unit
  - This represents the highest output available from the unit for economic dispatch

Unit Detail

- **Economic Min (MW):** The minimum energy available from the unit for economic dispatch
- **Emergency Min (MW):** The lowest level of energy in MW the unit can produce and maintain a stable level of operation. The Operating Company operates the unit at this level during a Minimum Generation Emergency
- **CIR:** Indicates the MW value of the Capacity Interconnection Rights of the wind resource
  - For a wind resource, the Economic Min and Emergency Min must be less than or equal to the resource's CIR value

Unit Detail

- **Default Ramp Rate (MW/Min):** The default energy ramp rate, in MW/minute, for increasing or decreasing a unit's output
  - This average rate is used by PJM in the Day-Ahead commitment process if the segmented Energy Ramp rate is not entered.

- Use the **Unit Detail** web page to change the Startup and no-load costs during the open enrollment periods
  - Period 1 Cost Based Startup Cost and Period 2 Cost Based Startup Cost
    - Indicates whether or not a unit's startup and no-load are cost based for Period 1 and Period 2 respectively

Energy Ramp Rates

- A generating unit's energy ramp rate can be defined by MW ranges, or segments
- The MW segment ramp rates are used during real-time operations

A maximum of 20 Ramp Rate segments can be defined

- The MW/Minute increase or decrease of a unit between the previous and current segments
  - Up Ramp Rate
  - Down Ramp Rate
    - Must be greater than or equal to up ramp rate

Synchronized Reserve Ramp Rates

- Synchronized reserve ramp rates may be specified for reserve resources (MW/min)
- A maximum of 10 ramp rate segments can be defined
- These rates must be greater than or equal to the real time economic ramp rate(s) submitted for the unit
  - Synchronized ramp rates that exceed economic ramp rates must be justified via submission of actual data from past synchronized events to the PJM Performance Compliance Department

Shortage Conditions

- Reserve Requirements exist for:
  - Primary Reserve Requirements (RTO & Sub Zone)
  - Synchronized Reserve Requirements for same zone/sub zone
- A reserve shortage occurs when there are not enough non-emergency resources available to maintain the balance of generation, load, and reserve requirements in the event of an unforeseen incident including, but not limited to:
  - Extreme weather
  - Higher than average generator outages
  - Higher peak load growth
  - Unexpected transmission outage

Shortage Pricing

- **Max Energy Price = Energy Offer Cap + 2 * Reserve Penalty Factor**
  - Yields $3,700/MWh max energy price under shortage conditions going forward
- Current offer cap rules apply year round

Schedule Parameters

Price-Based Unit Schedule Requirements

Units must have at least one cost-based schedule and at least one price-based schedules available:

1. Cost-based schedule must be parameter limited
2. Two price-based schedules
    a) Non-parameter limited
    b) Parameter limited - (Required)

Schedule Manager

Schedules define the offer and offer type

- Multiple schedules can be created
  - Schedule Name (8 characters) – Name used to reference schedule offer
  - Schedule Description (40 characters) – Text description of the schedule
  - Schedule Type
    - 1-12: Cost-based Parameter Limited Schedules (PLS)
    - 79: Price PLS
    - 99: Price-based schedule

Schedule Detail

- **Use Startup No Load:** The generation owner determines whether PJM should use the startup and no-load information for their unit
  - Price-based or Cost-based, on a daily basis
- **Minimum Downtime** (hours): The minimum number of hours between when the unit shuts-down and the next time the unit can be online
- **Minimum Runtime** (hours): The minimum number of hours a unit must run before being taken off-line

Schedule Detail

- **Maximum Weekly Starts:** The maximum number of times a unit can be started in one week
- **Maximum Runtime** (hours): The max number of hours a unit can run before it needs to be shut down
- **Maximum Daily Starts:** The maximum number of times that a unit can be started in a day
- **Maximum Weekly Energy** (MWh): The maximum amount of energy, reported in MWh, that the unit can produce in one week (used for study purposes)

Schedule Offers

- Up to 10 pairs of MW and pricing points can be created or modified for each price schedule

- The Offer Slope selection can be used to calculate the schedule's offer when dispatched between MW segments

  (Cannot be changed for today or the next day when the market is closed)

Schedule Selection

The Schedule Selection web page is used to mark schedules as Available, or Not Available, and allows the user to modify the no load, cold start, intermediate start and hot start costs

- At least one cost-based schedule must be available in both the Day-Ahead Market and in the Balancing Market
- Two price-based schedules available:
    a) Non-parameter limited
    b) Parameter limited

Dual Fuel Capability Field

- Mandatory field
- Used to identify the ability of a unit to switch to an alternate type of fuel

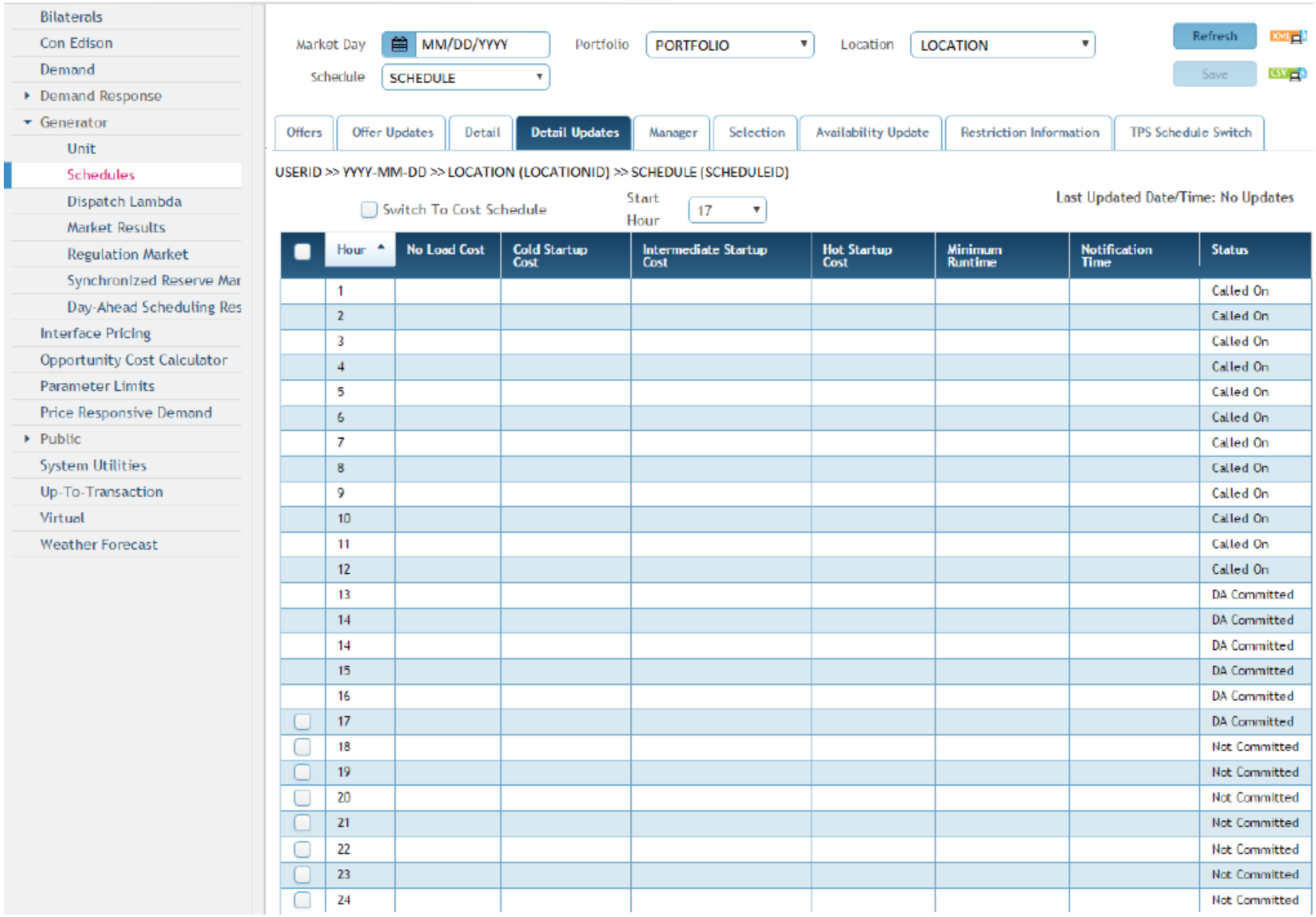
Intraday Updates to Offers

Incremental Energy Offer Price Updates

Type of Unit	Type of Schedule	Committed Hours	Uncommitted Hours
Cost-Based*	Cost	Increase/Decrease	Increase/Decrease
Price-Based	Price	Decrease	Increase/Decrease
	Cost	Increase/Decrease	Increase/Decrease

*Cost-Based units cannot have a Price-Based schedule

Price Increase Lockout Periods

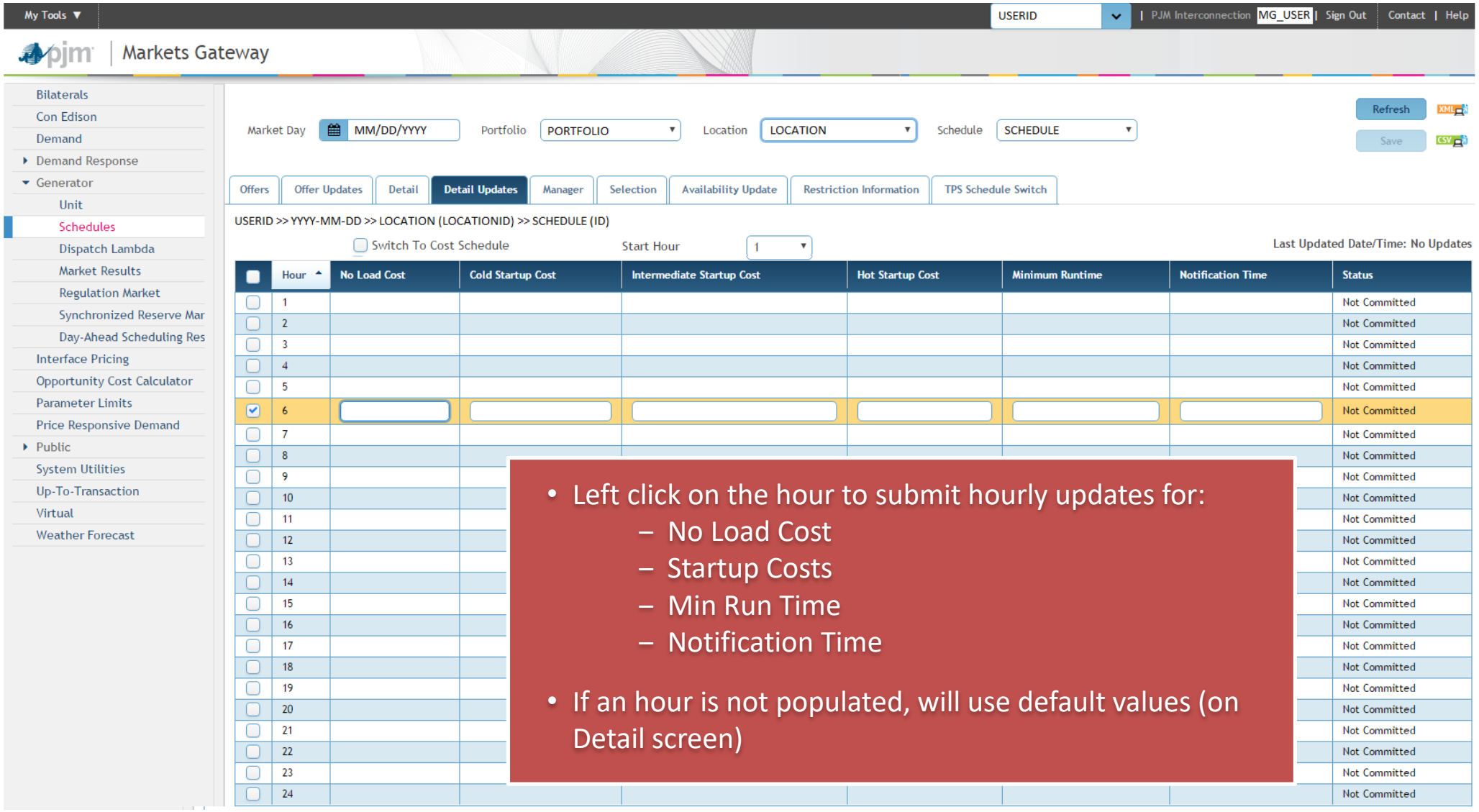


Real Time Updates to No Load and Startup Costs

- No load cost and startup costs (cold, intermediate, hot) can be updated hourly via the Detail Updates Screen based on the following rules:

Type of Schedule	Startup/No load Election	Updates Permitted
Cost	Cost	Increase/Decrease hourly
Price	Cost	Increase/Decrease hourly
	Price	Changed for bi-annual periods

Detail Updates Screen in Markets Gateway



- Left click on the hour to submit hourly updates for:
  - No Load Cost
  - Startup Costs
  - Min Run Time
  - Notification Time
- If an hour is not populated, will use default values (on Detail screen)

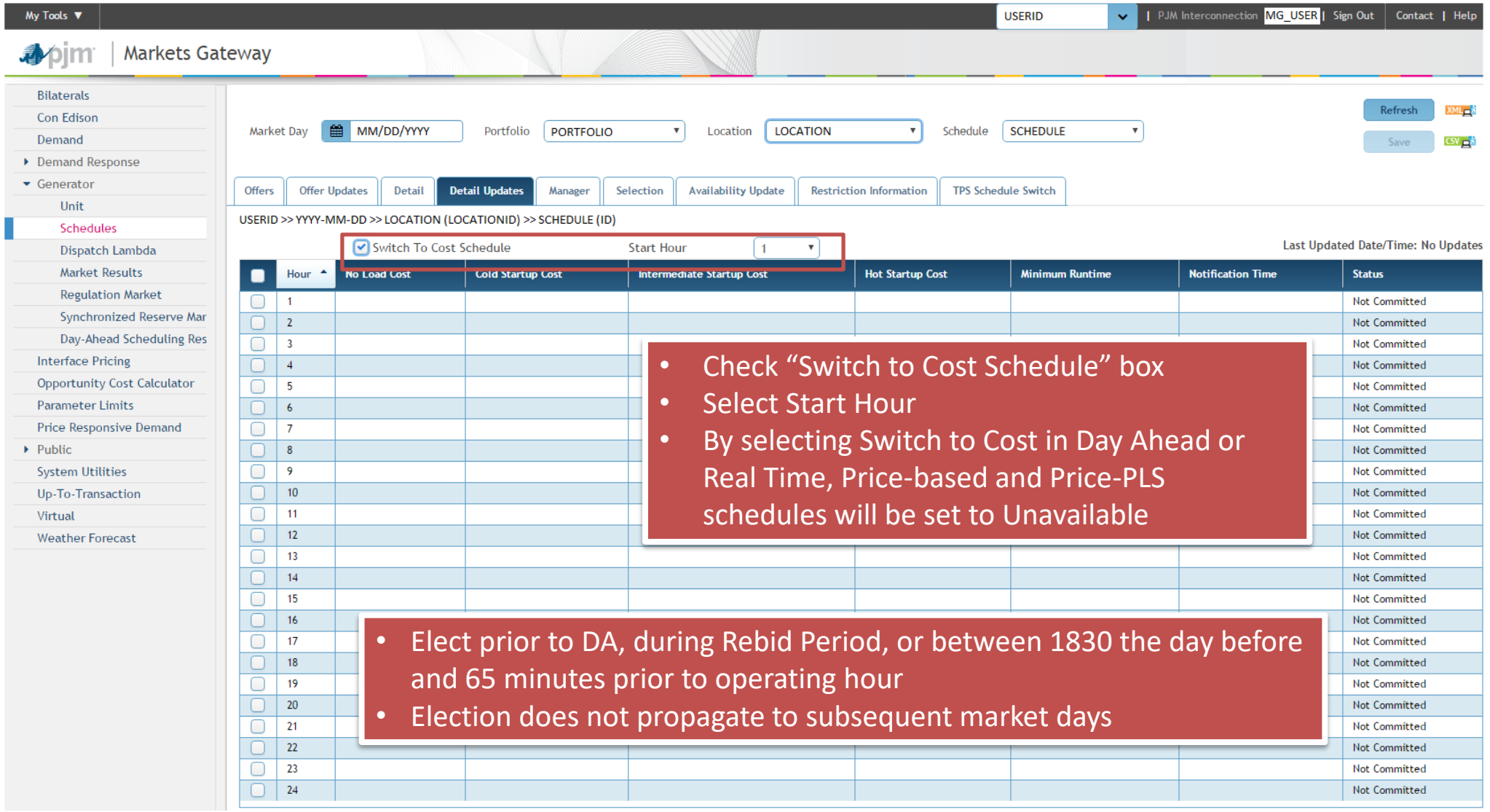
Real Time Updates to Notification Time and Min Run Time

- Notification Time and Min Run Time:
  - May be updated hourly up to 65 minutes before the start of the target hour (excluding lockout periods)
  - Updates are used in Reliability Run and Real Time only
  - Min Run Time cannot be updated for committed hours
  - Updates made via the Detail Updates Screen

Switch to Cost Schedule

- If a unit is committed on a price schedule and its cost schedule incremental energy offer subsequently exceeds its price schedule value, it may elect to be switched to its cost schedule
  - Unit will be switched to use the cheapest available cost schedule
  - The unit must then stay on its cost schedule for the rest of the Operating Day
  - The price schedule will become unavailable and will not be permitted to made available again for the rest of the Operating Day

Switch to Cost in Markets Gateway



Schedule Availability Update for Dual Fuel Units

- Situations may arise for Dual Fuel units when a fuel switch is required
- If a unit is designated as Dual Fuel on the Generator>Unit>Detail tab in Markets Gateway, schedule availability may be changed hourly throughout the operating day
  - May be changed in Real Time only, between 1830 the day before and 65 minutes before the operating hour
  - For cost schedules only
  - Price schedule remains Available (note: changing Availability does not imply switch to cost)
  - Schedule may be changed from Available to Unavailable, and vice versa, as needed
  - One cost schedule per fuel type may be Available at any one time
  - Can be changed for hours in which a schedule is not committed

Parameter Limited Schedules

Parameter-Limited Schedules (PLS)

- Generation resources shall submit and be subject to pre-determined limits on non-price offer parameters ("Parameter Limited Schedules")
- Parameter limits are **limitations** that **could be imposed** on the parameters that generators submit as part of their offer
- PJM posts unit class specific parameter limits in Section 6.6 of Schedule 1 in the **Operating Agreement**
  - A Capacity Market Seller that does not believe its Generation Capacity Resource can meet the unit-specific values determined by the Office of the Interconnection due to actual operating constraints, and who desires to establish adjusted unit-specific parameters for those resources, may request adjusted unit-specific parameter limitations.

Unit Specific Parameters For Capacity Performance Resources

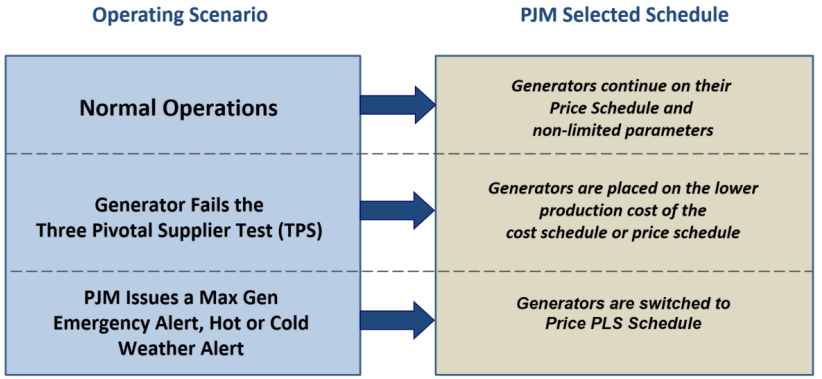
Parameter limited schedules shall be defined for the following parameters

Parameter	Definition Location
Turn Down Ratio	PJM OATT
Minimum Down Time	PJM OATT
Minimum Run Time	PJM OATT
Maximum Daily Starts	PJM OATT
Maximum Weekly Starts	PJM OATT
Maximum Run Time	PJM OATT
Start-Up Time	PJM OATT
Notification Time	PJM OATT

Switched to Price Parameter-Limited Schedules When PJM…

- Declares a Maximum Generation Emergency
- Issues a
  - Maximum Generation Emergency Alert
  - Hot Weather Alert
  - Cold Weather Alert
- Schedules units based on the anticipation of a (for all, or any part, of an Operating Day):
  - Maximum Generation Emergency
  - Maximum Generation Emergency Alert
  - Hot Weather Alert
  - Cold Weather Alert

Schedule Selection – Status Quo



**Emergency conditions includes Maximum Generation Emergency, Maximum Generation Emergency Alert, Hot Weather Alert, Cold Weather Alert

	Fails TPS	Does Not Fail TPS
Non-Emergency Conditions	Committed on Cheapest of Cost-Based PLS offer or Price-based offer (non-PLS)	Committed on Price-based offer (Non-PLS)
Emergency Conditions	Committed on Cheapest of Cost-based PLS offer, Price-based (non-PLS), or Price-based PLS offer	Committed on Cheapest of Price-based offer (non-PLS) or Price-based PLS offer

Current Selection of Cheapest Schedule

The day-ahead and real time markets have different approaches for selecting the cheapest schedule at the time of commitment due to their different time horizons

- Day-ahead Market: Commitment of resources across all 24 hours of the day are solved in a single solution
  - Resources are mitigated on the schedule with the lowest overall production cost (considering the MW level at which they are committed in commitment solution)
- Real Time Market: Commitment decisions happen separately from the 5- minute dispatch decisions
  - Selection of the mitigated schedule must use an assumed MW level and commitment duration since the eventual RT dispatch MW and length of commitment beyond minimum run time is unknown at the time of commitment
  - Resources are mitigated on the schedule with the lowest production cost at economic minimum output over the minimum run time of the schedule

Resource Limitation Reporting

Resource Limitation Reporting (via Markets Gateway)

Restrictions that **limit run time**, and can be **monitored in advance** of current operating day and/or Day-Ahead:

- Onsite Fuel Inventory
- Emissions Hours
- Demineralized Water
- Cooling Water
- Other Consumables

Previous Communication Methods for Unit Limitations

- **Supplementary Status Report (SSR) Part G** – ~~see Manual 13~~
- Annual & Periodic GO Survey questions
- Existing Markets Gateway offer and parameter fields
- Informational eDART tickets
- Emails & phone calls

The above methods are:

- Static snapshots
- Not dynamically tied to actual run-hours
- Cumbersome to communicate (can lead to conflicting information)

Purpose of Unit Limitation Reporting in Markets Gateway

Unit Resource Limitation Reporting was implemented in Markets Gateway in 2019 to **consolidate** previous methods of limitation communication, and **dynamically track** how close a unit is to its limitations by:

1. Providing a mechanism for members to regularly update limitation information in terms of “hours remaining” for a specified time window;

2. Linking member-provided limitation hours to actual unit run hours to monitor how close unit is to its limitation; and

3. Displaying limitation information in tool for PJM Dispatch & Operations Planning for enhanced operational awareness

Resource Limitation Reporting

- Units considered Resource Limited if less than 72 hours of remaining runtime at maximum capacity limited by primary/alternate on-site fuel, emissions, demineralized or cooling water, other consumables
  - Excluded natural gas units with daily fuel restrictions from the Resource Limited Unit definition and new reporting requirement via Markets Gateway, due to their daily nature
  - These restrictions should be reported as they are today via updated unit parameters, and outage reporting if unit is unavailable

Exhibit 5 in Manual 13 Section 6.4 – Resource Limitation Reporting Table

Resource Limited Unit (Type)	Resource Limitations					PJM Member Actions
	On-site Fuel Only	Emissions	Cooling Water	Demin. Water	Other	
CT	< 72 hours					Report as Resource Limited in Markets Gateway
	< 24 hours					Update Max Run fields in Markets Gateway
	< 16 hours					Verbally notify PJM Master Coordinator
	< 16 hours					Can be placed in Max Emergency during normal operating conditions
	< 16 hours					Place in Max Emergency (if PJM issues Cons. Ops/Hot/Cold Weather Alert)
Steam	< 72 hours					Report as Resource Limited in Markets Gateway
	< 32 hours					Verbally notify PJM Master Coordinator
	< 32 hours					Can be placed in Max Emergency during normal operating conditions
	< 32 hours					Place in Max Emergency (if PJM issues Cons. Ops/Hot/Cold Weather Alert)
	< 24 hours					Update Max Run fields in Markets Gateway

Yellow Highlighting - Minimum Level Thresholds for Resource Limited Units

Gas-Only Units with Fuel Limitations:

1) These are not considered Resource Limited Units, and should not be reported as Resource Limited in Markets Gateway.
2) These should not be placed in Max Emergency, following PJM Cons. Ops/Hot/Cold Weather Alerts, but remain Economic, unless directed otherwise by PJM.
3) Gas-Only Units with other Resource Limitations (emissions, etc) should report as indicated in the above table.

Dual Fuel (Gas/Other) Units:

1) These should report as Resource Limited for only on-site fuel restrictions or other Resource Limitations as indicated in the above table. They should not report natural gas fuel restrictions.
2) These may be placed in Max Emergency, following PJM Cons. Ops/Hot/Cold Weather Alerts, for only on-site fuel restrictions (when unavailable on natural gas and on-site fuel falls below Minimum Level Thresholds) or other Resource Limitations as indicated in the above table.

Exhibit 5: Resource Limitations Reporting

Operation of Resource Limited Units

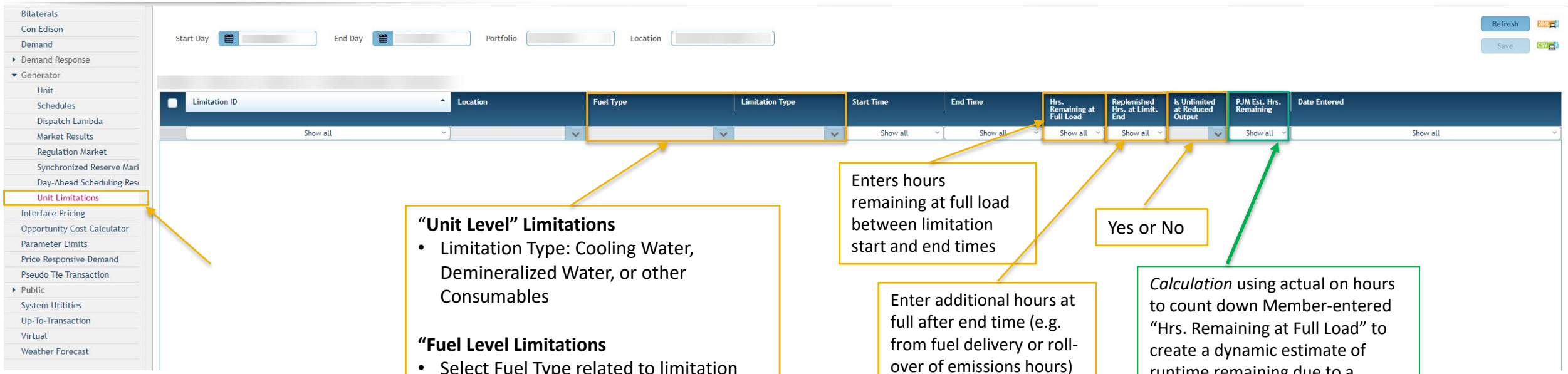
- When PJM declares Conservative Operations, or a Cold or Hot Weather Alert, PJM requests that resource limited units bid in the Maximum Emergency category
  - This will serve to preserve these resources for the times when they are needed most
- If PJM asks a unit to operate differently than what was accepted in the day ahead market due to resource limitations, then this unit would be paid its lost opportunity cost for the accepted hours that it was not run

Operation of Resource Limited Units

- Natural gas-fired units that experience fuel supply/transportation restrictions should NOT be placed in Maximum Emergency, Instead, they should remain available for economics to ensure that PJM tools economically schedule the gas-fired units
- Dual fuel units that can run on either natural gas or another on-site fuel are placed in Maximum Emergency when limited by non-fuel (emissions, or other consumable) resource limitations to less than 16 hours for CTs and 32 hours for Steam
  - When fuel limited, they are to be placed in Maximum Emergency only when unavailable on natural gas, and their on-site fuel inventory is less than 16 hours for CTs and 32 hours for Steam

Markets Gateway

New Generator > Unit Limitations



"**Unit Level" Limitations**
- Limitation Type: Cooling Water, Demineralized Water, or other Consumables

"Fuel Level Limitations
- Select Fuel Type related to limitation
- Limitation Type: Emissions, Onsite Fuel

Enters hours remaining at full load between limitation start and end times

Enter additional hours at full after end time (e.g. from fuel delivery or roll-over of emissions hours)

Yes or No

Calculation using actual on hours to count down Member-entered "Hrs. Remaining at Full Load" to create a dynamic estimate of runtime remaining due to a limitation

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Example 1: Single Fuel Unit

- XYZ Unit 1 CT is an oil CT with demineralized water and onsite fuel supply restrictions
- Current Datetime: 06/1/2022 08:00:00
- XYZ Unit 1 CT has been on since 06/1/2022 06:00:00

	Limitation ID	Location	Fuel Type	Limitation Type	Start Time	End Time	Hrs. Remaining at Full Load	Replenished Hrs. at Limit. End	Is Unlimited at Reduced Output	PJM Est. Hrs. Remaining	Date Entered
	#####	XYZ Unit 1 CT	Petroleum | Kero…	Demin. Water	06/1 00:00	06/7 23:59	16	168	No	14.00	5/29/2022 08:00
	#####	XYZ Unit 1 CT	Petroleum | Kero…	Onsite Fuel	06/1 00:00	06/15 13:00	40	720	No	38.00	5/29/2022 08:00

User Entered

Populated by System

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Example 2: Dual Fuel Unit

- XYZ Unit 2 CT is a dual-fuel CT with onsite fuel supply and emissions restrictions
- Current Datetime: 06/1/2022 08:00:00
- *"PJM Est. Hrs Remaining" calculation for fuel dependent restrictions will use hours associated with fuel related to current schedule*
  - XYZ Unit 2 CT has been on for 2 hours and is running on Natural Gas schedule. Emissions restriction hours for Natural Gas are counted down. If Unit 2 switches to an oil schedule, countdown for Natural Gas hours will pause and countdown for Oil hours will begin

	Limitation ID	Location	Fuel Type	Limitation Type	Start Time	End Time	Hrs. Remaining at Full Load	Replenished Hrs. at Limit. End	Is Unlimited at Reduced Output	PJM Est. Hrs. Remaining	Date Entered
	#####	XYZ Unit 2 CT	Gas | Natural Gas	Emissions	06/1 00:00	06/30 23:59	60	720	Yes	58.00	5/29/2022 08:00
	#####	XYZ Unit 2 CT	Petroleum | Kero…	Emissions	06/1 00:00	06/30 23:59	20	720	Yes	20.00	5/29/2022 08:00
	#####	XYZ Unit 2 CT	Petroleum | Kero…	Onsite Fuel	06/1 00:00	06/30 13:00	40	720	No	40.00	5/29/2022 08:00

Member Entered

Populated by System

Example 3: Multiple Units at Station

- If multiple units at a station share restriction hours, “Hours Remaining at Full Load” should be divided up and entered on a unit basis. The hours remaining for the station should not be entered for each unit – this would overestimate the hours remaining.
  - Station with units 1, 2, and 3 share a fuel supply. With current inventory, the station has 200 hours remaining at full load. Based on unit availability and other operating conditions, this 200 hours is divided up and allocated to each unit. Next fuel delivery will provide an additional 720 hours.

	Limitation ID	Location	Fuel Type	Limitation Type	Start Time	End Time	Hrs. Remaining at Full Load	Replenished Hrs. at Limit. End	Is Unlimited at Reduced Output	PJM Est. Hrs. Remaining	Date Entered
	#####	UVW Unit 1 CT	Petroleum | Kero…	Onsite Fuel	06/1 00:00	06/15 09:00	100	240	No	98.00	5/29/2022 08:00
	#####	UVW Unit 2 CT	Petroleum | Kero…	Onsite Fuel	06/1 00:00	06/15 09:00	50	240	No	48.00	5/29/2022 08:00
	#####	UVW Unit 3 CT	Petroleum | Kero…	Onsite Fuel	06/1 00:00	06/15 09:00	50	240	No	48.00	5/29/2022 08:00

Member Entered

Populated by System

Three-Pivotal Supplier Test

Three Pivotal Supplier Test

- The TPS test is a test for structural market power. The test examines the concentration of ownership of the supply compared to the level of demand.
  - The test does not examine the competitiveness of offers or other factors. It is a test of ownership concentration relative to demand.
- PJM utilizes the Three Pivotal Supplier (TPS) Test to mitigate market power for:
  - Energy Market
  - Regulation Market
  - RPM
  - Shortage Pricing

Three Pivotal Supplier Test

- A test failure means that the ownership of the supply needed is concentrated among few suppliers:
  - Those suppliers have the potential to exercise market power (structural market power)
  - It does not mean those suppliers are attempting to exercise market power
  - A test failure triggers mitigation as a preventative step in the event of a concentration of ownership

Basic Theoretical Concepts of TPS

- Each supplier is ranked from largest to smallest offered MW of eligible supply
- If there are not enough MWs to satisfy the constraint without using the top two suppliers' output plus the output of the supplier being tested, then those three suppliers are jointly pivotal
- Because the supply can be constrained by those three owners and the demand could potentially not be satisfied, they are considered to have structural market power
- If any test supplier fails, then the top two suppliers also fail
  - **Resources that fail TPS are placed on the lower production cost of the cost schedule or price schedule**

TPS Schedule Switch – Markets Gateway

- Indicates resources that have been switched schedules due to a constraint after failing the TPS test
  - Shows the original and new schedule for the specific unit
  - Shows which constraint and contingency that caused the unit to be offer-capped

Questions?

PJM Client Management & Services

Telephone: (610) 666-8980

Toll Free Telephone: (866) 400-8980

Website: www.pjm.com

The Member Community is PJM's self-service portal for members to search for answers to their questions or to track and/or open cases with Client Management & Services