Day-Ahead Energy Market

PJM State & Member Training Dept.

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Objectives

Students will be able to:

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

eMKT Intro

Uses of eMKT

PJM eMKT 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 eMKT to prepare and submit:

- Generation offers
- Regulation offers
- Synchronized reserve offers
- Demand bids
- Increment offers and decrement bids
- Load response bids

Uses of eMKT

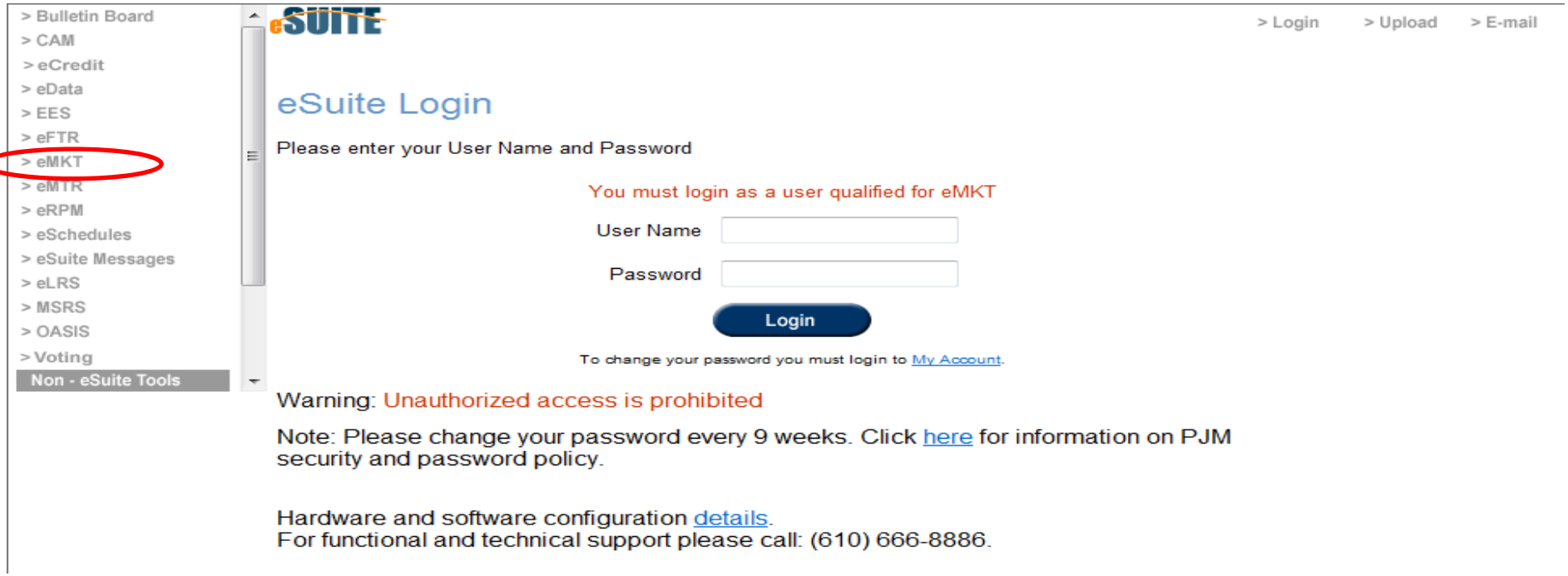
- Enter bilateral regulation transactions
- Enter bilateral synchronized reserve transactions
- Review public and private Day-Ahead Energy market results
- Review public and private Ancillary Services Market results

Interfacing with eMKT

- **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

eMKT Login


> Bulletin Board
> CAM
> eCredit
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> EES
> eFTR
> eMKT
> eMTR
> eRPM
> eSchedules
> eSuite Messages
> eLRS
> MSRS
> OASIS
> Voting
Non - eSuite Tools
eSUITE
> Login
> Upload
> E-mail
eSuite Login
Please enter your User Name and Password
You must login as a user qualified for eMKT
User Name
Password
Login
To change your password you must login to My Account.
Warning: Unauthorized access is prohibited
Note: Please change your password every 9 weeks. Click here for information on PJM security and password policy.
Hardware and software configuration details.
For functional and technical support please call: (610) 666-8886.

PJM Day-Ahead Market

Capacity Resource Requirements

- Generation Capacity Resources shall submit a schedule of availability for the next seven days and 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

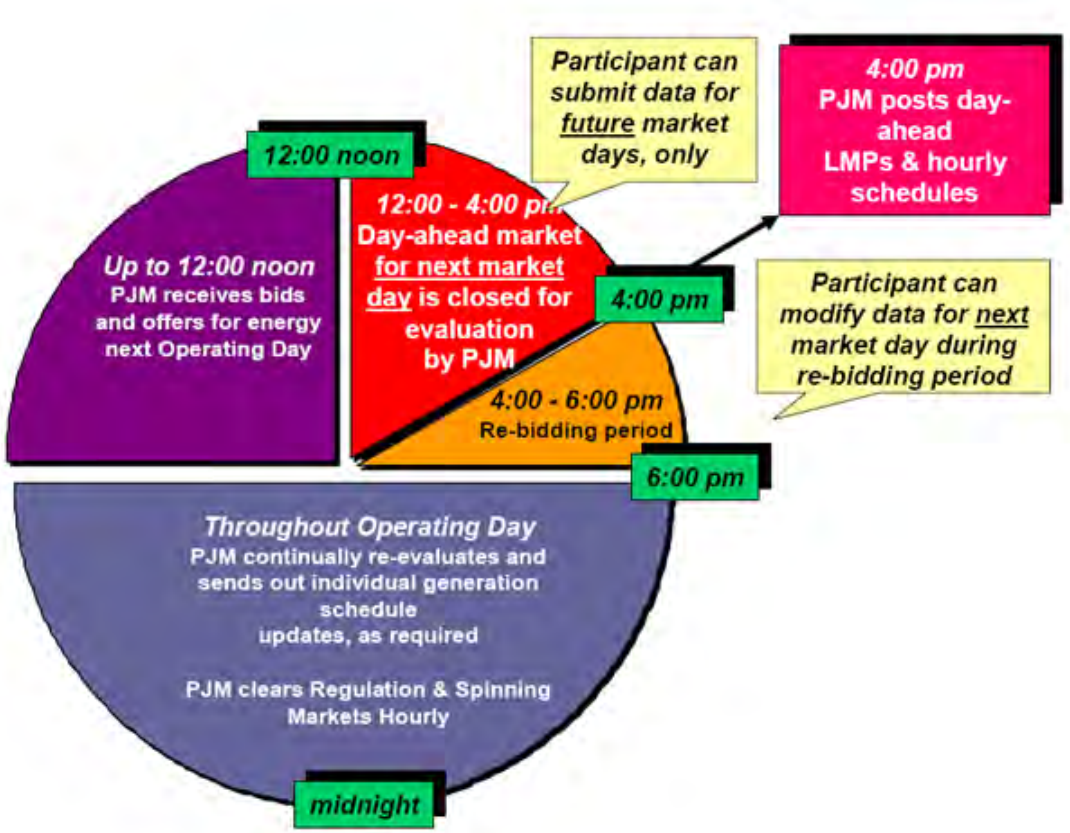
Capacity Resource Requirements

- Any generator that is a PJM generation capacity resource that has an RPM Resource Commitment must submit a bid schedule into the Day-ahead Market even if it is self-scheduled or unavailable due to outage

PJM eMKT Timeline

All Energy offers need to respect the Day-Ahead market clearing timelines:

1) *Offers entered by 12 Noon*
2) *From 12 Noon to 4PM, PJM runs the DA market for the next operating day*
3) *At 4PM, PJM posts the resources that cleared the DA market, along with DA LMPs*



Updating Generation Data When the Market is Closed

- When the Market is closed, you **cannot** update the generator Unit and Schedule data

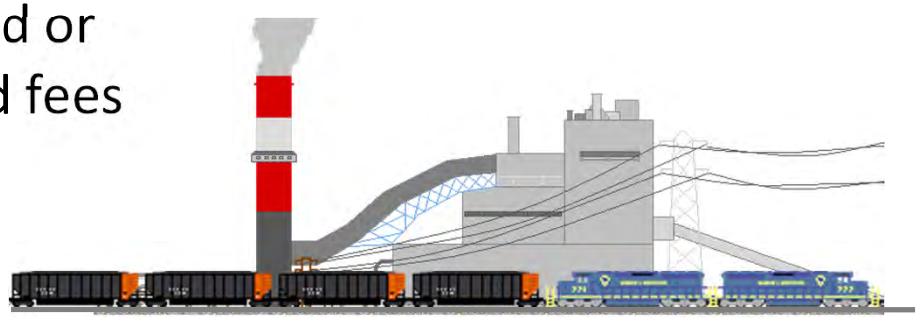
Exception

- When the Market is closed, you **can:**
  1. Make Unit Hourly Updates for:
     a) Current day – operating hour and beyond
     b) Two days in the future through 6 days in the future

The DA Market is closed from 12 Noon through 4PM, and 6PM through 12AM

Cost-based Start Costs for Price-based Units

- Price-based units choosing price-based start-up and no-load costs can only change them twice per year
- Price-based units have the option to submit cost-based start-up and no-load costs on a daily basis
- 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



Cost-based Start Costs for Price-based Units

- Open Enrollment Window:

Period	Period Covers:	Submit By:
1	April 1st to September 30th	1200 Hours March 31st
2	October 1st to March 31st	1200 Hours September 30th

Enrollment exceptions:

- **Initial request to switch to market-based offers**
- **New generating resource**

Use Startup and No-load Switch (Price Based Units)

- The Operating Company determines whether PJM should use the startup and no load information for a price-based unit. This is accomplished by marking the Use Startup No Load switch available and unavailable on the Schedule Detail web page
- The Operating Company indicates on the Unit Detail webpage if a priced-based unit's startup cost is price-based or cost-based
- The Use Startup No Load switch can be set each day
  - Yes — PJM should use the Startup and no-load information for the selected schedule
  - No — PJM should not use the Startup and no-load data elements

Generator Operating Parameters

- Each generator has different characteristics that it submits to PJM along with their energy bid
- These variables can be cost-based, time-based, or a physical parameter:
  - Cost variables: Start-up cost, no-load cost
  - Time variables: Notification time, start-up time, min-run time, min-down time
  - Physical parameters: Min and Max, ramp rate

Unit Parameters

- Generators can be Cost-based or Price-based:
  - Determined for each new unit or new unit ownership
    - Cost (per Cost Development Guidelines)
    - Price (per participants offer strategy)
    - **A Generation Capacity Resource offer may not exceed $1000/MWh**
      - Under normal conditions
      - FERC granted temporary waiver during time of extreme gas prices

Start Cost

- **Start costs** Startup cost (or price) is associated with the cost to supply steam to operate the turbine and bring the generating unit to synchronous speed. There are three states for Startup costs (or prices):
    - Hot
    - Intermediate
    - Cold

Start Cost is the dollars per start as determined from start fuel, total fuel-related cost, performance factor, electrical costs, start maintenance adder, and additional labor cost

Temperature State Definitions

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

Cold and Intermediate state definitions

The amount of time in hours, after shutdown that a hot temperature state unit takes to cool down to a cold or intermediate temperature state

- **Hot to Cold Time**
- **Hot to Inter Time**

Hot to Cold Time >= Hot to Inter Time

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

No-Load Cost

- No-load cost (or price) is the hourly fixed cost (or price), expressed in $/hr, to run the generating unit at zero net output
  - Needed to create the starting point of a monotonically increasing incremental cost curve

Use Start Costs

3. 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

Operational Limits

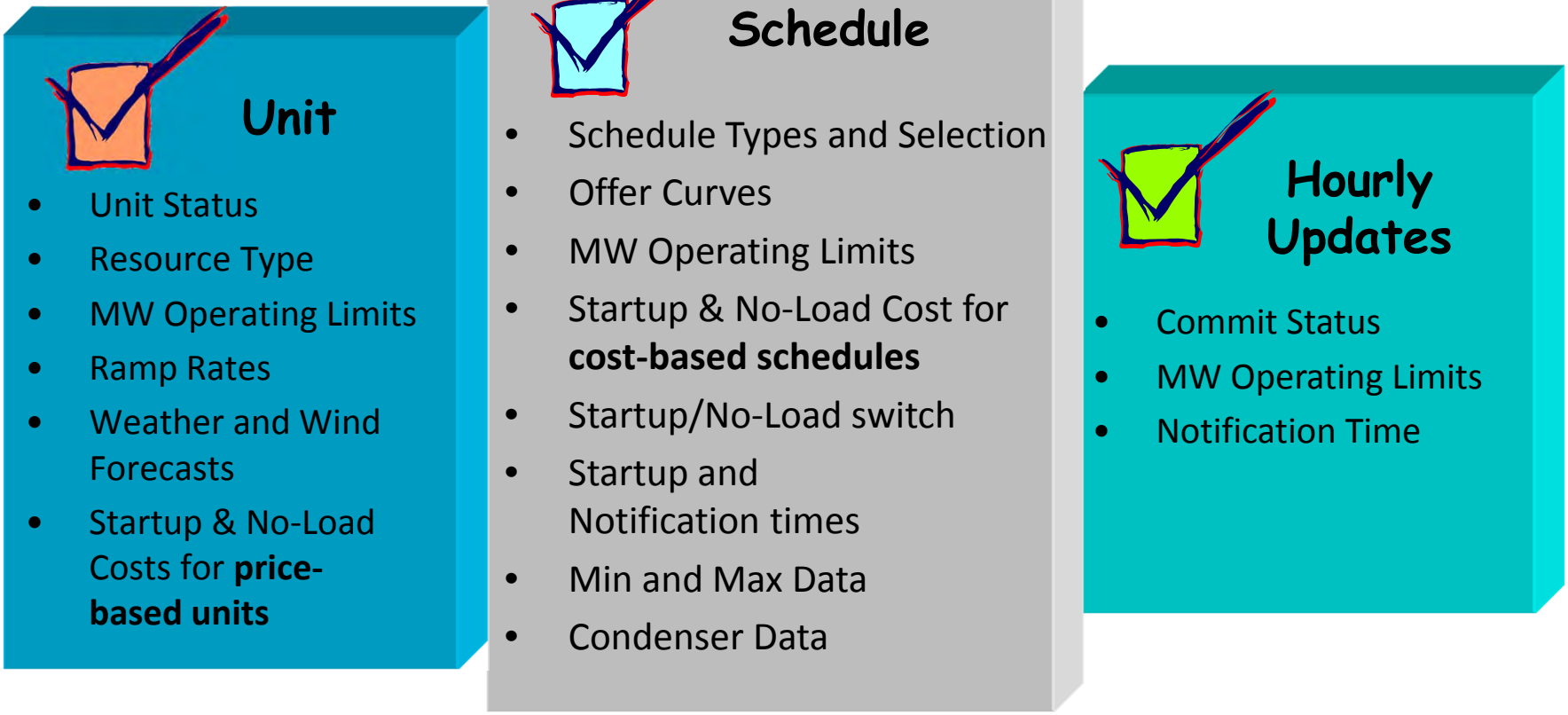
The operating limits are defined on a **schedule basis and unit basis**. Operating limits defined on a schedule basis override the operating limits that are defined on a unit basis

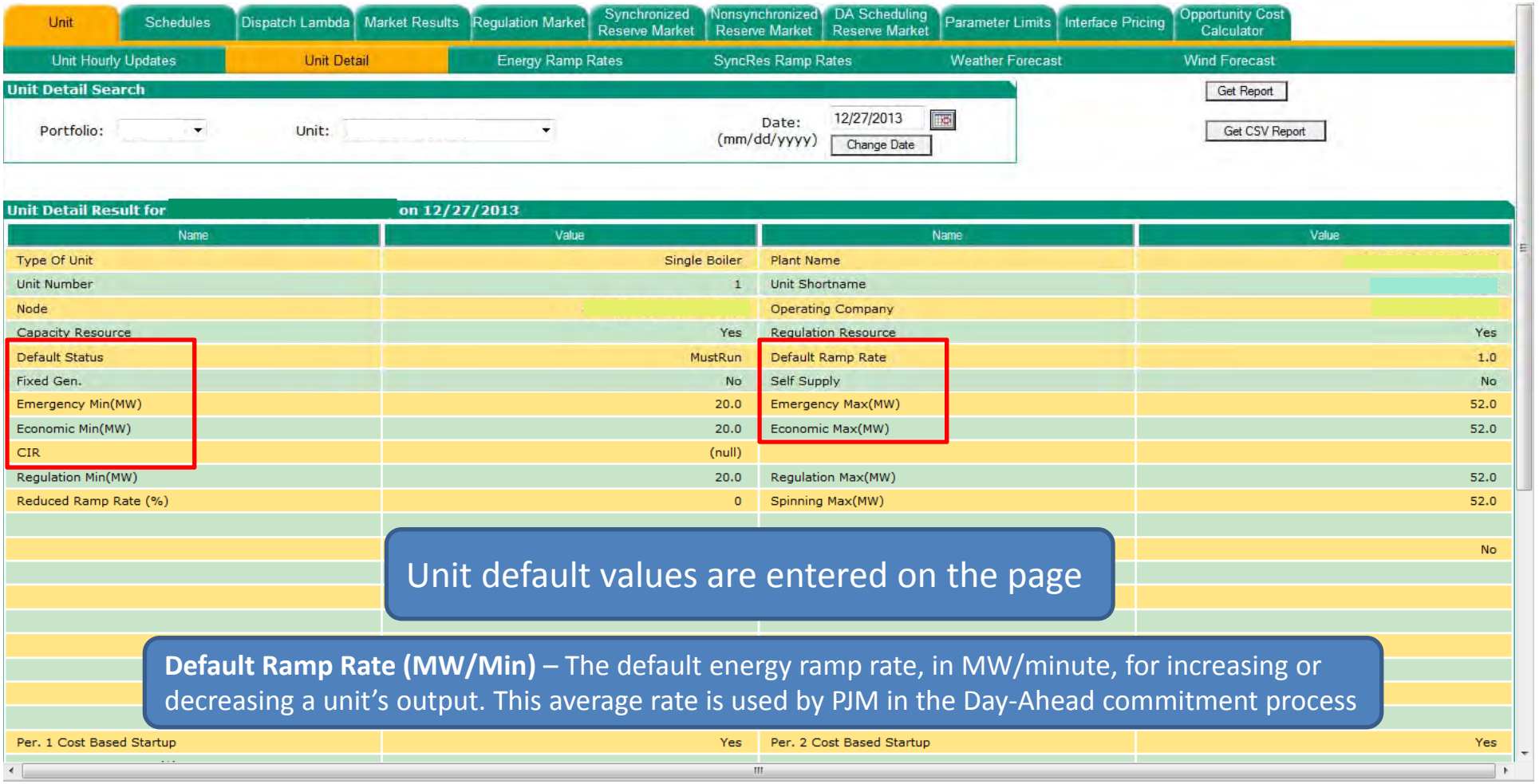
- **Emergency Max (MW)** - The MW energy level at which the operating company operates the generating unit once PJM requests Maximum Emergency Generation. This represents the highest short-term MW level a generating unit can produce and may require extraordinary procedures to produce the desired output
- **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

Operational Limits (cont.)

- **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 Parameters in eMKT





Unit default values are entered on the page

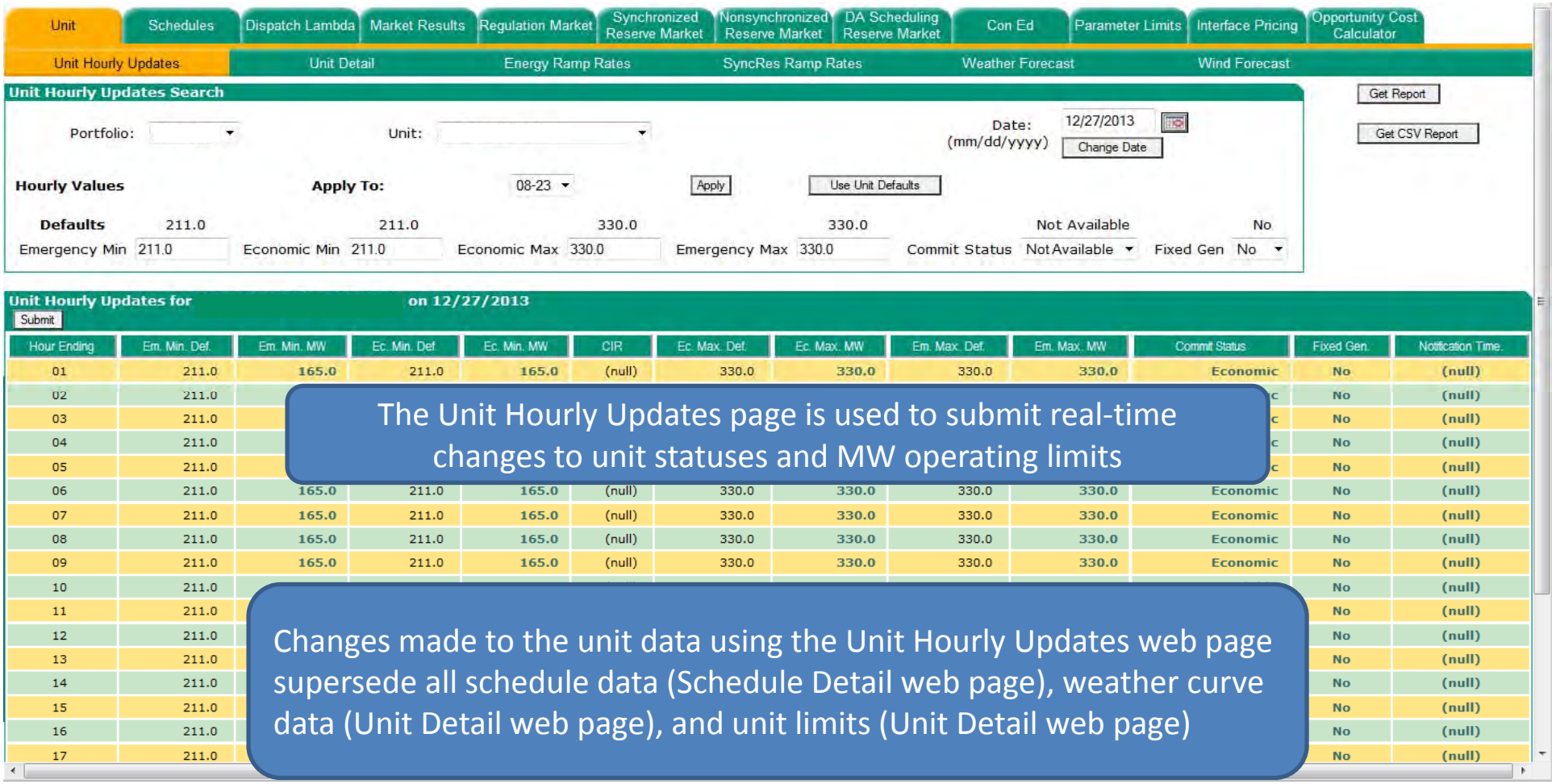
Default Ramp Rate (MW/Min) – The default energy ramp rate, in MW/minute, for increasing or decreasing a unit's output. This average rate is used by PJM in the Day-Ahead commitment process

Price-based Start Costs for Price-based Units

Use the **Unit Detail** web page to change the Startup and no-load costs during the open enrollment periods

Per. 1 Cost Based Startup	Yes	Per. 2 Cost Based Startup	Yes
Per. 1 Hot Startup Cost($)	0.00		
Per. 1 Inter Startup Cost($)	0.00		
Per. 1 Cold Startup Cost($)	0.00		
Per. 1 No Load Cost($)	1013.00		
Condense Available	No	Condense Startup Cost($)	0.00
Condense Energy Usage(MW)	0.0	Condense To Gen Cost($)	0.00
Condense Notification Time	0.0	Condense Hourly Cost($)	(null)

- Per. 1 Cost Based Startup Cost and Per. 2 Cost Based Startup Cost - Indicates whether or not a unit Startup cost and no-load costs are cost based for Period 1 and Period 2 respectively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Opportunity Cost Calculator
Unit Hourly Updates
Unit Detail
Energy Ramp Rates
SyncRes Ramp Rates
Weather Forecast
Wind Forecast
Unit Hourly Updates Search
Get Report
Get CSV Report
Portfolio:
Unit:
Date: (mm/dd/yyyy)
12/27/2013
Change Date
Hourly Values
Apply To:
08-23
Apply
Use Unit Defaults
Defaults 211.0 211.0 330.0 330.0 Not Available No
Emergency Min 211.0
Economic Min 211.0
Economic Max 330.0
Emergency Max 330.0
Commit Status Not Available
Fixed Gen No
Unit Hourly Updates for on 12/27/2013
Submit
Hour Ending | Em. Min. Def. | Em. Min. MW | Ec. Min. Def. | Ec. Min. MW | CIR | Ec. Max. Def. | Ec. Max. MW | Em. Max. Def. | Em. Max. MW | Commit Status | Fixed Gen. | Notification Time.
01 211.0 165.0 211.0 165.0 (null) 330.0 330.0 330.0 330.0 Economic No (null)
02 211.0 No (null)
03 211.0 No (null)
04 211.0 No (null)
05 211.0 No (null)
06 211.0 165.0 211.0 165.0 (null) 330.0 330.0 330.0 330.0 Economic No (null)
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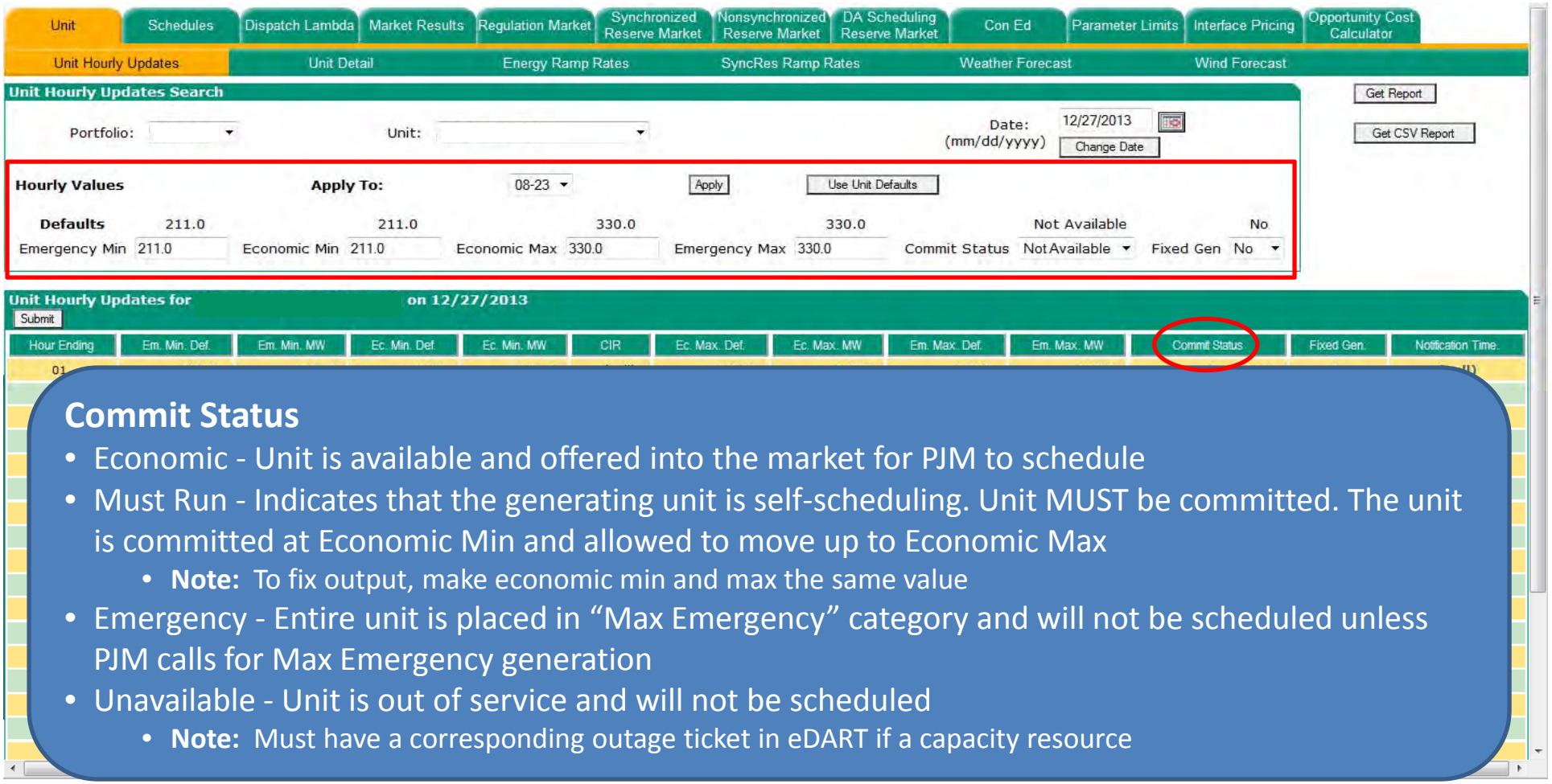
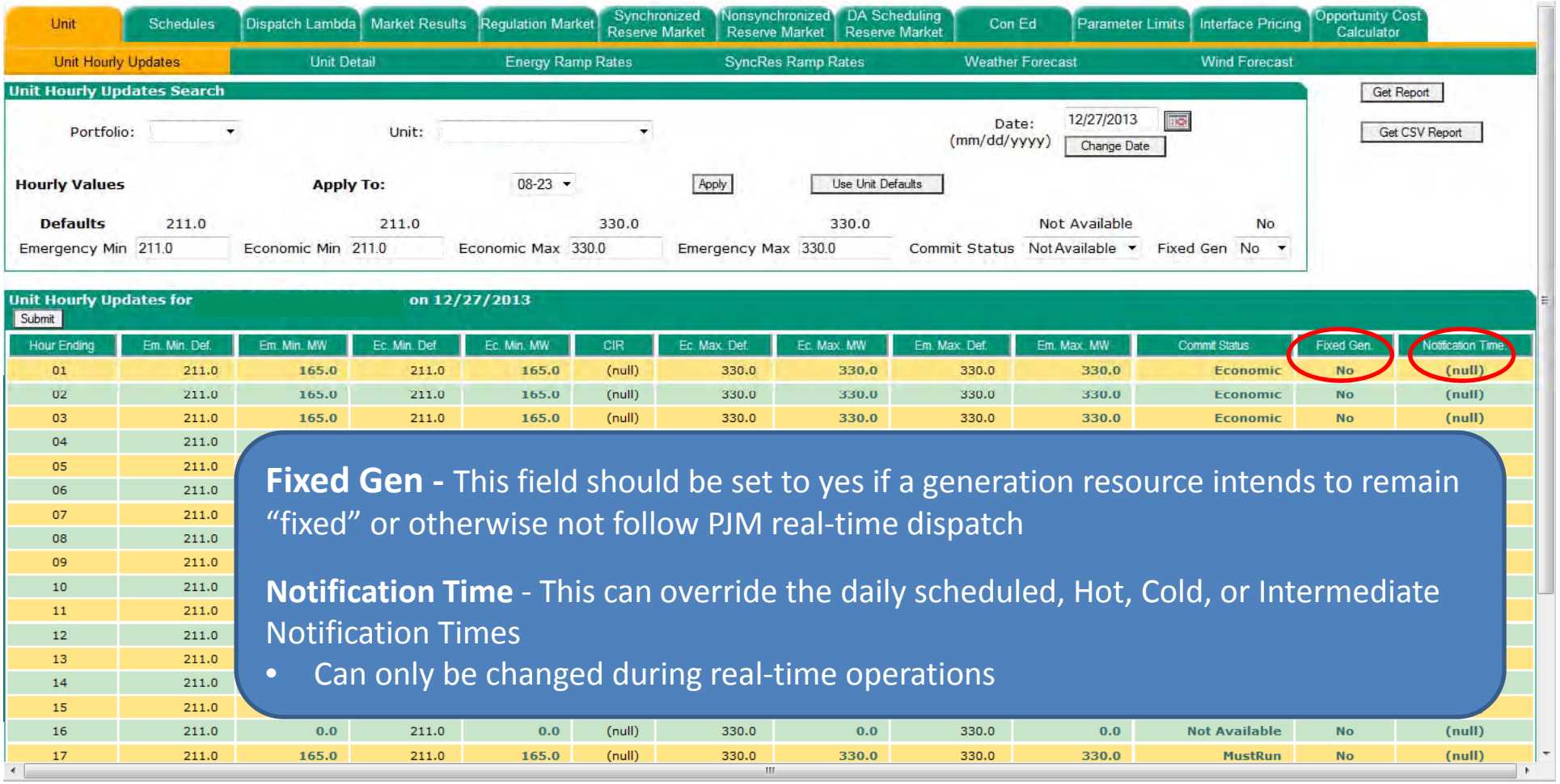
16 211.0 No (null)
17 211.0 No (null)
The Unit Hourly Updates page is used to submit real-time changes to unit statuses and MW operating limits
Changes made to the unit data using the Unit Hourly Updates web page supersede all schedule data (Schedule Detail web page), weather curve data (Unit Detail web page), and unit limits (Unit Detail web page)



Commit Status

- Economic - Unit is available and offered into the market for PJM to schedule
- Must Run - Indicates that the generating unit is self-scheduling. Unit MUST be committed. The unit is committed at Economic Min and allowed to move up to Economic Max
  - **Note:** To fix output, make economic min and max the same value
- Emergency - Entire unit is placed in "Max Emergency" category and will not be scheduled unless PJM calls for Max Emergency generation
- Unavailable - Unit is out of service and will not be scheduled
  - **Note:** Must have a corresponding outage ticket in eDART if a capacity resource

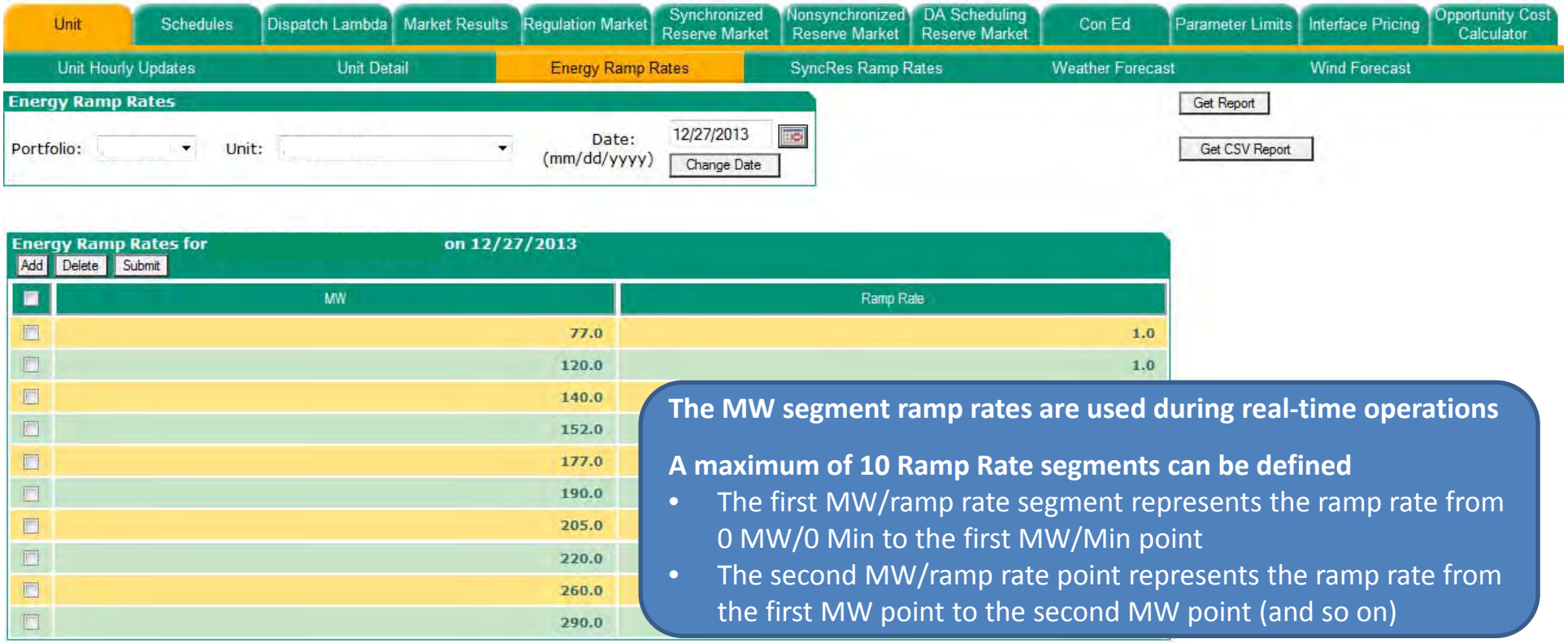


Fixed Gen - This field should be set to yes if a generation resource intends to remain "fixed" or otherwise not follow PJM real-time dispatch

Notification Time - This can override the daily scheduled, Hot, Cold, or Intermediate Notification Times

- Can only be changed during real-time operations

Energy Ramp Rates



The MW segment ramp rates are used during real-time operations

A maximum of 10 Ramp Rate segments can be defined

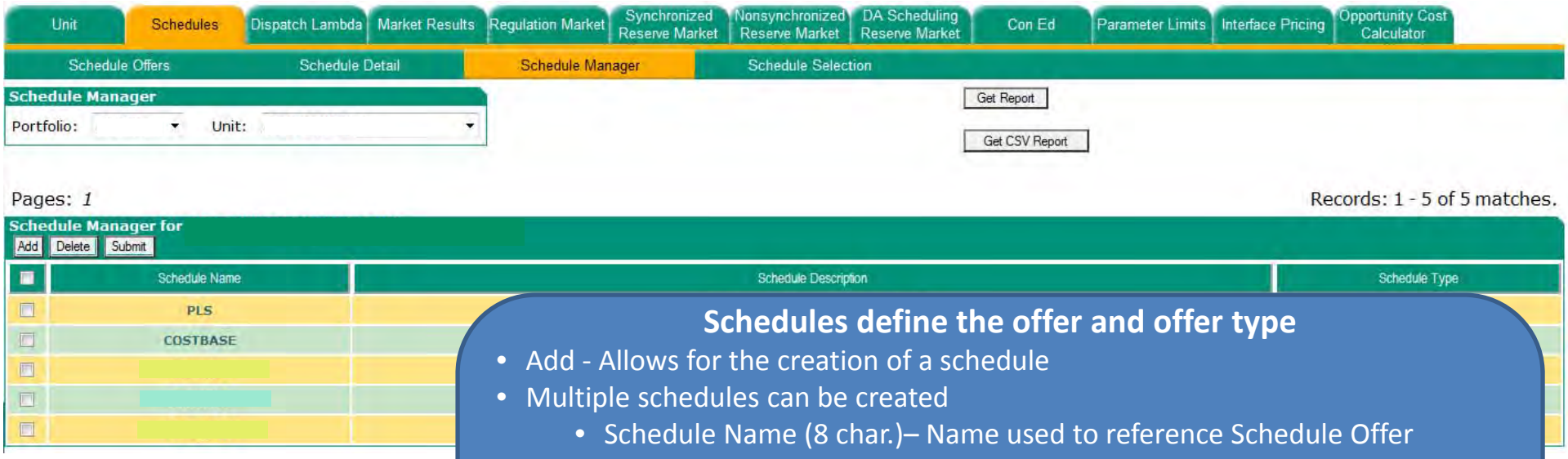
- The first MW/ramp rate segment represents the ramp rate from 0 MW/0 Min to the first MW/Min point
- The second MW/ramp rate point represents the ramp rate from the first MW point to the second MW point (and so on)

Schedule Parameters

Unit Schedule Requirements

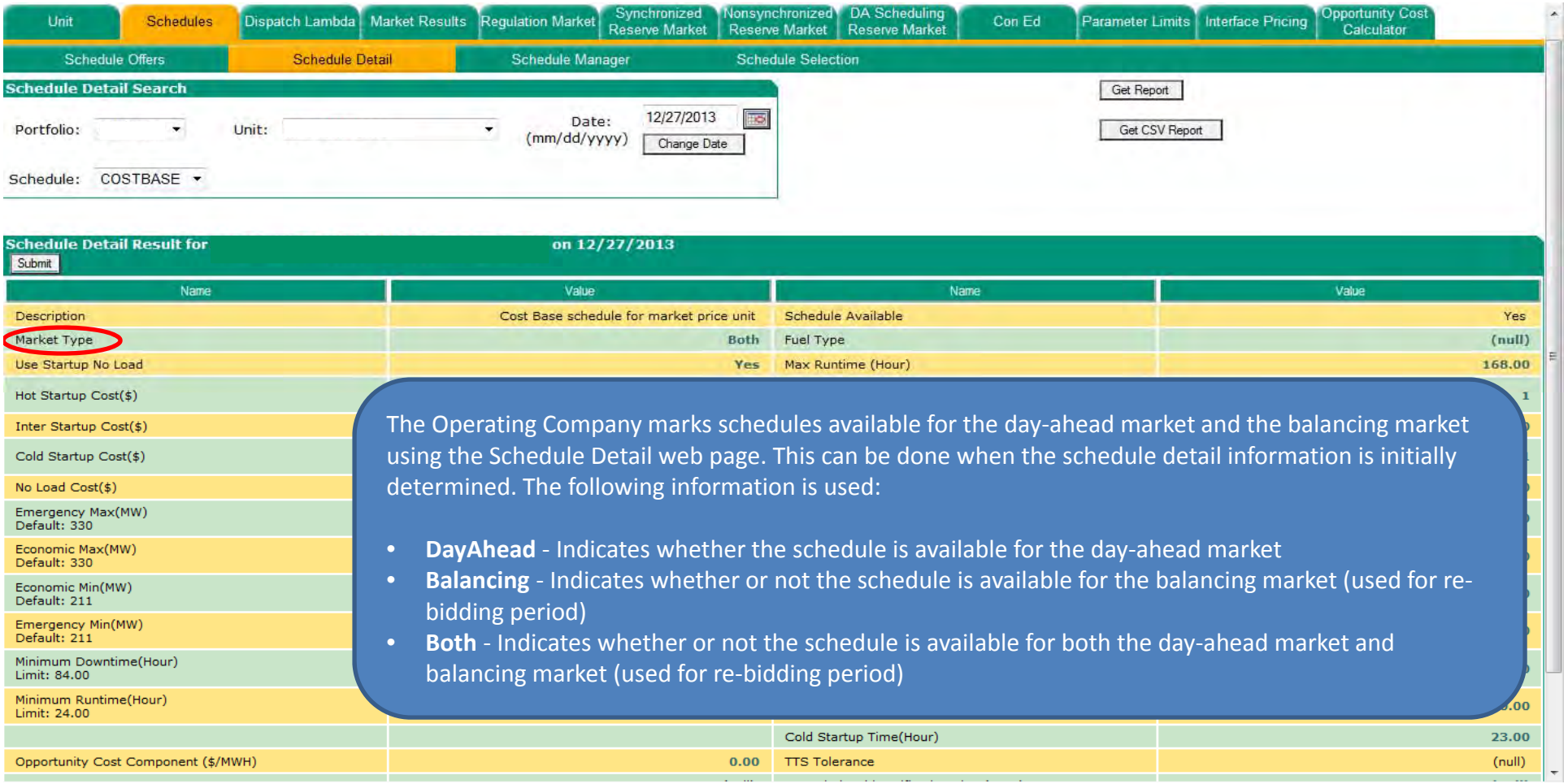
- Units must have at least one Cost-Based Schedule and a Price-Based Schedule available

1. Cost-based Schedule must be Parameter Limited
2. Two Price-based schedules, one of which must be Available
    a) Non Parameter Limited
    b) Parameter Limited (if unavailable, then “Use Max Gen” on Schedule Selection page must be set to yes)



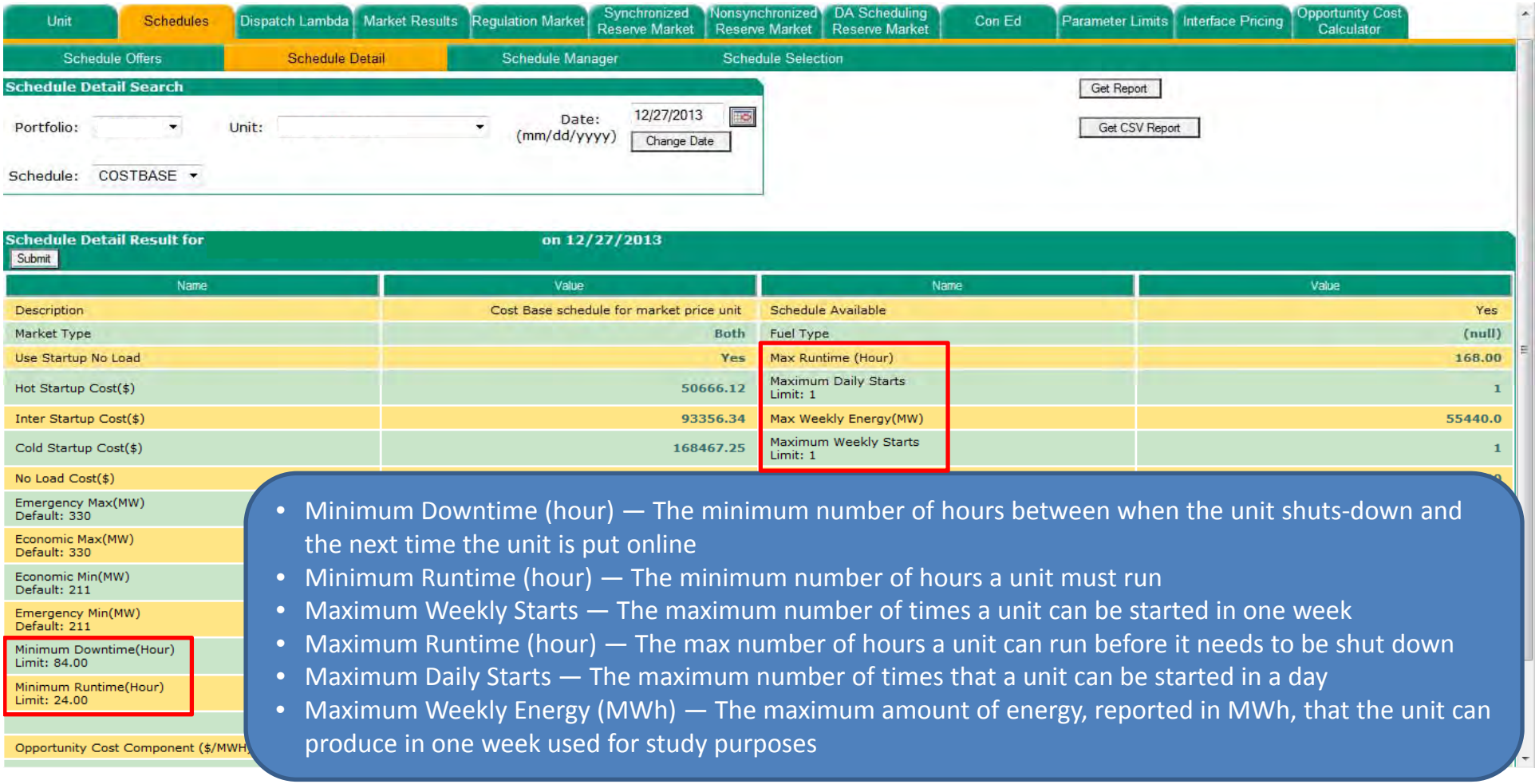
Schedules define the offer and offer type

- Add - Allows for the creation of a schedule
- Multiple schedules can be created
  - Schedule Name (8 char.)– Name used to reference Schedule Offer
  - Schedule Description (40 char.) – Text description of the schedule
  - Schedule Type
    - 1 - 69 and 80 - 90 — cost-based parameter limited schedules (PLS)
    - 70 - 79 — Price PLS schedules
    - 90 - historic LMP schedule
    - 91 - 99 — price-based schedules
- Delete – Delete a schedule
- Submit – Submit the results of adding or deleting a schedule
- Add, Delete or Submit is not permitted when market is closed

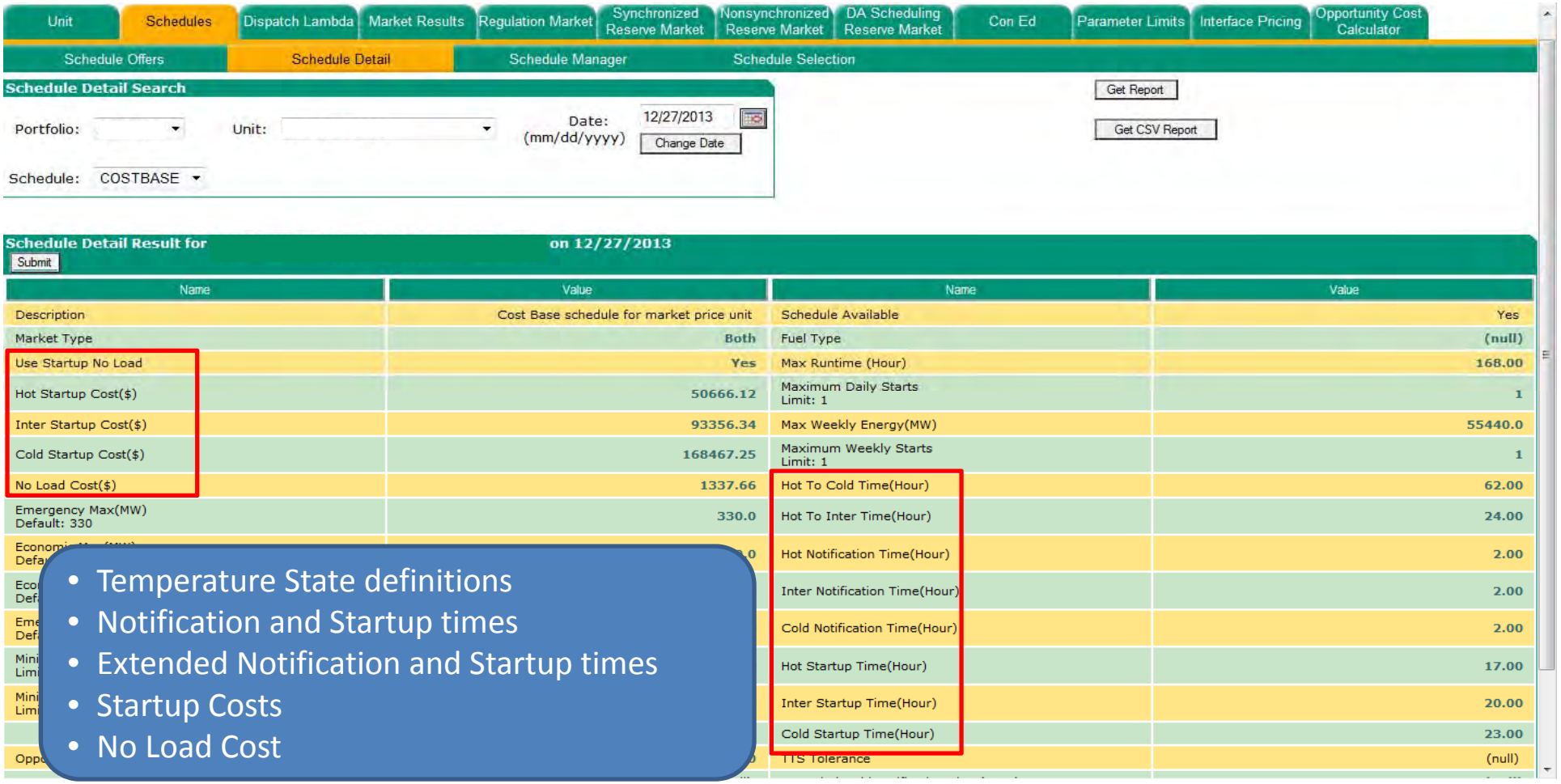


The Operating Company marks schedules available for the day-ahead market and the balancing market using the Schedule Detail web page. This can be done when the schedule detail information is initially determined. The following information is used:

- **DayAhead** - Indicates whether the schedule is available for the day-ahead market
- **Balancing** - Indicates whether or not the schedule is available for the balancing market (used for re-bidding period)
- **Both** - Indicates whether or not the schedule is available for both the day-ahead market and balancing market (used for re-bidding period)



- Minimum Downtime (hour) — The minimum number of hours between when the unit shuts-down and the next time the unit is put online
- Minimum Runtime (hour) — The minimum number of hours a unit must run
- Maximum Weekly Starts — The maximum number of times a unit can be started in one week
- Maximum Runtime (hour) — 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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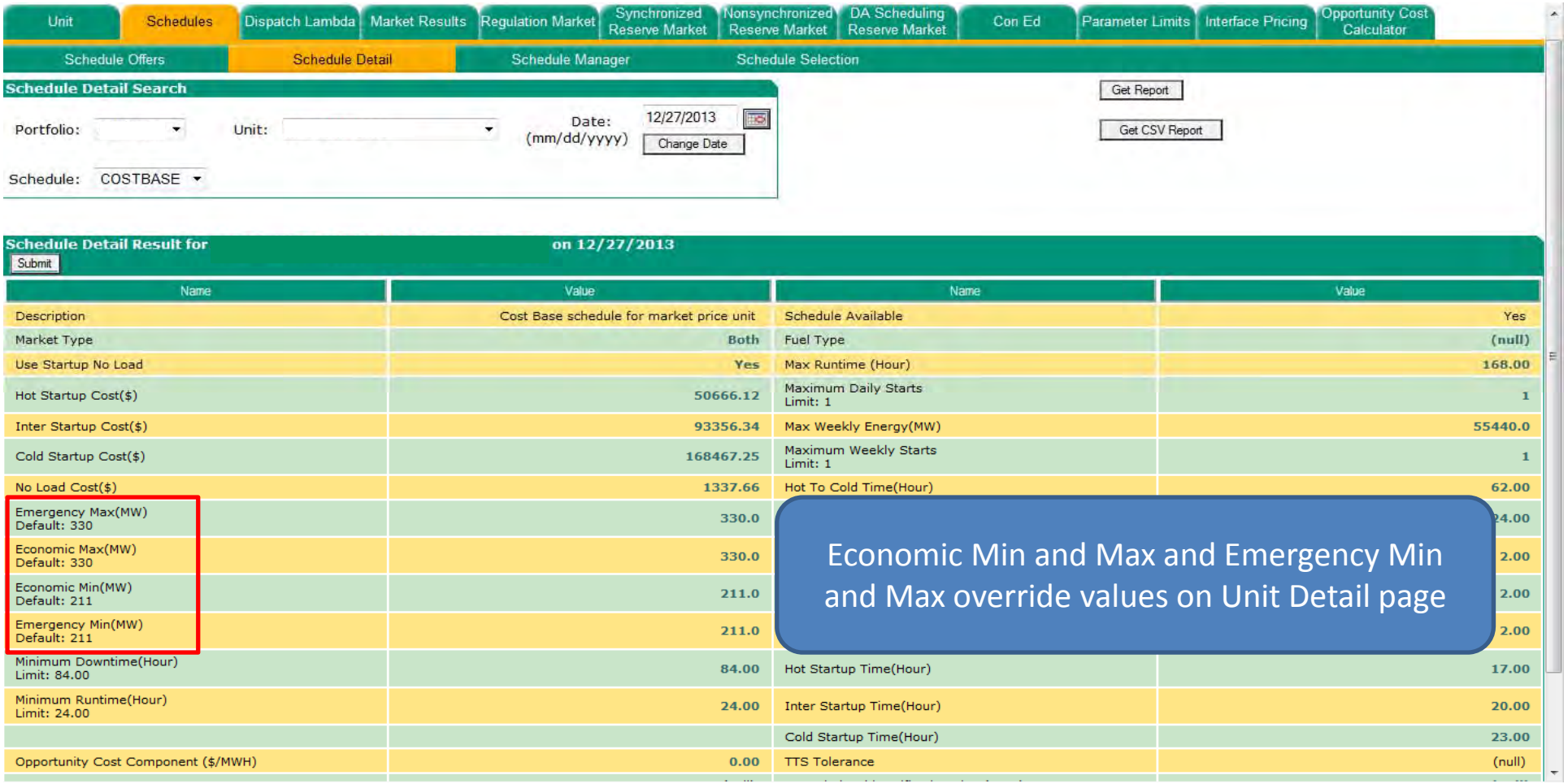
Opportunity Cost Calculator
Schedule Offers
Schedule Detail
Schedule Manager
Schedule Selection
Schedule Detail Search
Portfolio:
Unit:
Date: (mm/dd/yyyy)
12/27/2013
Change Date
Schedule: COSTBASE
Get Report
Get CSV Report
Schedule Detail Result for
on 12/27/2013
Submit
Name
Value
Name
Value
Description
Cost Base schedule for market price unit
Schedule Available
Yes
Market Type
Both
Fuel Type
(null)
Use Startup No Load
Yes
Max Runtime (Hour)
168.00
Hot Startup Cost($)
50666.12
Maximum Daily Starts Limit: 1
1
Inter Startup Cost($)
93356.34
Max Weekly Energy(MW)
55440.0
Cold Startup Cost($)
168467.25
Maximum Weekly Starts Limit: 1
1
No Load Cost($)
1337.66
Hot To Cold Time(Hour)
62.00
Emergency Max(MW) Default: 330
330.0
Hot To Inter Time(Hour)
24.00
Hot Notification Time(Hour)
2.00
Inter Notification Time(Hour)
2.00
Cold Notification Time(Hour)
2.00
Hot Startup Time(Hour)
17.00
Inter Startup Time(Hour)
20.00
Cold Startup Time(Hour)
23.00
TTS Tolerance
(null)
• Temperature State definitions
• Notification and Startup times
• Extended Notification and Startup times
• Startup Costs
• No Load Cost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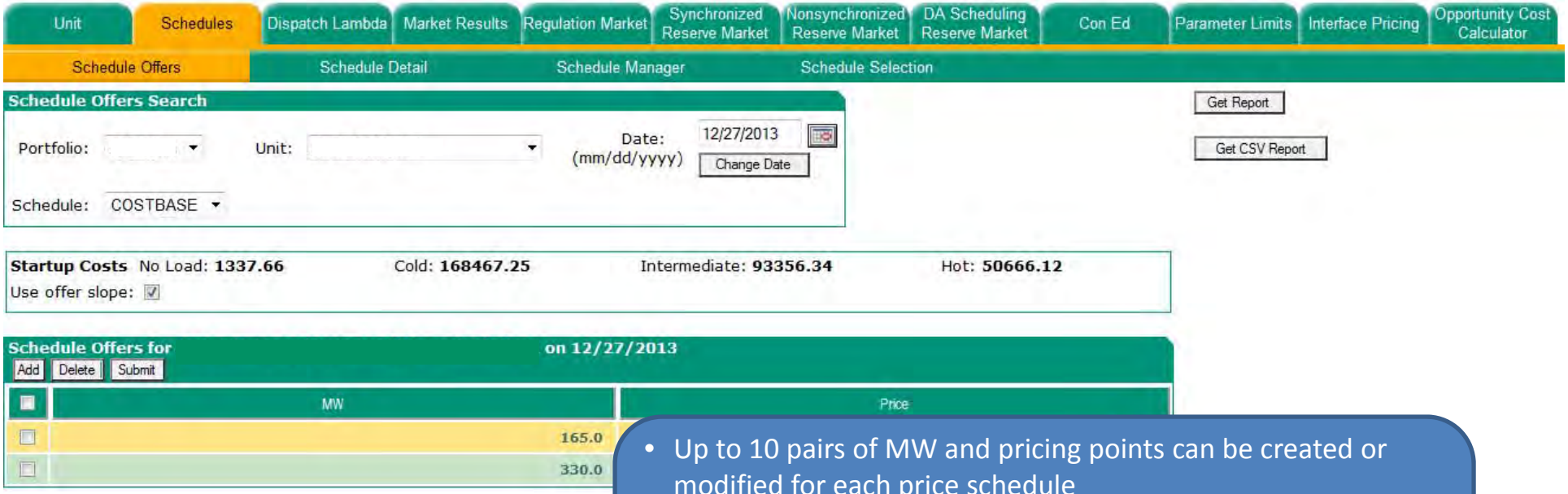
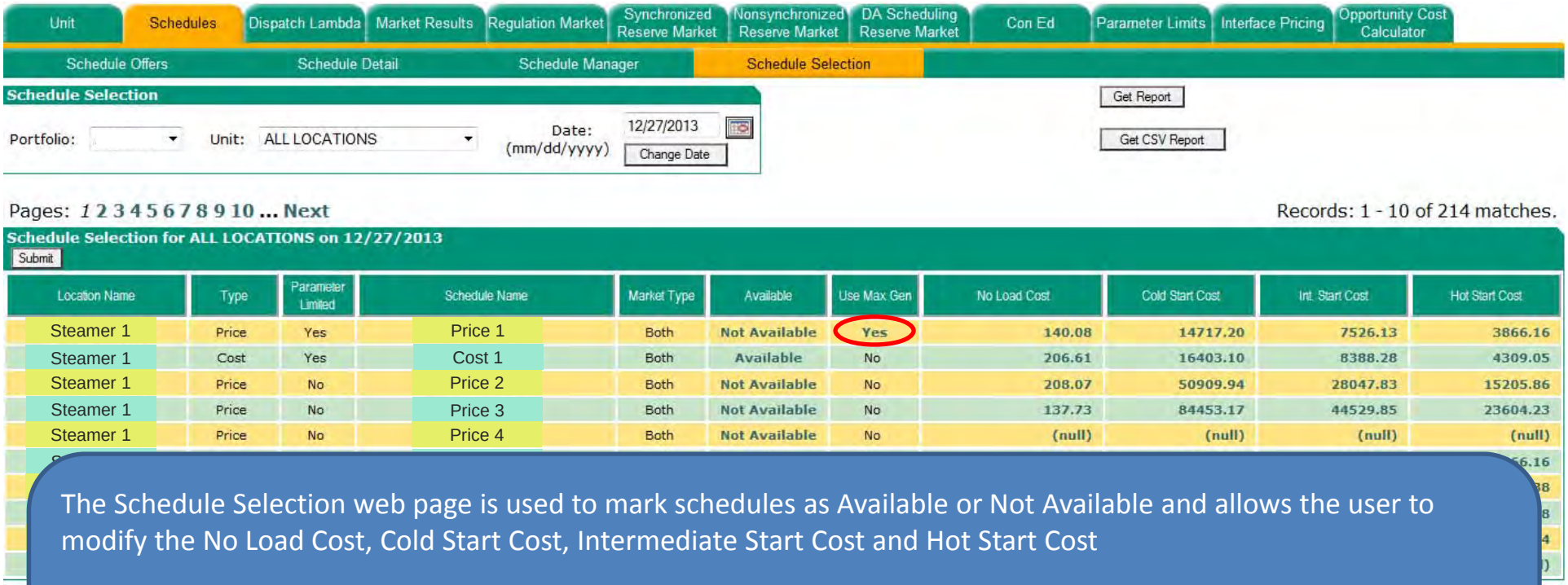
Schedule Manager
Schedule Selection
Schedule Detail Search
Portfolio:
Unit:
Date: (mm/dd/yyyy)
12/27/2013
Change Date
Schedule: COSTBASE
Get Report
Get CSV Report
Schedule Detail Result for
on 12/27/2013
Submit
Name
Value
Name
Value
Description
Cost Base schedule for market price unit
Schedule Available
Yes
Market Type
Both
Fuel Type
(null)
Use Startup No Load
Yes
Max Runtime (Hour)
168.00
Hot Startup Cost($)
50666.12
Maximum Daily Starts Limit: 1
1
Inter Startup Cost($)
93356.34
Max Weekly Energy(MW)
55440.0
Cold Startup Cost($)
168467.25
Maximum Weekly Starts Limit: 1
1
No Load Cost($)
1337.66
Hot To Cold Time(Hour)
62.00
Emergency Max(MW) Default: 330
330.0
Economic Max(MW) Default: 330
330.0
Economic Min(MW) Default: 211
211.0
Emergency Min(MW) Default: 211
211.0
Minimum Downtime(Hour) Limit: 84.00
84.00
Hot Startup Time(Hour)
17.00
Minimum Runtime(Hour) Limit: 24.00
24.00
Inter Startup Time(Hour)
20.00
Cold Startup Time(Hour)
23.00
Opportunity Cost Component ($/MWH)
0.00
TTS Tolerance
(null)
Economic Min and Max and Emergency Min and Max override values on Unit Detail page

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
- Offer Curve data is effective beginning the date shown



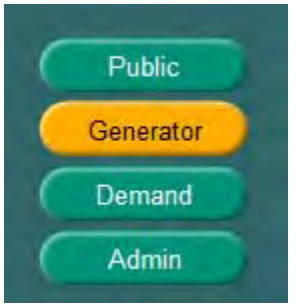
The Schedule Selection web page is used to mark schedules as Available or Not Available and allows the user to modify the No Load Cost, Cold Start Cost, Intermediate Start Cost and Hot Start Cost

- At least one cost-based schedule must be made available in both the Day-Ahead Market and in the Balancing Market
- Only one priced-based schedule can be made available in both the Day-Ahead Market and in the Balancing Market
- The price-based parameter-limited schedule may be **unavailable**, and if it is, the "**Use Max Gen**" flag must be set to "**yes**"

Private Information

Private Information Overview

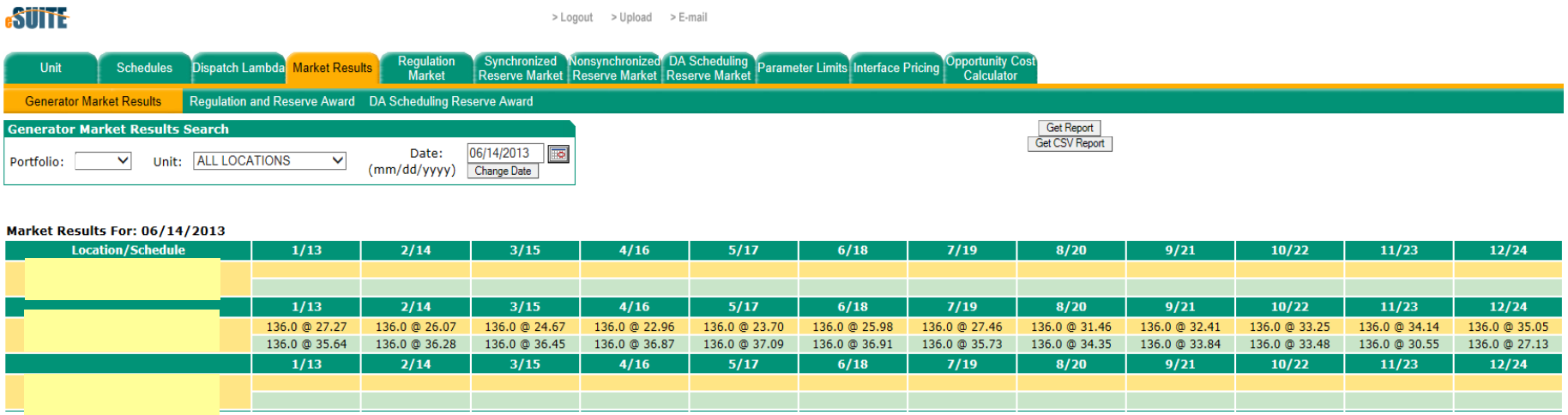
- Private generation information includes day-ahead generation schedules and day-ahead LMPs for generating units under the control of the participant and private generation messages



Market Results

Posted at 1600

Day-ahead notification of generation schedules



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Unit | Schedules | Dispatch Lambda | Market Results | Regulation Market | Synchronized Reserve Market | Nonsynchronized Reserve Market | DA Scheduling Reserve Market | Parameter Limits | Interface Pricing | Opportunity Cost Calculator

Generator Market Results | Regulation and Reserve Award | DA Scheduling Reserve Award

Generator Market Results Search

Portfolio: Unit: ALL LOCATIONS Date: 06/14/2013 (mm/dd/yyyy) Change Date

Get Report
Get CSV Report

Market Results For: 06/14/2013

Location/Schedule	1/13	2/14	3/15	4/16	5/17	6/18	7/19	8/20	9/21	10/22	11/23	12/24
	1/13	2/14	3/15	4/16	5/17	6/18	7/19	8/20	9/21	10/22	11/23	12/24
	136.0 @ 27.27	136.0 @ 26.07	136.0 @ 24.67	136.0 @ 22.96	136.0 @ 23.70	136.0 @ 25.98	136.0 @ 27.46	136.0 @ 31.46	136.0 @ 32.41	136.0 @ 33.25	136.0 @ 34.14	136.0 @ 35.05
	136.0 @ 35.64	136.0 @ 36.28	136.0 @ 36.45	136.0 @ 36.87	136.0 @ 37.09	136.0 @ 36.91	136.0 @ 35.73	136.0 @ 34.35	136.0 @ 33.84	136.0 @ 33.48	136.0 @ 30.55	136.0 @ 27.13
	1/13	2/14	3/15	4/16	5/17	6/18	7/19	8/20	9/21	10/22	11/23	12/24

Questions?