



# Energy Market Opportunity Costs for Generators with Environmental and Energy Limits

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1. Opportunity Cost:
  - Who?
  - Why?
  - What?
  - How?
2. Screen Shots of eMKT calculator

- *COST OFFERS ONLY*
- ***Externally imposed run-hour restriction on a generation unit.***
- Examples:
  - Limit on emissions for the unit imposed by a regulatory agency or legislation
  - A direct run hour restriction in the operating permit
  - Heat input limitation defined by a regulatory decision or operating permit.

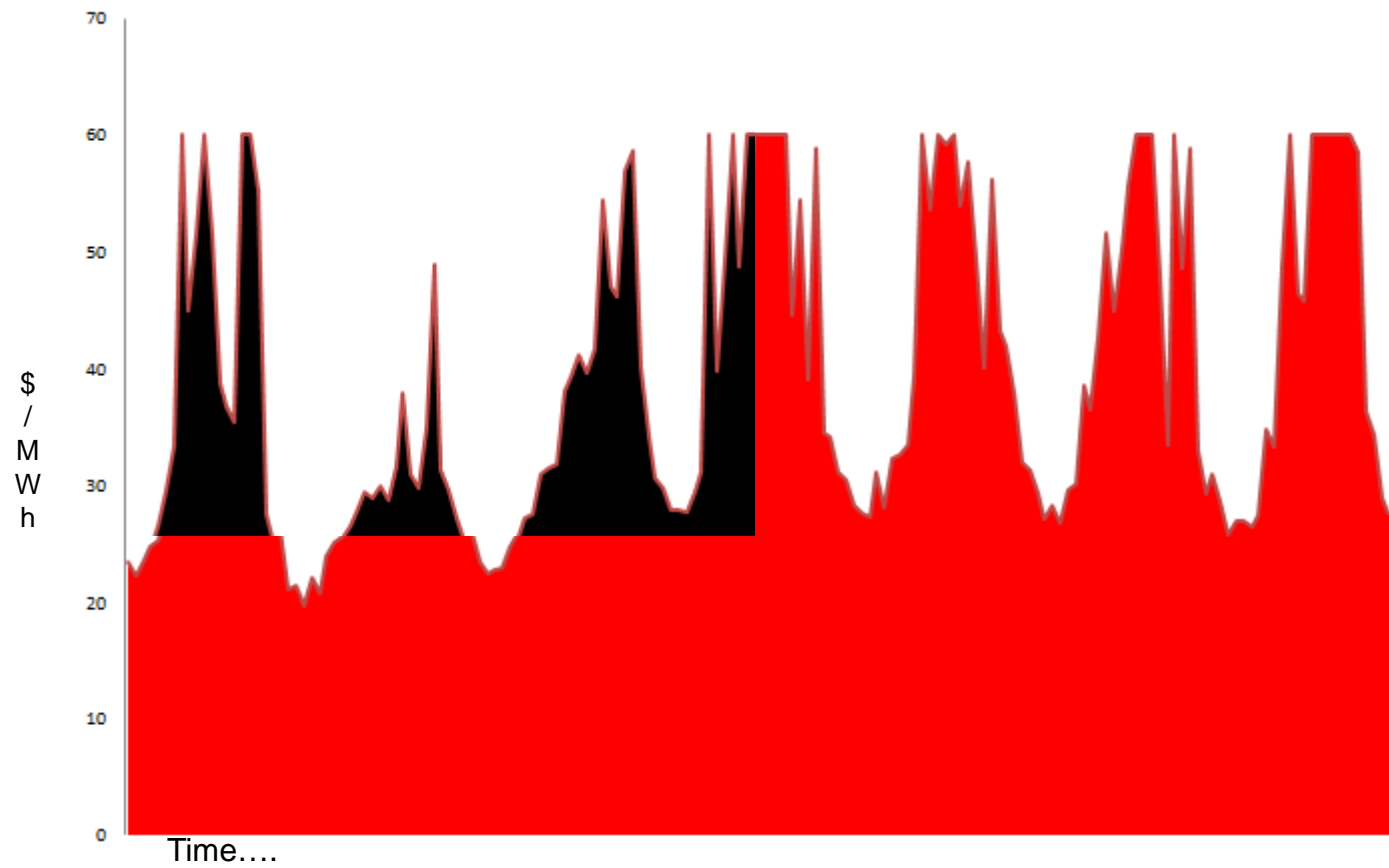
## Three Pivotal Supplier Test:

Questions:

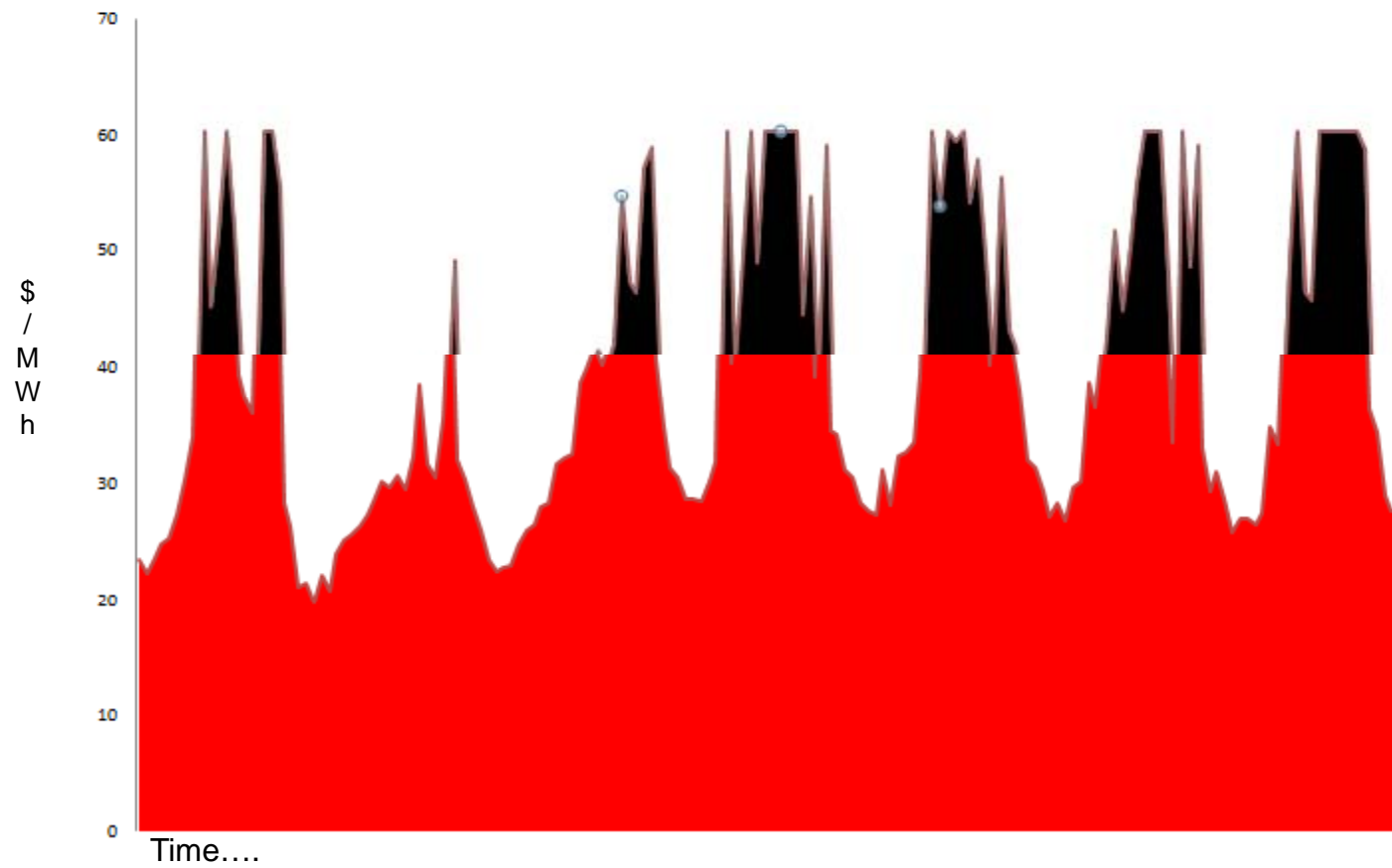
Was it Just & Reasonable?

FERC found no evidence that it wasn't Just & Reasonable, but that opportunity costs should be addressed

### Dispatch without Opportunity Cost



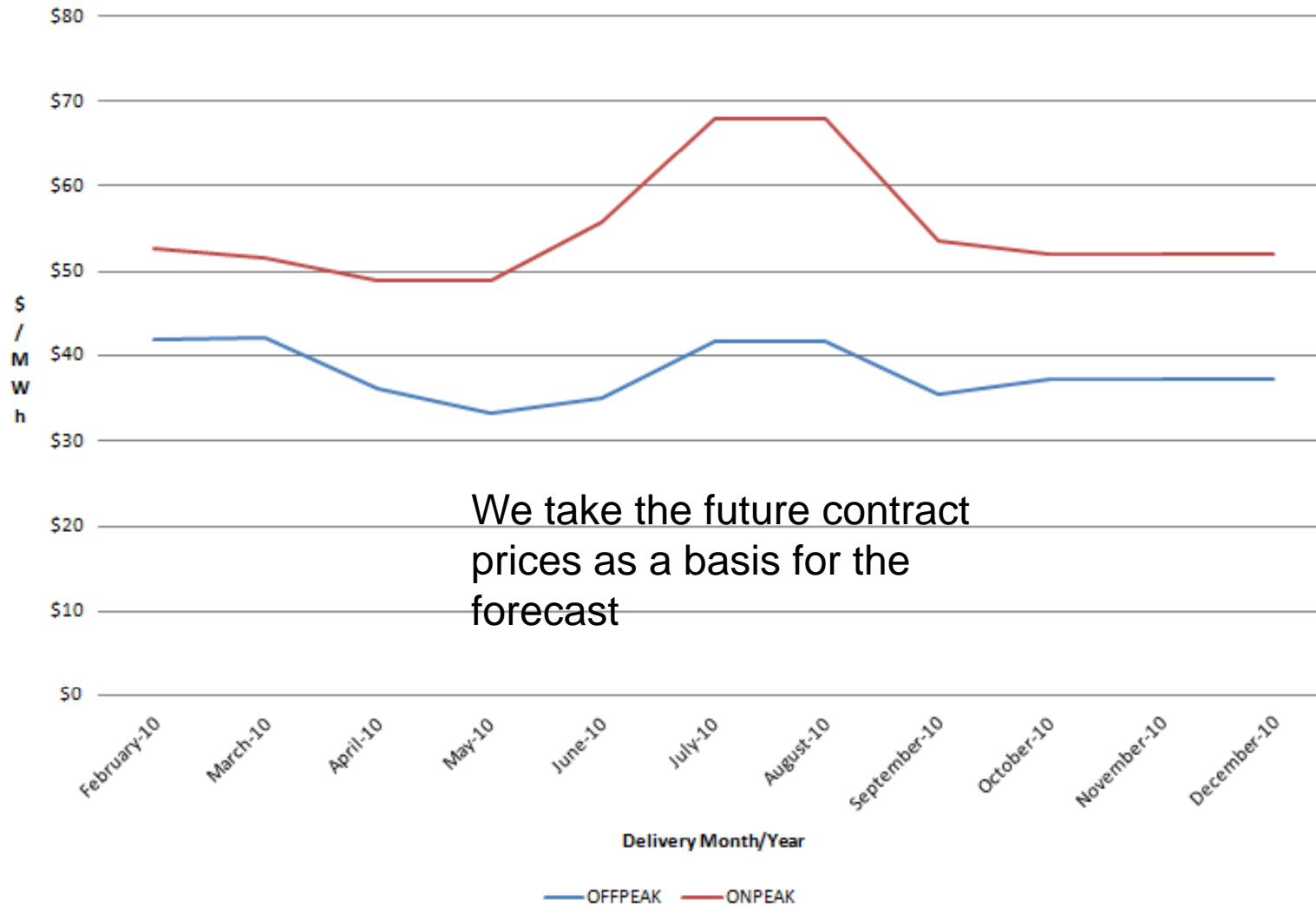
### Dispatch with Opportunity Cost



- **STEP 1: Forecast LMPs**
  - Taken from future contract prices
- **STEP 2: Forecast Dispatch Cost**
  - Taken from future contract prices
- **STEP 3: Margin = LMP – Dispatch Cost**
- **STEP 4: Rank Margins**
- **STEP 5: Select Margin that correlates to your run hour restriction**

# STEP 1a Forecast LMP: Future Contract Prices

**Energy Contracted for Delivery to PJM Western Hub**



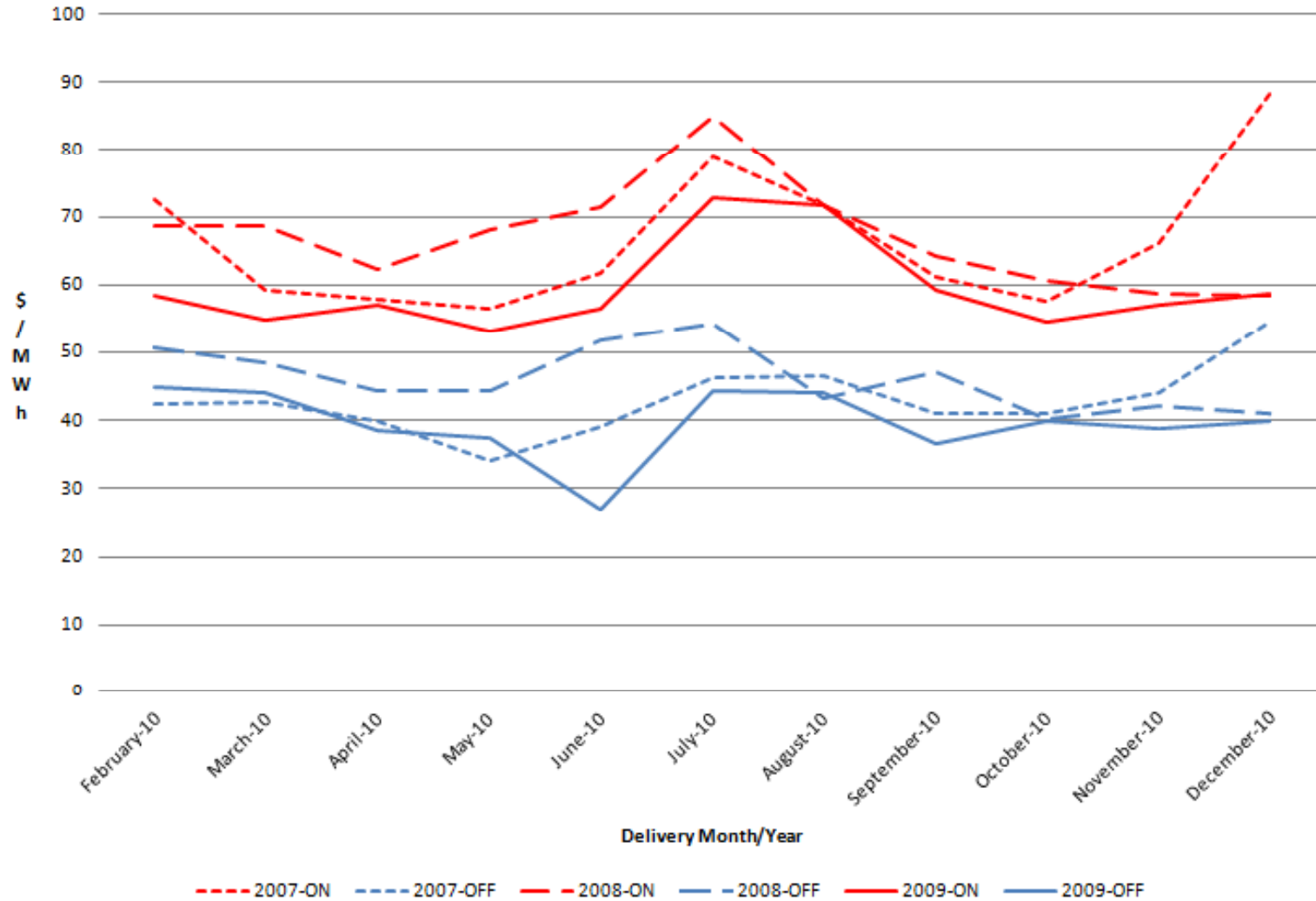
We take the future contract prices as a basis for the forecast

- But my generator isn't at PJM Western Hub!
  - How do I get to my generator?
  - 3 years historical basis
  - Historical Bus LMP divided by PJM Western Hub LMP hourly averaged on and off peak to get ratios to deliver the LMP forecast to my bus.



# STEP 1b Forecast LMP: Add 3 historical basis adjustments

## ONPEAK AND OFFPEAK ENERGY DELIVERED TO GENERATOR

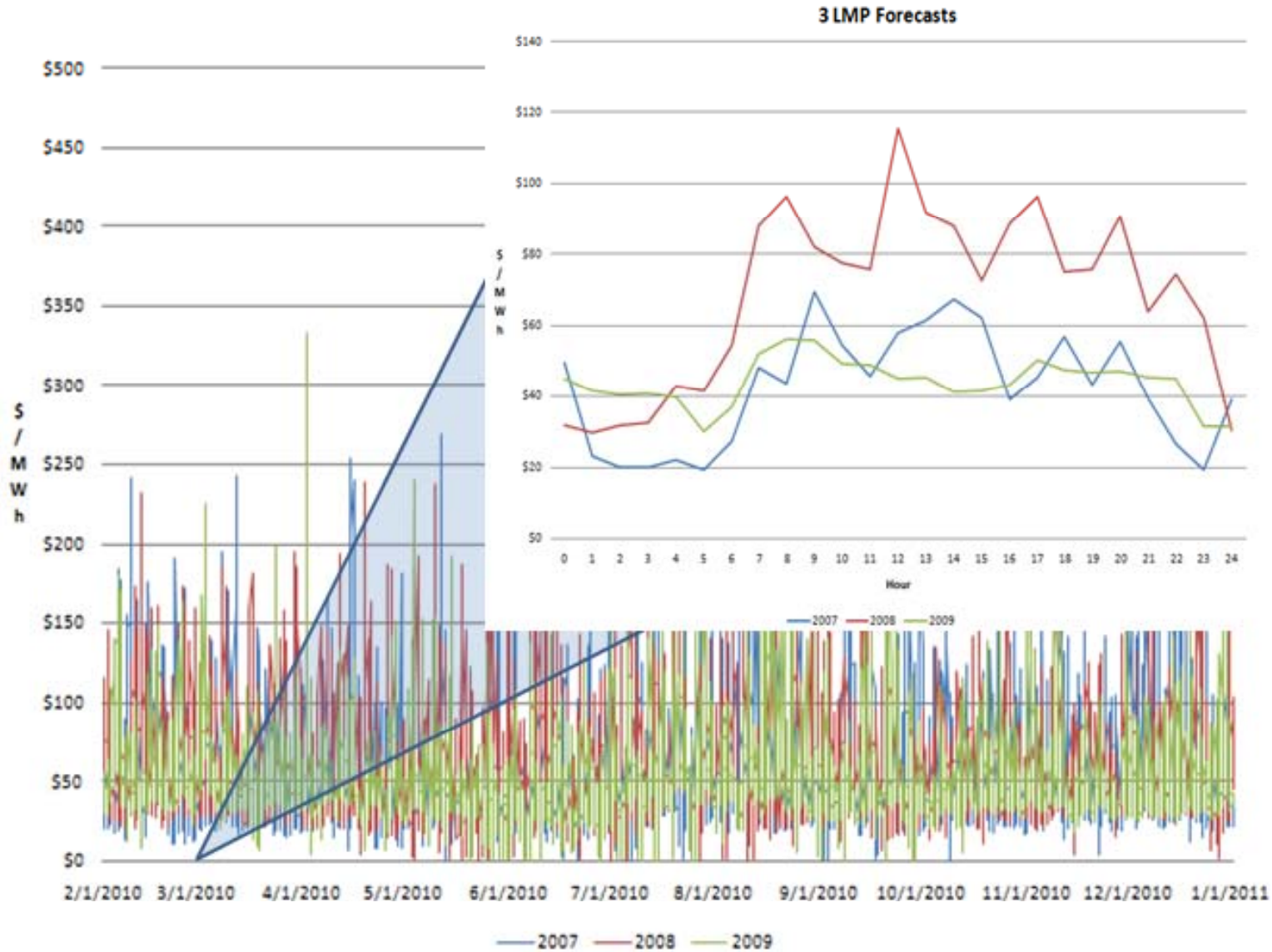




That doesn't look like hourly LMPs to me....

- What about hourly changes in energy prices?
- Aren't you going to add an hourly shape?

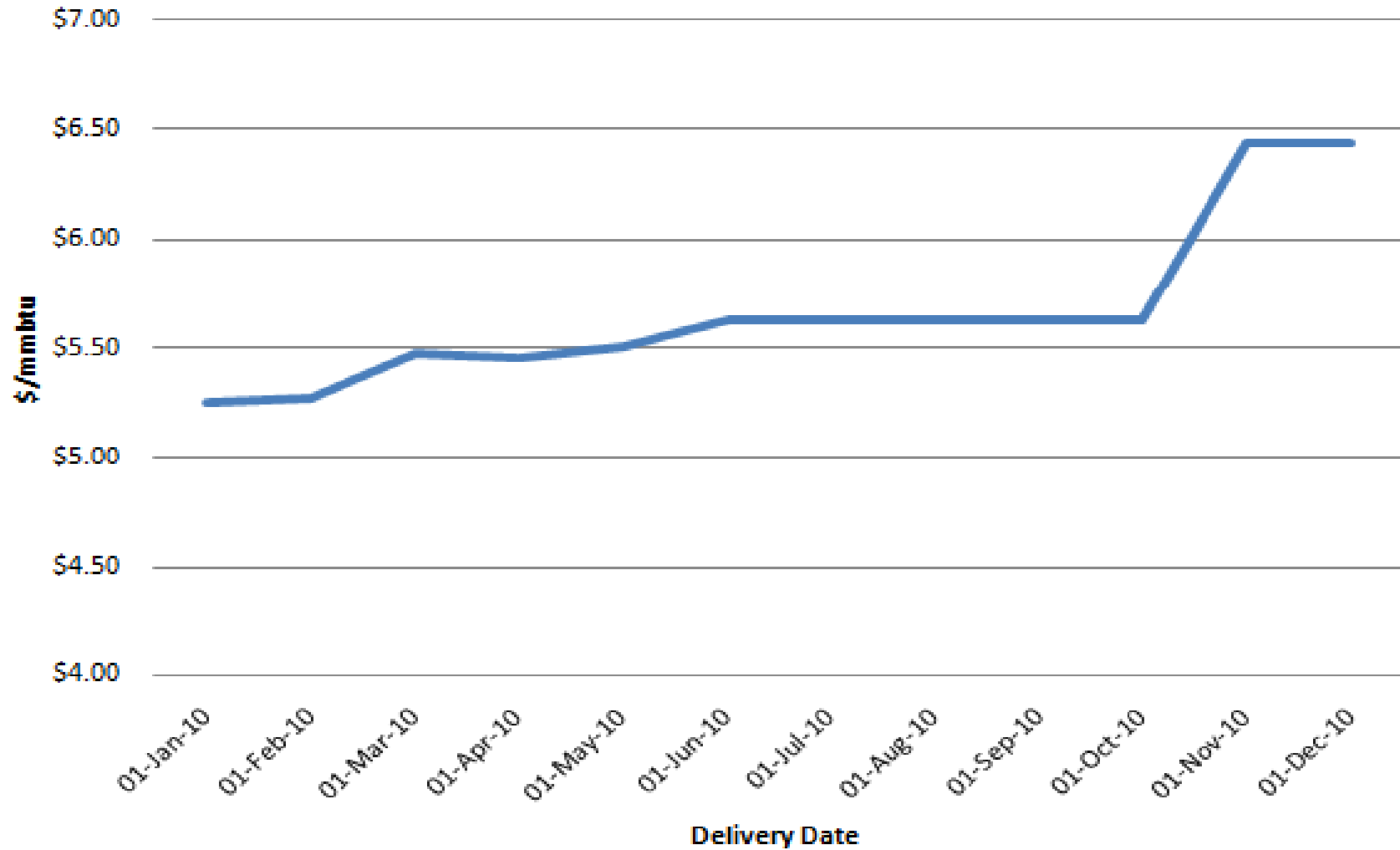
# STEP 1c Forecast LMP: How about 3 hourly shapes?



- Now how much will it cost the generator to supply energy?
  - There are many components in the cost based offer (outlined in PJM Manual 15)
  - However fuel cost usually makes up more than more than 90% of the cost offer
  - This brings us to STEP 2: Forecast Dispatch Cost

## STEP 2: Fuel Contracts for Delivery in the Future

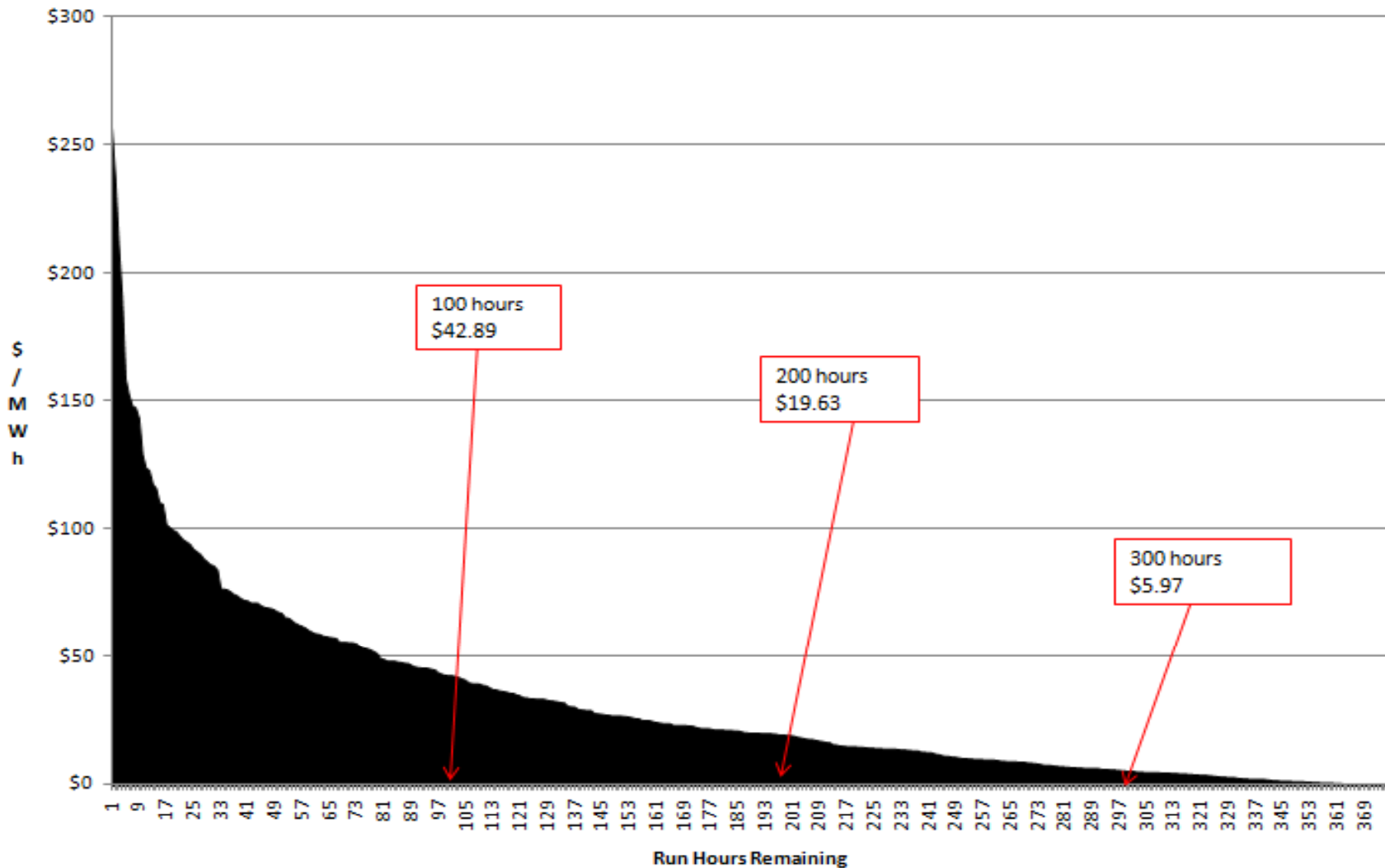
### Gas Delivery Contracts



# LMP -DISPATCH COST MARGIN

# Step 4: Unit runs out of hours, the component increases

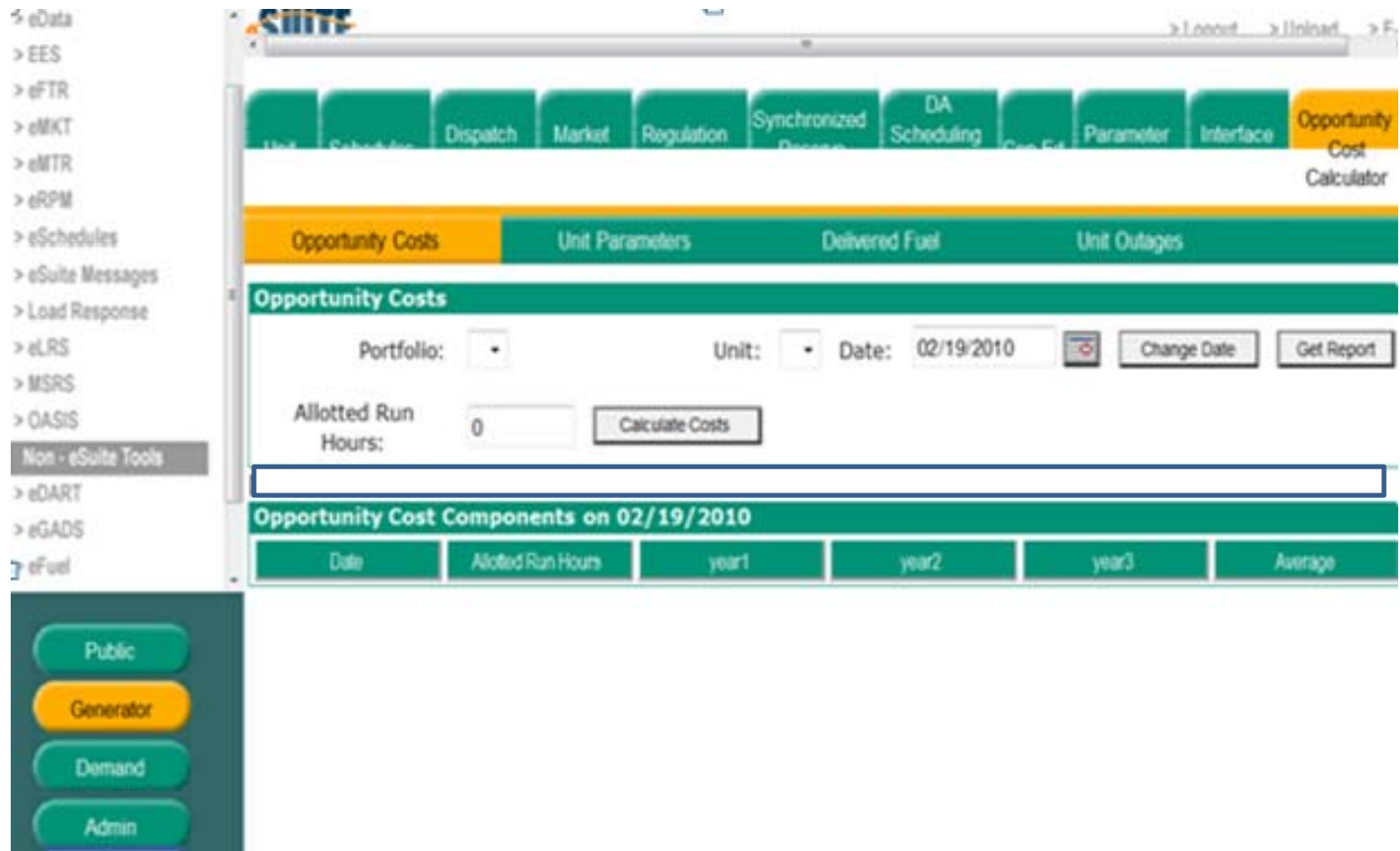
## Top 400 Margins



## What if I run out of hours?

If you use this method....

- Self-scheduled more than 50% or more of its available run hours: Forced Outage.
- Self-scheduled less than 50% of its available run hours: Outside Management Control



The screenshot shows the eMKT Calculator interface. On the left is a navigation menu with the following items:

- > eData
- > EES
- > eFTR
- > eMKT
- > eMTR
- > eRPM
- > eSchedules
- > eSuite Messages
- > Load Response
- > eLRS
- > MSRS
- > OASIS
- Non - eSuite Tools
- > eDART
- > eGADS
- > eFuel

The main content area features a top navigation bar with tabs: Unit, Schedules, Dispatch, Market, Regulation, Synchronized, DA Scheduling, Cap Ex, Parameter, Interface, and Opportunity Cost Calculator. Below this is a sub-navigation bar with tabs: Opportunity Costs, Unit Parameters, Delivered Fuel, and Unit Outages. The 'Opportunity Costs' section contains the following form elements:

- Portfolio:
- Unit:
- Date:
- Allotted Run Hours:

Below the form is a table titled "Opportunity Cost Components on 02/19/2010":

Date	Allotted Run Hours	year1	year2	year3	Average

At the bottom left, there is a vertical sidebar with buttons for: Public, Generator, Demand, and Admin.

Unit Parameters for  on 01/01/2010

Location	Heat Rate (MMBtu/MWh)	VOM (\$/MWh)	CO2 Rate (Lbs/MMBtu)	SO2 Rate (Lbs/MMBtu)	NOX Rate (Lbs/MMBtu)	FMU Adder (\$/MWh)	Use Fuel Volatility	Use % Adder	Fuel Type Name
<input type="text"/>	10.3450	2.22	117.0000	1.2000	0.3280	(null)	No	No	C.App_PIT_1.2_BARGE

Unit Parameters for  on 01/01/2010

Location	Heat Rate (MMBtu/MWh)	VOM (\$/MWh)	CO2 Rate (Lbs/MMBtu)	SO2 Rate (Lbs/MMBtu)	NOX Rate (Lbs/MMBtu)	FMU Adder (\$/MWh)	Use Fuel Volatility	Use % Adder	Fuel Type Name
<input type="text"/>	10.3450	2.22	117.0000	1.2000	0.3280	(null)	No	No	C.App_PIT_1.2_BARGE

Once submitted the parameters will turn from red to green.  
Refer to Manual 15

Opportunity Costs    Unit Parameters    **Delivered Fuel**    Unit Outages

**Delivered Fuel**

Portfolio:     Unit:     Start Date:  (mm/dd/yyyy)    End Date:  (mm/dd/yyyy)       

Pages: 1 2 3 4 Next    Records: 1 - 10 of 32 matches.

Delivered Fuel for

Day	Delivered Fuel Price
01/01/2009	(null)
01/02/2009	(null)
01/03/2009	(null)
01/04/2009	(null)
01/05/2009	(null)
01/06/2009	(null)
01/07/2009	(null)
01/08/2009	(null)
01/09/2009	(null)
01/10/2009	(null)

Enter Delivered Fuel Price  
In \$/mmBtu for the previous  
three years

You must enter 3 previous years data to use the result.

Opportunity Costs    Unit Parameters    Delivered Fuel    **Unit Outages**

Outages

Portfolio: 1 - ALL UNITS    Unit:    Start Date: 01/01/2010    End Date: 12/31/2010    Change Date    Get Report

Pages: 1    Records: 1 - 2 of 2 matches.

Outages for 10100101

Add    Delete    Submit

	Start Day	End Day
<input type="checkbox"/>	3/2/2010	3/4/2010
<input checked="" type="checkbox"/>	01/17/2010	01/19/2010
<input checked="" type="checkbox"/>	05/01/2010	05/10/2010

Enter Projected Outages for the rest of the Calendar Year

Opportunity Costs		Unit Parameters		Delivered Fuel		Unit Outages	
<b>Opportunity Costs</b>							
Portfolio:	1 - ALL UNITS	Unit:		Date:	02/18/2010	Change Date	Get Report
Allotted Run Hours:	600	Calculate Costs					
<b>Opportunity Cost Components For</b> [Unit] <b>in</b> 02/18/2010							
Date	Allotted Run Hours	2007	2008	2009	Average		
2010-02-19	600	10.54	12.62	0	7.72		

## Calculation of Opportunity Cost

- Click on the Opportunity Cost tab
- Select the Allotted Run Hours
- Hit calculate costs

## Interpretation of Opportunity Cost

This is the maximum amount you can use in your cost offer for opportunity cost

- The calculated Opportunity Cost Component is a maximum
- eMKT does NOT AUTOMATICALLY ADD this component to your Cost Offer
- You must manually include your opportunity cost component as desired into your segmented energy offer
- Generation owners who include opportunity costs in their cost-based offers must recalculate their opportunity cost no less frequently than once per week.

- If your segmented energy offer was \$5 and your computed opportunity cost component was \$2.50 you would:
  - Enter \$2.50 as your opportunity cost component
  - Enter \$7.50 as your segmented energy offer



# Including an Opportunity Cost Component in your Cost Offer

Choose Schedules > Schedule Detail

Unit Schedules Dispatch Lambda Market Results Regulation Market Synchroniz Reserve Ma

Schedule Offers Schedule Detail Schedu

Schedule Detail Search

Portfolio: [ ] Unit: [ ]

Schedule: Cost

From the drop down box next to “Schedule” choose your cost schedule.

Schedule Detail Result for [ ]

Name	Value
Description	Cost based schedule
Market Type	Both
Use Startup No Load	Yes
Hot Startup Cost(\$)	0.00
Inter Startup Cost(\$)	0.00
Cold Startup Cost(\$)	0.00
No Load Cost(\$)	1059.90
Emergency Max(MW) Default: 237.8	238.0
Economic Max(MW) Default: 237.8	238.0
Economic Min(MW) Default: 87.1	60.0
Emergency Min(MW) Default: 58.8	60.0
Minimum Downtime(Hour)	9.00
Minimum Runtime(Hour)	15.00
Opportunity Cost Component (\$/MWH)	(null)

Enter the data in the row called “Opportunity Cost Component” under the column called “Value”

Enter up to the calculated average opportunity cost component in this field.

**YOU MUST NOW INCLUDE THIS VALUE IN YOUR SEGMENTED ENERGY OFFER**

**SUITE** Logout Upload

Unit Schedules Dispatch Lambda Market Results Regulation Market Synchronized Reserve Market DA Scheduling Reserve Market

Schedule Offers Schedule Detail Schedule Manager Schedule Sales

**Schedule Offers Search**

Portfolio:  Unit:  Date:

Schedule:

MW	PRICE
10	\$5.00
20	\$6.00
30	\$7.00
40	\$8.00
50	\$9.00



MW	PRICE
10	\$7.50
20	\$8.50
30	\$9.50
40	\$10.50
50	\$11.50

- **DISCLAIMER:**
- This calculator is a service for participants to estimate their possible opportunity costs
- Participants are responsible for the components of their cost offer
- You must follow all rules in Manual 15