Opportunity Cost Calculator v2:
Energy Market Opportunity Costs
Non-Regulatory Opportunity Costs

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November, 2015

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Opportunity Cost Calculator
v2 Instructions

The following instructions describe, in a systematic format, how to use the Opportunity Cost Calculator Tool version 2 in the PJM eMKT environment to calculate opportunity costs for Energy Market Opportunity Costs (EMOC) and Non-Regulatory Opportunity Costs (NROC) for generation units. PJM staff requests that any issues found in the calculator promptly be reported to eMKTOPCostCalculator@pjm.com.

UPDATE ~ November 6, 2015 – Currently, the opportunity cost calculator is only able to calculate adders for time periods greater than 30 days.

Energy Market Opportunity Cost (EMOC) shall mean the difference between (a) the forecasted cost to operate a specific generating unit when the unit only has a limited number of available run hours due to limitations imposed on the unit by Applicable Laws and Regulations (as defined in PJM Tariff), and (b) the forecasted future hourly Locational Marginal Price at which the generating unit could run while not violating such limitations. Energy Market Opportunity Cost therefore is the value associated with a specific generating unit's lost opportunity to produce energy during a higher valued period of time occurring within the same compliance period, which compliance period is determined by the applicable regulatory authority and is reflected in the rules set forth in PJM Manual 15. Energy Market Opportunity Costs shall be limited to those resources which are specifically delineated in Schedule 2 of the Operating Agreement[i].

Issue Tracking: Generator Cost Development: Opportunity Cost Calculation for Energy & Environmentally Limited Units

Non-Regulatory Opportunity Cost (NROC) shall mean the difference between (a) the forecasted cost to operate a specific generating unit when the unit only has a limited number of starts or available run hours resulting from (i) the physical equipment limitations of the unit, for up to one year, due to original equipment manufacturer recommendations or insurance carrier restrictions, (ii) a fuel supply limitation, for up to one year, resulting from an event of force majeure; and, (b) the forecasted future hourly Locational Marginal Price at which the generating unit could run while not violating such limitations. Non-Regulatory Opportunity Cost therefore is the value associated with a specific generating unit's lost opportunity to produce energy during a higher valued period of time occurring within the same period of time in which the unit is bound by the referenced restrictions, and is reflected in the rules set forth in PJM Manual 15. Non-Regulatory Opportunity Costs shall be limited to those resources which are specifically delineated in Schedule 2 of the Operating Agreement.[1]

Issue Tracking: Generator Cost Development: Other Opportunity Costs

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[1] Page 1486 PJM OATT http://pjm.com/documents/~/media/documents/agreements/tariff.ashx

When a generating unit can use NROC or EMOC: For a generating unit that is subject to operational limitations due to energy or environmental limitations imposed on the generating unit by Applicable Laws and Regulations (as defined in the PJM Tariff), the Market Participant may include in the calculation of its "other incremental operating costs" an amount reflecting the unit-specific Energy Market Opportunity Costs expected to be incurred. Such unit-specific Energy Market Opportunity Costs are calculated by forecasting Locational Marginal Prices based on future contract prices for electricity using PJM Western Hub forward prices, taking into account historical variability and basis differentials for the bus at which the generating unit is located for the prior three year period immediately preceding the relevant compliance period, and subtract there from the forecasted costs to generate energy at the bus at which the generating unit is located, as specified in more detail in PJM Manual 15. If the difference between the forecasted Locational Marginal Prices and forecasted costs to generate energy is negative, the resulting Energy Market Opportunity Cost shall be zero. Notwithstanding the foregoing, a Market Participant may submit a request to PJM for consideration and approval of an alternative method of calculating its Energy Market Opportunity Cost if the standard methodology described herein does not accurately represent the Market Participant's Energy Market Opportunity Cost.

For a generating unit that is subject to operational limitations because it only has a limited number of starts or available run hours resulting from (i) the physical equipment limitations of the unit, for up to one year, due to original equipment manufacturer recommendations or insurance carrier restrictions, or (ii) a fuel supply limitation, for up to one year, resulting from an event of force majeure , the Market Participant may include in the calculation of its "other incremental operating costs" an amount reflecting the unit-specific Non-Regulatory Opportunity Costs expected to be incurred. Such unit-specific Non-Regulatory Opportunity Costs are calculated by forecasting Locational Marginal Prices based on future contract prices for electricity using PJM Western Hub forward prices, taking into account historical variability and basis differentials for the bus at which the generating unit is located for the prior three year period immediately preceding the period of time[2]

PJM market participants are reminded that the inclusion of opportunity costs for energy and environmentally limited units via this tool is for informational purposes only. Each participant is responsible for his or her cost offer and the rules currently approved in Manual 15, Cost Development Guidelines:

http://pjm.com/~/media/documents/manuals/m15.ashx

The second version of the calculator can assume any standard or rolling compliance time period up to one year, up to two contract fuel prices allocated by ratio, up to two fuel types per unit, fuel delivery costs, start costs and minimum runtime restrictions.

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[2] PJM OA page401 http://pjm.com/~/media/documents/agreements/oa.ashx effective 4/16/2011 - Docket #: ER11-3384-001

Step 1: Log into eMKT

Go to: https://esuite.pjm.com/mui/


If you do not currently have a PJM eSuite account, you can apply for one by clicking on the eSuite New User button as shown below. You will need to provide your company name and request Read/Write access to eMKT.

Step 2: Opening the Opportunity Cost Calculator

Once you have logged in, click on the Generator button in the lower left corner. The tab to the Opportunity Cost Calculator will appear in the in the upper right. It is the last tab in the row.

Click Generator button to reveal calculator tab.
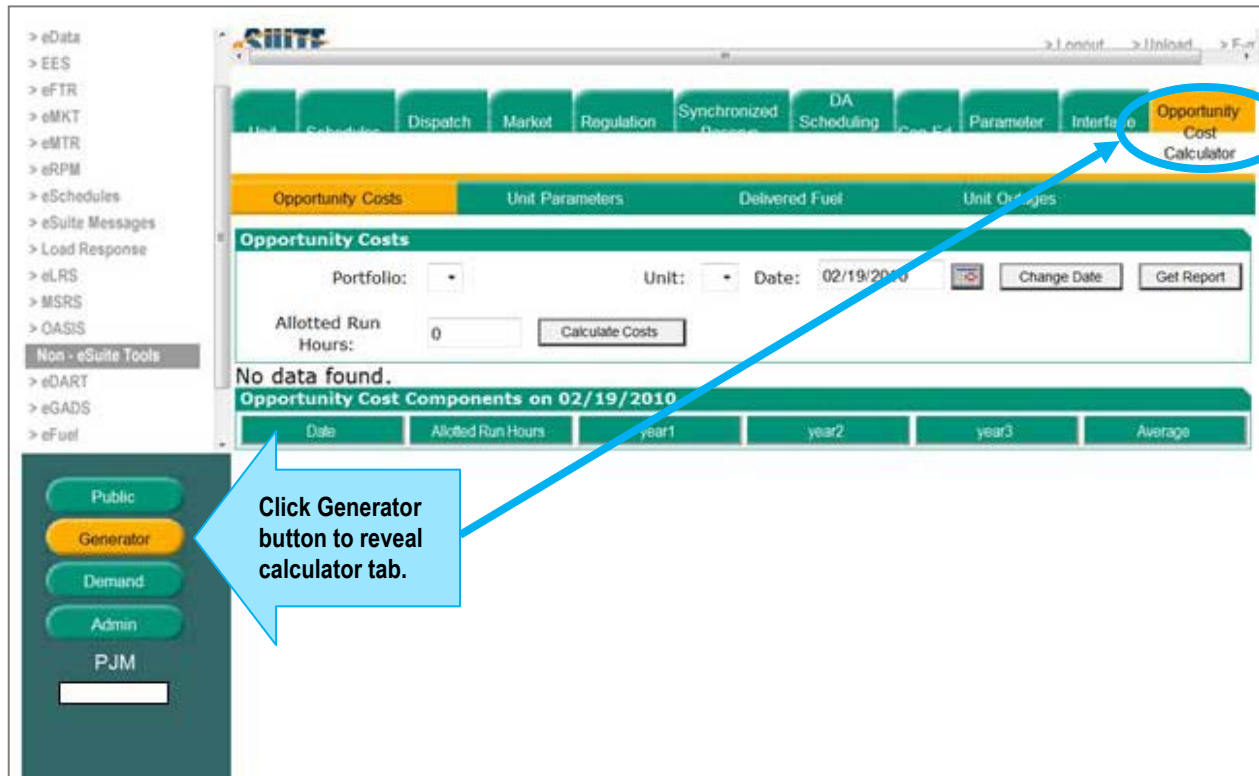
Once you click on the Opportunity Cost Calculator tab, it will open the calculator page and you will find five sub-pages: **Opportunity Costs, Unit Parameters, Delivered Fuel, Unit Outages and Forecasted Allowance.**
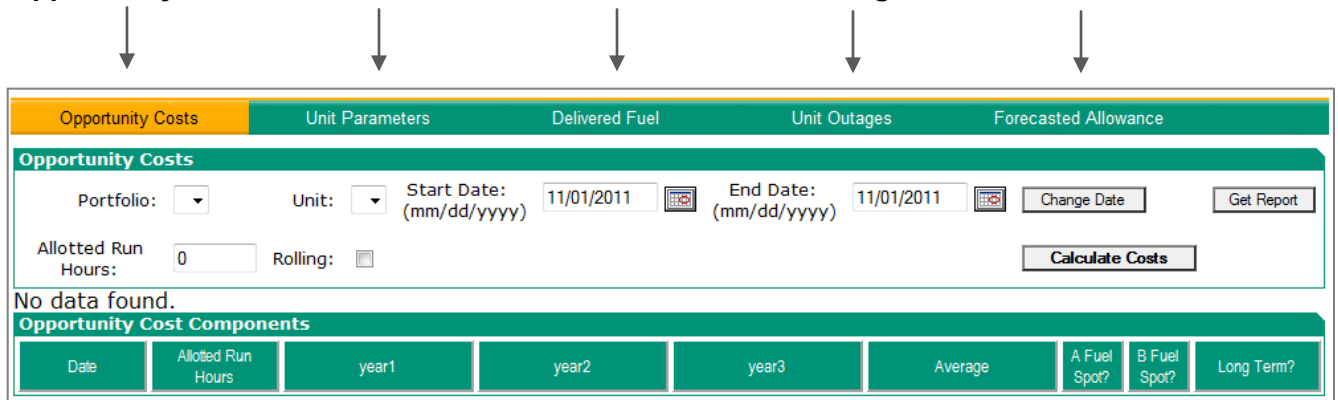
Step 3: Start on the Unit Parameter Tab

To begin, go to the Unit Parameters Tab, choose your portfolio and unit and enter the start date as the date for which you are calculating opportunity cost, usually the next operating day; then click Change Date.

The fields are defined as follows:

Heat Rate (MMBtu/MWh)	The expected future full load seasonal heat rate (May – September or October– April) for the compliance period. Please note that in a calendar year you will need to submit three heat rates, winter (January– April), summer (May – September), and winter (October – December). This field cannot be null. For the first winter heat rate, click on the calendar icon to the right of the date field and select January within the compliance period, then click change date. Enter the winter heat rate and the rest of the required fields for the unit parameters (VOM, CO_2, SO_2, NO_X, etc), then click submit. For the summer heat rate, click on the calendar icon to the right of the date field and select May, then click change date. Enter summer heat rate and the rest of the fields for the unit parameters, then click submit. For the second winter heat rate, click on the calendar icon to the right of the date field and select October, then click change date. Enter the winter heat rate and the rest of the field for the unit parameters, then click submit.
VOM ($/MWh)	VOM as used in the cost based offer as explained by PJM Manual 15, Section 2: Policies for all Unit Types as well as specific unit type constraints in subsequent sections. This field cannot be null.
CO2 Rate (Lbs/MMBtu) **SO2 Rate (Lbs/MMBtu)** **NOX Rate (Lbs/MMBtu)**	Unit SO_2, CO_2, and NO_X Emission Rates (lbs/mmBtu) (Note that the CO_2 adder is in effect only for incurring mandatory carbon emission charges). If not subject to RGGI then enter $0. This field cannot be null.

FMU Adder ($/MWh)	Frequently Mitigated Unit (FMU) or Associated Unit Adder as defined in PJM Manual 15, Section 9: Opportunity Cost Guidelines. If you enter a value in this field then you cannot select Use % Adder. However, you do not have to choose either FMU Adder or Use % Adder. This field can be null. Only units allowed FMU from the IMM may use the FMU.
Use % Adder	Per the OA, a generator may include a ten-percent (10%) adder to their computed cost offer as defined in PJM Manual 15. A generator must elect to include this adder in full, in part, or not at all; just as it does it in its cost based offer. This may not be used together with the FMU Adder. However, you do not have to choose either FMU Adder or Use % Adder. This field can be null.
Min Run Time	MRT is the minimum full hour operation for a unit based on the unit type's parameter limits. Data entered should be a whole numbers and no less than 1 or more than 24. This field cannot be null. The value should match the minimum runtime on the cost based offer.
Start Cost	This is the start cost used in the cost based offer. Unit-specific start up costs: cold startup costs for combined cycle and combustion turbine units and hot startup costs for steam units. If left null, no start cost is assumed.
Economic Max	EcoMax is the highest unrestricted level of energy, in MW, that the operating company operates the unit under normal operation. This represents the highest output available from the unit for economic dispatch. This is a whole number. This field cannot be null.
A Fuel Type **B Fuel Type**	The calculator can recognize two types of fuel per unit. Choose Fuel A, the primary type of fuel, from the drop- down. Then choose Fuel B, the secondary type of fuel. If the unit only burns one type of fuel then leave Fuel B as null.
A Price Type **B Price Type**	Select Contract if you intend to enter a contract price for the compliance period. Select Spot if you would like to use the market forward price for your fuel. If you have selected dual fuel types for a unit then you will need to select the correct price type for each fuel. If the unit has only one fuel type, then indicate the price type only once.
A Fuel % **B Fuel %**	Indicate the percentage the unit runs on the fuel. If the unit is dual fuel the total of A Fuel% and B Fuel% must equal 1.0 or you will receive an error. Additionally, percentages can only be entered in as tenths using hundredths or thousandths with result in rounding and potential totals that are larger than the 1.0 constraint. If the unit runs on a single fuel you must indicate that 1.0 of the unit runs on the fuel, otherwise you will receive an error. This field cannot be null.

Below is an example of filled in unit parameters after submitting. The text font is red before it is submitted then turns to green. Once it has been submitted you can navigate away from the page without losing your entries.

Opportunity Costs	Unit Parameters	Delivered Fuel	Unit Outages	Forecasted Allowance

Unit Parameters

Portfolio: 1 - ALL UNITS   Unit: Date: (mm/dd/yyyy) 01/04/2012   Change Date   Get Report

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

Unit Parameters for   **on 01/04/2012**

Submit

Unit Name	CR 658610XX	Text is red before submitted.		VOM ($/MWh)	2.22	CO2 Rate (Lbs/MMBtu)	117.0000
SO2 Rate (Lbs/MMBtu)	1.2000	NOX Rate (Lbs/MMBtu)	0.5280	FMU Adder ($/MWh)	(null)	Use % Adder	Yes
Min Run Time	1	Start Cost	1000.00	Economic Max	20.00		
A Fuel Type	Columbia_Gas_App	A Price Type	CONTRACT	A Fuel %	0.90		
B Fuel Type	Jet_USAC	B Price Type	SPOT	B Fuel %	0.10		

Step 4: Delivered Fuel Tab

After the unit parameters have been submitted, you can enter the future month delivered fuel and delivered fuel history from the three previous years.

For the Monthly Delivered Fuel section you provide the future adders and expected contract price for a fuel delivered to the unit. Please note that if both fuel types selected on Unit Parameter tab are Contract then there will be two places to enter future monthly delivered fuel.

In the Delivered Fuel section you can provide unit fuel history to calculate the volatility adder.   If you do not provide the fuel history, the calculator will use default historical fuel price for the unit type.

Opportunity Costs	Unit Parameters	Delivered Fuel	Unit Outages	Forecasted Allowance

Delivered Fuel

Portfolio: 1 - ALL UNITS   Unit: Start Date: (mm/dd/yyyy) 12/27/2011   End Date: (mm/dd/yyyy) 12/27/2011   Change Date

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

Monthly Delivered Fuel for

Submit   Download XML

Month	Fuel Type	Desc Of Adder	Fuel Delivery Adders	Fuel Contract Price
12/01/2011	(null)	(null)	(null)	(null)

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

Delivered Fuel for

Submit   Download XML

Day	Fuel Type	Price Type	Delivered Fuel Price ($/MMBTU))
12/27/2011	(null)	(null)	(null)

To begin, adjust the start date to the beginning of the period to be evaluated such as 1/1/2012 and the end date to the end of the period to be evaluated such as 11/4/12 and click change date. This will create the rows in Monthly Delivered Fuel for the future that you will then populate with data.

Next, drop down to the Monthly Delivered Fuel Section. Enter the fuel type, a description of the adder, the fuel adders and the fuel contract price. Click Submit when you have entered all lines in the block or you will lose the data when you advance to the next page. To advance to the next page click on the following page number or Next. You may also upload via XML.

After you have submitted the Monthly Delivered Fuel, then adjust the start date to the three years in the past such as 1/1/2009 and the end date to the end of the three year period such as 12/31/11 and click change date. This will create the rows in Delivered Fuel to input the historic fuel that you will then populate with data.

Next, drop down to the Delivered Fuel for <UNIT NAME> section enter the daily historic fuel type, price type (spot or contract) and delivered fuel price in $/mbtu to the unit . Click Submit after each page or you will lose your data. Click Next or the page number to advance to the next page. You may also use the Download XML button instead of entering each of the month's values by hand.

Opportunity Costs	Unit Parameters	Delivered Fuel	Unit Outages	Forecasted Allowance

Delivered Fuel

Portfolio: 1 - ALL UNITS   Unit: Start Date: (mm/dd/yyyy) 01/01/2012   End Date: (mm/dd/yyyy) 11/04/2012   Change Date

Pages: *1 2* **Next**   Records: 1 - 10 of 11 matches.

Monthly Delivered Fuel for

Submit   Download XML

Month	Fuel Type	Desc Of Adder	Fuel Delivery Adders	Fuel Contract Price
01/01/2012	Columbia_Gas_App	Jan	2	76.80
02/01/2012	Columbia_Gas_App	Feb	3	85.96
03/01/2012	Columbia_Gas_App	Mar	2	74.00
04/01/2012	Columbia_Gas_App	Apr	1	68.00
05/01/2012	Columbia_Gas_App	May	1	56.90
06/01/2012	Columbia_Gas_App	Jun	1	69.00
07/01/2012	Columbia_Gas_App	Jul	1	75.00
08/01/2012	Columbia_Gas_App	Aug	1	89.00
09/01/2012	Columbia_Gas_App	Sep	1	83.00
10/01/2012	Columbia_Gas_App	Oct	1	71.00

Pages: *1 2 3 4 5 6 7 8 9 10 ...* **Next**   Records: 1 - 10 of 309 matches.
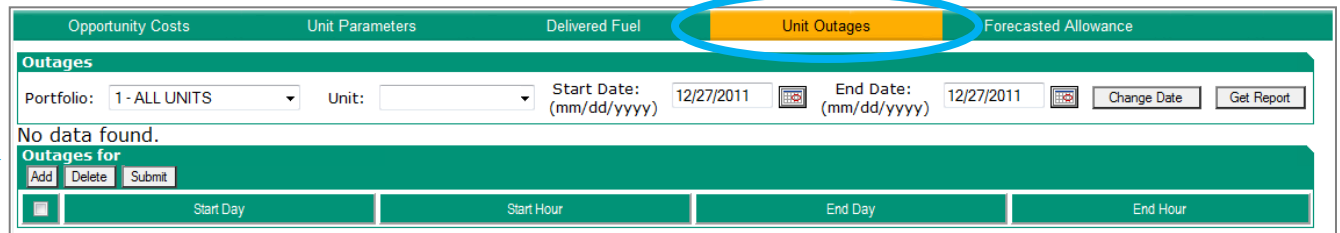
Delivered Fuel for

Submit   Download XML   **You do not need to click submit if you use the Download XML button.**

Day	Fuel Type	Price Type	Delivered Fuel Price ($/MMBTU)
01/01/2012	(null)	(null)	(null)
01/02/2012	(null)	(null)	(null)
01/03/2012	(null)	(null)	(null)
01/04/2012	(null)	(null)	(null)
01/05/2012	(null)	(null)	(null)

Step 5: Unit Outages Tab

Next, input future unit outages by selecting the Unit Outages tab. Enter the start date, start hour, end date and end hour for the time period.

First enter the start date of the period to be evaluated, enter the end date, and then click change date to submit.

Drop down to the Outages section and click the Add button. Enter the start date, start hour, end date and end hour of the outage. If you have additional outages click the Add button again filling in the fields. When you have completed outages for the unit click the check box next to each outage and click the submit button. The outage data will turn green indicating they have been submitted properly.

If you make a mistake after an outage is submitted, click the check box then click deleted to remove the outage.

Step 6: Forecasted Allowance Tab

For rolling compliance time periods, this tab indicates the remaining hours for the time period under rolling evaluation. This tab only needs to be filled out if you are evaluating opportunity costs under a rolling compliance time period.

Button turns green if submitted correctly.

Begin by changing the effective date to the start of the compliance period for evaluation and the termination date to the end of the compliance period. Click Change Date to make the change.
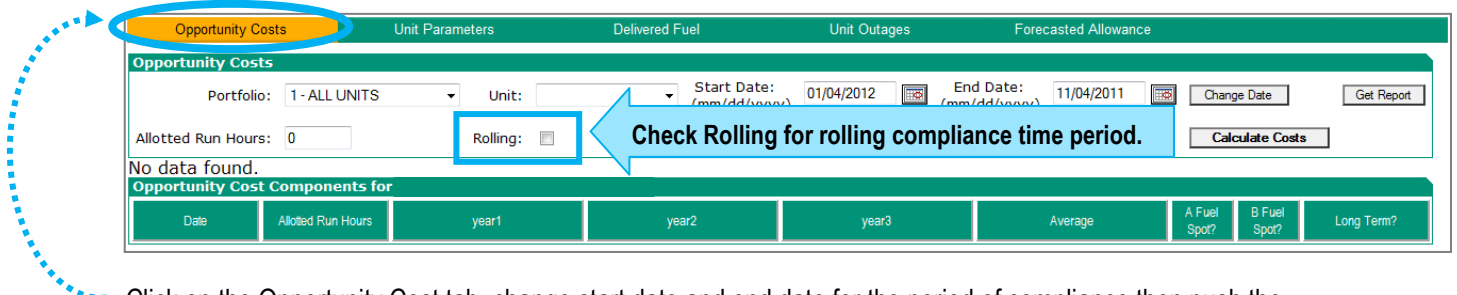
Then drop down to the Unit Forecasted Allowance. Click Add then enter the effective day, termination day and the remaining forecasted allowance. As you enter the values the field should be red. Click Submit. If it is successfully submitted it will turn green.

If you make a mistake after an allowance has been submitted, click the check box next to it. Then click Deleted to remove the entry. Forecasted Allowance Periods cannot overlap.

Step 7: Opportunity Cost Tab or Bringing it All Together

Now you are ready to compute opportunity cost. For each of the three previous years, the calculator will find the opportunity cost for that year by taking the average total margin of the lowest value block added before the run hour limit was reached. The three opportunity costs will then be averaged to get the opportunity cost adder available to the generator. If the opportunity cost adder is less than 0, the opportunity cost adder will be set to 0.

Click on the Opportunity Cost tab, change start date and end date for the period of compliance then push the Change Date button.

If you are using a rolling compliance time period click the check box next to Rolling and make sure that the Forecasted Allowance is indicated on the Forecasted Allowance tab as described in Step 5.

If you are using the standard (no rolling) compliance period, enter the number of run hours left within the compliance period in the Allotted Run Hours field. This number should not be greater than 8760 in a normal year or 8784 in a leap year.

Once you are ready to compute, hit calculate costs and wait for it to populate. Opportunity Cost Calculator displays the three numbers that correspond to the minimum run hour, the three base year margin hours are averaged together to get the maximum opportunity cost available to the generator.

Step 8: Enter Opportunity Cost Result into your Offer

The calculated Opportunity Cost is a maximum. The Opportunity Cost Component will not be added to your Cost Offer by PJM. You must enter your opportunity cost component in your segmented energy offer in eMKT.

Enter Opportunity Cost Component here

From navigation bar at the top of the page Choose Schedules > Schedule Detail. From the drop down box next to "Schedule" choose cost. Enter the data in the row called "Opportunity Cost Component" under the column called "Value".

Then you must add the Opportunity Cost Component to you cost offer for each price/mw increment.

From navigation bar at the top of the page Choose Schedules > Schedule Offers. Enter the Portfolio and Unit for which you calculated the Opportunity Cost. Enter the date and the select "COSTBASE". Under the Price section on the right hand side of the screen add the Opportunity Cost to each price increment. The number will turn green and display your entry when you have successfully entered it.

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[i] Page 1482-1483 Open Access Transmission Tariff (OATT)