

2016 Fall Release Training - Bid Cost Recovery Modification and Variable Energy Resources Settlement

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Settlement Analysts



Acronyms

- BCR Bid Cost Recovery
- CMRI Customer Market Results Interface
- DA Day-ahead
- DASE Day-ahead Scheduled Energy
- DMLE Day-ahead Minimum Load Energy
- EIR Eligible Intermittent Resources
- FCS Forecast
- HE Hour Ending
- LMP Locational Marginal Price
- MEAF Metered Energy Adjustment Factor
- NGR Non-generator resources
- PDM Persistent Deviation Metric
- RIE Residual Imbalance Energy
- TEE Total Expected Energy
- VER Variable Energy Resource



What are you going to learn?

- Changes to the settlement of residual imbalance energy (RIE) for Variable Energy Resources (VER)
- Changes to application of persistent deviation metric for RIE
- Changes to the calculation of day-ahead metered energy adjustment factor (DA MEAF)



Objectives

- Given the settlements changes that will be included in the 2016 Fall Release:
 - Recognize the updated residual imbalance energy settlement for VER's
 - Perform the step-by-step calculation of the updated day-ahead meter adjustment factor (MEAF)
 - Perform the updated day-ahead MEAF for pumped storage



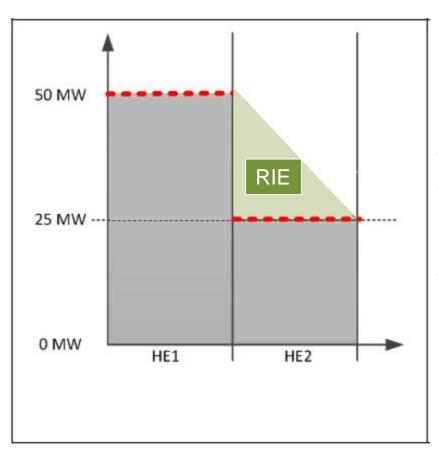


Residual Imbalance Energy Changes



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RIE is the "left over" energy after forecast or dispatch changes



This example is after the end of a trading hour. RIE can also occur leading up to a trading hour.



Why the change?

Problem **1998**

Current residual imbalance energy (RIE) provisions do not appropriately treat situations in which a variable energy resource (VER) is ramping due to a change in its forecasted energy output versus situations in which a VER is dispatched based on its bid.

<u>Solution</u>

VER settlement will distinguish between

- the RIE above the forecast and;
- the RIE within the forecast



Comparison example with no LMP change

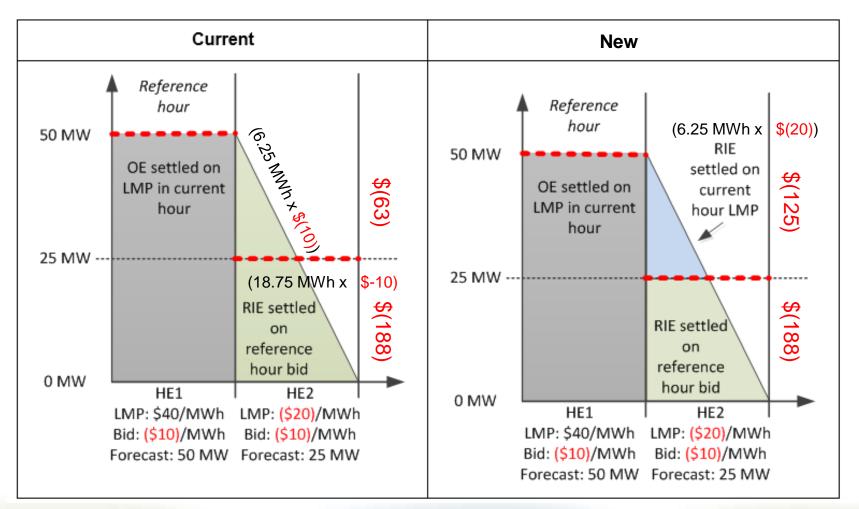
Current New Reference Reference hour hour (72.5 MM/1 + \$170) (72,5 MM/5+ 50 MW 50 MW \$(125) \$500 OE settled on OE settled on RIE LMP in current LMP in current settled hour hour on LMP in current hour bid hour 25 MW -25 MW ---\$1,000 \$1,000 OE settled on OE settled on LMP in current LMP in current hour hour (25 MWh x 40) 0 MW 0 MW HE1 HE2 HE1 HE2 LMP: \$40/MWh LMP: \$40/MWh LMP: \$40/MWh LMP: \$40/MWh Bid: (\$10)/MWh Bid: (\$10)/MWh Bid: (\$10)/MWh Bid: (\$10)/MWh Forecast: 50 MW Forecast: 25 MW Forecast: 50 MW Forecast: 25 MW

Forecast decrease – No LMP change



Comparison example with LMP change

Forecast decrease – LMP less than bid



New expected energy type "FCS"

- FCS = Forecast
- Represents capacity above the forecast

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Day-Ahead	Real-Time	Post-Market Defa	uit Bids Convergence B	idding Load Forecast	Reference Lt	E Energy	imbalance Market			
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Persistent Deviation Metric



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What is the persistent deviation metric?

- When a resource is consistently not following ISO dispatch then it is considered to be "persistently deviating"
- This metric eliminates incentive to inflate bid cost recovery payments through this adverse strategic market behavior



Why the change?

Problem

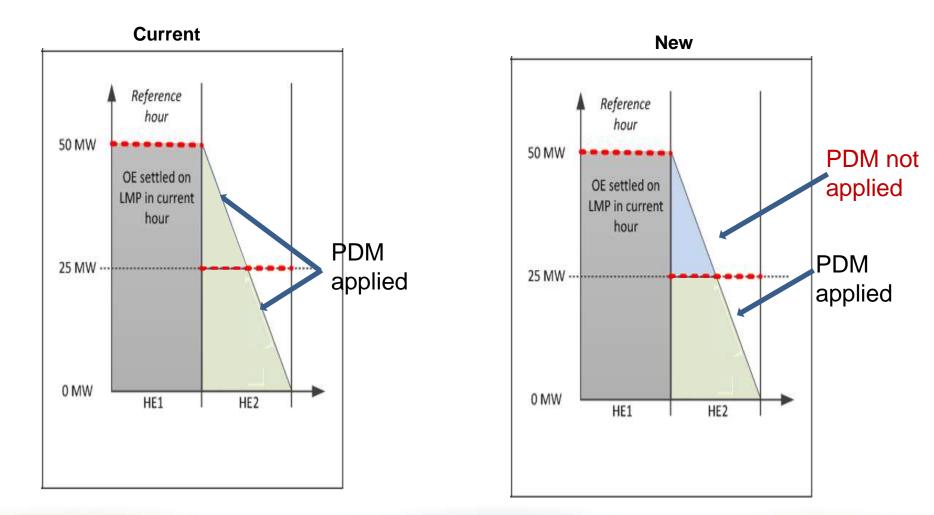
Currently the persistent deviation metric (PDM) is applied to all resources eligible for bid cost recovery, regardless of the reason for their deviation. VERs may be deviating because of the forecast, which is out of their control.

Solution

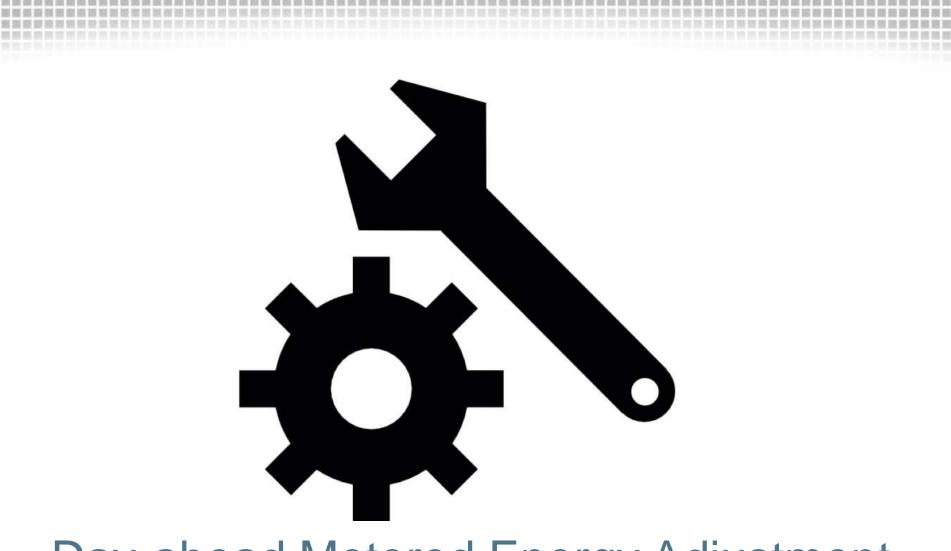
PDM will not be applied to energy amounts above a VERs forecast.



The persistent deviation metric will only apply to the RIE that is not due to the forecast.







Day-ahead Metered Energy Adjustment Factor



What is the metered energy adjustment factor (MEAF)?

- In bid cost recovery, the MEAF is used to align dayahead bid cost recovery (DA BCR) payments with energy produced by a resource.
- Scales a resource's BCR to the extent the resource operates below its DA schedule.





• The current DA MEAF needs to be updated to resolve some flaws that caused inappropriate results

Effective Day-Ahead Scheduled Energy (Effective DASE)

The minimum of the Expected Energy and the Day-Ahead Scheduled Energy



MEAF modifications for generating units and resource specific system resources

Step	Condition and action
Step 1	If (Effective DASE >= DA Min Load Energy) and Effective DASE >0 Then Step 2 Otherwise proceed to step 6
Step 2	If ((Metered Energy - Regulation Energy < DA Minimum Load Energy – Tolerance Band) or (Metered Energy – Regulation Energy <=0)) Then DA MEAF = 0 Otherwise proceed to step three

* Does not apply to non-generation resources (NGR)



MEAF modifications for generating units and resource specific system resources

Step	Conditions and Actions
Step 3	If (ABS(Metered Energy – Regulation Energy – Effective DASE) <= Performance Metric Tolerance Band) Then DA MEAF = 1 Otherwise proceed to Step 4
Step 4	If (ABS(Effective DASE – DA Minimum Load Energy)) <=0 Then DA MEAF = 1 Otherwise proceed to Step 5
Step 5	DA MEAF = $Min \left[1, Max \left(0, \frac{Metered Energy - DA Minimum Load Energy - Regulation Energy}{Effective DASE - DA Minimum Load Energy} \right) \right]$



MEAF modifications for generating units and resource specific system resources

Step	Conditions and Actions
Step 6	If (Effective DASE < DA Minimum Load Energy) and (Effective DASE >0) Then DA MEAF = 1 Otherwise proceed to Step 7
Step 7	If Effective DASE > 0 and Expected Energy <= 0 and Metered Energy <= 0 Then DA MEAF = 1 Otherwise the DA MEAF = 0



Step 1: If (Effective DASE >= DA Min Load Energy) and Effective DASE >0 Remember ... Effective DASE is the minimum of the TEE and the DASE

Then **Step 2...** Otherwise proceed to step 6

CMRI results	HE20
Energy	46.90 MWh
DASE	46.90 MWh
DMLE	19.92 MWh
TEE	26.88 MWh



Step 2:

If ((Metered Energy – Regulation Energy < DA Minimum Load Energy – Tolerance Band) or (Metered Energy – Regulation Energy <=0))

Then DA MEAF = 0.... Otherwise proceed to step 3

CMRI results	HE 20	METER	HE20
Reg up	26.90 MWh	Int 1 -12	46.90 MWh
Effective DASE	26.88 MWh		
DMLE	19.92 MWh	Resource	HE 20
Tolerance Band	> of 3% of Pmax or 5MW	Characteristics	
	/#intervals	Pmin 20	Pmax 100

Step 3: If (ABS(Metered Energy – Regulation Energy – Effective DASE) <= Performance Metric Tolerance Band)

Then > DA MEAF = 1...Otherwise proceed to Step 4

CMRI results	HE 20	METER	HE20
Energy	46.90 MWh	Int 1 -12	46.90
Reg up	26.90 MWh	Resource	HE 20
DASE	46.90 MWh	Characteristics	
DMLE	19.92 MWh	Pmin 20	Pmax 100
TEE	26.88 MWh		
Tolerance Band	> of 3% of Pmax or 5MW /12 intervals	Greater of (3% x100 = 3 MW) or 5 MV divided by 12 intervals = .41666	

(ABS(46.90 MWh - 26.90 MWh - 26.88 MWh) <= .42 MWh)



Step 4

Step 4: If (Effective DASE – DA Minimum Load Energy) <=0</p> Then DA MEAF = 1 ... Otherwise proceed to Step 5

CMRI results	HE 20	METER	HE20
Energy	46.90 MWh	Int 1 -12	46.90
Reg up	26.90 MWh	Resource	HE 20
DASE	46.90 MWh	Characteristics	
DMLE	19.92 MWh	Pmin 20	Pmax 100
TEE	26.88 MWh		
Tolerance Band	> of 3% of Pmax or 5MW /#intervals		

(26.88 MWh – 19.92 MWh) <=0



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Step 5

Step 5: DA MEAF = $Min \left[1, Max \left(0, Metered Energy - DA Minimum Load Energy - Regulation Energy \right) \right]$ Effective DASE - DA Minimum Load Energy

CMRI results	HE 20
Energy	46.90 MWh
Reg up	26.90 MWh
DASE	46.90 MWh
DMLE	19.92 MWh
TEE	26.88 MWh
Tolerance Band	> of 3% of Pmax or 5MW /#intervals

METER	HE20
Int 1 -12	46.90
Resource Characteristics	HE 20
Pmin 20	Pmax 100

$$Min\left[1, Max\left(0, \frac{46.90 \text{ MWh} - 19.92 \text{ MWh} - 26.90 \text{ MWh}}{26.88 \text{ MWh} - 19.92 \text{ MWh}}\right)\right] = .0114$$



Step 6: If (Effective DASE < DA Minimum Load Energy) and (Effective DASE >0)

Then

DA MEAF = 1 ... Otherwise proceed to Step 7

CMRI results	HE 20	METER	HE20
Energy	46.90 MWh	Int 1 -12	46.90
Reg up	26.90 MWh	Resource	HE 20
DASE	46.90 MWh	Characteristics	
DMLE	50 MWh	Pmin 20	Pmax 100
TEE	26.88 MWh		
Tolerance Band	> of 3% of Pmax or 5MW /#intervals		

(26.88 MWh < 50.00 MWh) and (26.88 MWh >0)



Step 7

Step 7:

If Effective DASE is positive and Expected Energy <= 0

Then

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DA MEAF = 1 ... Otherwise the DA MEAF = 0
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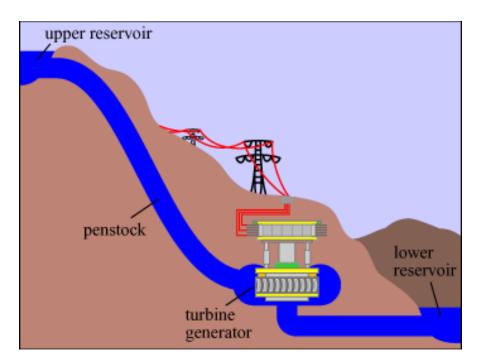
CMRI results	HE 20	METER	HE20
Energy	46.90 MWh	Int 1 -12	46.90
Reg up	26.90 MWh		
DASE	46.90 MWh	Resource Characteristics	HE 20
DMLE	50 MWh	Pmin 20	Pmax 100
TEE	26.88 MWh		
Tolerance Band	> of 3% of Pmax or 5MW /#intervals		





New rules for application of MEAF to pumped storage bid cost recovery

In the day-ahead market these resources may, under certain circumstances, have negative day – ahead energy and still be eligible for BCR.





MEAF modifications for pumping energy

The system shall formulate the MEAF for Pump Storage resources in 2 steps

Step	Conditions and Actions
Step 1	If DA Pumping Energy is negative, and Expected Energy is negative Then DA MEAF = $Min\left[1, Max\left(0, \frac{Metered Energy}{Expected Energy}\right)\right]$



MEAF modifications for pump energy

Step Conditions and Actions

Step 2 If DA Pumping Energy is negative, and Expected Energy is >= 0 and Metered Energy >= 0 Then MEAF = 1

Otherwise, its Day-ahead MEAF = 0



Summary

- RIE settlement for VER's changes:
 - a) RIE portion above the forecast will settle using the current hour LMP
 - b) RIE portion within the forecast will settle using the reference hour bid
- For VERs, PDM is not applied to the portion above the forecast
- New MEAF calculations for supply resources and resource specific system resources
- MEAF does not apply to non-generator resources (NGR)
- New two-step process for pumped storage MEAF calculation



For more information on the following topics

- Tariff filing and FERC Order
- Business Requirements Specifications
- Policy Development

Go to: <u>caiso.com>Stay Informed>Stakeholder</u> <u>Processes>Bid cost recovery and variable energy resource</u> <u>settlements</u>





