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

Cynthia Hinman

External Training Team

Target audience

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?

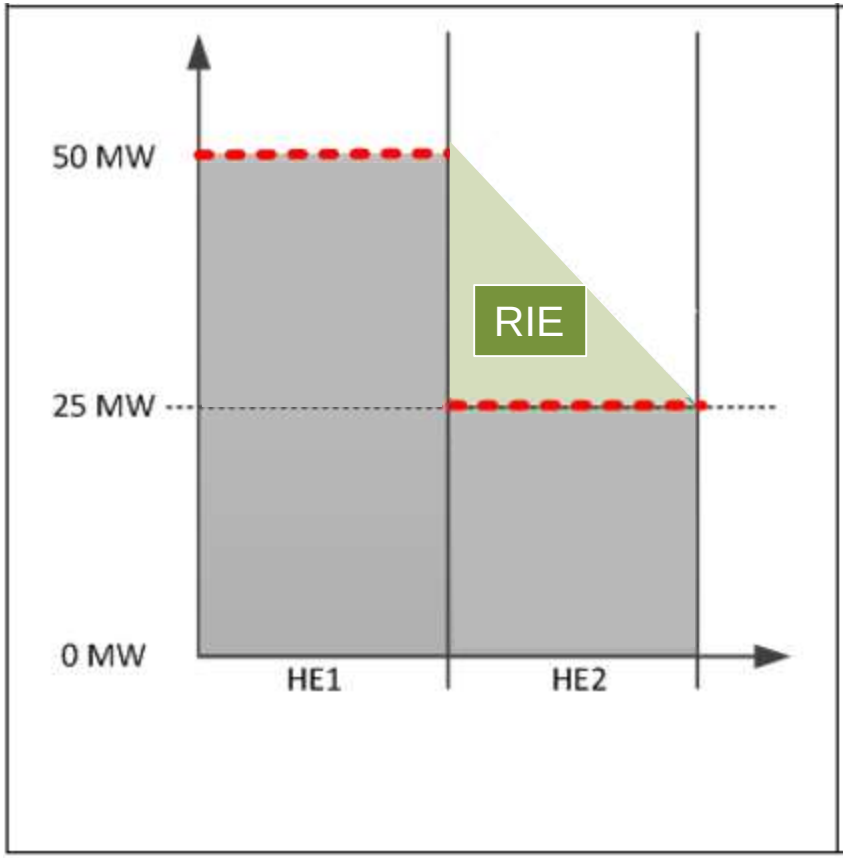
- Changes to the settlement of residual imbalance energy (RIE) for Variable Energy Resources (VER)
- Changes to application of persistent deviation metric for RIE
- Changes to the calculation of day-ahead metered energy adjustment factor (DA MEAF)

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

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

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.

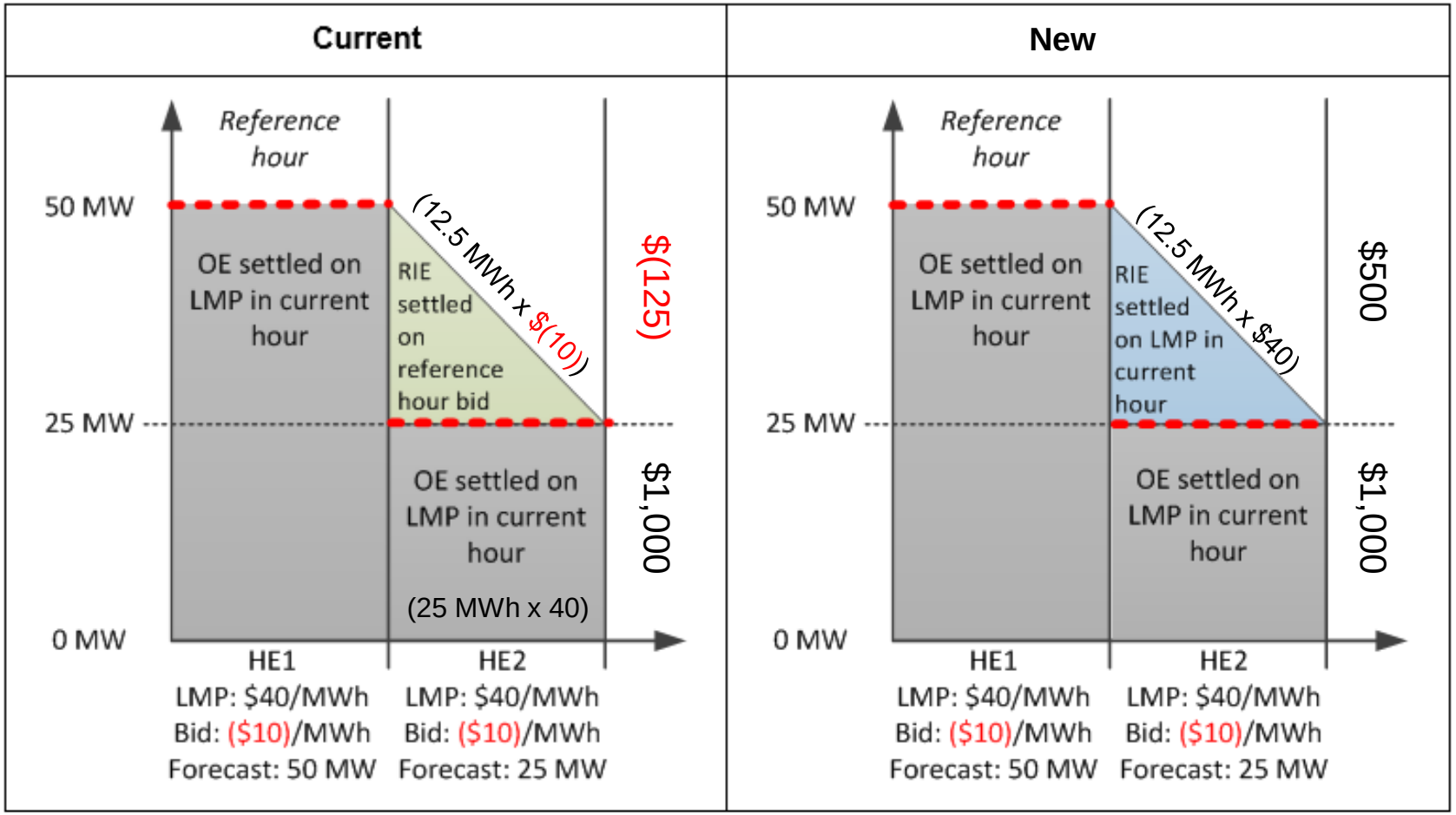
Solution

VER settlement will distinguish between

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

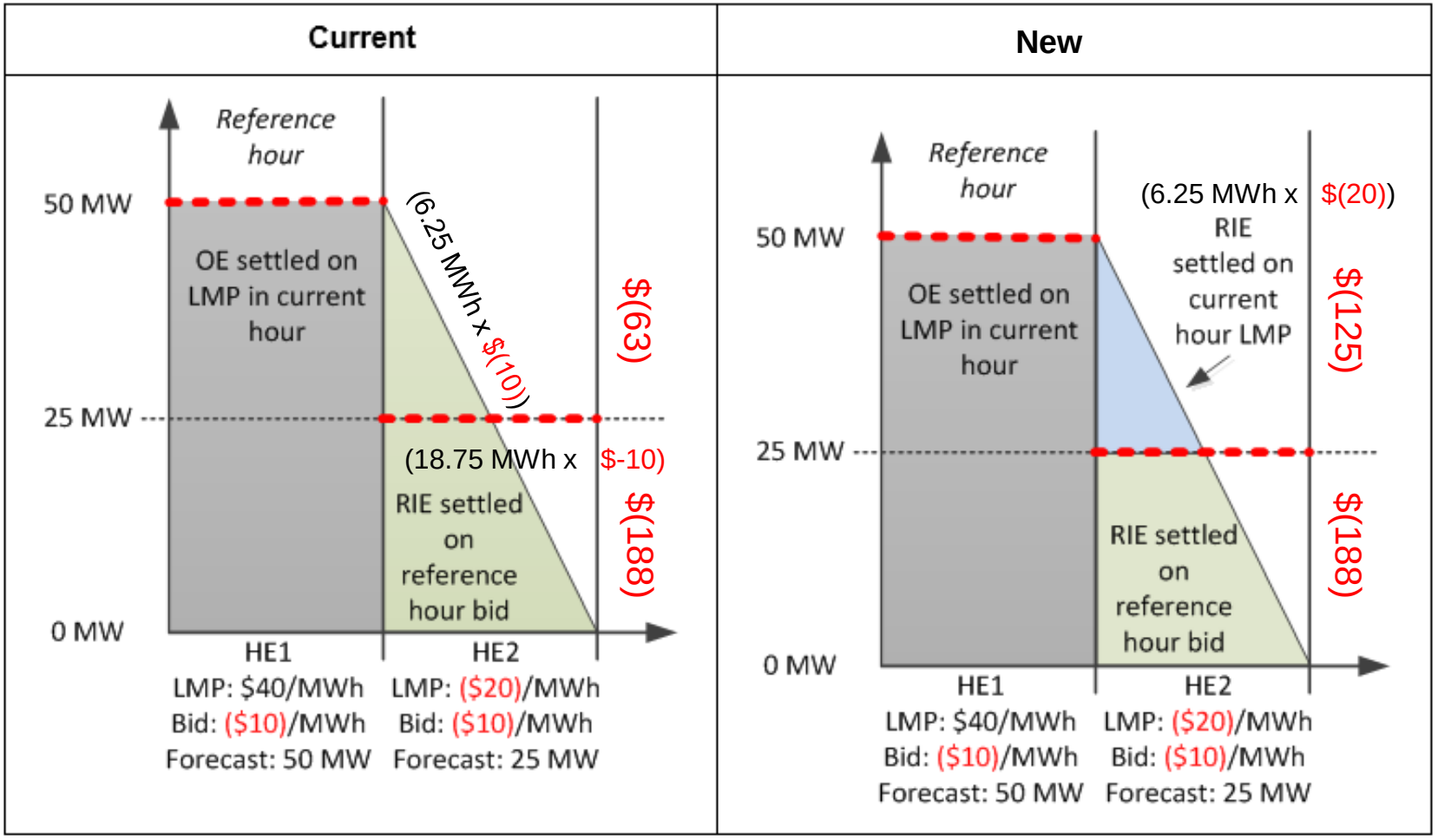
Comparison example with no LMP change

Forecast decrease – No LMP change



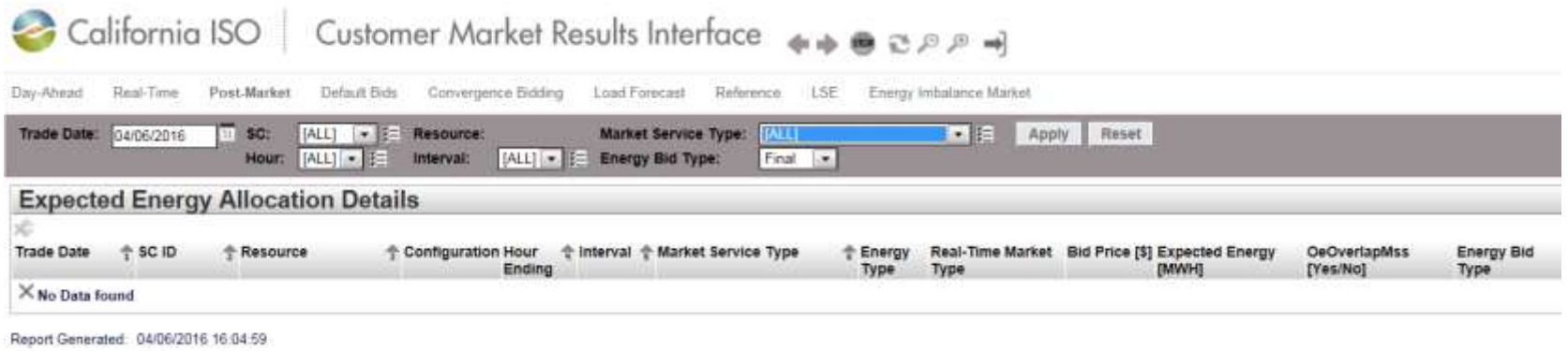
Comparison example with LMP change

Forecast decrease – LMP less than bid



New expected energy type “FCS”

- FCS = Forecast
- Represents capacity above the forecast



Persistent Deviation Metric

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

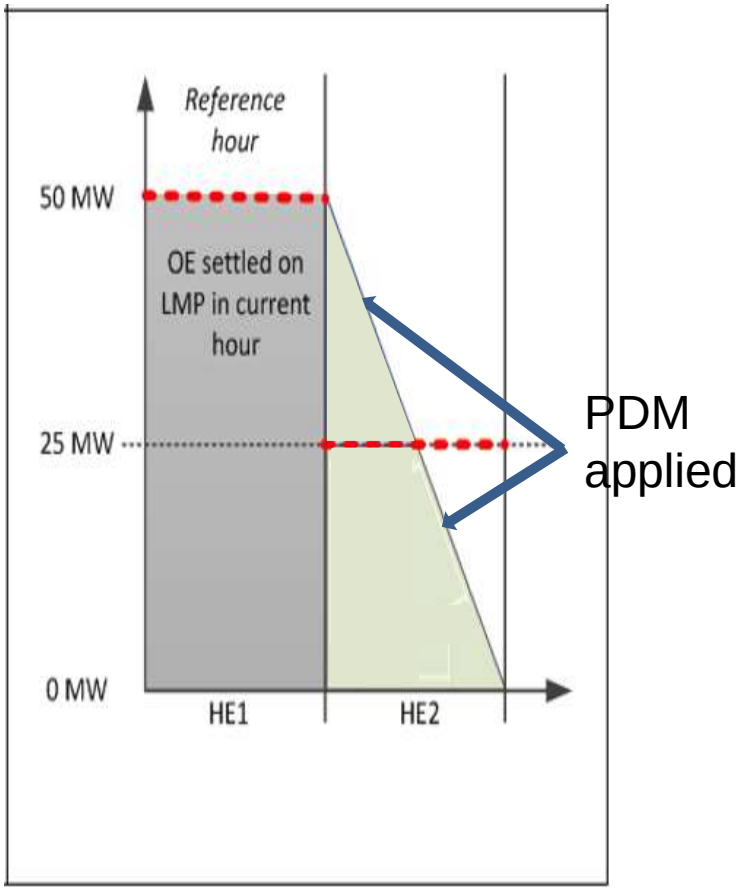
Currently the persistent deviation metric (PDM) is applied to all resources eligible for bid cost recovery, regardless of the reason for their deviation. VERs may be deviating because of the forecast, which is out of their control.

Solution

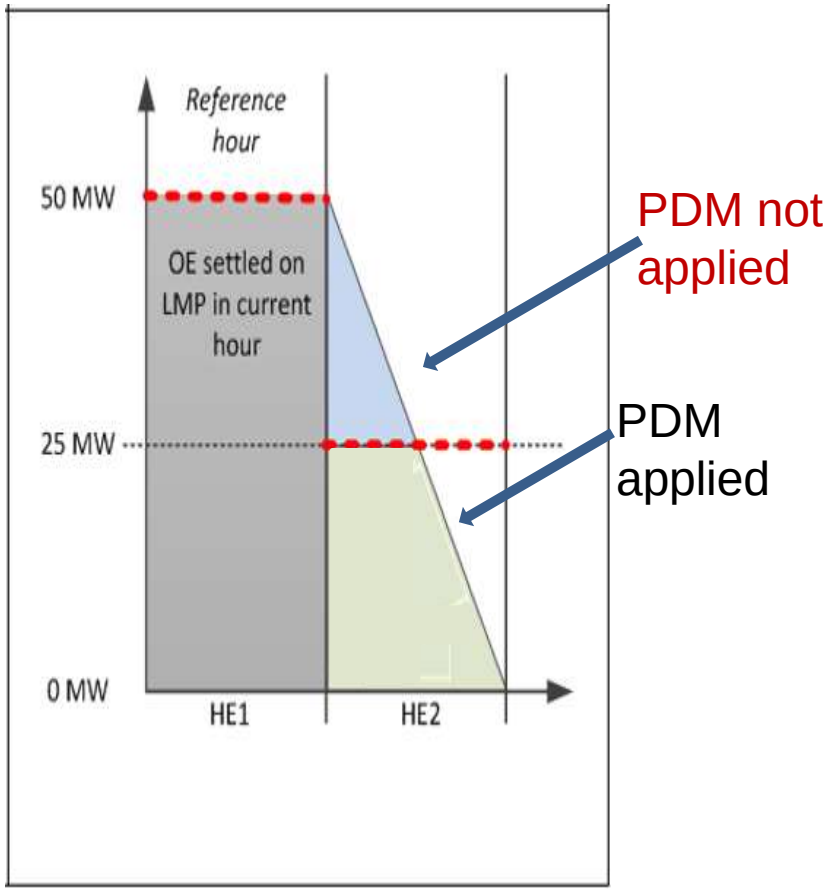
PDM will not be applied to energy amounts above a VERs forecast.

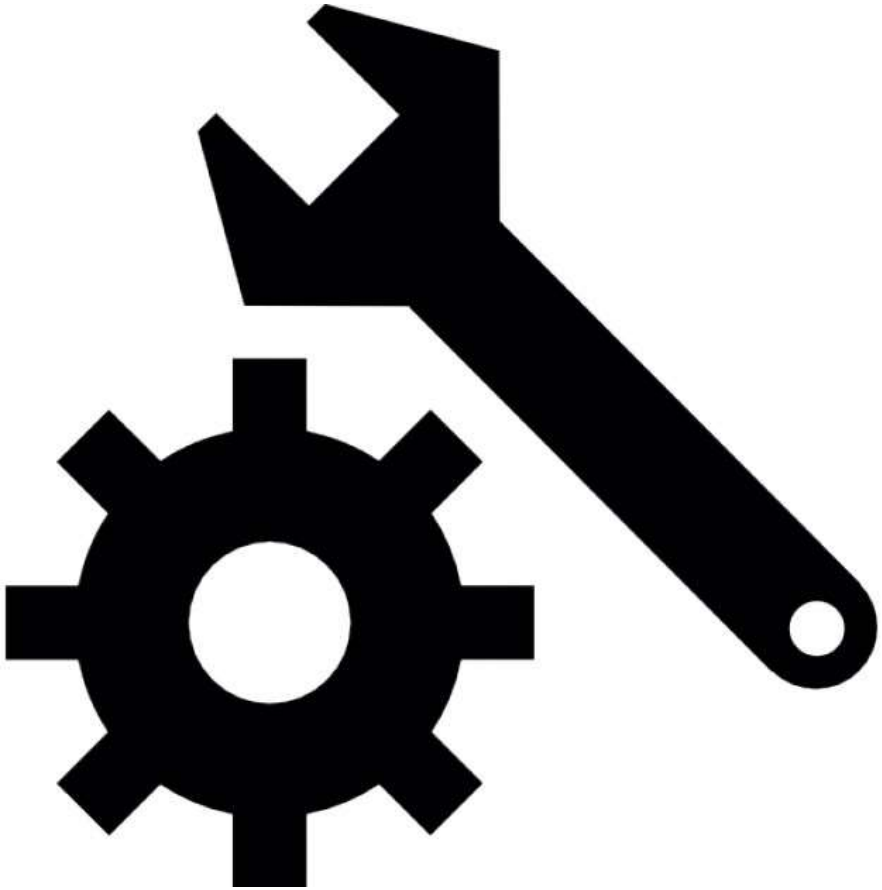
The persistent deviation metric will only apply to the RIE that is not due to the forecast.

Current



New





Day-ahead Metered Energy Adjustment Factor

What is the metered energy adjustment factor (MEAF)?

- In bid cost recovery, the MEAF is used to align day-ahead 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.

Why the change?

- 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 = $Min\left[1, Max\left(0, \frac{\text{Metered Energy – DA Minimum Load Energy – Regulation Energy}}{\text{Effective DASE – DA Minimum Load Energy}}\right)\right]$

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*

MEAF calculation step 1

Remember … Effective DASE is the minimum of the TEE and the DASE

Step 1:

If (Effective DASE >= DA Min Load Energy)

and Effective DASE >0

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

(26.88 MWh **>=** 19.92 MWh) and 26.88 MWh **>** 0

Step 2

MEAF calculation step 2

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
Reg up	26.90 MWh
Effective DASE	26.88 MWh
DMLE	19.92 MWh
Tolerance Band	> of 3% of Pmax or 5MW /#intervals

METER	HE20
Int 1 -12	46.90 MWh

Resource Characteristics	HE 20
Pmin 20	Pmax 100

((46.90 **MWh** – 26.90 **MWh** **<** 19.92 **MWh** -.42 **MWh**) or (46.90 **MWh** – 26.90 **MWh** **<=**0))

Step 3

MEAF calculation step 3

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
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 /12 intervals

METER	HE20
Int 1 -12	46.90

Resource Characteristics	HE 20
Pmin 20	Pmax 100

Greater of (3% x100 = 3 MW) or 5 MW divided by 12 intervals = .41666

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

Step 4

MEAF calculation step 4

Step 4:

If (Effective DASE – DA Minimum Load Energy) <=0

Then ⟹ DA MEAF = 1 …*Otherwise proceed to Step 5*

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

(26.88 MWh – 19.92 MWh) <=0

Step 5

MEAF calculation step 5

Step 5:

DA MEAF =

$$Min\left[1, Max\left(0, \frac{\text{Metered Energy – DA Minimum Load Energy – Regulation Energy}}{\text{Effective DASE – DA Minimum Load Energy}}\right)\right]$$

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

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

MEAF calculation step 6

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
Energy	46.90 MWh
Reg up	26.90 MWh
DASE	46.90 MWh
DMLE	**50 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

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

Step 7

MEAF calculation step 7

Step 7:

If Effective DASE is positive and Expected Energy <= 0

Then

DA MEAF = 1 … *Otherwise the DA MEAF = 0*

CMRI results	HE 20
Energy	46.90 MWh
Reg up	26.90 MWh
DASE	46.90 MWh
DMLE	**50 MWh**
TEE	26.88 MWh
Tolerance Band	> of 3% of Pmax or 5MW /#intervals

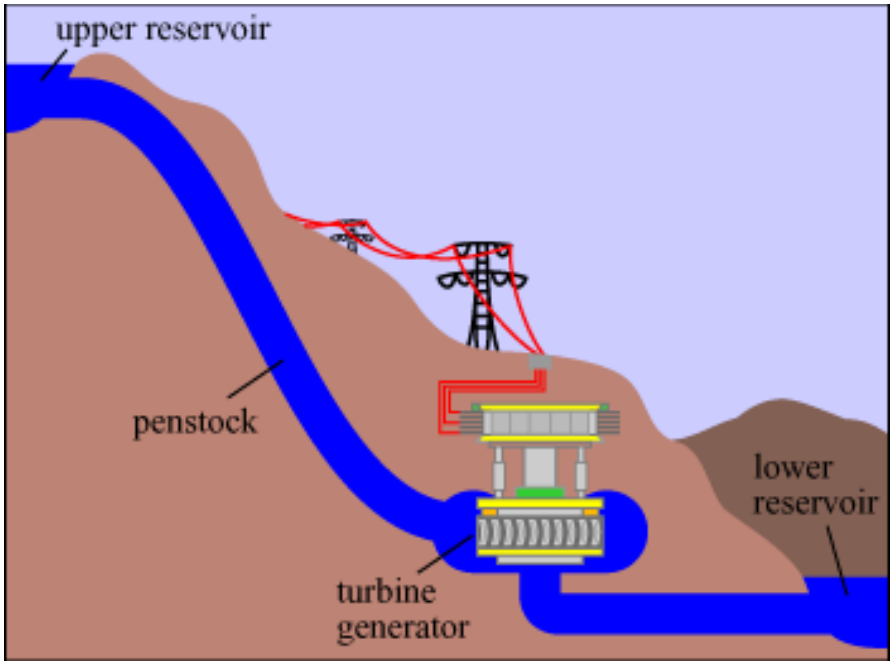
METER	HE20
Int 1 -12	46.90

Resource Characteristics	HE 20
Pmin 20	Pmax 100

Done!

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 = $\text{Min}\left[1, \text{Max}\left(0, \frac{\text{Metered Energy}}{\text{Expected Energy}}\right)\right]$

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: caiso.com>Stay Informed>Stakeholder Processes>Bid cost recovery and variable energy resource settlements

Thank You