Storage Bid Cost Recovery and Default Energy Bid Enhancements

Addendum to the Draft Final Proposal for Track 1

October 15, 2024

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1. Addendum on Modified Bid Cost Recovery Formulas

As illustrated in the Draft Final Proposal (DFP), the issues related to storage bid cost recovery (BCR) are complex and merit significant analysis and review. It is clear that the extension of the existing BCR construct to storage resources has resulted in complications and unintended outcomes that merit a holistic revision of the uplift mechanism applicable to this resources. This being said, it is also evident from the material discussed herein that the current design gap that could allow for strategic bidding behavior to unduly inflate BCR payments for storage assets must be closed in the near-term as it exposes market participants and ratepayers to adverse financial outcomes.

In this context, the ISO proposed to move forward with a near-term, interim solution focused on modifying the real-time energy bid cost calculation in the real-time BCR settlement for storage resources between the fifteen-minute market (FMM) and the day-ahead schedule as well as between the real-time dispatch (RTD) and the fifteen-minute schedule. This would be done by applying the formula CESA proposed for buy-backs for all intervals in which the difference in dispatch is less or equal to zero between the fifteen minute market and the day-ahead schedule as well as between the RTD and the fifteen-minute schedule. Conversely, the formula CESA proposed for sell-backs would be applied for all intervals in which the difference in dispatch is greater than zero between the fifteen minute market and the day-ahead schedule as well as between the RTD and the fifteen-minute schedule.

Since the publication of the DFP, the ISO held a stakeholder meeting on October 9th and went through the DFP and a series of examples contained therein. In response to the DFP and the aforementioned examples, several stakeholders requested added clarity on the formulas used to calculate Real-Time Energy Bid Costs across the different approaches included therein. This addendum seeks to offer such clarifications.

Status Quo

For the status quo examples, the BCR surpluses and shortfalls were calculated using the following formula:

- (FMM Dispatch – DA Schedule) * (FMM Bid – FMM LMP)
- (RTD Dispatch – FMM Schedule) * (RTD Bid – RTD LMP)

BCR using DA LMP

For the approach that uses the DA LMP instead of the RT bid to calculate the Real-Time Energy Bid Cost, the ISO used the following formulas across all intervals:

- (FMM Dispatch – DA Schedule) * (**DA LMP** – FMM LMP)
- (RTD Dispatch – FMM Schedule) * (**DA LMP** – RTD LMP)

For the version of this approach where the modified calculation is only utilized in the intervals that meet the trigger conditions established by the California Energy Storage Alliance (CESA), the ISO used the following formulas:

- To identify the intervals where the modified calculation should be applicable for:
    - For a buy-back:
      If(AND(DA Schedule > 0, DA Schedule > FMM Dispatch, FMM Dispatch >= 0))
    - For a sell-back:
      If(AND(DA Schedule < 0, DA Schedule < FMM Dispatch, FMM Dispatch <= 0))
- Modified formula applicable for said intervals (either buy- or sell-back):
    - (FMM Dispatch – DA Schedule) * (**DA LMP** – FMM LMP)
    - (RTD Dispatch – FMM Schedule) * (**DA LMP** – RTD LMP)
- Formula applied for the remainder of the intervals (*i.e.,* those that do not meet the trigger conditions):
    - (FMM Dispatch – DA Schedule) * (FMM Bid – FMM LMP)
    - (RTD Dispatch – FMM Schedule) * (RTD Bid – RTD LMP)

BCR using RT DEB

For the approach that uses the RT DEB instead of the RT bid to calculate the Real-Time Energy Bid Cost, the ISO used the following formula across all intervals:

- (FMM Dispatch – DA Schedule) * (**RT DEB** – FMM LMP)
- (RTD Dispatch – FMM Schedule) * (**RT DEB**– RTD LMP)

For the version of this approach where the modified calculation is only utilized in the intervals that meet the trigger conditions established by CESA. The ISO used the following formulas:

- To identify the intervals where the modified calculation should be applicable for:
    - For a buy-back:
      If(AND(DA Schedule > 0, DA Schedule > FMM Dispatch, FMM Dispatch >= 0))
    - For a sell-back:
      If(AND(DA Schedule < 0, DA Schedule < FMM Dispatch, FMM Dispatch <= 0))
- Modified formula applicable for said intervals (either buy- or sell-back):
    - (FMM Dispatch – DA Schedule) * (**RT DEB** – FMM LMP)
    - (RTD Dispatch – FMM Schedule) * (**RT DEB** – RTD LMP)
- Formula applied for the remainder of the intervals (*i.e.,* those that do not meet the trigger conditions):
    - (FMM Dispatch – DA Schedule) * (FMM Bid – FMM LMP)
    - (RTD Dispatch – FMM Schedule) * (RTD Bid – RTD LMP)

BCR using the First Min/Max Methodology

For the approach that uses the first version of the Min/Max formulas proposed by CESA, the ISO used the following formulas across all intervals:

- FMM Bid Costs:
  - If(Differential FMM Dispatch > 0, (FMM Dispatch – DA schedule) * (**[Min(DA LMP, RT DEB, FMM Bid)]** – FMM LMP), 0)
  - If(Differential FMM Dispatch <= 0, (FMM Dispatch – DA schedule) * (**[Max(DA LMP, RT DEB, FMM Bid)]** – FMM LMP), 0)
- RTD Bid Costs:
  - If(Differential RTD Dispatch > 0, (RTD Dispatch – FMM schedule) * (**[Min(DA LMP, RT DEB, RTD Bid)]** – RTD LMP), 0)
  - If(Differential RTD Dispatch <= 0, (RTD Dispatch – FMM schedule) * (**[Max(DA LMP, RT DEB, RTD Bid)]** – RTD LMP), 0)

For the version of this approach where the modified calculation is only utilized in the intervals that meet the trigger conditions established by CESA, the ISO used the following formulas:

- To identify the intervals where the modified calculation should be applicable for:
  - For a buy-back:
    If(AND(DA Schedule > 0, DA Schedule > FMM Dispatch, FMM Dispatch >= 0))
  - For a sell-back:
    If(AND(DA Schedule < 0, DA Schedule < FMM Dispatch, FMM Dispatch <= 0))
- Modified formula applicable for said intervals:
  - For intervals flagged as buy-back intervals based on the triggers above:
    (FMM Dispatch – DA schedule) * (**[Max(DA LMP, RT DEB, FMM Bid)]** – FMM LMP)
    (RTD Dispatch – FMM schedule) * (**[Max(DA LMP, RT DEB, RTD Bid)]** – RTD LMP)
  - For intervals flagged as sell-back intervals based on the triggers above:
    (FMM Dispatch – DA schedule) * (**[Min(DA LMP, RT DEB, FMM Bid)]** – FMM LMP)
    (RTD Dispatch – FMM schedule) * (**[Min(DA LMP, RT DEB, RTD Bid)]** – RTD LMP)
- Formula applied for the remainder of the intervals (*i.e.,* those that do not meet the trigger conditions):
  - (FMM Dispatch – DA Schedule) * (FMM Bid – FMM LMP)
  - (RTD Dispatch – FMM Schedule) * (RTD Bid – RTD LMP)

BCR using the Latest Min/Max Methodology [1]

For the approach that uses the latest version of the Min/Max formulas proposed by CESA and supported by other stakeholders across all intervals (the Draft Final Proposal), the ISO used the following formulas across all intervals:

- FMM Bid Costs:
  - If(Differential FMM Dispatch > 0, (FMM Dispatch – DA schedule) * (**[Min(FMM Bid, Max(DA LMP, Charge Portion of RT DEB, FMM LMP)]** – FMM LMP), 0)
  - If(Differential FMM Dispatch <= 0, (FMM dispatch – DA schedule) * (**[Max(FMM Bid, Min(DA LMP, Discharge Portion of RT DEB, FMM LMP)]** – FMM LMP), 0)
- RTD Bid Costs:
  - If(Differential RTD Dispatch > 0, (RTD Dispatch – FMM Dispatch) * (**[Min(RTD Bid, Max(DA LMP, Charge Portion of RT DEB, RTD LMP)]** – RTD LMP), 0)
  - If(Differential RTD Dispatch <= 0, (RTD dispatch – DA schedule) * (**[Max(RTD Bid, Min(DA LMP, Discharge Portion of RT DEB, RTD LMP)]** – RTD LMP), 0)

For the version of this approach where the modified calculation is only utilized in the intervals that meet the trigger conditions established by CESA, the ISO used the following formulas:

- To identify the intervals where the modified calculation should be applicable for:
  - For a buy-back:
    If(AND(DA Schedule > 0, DA Schedule > FMM Dispatch, FMM Dispatch >= 0))
  - For a sell-back:
    If(AND(DA Schedule < 0, DA Schedule < FMM Dispatch, FMM Dispatch <= 0))
- Modified formula applicable for said intervals:
  - For intervals flagged as buy-back intervals based on the triggers above:
    (FMM Dispatch – DA Schedule) * ((**[Max(FMM Bid, Min(DA LMP, Discharge Portion of RT DEB, FMM LMP)]** – FMM LMP)
    (RTD Dispatch – FMM Schedule) * ((**[Max(RTD Bid, Min(DA LMP, Discharge Portion of RT DEB, RTD LMP)]** – RTD LMP)
  - For intervals flagged as sell-back intervals based on the triggers above:
    (FMM Dispatch – DA Schedule) * (**[Min(FMM Bid, Max(DA LMP, Charge Portion of RT DEB, FMM LMP)]** – FMM LMP)

[1] Please note that the formulas described in this section refer to the Charge and Discharge portions of the RT DEB. The calculation for these portions of the DEB may vary slightly since the Charging portion does not include the Variable Storage Operation Cost. In practice, this rarely results in different values for each of the portion since they are defined as:

- Charging Portion = Max(Energy Cost, Nth Highest DA LMP)*1.1
- Discharging Portion = Max (Energy Cost + Variable Storage Operation Cost, Nth Highest DA LMP)*1.1

As such, it is often the case that both the Charging and Discharging portions of the DEB are calculated at equivalent values resulting in the DEB being collapsed into a single segment that covers the whole operating range. As such, for simplicity, the Excel that accompanies this Addendum uses a single DEB for the purposes of this approach.

(RTD Dispatch – FMM Schedule) * (**[Min(RTD Bid, Max(DA LMP, Charge Portion of RT DEB, RTD LMP)]** – RTD LMP)

- Formula applied for the remainder of the intervals (*i.e.,* those that do not meet the trigger conditions):
    - (FMM Dispatch – DA Schedule) * (FMM Bid – FMM LMP)
    - (RTD Dispatch – FMM Schedule) * (RTD Bid – RTD LMP)

Regarding intervals with no DA Schedule

During the stakeholder meeting held October 9th, some stakeholders suggested that, for the intervals in which a resource does not have a DA schedule, the ISO should modify the latest Min/Max methodology to exclude the DA LMP. This approach was not taken in the examples included in the DFP, but it is included in the Excel spreadsheet that accompanies this Addendum. As such, in the accompanying Excel spreadsheet, the ISO used the following formulas for instances in which the resource does not have a DA schedule:

- FMM Bid Costs:
    - If(Differential FMM Dispatch > 0, (FMM Dispatch – DA schedule) * (**[Min(FMM Bid, Max(Charge Portion of RT DEB, FMM LMP)]** – FMM LMP), 0)
    - If(Differential FMM Dispatch <= 0, (FMM dispatch – DA schedule) * (**[Max(FMM Bid, Min(Discharge Portion of RT DEB, FMM LMP)]** – FMM LMP), 0)
- RTD Bid Costs:
    - If(Differential RTD Dispatch > 0, (RTD Dispatch – FMM Dispatch) * (**[Min(RTD Bid, Max(Charge Portion of RT DEB, RTD LMP)]** – RTD LMP), 0)
    - If(Differential RTD Dispatch <= 0, (RTD dispatch – DA schedule) * (**[Max(RTD Bid, Min(Discharge Portion of RT DEB, RTD LMP)]** – RTD LMP), 0)