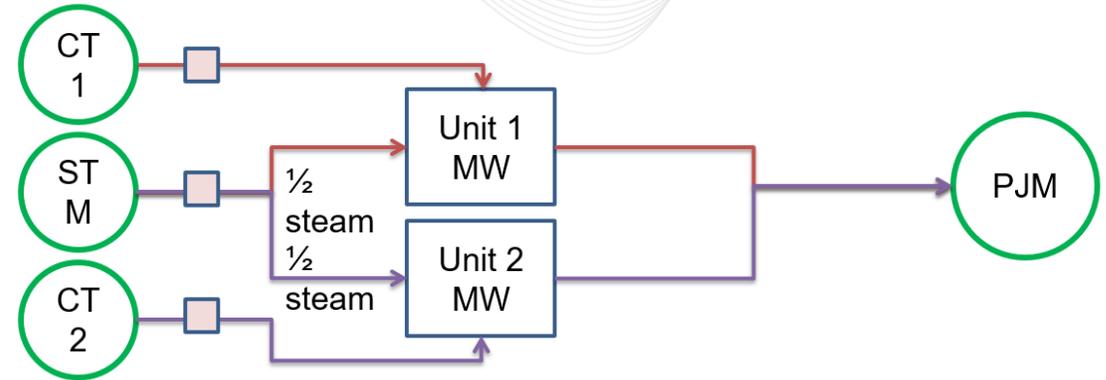


Virtual Combined Cycle Units in Regulation

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- Combined Cycle can be modeled as multiple virtual Market units
- There is a possibility for unbalanced or unequal regulation awards to each “unit”
- Vistra has provided education on operational and technical challenges resulting from the unequal regulation awards.



- To minimize the frequency of unbalanced regulation market awards:
 - Market Sellers may submit identical MW and price offers in both the regulation and the energy markets
 - Resources may use Performance Group for equal Historic Performance Score.

$$\begin{aligned}
 \text{Adjusted Total Offer Cost (\$)} &= \frac{\left(\begin{array}{c} \text{Capability} \\ \text{Cost} \end{array} + \begin{array}{c} \text{Performance} \\ \text{Cost} \end{array} + \begin{array}{c} \text{Lost} \\ \text{Opportunity} \\ \text{Cost} \end{array} \right)}{\left(\begin{array}{c} \text{Benefits Factor of} \\ \text{Offered Resource} \end{array} \right) * \left(\begin{array}{c} \text{Historic} \\ \text{Performance} \\ \text{Score} \end{array} \right)}
 \end{aligned}$$

- Extend the logic of Regulation performance group performance sharing to the historic performance score (100 hour rolling average). This will ensure resource(s) in performance groups have the same historic performance score for clearing purposes.
- Status Quo
 - PJM will calculate the performance group hourly performance score and extend it to each market resource with assigned regulation for the given hour
- Proposed
 - In addition to the status quo
 - PJM will calculate the performance group historic performance score and extend it to each market resource in the performance group

- PJM will calculate the performance group hourly performance score and extend it to each market resource with assigned regulation for the given hour
- PJM will calculate the performance group historic performance score and extend it to each market resource in the performance group

4.5.7 Use of Performance Groups in the Performance Score

Resources may elect to use a performance group for performance score evaluation.

Performance groups can only be created for resources that satisfy one of the following criteria:

- Resources not eligible for LOC and total to less than or equal to 10 MW across Transmission Owner boundaries.
- A performance group can be any number of resources not eligible for LOC inside a Transmission Owner's boundary.
- Resources within a fleet with equivalent applicable offers and point of interconnection.

Resources that are part of a performance group will send the Operational Midpoints and Resource Allocation of the group TReg for the grouped resources by signal type as described in Section 4.4.2, Regulation Signals. Each resource will be metered independently.

PJM Actions

- PJM will receive additional control data to be used in the performance score calculation to be reflected resource owner's dispatch.

* **Insert the proposed language inclusion here**

PJM Member Actions

Examples of Proposed Performance Group Scoring

Scenario 1: Both units provided regulation service but different hourly integrated performance score

	Unit 1	Unit 2
Reg MW	10	10
Unit Hourly Performance Score	0.95	0.85
Performance Group Historic Performance Score	0.9	0.9

Performance group historic performance score calculation will include the average of both units' hourly performance score

Scenario 2: Unit 2 is on outage but unit 1 provided regulation

	Unit 1	Unit 2
Reg MW	10	0
Unit Hourly Performance Score	0.95	Null
Performance Group Historic Performance Score	0.95	0.95

Performance group historic performance score calculation will include the hourly performance score of unit 1



Note: The historic performance score is used solely for converting participants submitted Regulation offers to the adjusted offers used in the Regulation Market clearing

- The proposed change to the logic of the performance group historic performance score has no impact on settlement credit for the resource
 - Settlement uses 5 minute actual performance score
- To initialize the performance group historic performance score, we will use the average of the historic performance score of the market resources in the performance group.
- In a rare situation when resources of a performance group have unequal awards
 - Resource owner may contact PJM dispatch to deassign or lower the awards to be equal across all virtual units or to a level that the plant can safely perform to.
 - Dispatch will not split awarded MWs across virtual units.

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