

Tariff and OA Definitions

Hybrid Resource

"Hybrid Resource" shall mean an Energy Resource or a Generation Capacity Resource composed of ~~one more than one component behind the same Point of Interconnection generation component and one storage component behind the same Point of Interconnection~~ operating in the capacity, energy, and/or ancillary services market(s) as a single integrated resource, whereby each component is a separate generation and/or storage technology type. A Hybrid Resource forms all or part of a Mixed Technology Facility.

Closed-Loop Hybrid Resource

"Closed-Loop Hybrid Resource" shall mean a Hybrid Resource without a storage component, or that is physically or contractually incapable of charging from the grid.

Open-Loop Hybrid Resource

"Open-Loop Hybrid Resource" shall mean a Hybrid Resource with a storage component that is physically and contractually capable of charging its storage component from the grid.

State of Charge

"State of Charge" shall mean the quantity of physical energy stored in an Energy Storage Resource Model Participant or in ~~the a~~ storage component of a Hybrid Resource in proportion to its maximum State of Charge capability. State of Charge is quantified as defined in the PJM Manuals.

State of Charge Management

"State of Charge Management" shall mean the control of State of Charge of an Energy Storage Resource Market Participant or a storage component of a Hybrid Resource using minimum and maximum discharge (and, as applicable, charge) limits, changes in operating mode (as applicable), discharging (and, as applicable, charging) offer curves, and self-scheduling of non-dispatchable sales (and, as applicable, purchases) of energy in the PJM markets. State of Charge Management shall not interfere with the obligation of a Market Seller of an Energy Storage Resource Model Participant or of a Hybrid Resource to follow PJM dispatch, consistent with all other resources.

LOC Deviation

"LOC Deviation," shall mean, for units other than wind units, Hybrid Resources, or Energy Storage Resource, the LOC Deviation shall equal the desired megawatt amount for the resource determined according to the point on the Final Offer curve corresponding to the Real-time Settlement Interval real-time Locational Marginal Price at the resource's bus and adjusted for any reduction in megawatts due to Regulation, Synchronized Reserve, or Secondary Reserve assignments and limited to the lesser of the unit's Economic Maximum or the unit's Generation Resource Maximum Output, minus the actual output of the unit. For wind units, Hybrid Resources, or Energy Storage Resources, the LOC Deviation shall mean the deviation of the generating unit's output equal to the lesser of the PJM forecasted output, inclusive of state of charge, for the unit or the desired megawatt amount for the resource determined according to the point on the Final Offer curve corresponding to the Real-time Settlement Interval integrated real-time Locational Marginal Price at the resource's bus and adjusted for any reduction in megawatts due

to Regulation, Synchronized Reserve, or Secondary Reserve assignments, and shall be limited to the lesser of the unit's Economic Maximum or the unit's Generation Resource Maximum Output, minus the actual output of the unit.

RAA Definitions

Effective Nameplate Capacity

"Effective Nameplate Capacity" shall mean (i) for each Variable Resource and Combination Resource, the resource's Maximum Facility Output (or, for a Co-Located Resource, the applicable share of the Mixed Technology Facility's Maximum Facility Output); (ii) for each Limited Duration Resource, the sustained level of output that the unit can provide and maintain over a continuous period, whereby the duration of that continuous period matches the characteristic duration of the corresponding ELCC Class, with consideration given to ambient conditions expected to exist at the time of PJM system peak load, to the extent that such conditions impact such resource's capability, not to exceed the Maximum Facility Output (or, for a Co-Located Resource, the applicable share of the Mixed Technology Facility's Maximum Facility Output).

1.4C Participation of Hybrid Resources

Hybrid Resources may participate in markets according to the following provisions in this section 1.4C, as further detailed in the PJM Manuals. Hybrid Resources are settled in markets as a single unit.

(a) Energy that the Market Participant of an Open-Loop Hybrid Resource purchases from the PJM Interchange Energy Market for charging the storage component must be Direct Charging Energy. Direct Charging Energy shall not be purchased for charging the storage component of Closed-Loop Hybrid Resources.

(b) The Market Participant of an Open-Loop Hybrid Resource shall arrange for Network Integration Transmission Service or Point-to-Point Transmission Service for purchases of Non-Dispatched Charging Energy. Network Integration Transmission Service and Point-to-Point Transmission Service are not required for purchases of Dispatched Charging Energy.

(c) Hybrid Resources consisting solely of a solar-inverter-based components and a storage component shall be eligible to be dispatched for positive megawatts as otherwise applicable, to set price at positive megawatt points on their offer curve as otherwise applicable, and to self-schedule positive megawatt quantities, pursuant to the requirements of the PJM Manuals. Such Hybrid Resources shall specify a single energy offer curve with monotonically increasing dollar values. Open-Loop Hybrid Resources consisting solely of a solar-inverter-based components and a storage component shall be eligible to be dispatched for negative megawatts (i.e., charging) as otherwise applicable, to set price at negative megawatt points on their offer curve as otherwise applicable, and to self-schedule negative megawatt quantities, pursuant to the requirements of the PJM Manuals. In addition, such Hybrid Resources operating in Continuous Mode shall specify a single energy offer curve with monotonically increasing dollar values including both positive and negative megawatt quantities.

(d) Hybrid Resources with a storage component shall be responsible for management of their own State of Charge, provided that they must comply with PJM operational orders regardless of the incidental impact on State of Charge.

(e) Hybrid Resources may offer quantities equivalent to 0.1 MW or greater into all applicable PJM markets.

(f) For a Hybrid Resource with a variable resource component and a storage component: During intervals in which the storage component of a Hybrid Resource is not actively managing the net output of such resource, the Market Participant of such resource shall indicate such status to PJM.

(g) In order to properly distinguish Direct Charging Energy from Load Serving Charging Energy, Open-Loop Hybrid Resources that are distribution-connected or co-located with end-use load shall include systems that are capable of measuring the below categories of electric energy, unless a different configuration is agreed to by the electric distribution company, the Energy Storage Resource, and PJM. The categories are: i) electric energy that is withdrawn from the grid and stored in the energy storage component; ii) electric energy that is generated on-site by a resource other than the energy storage component and stored in the energy storage component; iii) electric energy that is discharged by the energy storage component and injected onto the grid; and iv) electric energy that is discharged from the energy storage component and consumed by on-site end-use load that is not Station Power (if any such on-site end-use load exists). The measurement systems shall comply with the accuracy requirements for meters as described in PJM Manual 01. Additional details for the configuration of such measurement systems under various specific configurations are specified in PJM Manual 14D. If the distribution utility is unwilling or unable to net out from the host customer's retail bill Direct Charging Energy associated with an Open-Loop Hybrid Resource that is distribution connected or co-located with end-use load that is not Station Power, then PJM shall not bill the corresponding Market Participant for any Direct Charging Energy. Market Participants shall only be credited for sale transactions in PJM markets of electric energy produced from Open-Loop Hybrid Resources if that same sale transaction of electric energy is not also credited at retail.

Tariff Attachment K Appendix Section 3.2 and OA Schedule 1 Section 3.2

(f-4) A Market Seller of a wind generating unit, [Hybrid Resource or Energy Storage Resource](#) that is pool-scheduled or self-scheduled, has SCADA capability to transmit and receive instructions from the Office of the Interconnection, has provided data and established processes to follow PJM basepoints pursuant to the requirements for wind generating units, [Hybrid Resource or Energy Storage Resource](#) as further detailed in this Agreement, the Tariff and the PJM Manuals, and which is operating as requested by the Office of the Interconnection, the output of which is reduced or suspended at the request of the Office of the Interconnection due to a transmission constraint or other reliability issue, and for which the , real-time LMP at the unit's bus is higher than the unit's offer corresponding to the level of output requested by the Office of the Interconnection (as indicated either by the desired MWs of output from the unit determined by PJM's unit dispatch system or as directed by the PJM dispatcher through a manual override), shall be credited for each Real-time Settlement Interval in an amount equal to the product of (A) the LOC Deviation times (B) the Real-time Price at the generation bus for the generating unit, minus (C) the Total Lost Opportunity Cost Offer, provided that the resulting outcome is greater than \$0.00. This equation is represented as $(A*B) - C$.