Section 8: Open-Loop Hybrid & Energy Storage

Welcome to the Open-Loop Hybrid & Energy Storage Resource Charging Energy section of the PJM Manual for Manual for Open Access Transmission Tariff Accounting. In this section, you will find the following information:

- A description of the accounting procedures for Energy Storage Resource and Open-Loop Hybrid Resource Charging Energy.

8.1 Overview of Charging Energy

An Energy Storage Resource or Open-Loop Hybrid Resource is a resource capable of receiving electric energy from the grid and storing it for later injection to the grid that participates in the PJM Energy, Capacity and/or Ancillary Services markets as a Market Participant. Examples of Energy Storage Resource technologies include but are not limited to pumped storage hydroelectric plants, batteries, and flywheels. A hybrid resource is composed of more than one component, whereby each component is a ~~one~~separate generation component and/or one storage component behind the same Point of Interconnection operating as a single integrated resource; an Open-Loop Hybrid is a hybrid resource with a storage component that is physically and contractually capable of charging its storage component from the grid.

Charging energy that is purchased for storing in an Energy Storage Resource or Open-Loop Hybrid Resource for later resale is always billed at the applicable Locational Marginal Price. However, different categories of charging energy accrue different sets of charges according to use. These categories are summarized as follows (formal definitions are in the PJM Tariff):

- "Direct Charging Energy" shall mean the energy that an Energy Storage Resource or Open-Loop Hybrid Resource purchases from the PJM Interchange Energy Market and (i) later resells to the PJM Interchange Energy Market; or (ii) is lost to conversion inefficiencies, provided that such inefficiencies are an unavoidable component of the conversion, storage, and discharge process that is used to resell energy back to the PJM Interchange Energy Market. Note that Direct Charging Energy is purchased by Energy Storage Resource Model Participants or Open-Loop Hybrid Resources and is divided into two subcategories:

  o Dispatched Charging Energy" shall mean all Direct Charging Energy that an Energy Storage Resource Model Participant or Open-Loop Hybrid Resource receives from the electric grid that is not otherwise Dispatched Charging Energy. An example of Non-Dispatched Charging Energy is charging energy at an ESR that is self-scheduled and not dispatchable.

  o "Non-Dispatched Charging Energy" shall mean all Direct Charging Energy that an Energy Storage Resource Model Participant or Open-Loop Hybrid Resource receives from the electric grid that is not otherwise Dispatched Charging Energy. An example of Non-Dispatched Charging Energy is charging energy at an ESR that is self-scheduled and not dispatchable.

- "Load Serving Charging Energy" shall mean energy that is purchased from the PJM Interchange Energy Market and stored in an Energy Storage Resource or Open-Loop Hybrid Resource for later resale to end-use load. Note that only Load Serving Entities may purchase Load Serving Charging Energy. Load Serving Charging Energy is comparable to ordinary load.

Non-Dispatched Charging Energy must pay applicable transmission charges as a Network Service User. By contrast, Dispatched Charging Energy does not pay such charges. Charging energy qualifies as Dispatched Charging Energy when the Energy Storage Resource or Open-Loop Hybrid Resource ~~follows PJM dispatch within 10% of the desired output and~~ meets one of the following conditions:

- Provides Energy Imbalance Service under Schedule 4 of the PJM Tariff. Energy Storage Resource Model Participants or Open-Loop Hybrid Resource shall be considered to be providing Energy Imbalance Service when they are dispatchable by PJM in real time. An Energy Storage Resource or Open-Loop Hybrid Resource shall be considered dispatchable when the fixed generation flag is set to "no" and the dispatchable range exceeds 10% of the absolute value of the relevant economic limit and the resource follows PJM dispatch within 10% of the desired output.
- Assigned to Regulation, Synchronized Reserves, or Reactive Service;
- Being manually dispatched for reliability

8.2 Charges for Direct Charging Energy

As described above, Direct Charging Energy purchases by Energy Storage Resource Model Participants or Open-Loop Hybrid Resource fall into two categories: Dispatched Charging Energy and Non-Dispatched Charging Energy. Dispatched Charging Energy does not pay transmission charges; however Non- Dispatched Charging Energy does pay transmission charges, and must arrange for Network Transmission Service. Non-Dispatched Charging Energy uses the transmission system, and an Energy Storage Resource Model Participant or Open-Loop Hybrid Resource purchasing Non-Dispatched Charging Energy is a Network Service User. As a result, certain Transmission Customer charges apply to Non-Dispatched Charging Energy that do not apply to generation output. However, the PJM Tariff states that Direct Charging Energy (which includes Non-Dispatched Charging Energy) is exempt from other Transmission Customer charges. Further, because Direct Charging Energy (including Non-Dispatched Charging Energy) is not end-use load, charges that are applicable to Load Serving Entities and to end-use load are not applicable to Direct Charging Energy. Therefore, Non-Dispatched Charging Energy is eligible for allocation of the following non-LMP charges and credits:

- Schedule 1A Transmission Owner Scheduling, System Control and Dispatch Service
- Schedule 9-3, 9-FERC, 9-OPSI, 9-CAPS, 9-FINCON, 9-MMU, and 9-PJM Settlement
- Schedule 10-NERC and 10-RFC
- Network Integration Transmission Service
- Network Transmission Service Offset
- MTEP Project Cost Recovery
- Transmission Enhancement

- Other Supporting Facilities
- Non-Firm Point-to-Point Transmission Service
- Black Start Service
- Unscheduled Transmission Service
- Reactive Supply and Voltage Control from Generation and Other Sources Service

An Energy Storage Resource or Open-Loop Hybrid Resource shall be considered charging when the Revenue Data for Settlements for a Real Time Settlement Interval corresponds to a withdrawal. The determination of Non-Dispatched Charging Energy vs. Dispatched Charging Energy shall be made for each Real Time Settlement Interval. Hourly Non-Dispatched Charging Energy is the sum of Revenue Data for Settlements for the Real Time Settlement Intervals which are determined to be Non- Dispatched Charging Energy over the hour divided by 12.

The PJM Tariff exempts Direct Charging Energy (which includes Non-Dispatched Charging Energy) from the following Transmission Customer charges:

- Schedule 9-1 Control Area Administration
- Allocations of Operating Reserve costs to scheduled day-ahead load and to real-time load pursuant to Tariff Attachment K Appendix Section 3.2.3 – Operating Reserves;
- Allocations of Reactive Service costs pursuant to Tariff Attachment K Appendix Section 3.2.3B – Reactive Services;
- Allocations of Synchronous Condensing costs pursuant to Tariff Attachment K Appendix Section 3.2.3C – Synchronous Condensing for Post-Contingency Operation;
- 500 kV Meter Errors
- Meter Correction Between Control Areas
- Inadvertent Interchange
- Allocation of Balancing Congestion Charges
- Distribution of Total Transmission Loss Charges
- Allocation of Auction Revenue Rights

The following non-LMP charges that apply to Load Serving Entities are not applicable to Direct Charging Energy (which includes Non-Dispatched Charging Energy):

- Synchronized, Non-Synchronized, and Secondary Reserves
- Regulation
- Capacity Market charges
- Economic Demand Response charges in Day-ahead and Real-Time; and
- Emergency Demand Response charges

FERC directed that Dispatched Charging Energy shall be exempt from paying transmission charges, and therefore charges that are applicable to Transmission Customer use of the transmission system are not applicable to Dispatched Charging Energy. Dispatched Charging Energy therefore pays the same non-LMP charges as generation output, namely:

- Schedule 9-3, 9-MMU, 9-PJM Settlements

8.3 Charges for Load Serving Charging Energy

Load Serving Charging Energy is PJM load that is purchased from PJM by a Load Serving Entity and stored in an Energy Storage Resource or Open-Loop Hybrid Resource for later end-use consumption. Load Serving Charging Energy is purchased at the aggregate nodal LMP that is applicable to the corresponding Load Serving Entity load. Load Serving Charging Energy is eligible for the same charges as ordinary load, including all Load Serving Entity charges, end-use load charges, and Transmission Customer charges.

8.4 Calculating Charges for Non-Dispatched Charging Energy

PJM will report to Electric Distribution Companies all hourly Energy Storage Resource Model Participant or Open-Loop Hybrid Resource purchases of Non-Dispatched Charging Energy in order to facilitate calculation of Network Service Peak Loads corresponding to those purchases. Non-Dispatched Charging Energy is not end-use load, and therefore the Electric Distribution Company shall not allocate any Peak Load Contribution value to any purchases of Non-Dispatched Charging Energy.