

Hybrids Phase 2

Andrew Levitt

Market Design & Economics

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Resources Subcommittee

- Clarify market participation and requirements for wind+battery, solar+wind, solar+wind+battery, and other non-solar hybrids.
- Discussion of potential market participation by Mixed Technology Facilities whose components have significant interactions (i.e., cannot operate independently) as two separate Co-Located Resources.
- Phase 2 is already specified in the previously approved hybrids charter:

4. Phasing

Items in the domain of separately-modeled co-located solar and battery storage will be discussed in a later phase of work, including but not limited to discussion of settlements, energy market participation, and modeling the interaction between the two units. In addition to separately-modeled co-located solar and battery storage, this phase of work will also explore the same potential market participation issues related to other types of hybrid and separately-modeled co-located unit combinations, such as, but not limited to, wind-battery and gas-battery.

Currently effective:

- **“Combination Resource”** shall mean a Generation Capacity Resource that has a component that has the characteristics of a Limited Duration Resource combined with (i) a component that has the characteristics of an Unlimited Resource or (ii) a component that has the characteristics of a Variable Resource.
- **“Energy Storage Resource”** shall mean 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.

From hybrids phase I, currently pending FERC filing and approval:

- **“Mixed Technology Facility”** shall mean a facility composed of distinct generation and/or electric storage technology types behind the same Point of Interconnection. Co-Located Resources and Hybrid Resources form all or part of Mixed Technology Facilities.”
- **“Co-Located Resource”** shall mean a component of a Mixed Technology Facility that operates in the capacity, energy, and/or ancillary services market(s) as a separate resource from the other components of such facility.
- **“Hybrid Resource”** shall mean an Energy Resource or a Generation Capacity Resource composed of one 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. A Hybrid Resource forms all or part of a Mixed Technology Facility.
- **“Open-Loop Hybrid Resource”** shall mean a Hybrid Resource that is physically and contractually capable of charging its storage component from the grid.

Tariff AttK Appendix Section 1.4B Participation of Hybrid Resources [pending FERC approval]

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

...

“(c) Hybrid Resources consisting of a solar component 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 of a solar component 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.”

Question: should gen+storage Mixed Tech Facilities operate as single-resource integrated hybrids when gen is not solar? Should they be included in the definition of Hybrid Resource? What about gen+gen? Gen+gen+storage? Etc?

SME/Presenter:
Andrew Levitt

Andrew.Levitt@pjm.com

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Member Hotline

(610) 666 – 8980

(866) 400 – 8980

custsvc@pjm.com

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