



Hybrid Resources Enhancements (Hybrids Phase 3)

Problem / Opportunity Statement

In July 2020, stakeholders initiated the **first phase** of work to define and/or clarify the market rules for hybrid resources. The first phase focused on co-located generation and energy storage hybrids in general, and solar-storage hybrids in particular, because these configurations represented the vast majority of all hybrid megawatts in PJM's queue at the time. Stakeholders worked through a number of revisions to PJM's Governing Documents, including provisions for the classification and categorization of these resources, rules for their participation in the energy and ancillary services markets, and other miscellaneous clarifications. The proposals were endorsed at both the December 2021 Markets and Reliability Committee ("MRC") and the January 2022 Members Committee ("MC"). FERC issued an Order approving the proposed revisions to PJM's Tariff in July 2022. The solar-storage participation model went into effect on July 1, 2023.

The **second phase** of the hybrids work commenced in February 2022 and focused on expanding the hybrids definition and market participation model to *all* combinations of inverter-based technologies (e.g., wind-battery, solar-wind, solar-wind-battery etc.) The final proposed revisions were endorsed at both the January 2023 MRC and the February 2023 MRC. FERC approved the changes in September 2023; they went into effect on November 1, 2023.

A great deal of work has already been done to enable the participation of hybrid resources in PJM markets. However, as PJM gains real-world experience with these resource configurations, it is becoming evident that a number of existing market rules would benefit from additional stakeholder discussion and further enhancements and/or clarification. For example, revisions may be warranted to the existing definitions of open and closed-loop hybrid systems as these prevent hybrids that have the capability to charge from the grid, but charge only from the on-site generation, from qualifying to participate as a closed-loop system. Clarifications may also be beneficial with regard to model switching rules, energy must offer requirements, state of charge requirements, and ancillary service participation, among others.

Finally, PJM anticipates the potential coming online of several gas-storage hybrid resources, a technical configuration that was not fully considered during the first and second phase of the Hybrids stakeholder initiative. PJM staff and stakeholders should discuss how existing business rules may or may not apply to gas-storage hybrids, including any additional clarification or enhancements that may be necessary to adapt existing rules to non-inverter based hybrid resources.