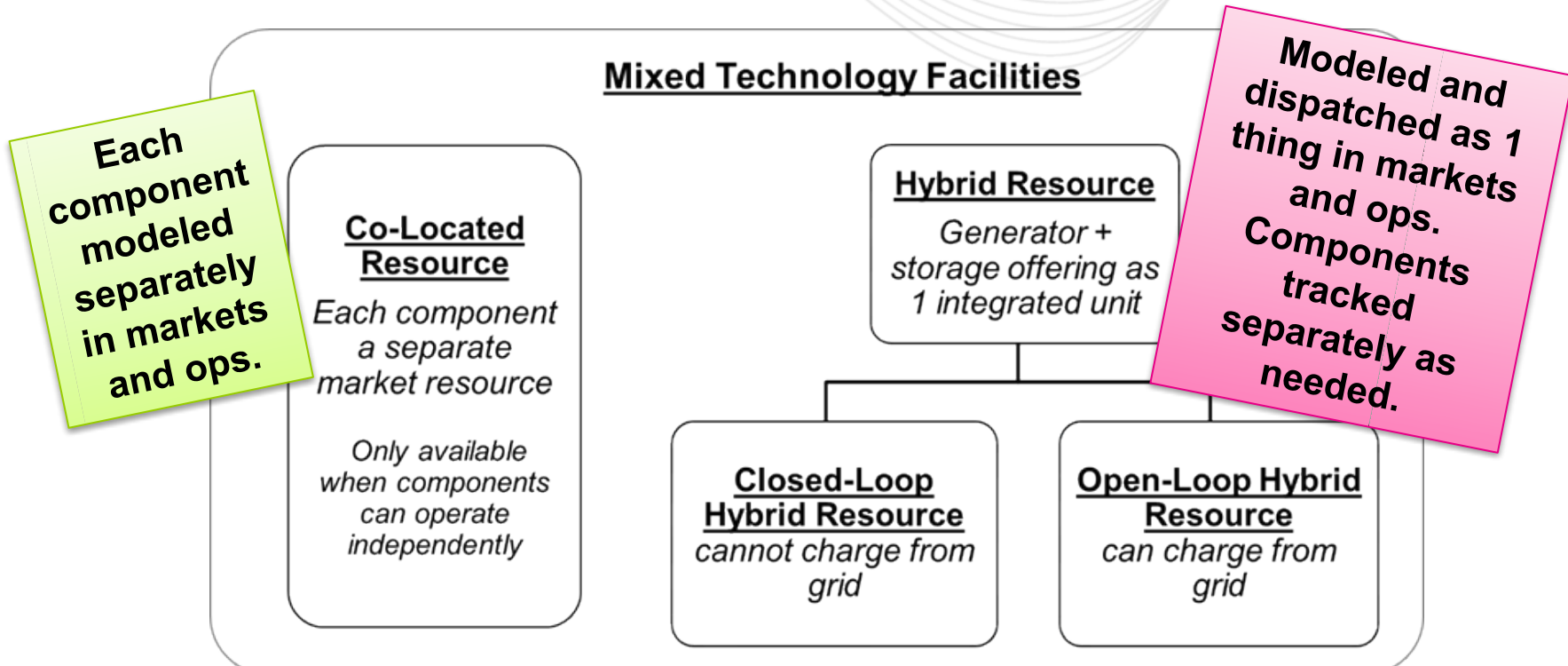# Hybrids Phase II Solution Package Proposal

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January 25, 2023

- Hybrids issue charge approved June, 2020, with aim to clarify market participation for tens of thousands of MW of mixed-fuel queue positions (mostly solar+battery).
- Hybrids Phase I focused on solar-storage hybrids, with some minor provisions for other types of hybrids .
  - *Phase 1a (classification and metering) is currently implemented, with manual language effective October 1, 2022*
  - *Phase 1b (energy market model) is targeted to go live June, 2023*
- **Hybrids Phase II encompasses other hybrids (e.g., wind+solar, etc).**
  - DIRS produced the present package proposal for consideration of standing committees. *The package requires Tariff changes*.
  - Manual revisions for Phase II to follow FERC approval.

Each component modeled separately in markets and ops.

**Mixed Technology Facilities**

**Co-Located Resource**
Each component a separate market resource

Only available when components can operate independently

**Hybrid Resource**
Generator + storage offering as 1 integrated unit

**Closed-Loop Hybrid Resource**
cannot charge from grid

**Open-Loop Hybrid Resource**
can charge from grid

Modeled and dispatched as 1 thing in markets and ops. Components tracked separately as needed.

"Hybrid Resources may participate in markets according to the following provisions in this section 1.4C, as further detailed in the PJM Manuals."

1. Broaden definition of "Hybrid Resource" from 1gen+1storage to any number of different types of gen (with or without storage).

   – The implication is that more resource types (e.g., hydro+solar, gas+solar, etc) inherit the "Hybrid Resources may participate in markets" provision from phase I.

2. Detailed energy market model for inverter-based hybrid resources:

   – Broaden applicability of the solar+storage energy market model to all inverter-based storage hybrids (e.g., wind+storage, wind+solar+storage, etc).

   – Inverter-based gen-only Hybrid Resources (e.g., wind+solar) use similar energy model as wind.

3. Clarify expected ECOMAX parameter from inverter-based hybrids (and standalone storage), and corresponding uplift rules.

   – E.g., a solar+wind hybrid is not eligible for lost opportunity cost payments in excess of the wind+solar backcast, even if bid-in ECOMAX were higher.

- Hybrid and Storage ECOMAX should be accurately reflected to the market
  - Example:  Solar+battery hybrid ECOMAX should not exceed battery_nameplate_MW plus anticipated_solar_availability when the battery is <u>not empty</u>, and ECOMAX should not exceed the anticipated_solar_availability only when the battery component is empty (min SoC).
  - Example: ECOMAX of an Energy Storage Resource Model Participant should not exceed 0 when the State Of Charge is at or below the Minimum State Of Charge (i.e., it is empty).

- To the extent that the parameter of a hybrid resource or standalone battery resource does not properly reflect the unit's capability, PJM reserves the right to limit lost opportunity cost (LOC) payments to the more accurate parameter value.

- Design Component 0a: the Maximum Facility Output at a Mixed Technology Facility shall be fully allocated to its component Co-Located Resources. This allocation effectively sets the Effective Nameplate Capacity (ENC, input to calculation of UCAP) of a Co-Located Resource that is a renewable or storage resource.

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