Hybrids Phase III: Manual 10 and 14D Changes

Maria Belenky
Lead Market Design Specialist,
Market Design

System Operations Subcommittee
May 29, 2025

- Hybrids Phase III filing accepted March 28, 2025

  – FERC Docket #ER25-1095-000

- Changes included allowing more than just inverter-based resources with storage components

- Updated Open-Loop and Closed-Loop classifications of Hybrid Resources

- **Section 2.1 Generation Outage Reporting Overview**

  – Updated eDART Reportable MW table (Exhibit 3) to include the reportable MW value of non-inverter-based components of Hybrid Resources

| Resource Type	eDART Reportable MW
For the inverter-based component of Hybrid Resource	Based on nameplate MW rating of the component
For the non-inverter-based component of Hybrid Resource	Total RPM (Owned) iCAP (Committed + Available) MW

- Section 4.2 Account Metering

  – Exhibit 7 generalized to include all resource types for Mixed Technology Facilities and Hybrid Resources
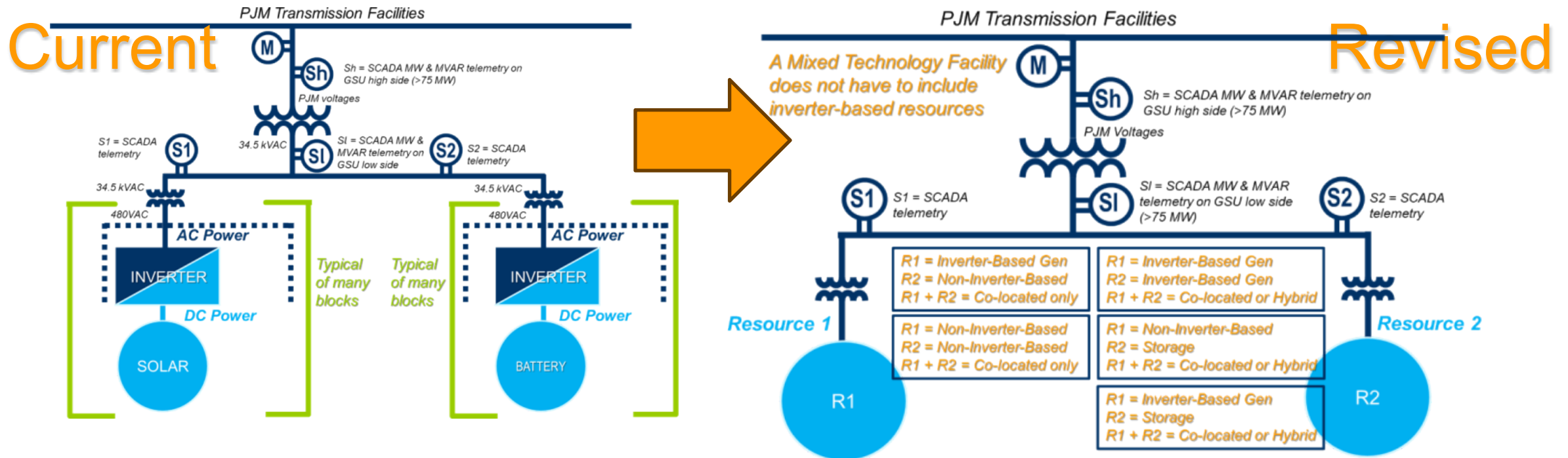
- Section 8.2.4 Generator Outage Reporting (Aggregate Turbine availability)

  – Updated language to emphasize wind outage reporting for all types of hybrids that include wind as a technology type

- Section 12.2.4 Generator Outage Reporting Section

  – Updated language to emphasize solar outage reporting for all types of hybrids that include solar as a technology type

- **Section 13.1 Marketing and Classification of Mixed Technology Facilities**

  - Modified language to broaden eligibility to participate as a Hybrid Resource

  - Clarified classifications of open-loop and closed-loop based on definition changes

  - Updated language and diagram to be inclusive of all eligible resource types for hybrids

  - Updated language to specify when a Mixed Technology Facility must participate as a Hybrid Resource

  - Noted classification of closed-loop for any Hybrid Resource without storage component

  - Clarified that for all Mixed Technology Facilities participation change notifications must be made no later than six (6) months in advance of its initial start in the energy markets.

- Attachment D PJM Generating Unit Reactive Capability Curve Specification and Reporting Procedures

  - Point 10 and Point 11 removed limiting language of inverter-based and non-inverter-based resources

  - Point 12 clarified language to only refer to Hybrid Resources with a storage component
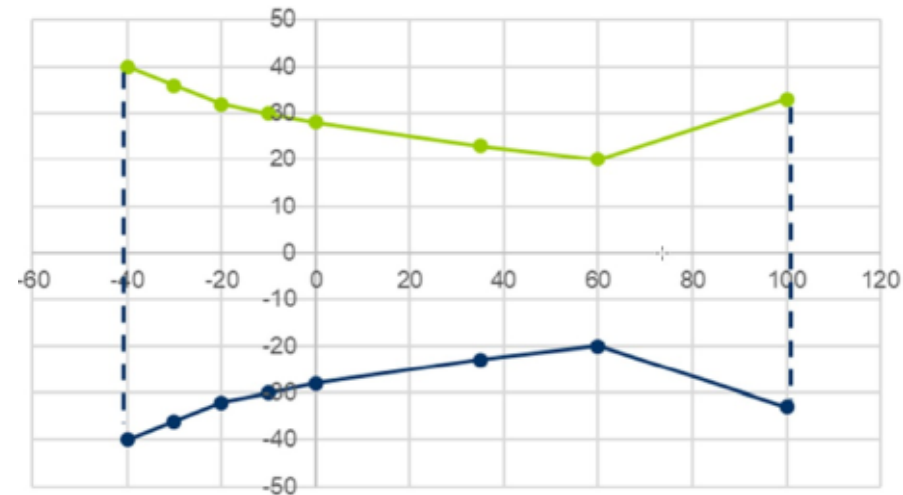
- **Attachment E PJM Generator and Synchronous Condenser Reactive Capability Testing**

  – Updated table to specify testing requirements specific to Hybrid Resources with a storage component

UNIT TYPE	MW OUTPUT	MVAR OUTPUT	TEST DURATION
FOSSIL, HYDRO ELECTRIC, BLACKSTART	MAX	MAX LAG	ONE HOUR
	MAX	MAX LEAD	WHEN LIMIT REACHED
	MIN	MAX LAG	WHEN LIMIT REACHED
	MIN	MAX LEAD	WHEN LIMIT REACHED
SYNCHRONOUS CONDENSER or GENERATOR THAT OPERATES IN THE SYNCHRONOUS CONDENSING MODE TO PROVIDE REACTIVE SUPPORT	N/A	MAX LAG	ONE HOUR
	N/A	MAX LEAD	WHEN LIMIT REACHED
NUCLEAR	MAX	MAX LAG	ONE HOUR
	MAX	MAX LEAD	WHEN LIMIT SREACHED
VARIABLE (Wind & Solar) (Testing done with at least 90% of turbines or inverters on line)	VARIABLE	MAX LAG	WHEN LIMIT REACHED
	VARIABLE	MAX LEAD	WHEN LIMIT REACHED
INVERTER-BASED ENERGY STORAGE RESOURCES Max MW Output = fully discharging	ZERO	MAX LAG	WHEN LIMIT REACHED
	ZERO	MAX LEAD	WHEN LIMIT REACHED
	MAX	MAX LAG	WHEN LIMIT REACHED
	MAX	MAX LEAD	WHEN LIMIT REACHED
Min MW Output = fully charging	MIN	MAX LAG	WHEN LIMIT REACHED
	MIN	MAX LEAD	WHEN LIMIT REACHED
DC-COUPLED INVERTER BASED STORAGE HYBRID RESOURCES Max MW Output = fully discharging/producing	ZERO	MAX LAG	WHEN LIMIT REACHED
	ZERO	MAX LEAD	WHEN LIMIT REACHED
	MAX	MAX LAG	WHEN LIMIT REACHED
	MAX	MAX LEAD	WHEN LIMIT REACHED
Min MW Output = fully charging with no production (or 0 MW net output if facility cannot charge from grid)	MIN	MAX LAG	WHEN LIMIT REACHED
	MIN	MAX LEAD	WHEN LIMIT REACHED
AC-COUPLED INVERTER BASED STORAGE HYBRID RESOURCES Zero net MW point must reflect the most conservative capability at that power level, for example with a battery at full charging and generation output matching as close to battery charge power as practicable.	ZERO	MAX LAG	WHEN LIMIT REACHED
	ZERO	MAX LEAD	WHEN LIMIT REACHED
Max MW Output = fully discharging/producing	MAX	MAX LAG	WHEN LIMIT REACHED
	MAX	MAX LEAD	WHEN LIMIT REACHED
Min MW Output = battery fully charging and generation at 0 MW (if facility cannot charge from grid, omit this point).	MIN	MAX LAG	WHEN LIMIT REACHED
	MIN	MAX LEAD	WHEN LIMIT REACHED
Max inverter operating point(MXIOP)= generation as close to full output as practicable and battery at full charging.	MXIOP	MAX LAG	WHEN LIMIT REACHED
	MXIOP	MAX LEAD	WHEN LIMIT REACHED
*Additional test points may be required if these do not capture the most restrictive capability scenarios.			

	Committee	Apr	May	Jun	Jul
Manual 10 Rev 46 **Manual 14-D Rev 68**	SOS		● 4/30 ● 5/29		
	OC		● 5/8 ★ 6/5		
	MRC			● 6/18 ★ 7/23	
	RSCS		○ 5/9		

● First Read
★ Endorsement
○ Info Only

Facilitator:
Kevin Hatch
Kevin.Hatch@pjm.com
Secretary:
Matt Wharton
Matthew.Wharton@pjm.com
SME/Presenter:
Maria Belenky
Maria.Belenky@pjm.com
Darrell Frogg
Darrell.Frogg@pjm.com
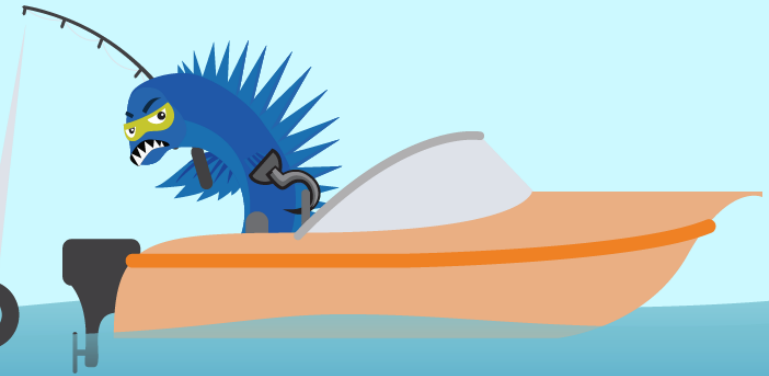
Hybrids Phase 3 Manual 10 and 14D Changes

Member Hotline

(610) 666 – 8980

(866) 400 – 8980

custsvc@pjm.com

PROTECT THE POWER GRID

THINK BEFORE YOU CLICK!

BE ALERT TO MALICIOUS PHISHING EMAILS

Report suspicious email activity to PJM.
Call (610) 666-2244 or email it_ops_ctr_shift@pjm.com