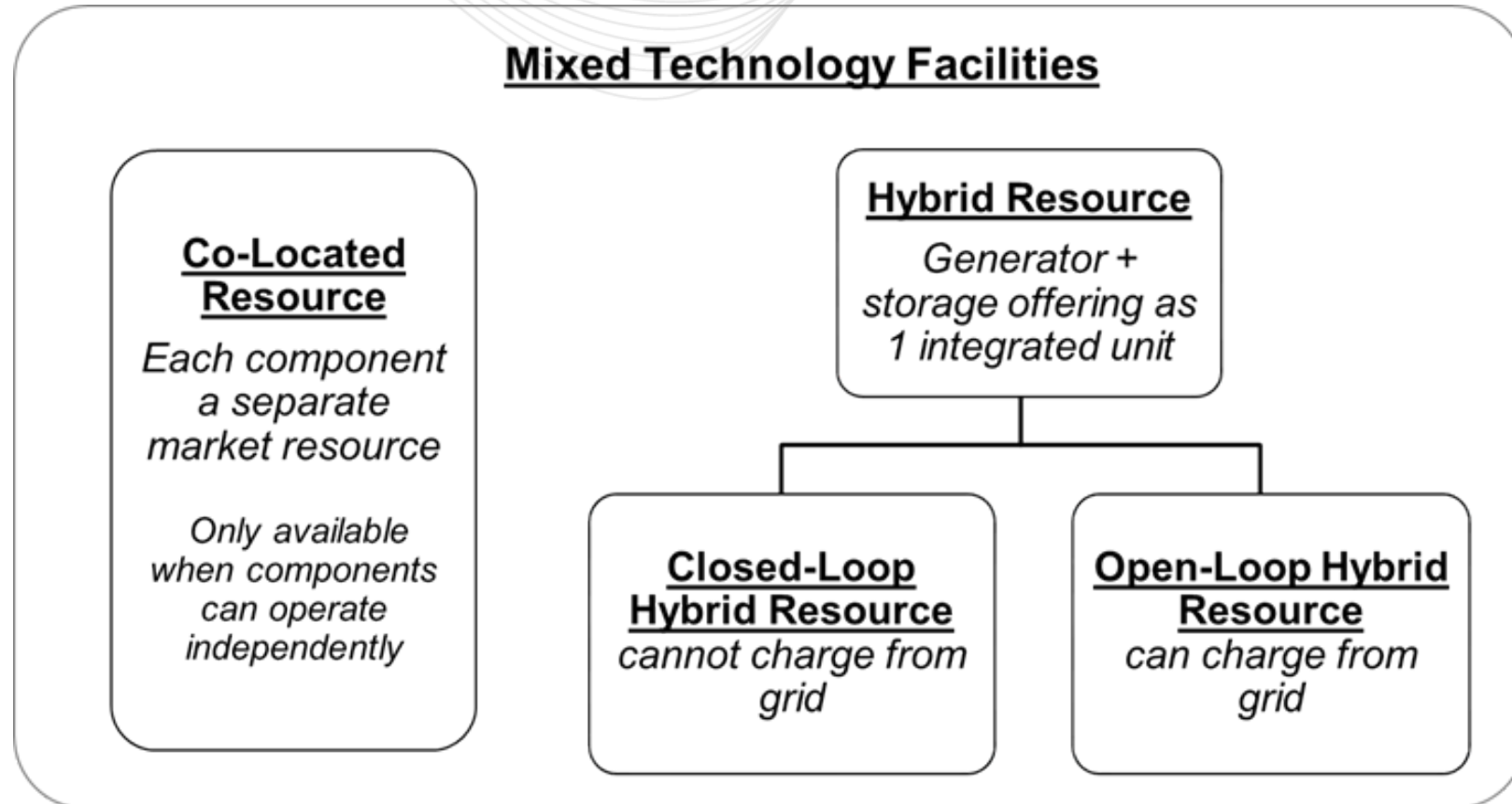


Summary of Potential Manual Language Changes for Mixed Technology Facilities and Hybrid Resources (Phase 1)

Andrew Levitt

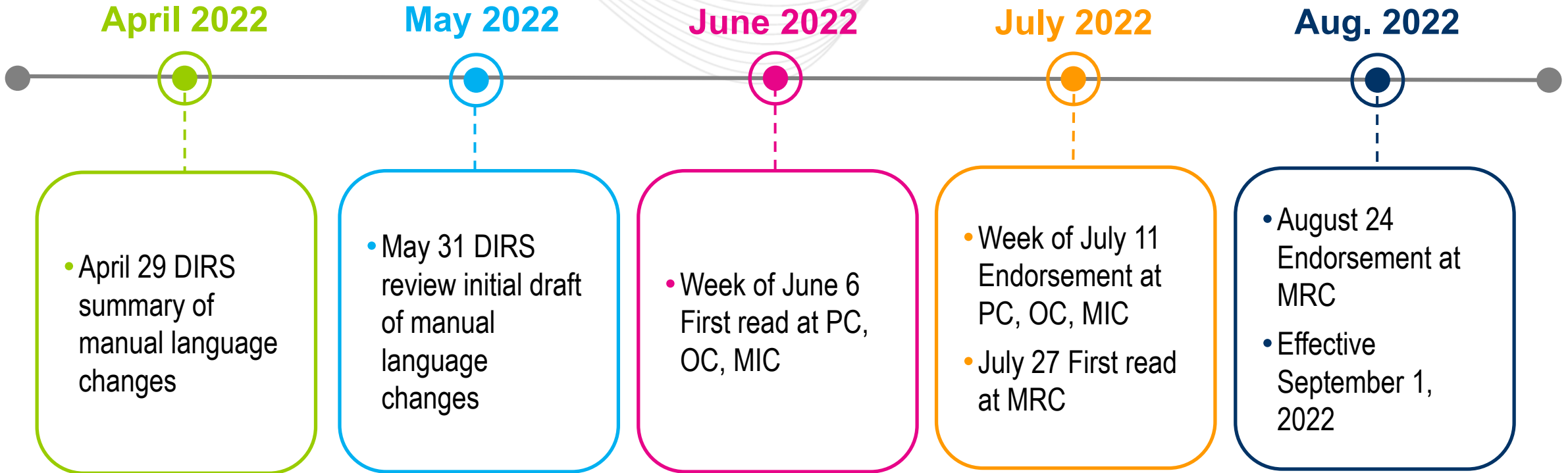
April 28, 2022

PJM DER and Inverter-based
Resources Subcommittee



- Two subphases: 1a and 1b
- **Phase 1a:** provisions related to classification and categorization of Mixed Technology Facilities as well as capacity market provisions would be effective June 1, 2022
 - Definition of Mixed Technology Facility, Hybrid Resource, Co-Located Resource, etc.
 - Classification rules: when and how to choose modeling, etc.
 - Intent is to support units currently under development that will be deciding on market modeling approach shortly. This includes metering provisions.
- **Phase 1b:** other provisions, including method to participate in energy and ancillary services markets, are targeted for effective date on June 1, 2023
- PJM will bring conforming manual language for hybrids phase 1 in two corresponding subphases (1a and 1b).

Hybrids: Potential Timing of Manual Language for Phase 1a Manual Language



Phase 1b manual language development to start late 2022/early 2023.

Manual 11 (phase 1b, 2023 effective date)

- Energy and ancillary services provisions for Hybrid Resources (e.g., self commitment, solar-only mode, scheduling negative megawatts, regulation and reserves treatment same as energy storage resources, etc.)
- Handling changes in energy market modeling of a Mixed Technology Facility
- Energy market must offer treatment for certain hybrids* same as Intermittent Resources and Capacity Storage Resources.

Manual 12 and 13 (phase 1b, 2023 effective date)

- ECOMIN cannot be less than CIRs for Hybrid Resources, achieving dispatch point within 5 minutes, Emergency Min = 0

Manual 18 (phase 1a, 2022 effective date)

- Capacity Market Must Offer treatment for certain hybrids same as Intermittent Resources and Capacity Storage Resources.

* *“Hybrid Resources consisting exclusively of components that in isolation would be Intermittent Resources or Capacity Storage Resources”*

- Manual 27 and Manual 28 (phase 1b, 2023 effective date)
 - Settlement of charging energy from Open Loop Hybrid Resources
 - Uplift eligibility

- Manual 14D (phase 1a, 2022 effective date)
 - State of Charge telemetry requirement for Hybrid Resources
 - Metering/telemetry for Mixed Technology Facilities, including component-level MW submetering telemetry for Hybrid Resources
 - eDart reporting by component for Hybrid Resources
 - Reactive capability and testing
 - Classification of Mixed Technology Resources
 - Single MOC for all Co-Located Resources at a Mixed Tech Facility.
- Manual 01 (phase 1a, 2022 effective date)
 - Accuracy requirements for submetering at Mixed Technology Facilities
- Manual 10 (phase 1a, 2022 effective date) –eDART reporting of hybrid components

- Manual 21A (phase 1b, 2023 effective date)
 - Separate GADS reporting by component for Hybrid Resources



Details/Redlines: Phase 1a (2022) Set of Hybrid Manual Changes

Section 5.4 “Sell Offers in RPM”

- “With the exception of Intermittent Resources, **and Capacity Storage Resources, and Hybrid Resources consisting exclusively of components that in isolation would be Intermittent Resources or Capacity Storage Resources**, each Generation Capacity Resource with available capacity that is capable or can reasonably become capable of qualifying as a Capacity Performance Resource must submit a Capacity Performance sell offer segment.”
- “Intermittent Resources, Capacity Storage Resources, **Hybrid Resources consisting exclusively of components that in isolation would be Intermittent Resources or Capacity Storage Resources**, Demand Resources, **and** Energy Efficiency Resources are not required to submit a Capacity Performance sell offer segment.”

Section 5.7.1 “Participation in the Base Residual Auction” and 5.8.1 “Participation in the Incremental Auctions”

- “Following a Base Residual Auction, a party’s Daily Unoffered ICAP for a generation resource is calculated and is equal to the Available ICAP Position minus the Offered ICAP in the party’s sell offer. Effective with the 2020/2021 Delivery Year, the Daily Unoffered ICAP for Capacity Storage, Intermittent, **Hybrid Resources consisting exclusively of components that in isolation would be Intermittent Resources or Capacity Storage Resources**, and Environmentally-Limited Resources is not applicable since these resources are not subject to a Capacity Performance must offer requirement.”

Section 5.8.1 “Participation in the Incremental Auctions”

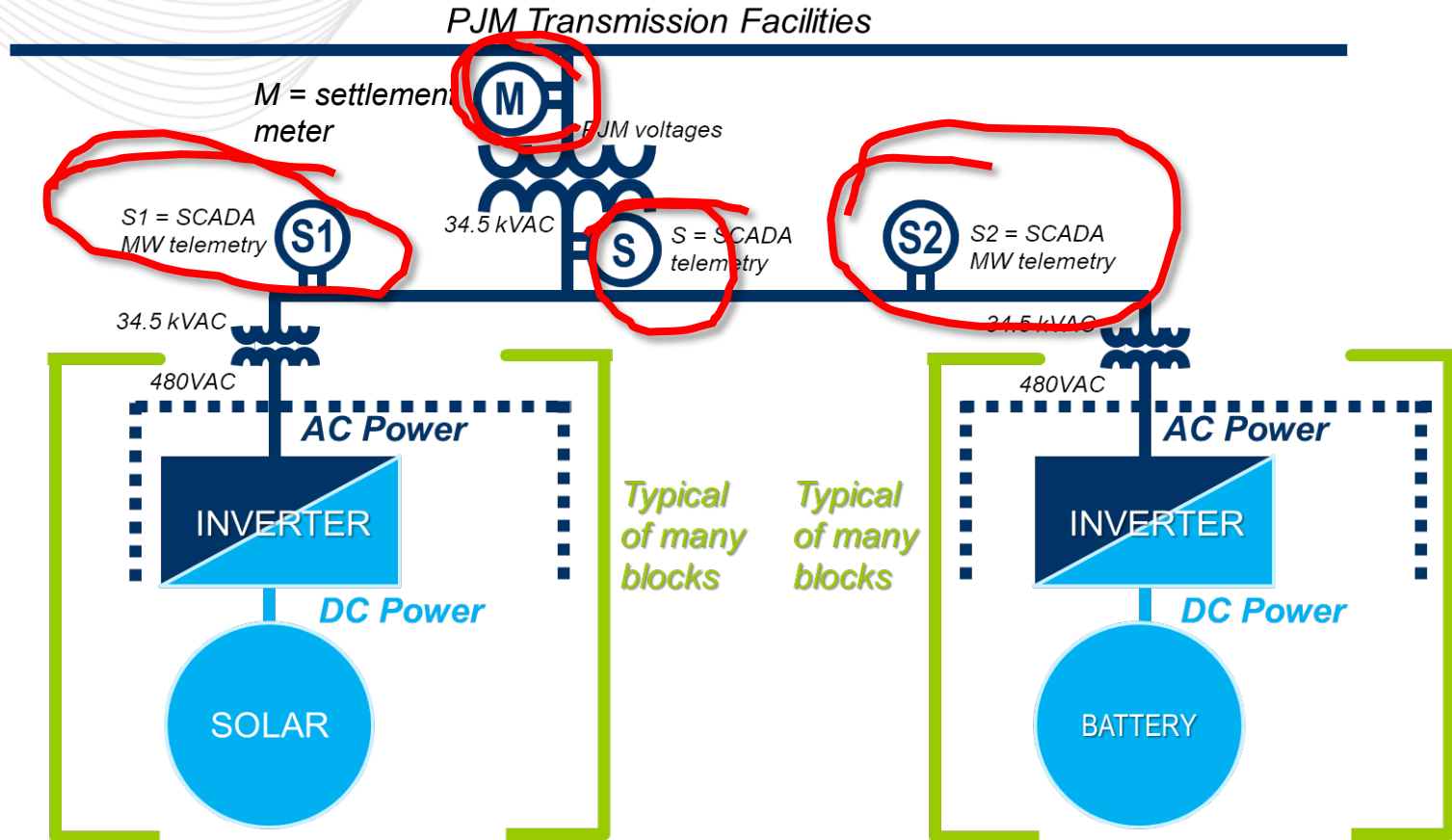
- A party’s Minimum Available ICAP Position represents the minimum amount that must be offered into an RPM Auction. A party’s Minimum Available ICAP Position on a unit for an RPM Auction is equal to the minimum Daily Minimum Available ICAP for such unit during the Delivery Year. Effective 2020/201 Delivery Year, a party’s Minimum Available ICAP for the summer/winter season will also be calculated in the Capacity Exchange system; however, Capacity Storage, Intermittent, **Hybrid Resources consisting exclusively of components that in isolation would be Intermittent Resources or Capacity Storage Resources**, and Environmentally Limited Resources are exempt from the Capacity Performance must offer requirement.”

- Accuracy requirements for submetering at Mixed Technology Facilities. In summary, regardless of Co-Located Resource vs. Hybrid Resource market participation approach:
 - Settlement-grade metering at the Point of Interconnection
 - SCADA-grade for MW submetering of each component

- eDART reporting for hybrids

Summary of Manual 14D Changes (phase 1a, 2022 effective date)

- State of Charge telemetry requirement for Hybrid Resources
- Metering/telemetry for Mixed Technology Facilities, including component-level MW submetering telemetry
- Separate eDart reporting by component for Hybrid Resources
- Reactive capability and testing
- Classification of Mixed Technology Facilities
- Single MOC for all Co-Located Resources at a Mixed Tech Facility.



Real Time Instantaneous Data Sent To PJM	
Frequency	1/1000th of HZ (i.e. 60.001 Hz)
Voltage	1/10th of kV (i.e. 69.1 kV)
Real Power MW	1 MW integer (i.e. 52 MW) required, but PJM will accept greater precision if available
Reactive Power MVAR	1 MVAR integer (i.e. 42 MVAR) required, but PJM will accept greater precision if available
Current State of Charge (Energy Storage Resource Model Participants <u>and Hybrid Resources</u> Only)	<u>1</u> MWh remaining
<u>Mixed Technology Facilities Only—Real Power MW from Each Component Technology (e.g., Solar MW and Battery MW)</u>	<u>1 MW</u>

- Section 4.1.7 – SCADA
- Section 4.2.3 Metering for Individual Generators
- Section 7.1.2 Voltage and Reactive Control
- A new Section 13 for Mixed Tech Facilities
- Attachment D
- Attachment E
- Attachment L



Details/Redlines: Phase 1b (2023) Set of Hybrid Manual Changes

- Energy and ancillary services provisions for Hybrid Resources (e.g., self commitment, solar-only mode, scheduling negative megawatts, regulation and reserves treatment same as energy storage resources, etc.)
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- Energy market must offer treatment for certain hybrids* same as Intermittent Resources and Capacity Storage Resources.

- ECOMIN cannot be less than CIRs for Hybrid Resources, achieving dispatch point within 5 minutes, Emergency Min = 0

- Settlement of charging energy from Open Loop Hybrid Resources
- Uplift eligibility