Market Participation Options for Mixed Technology Facilities (MTF)

Guidance for SIS Resources

Maria Belenky
Market Design

Interconnection Process Subcommittee

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Mixed Technology Facilities

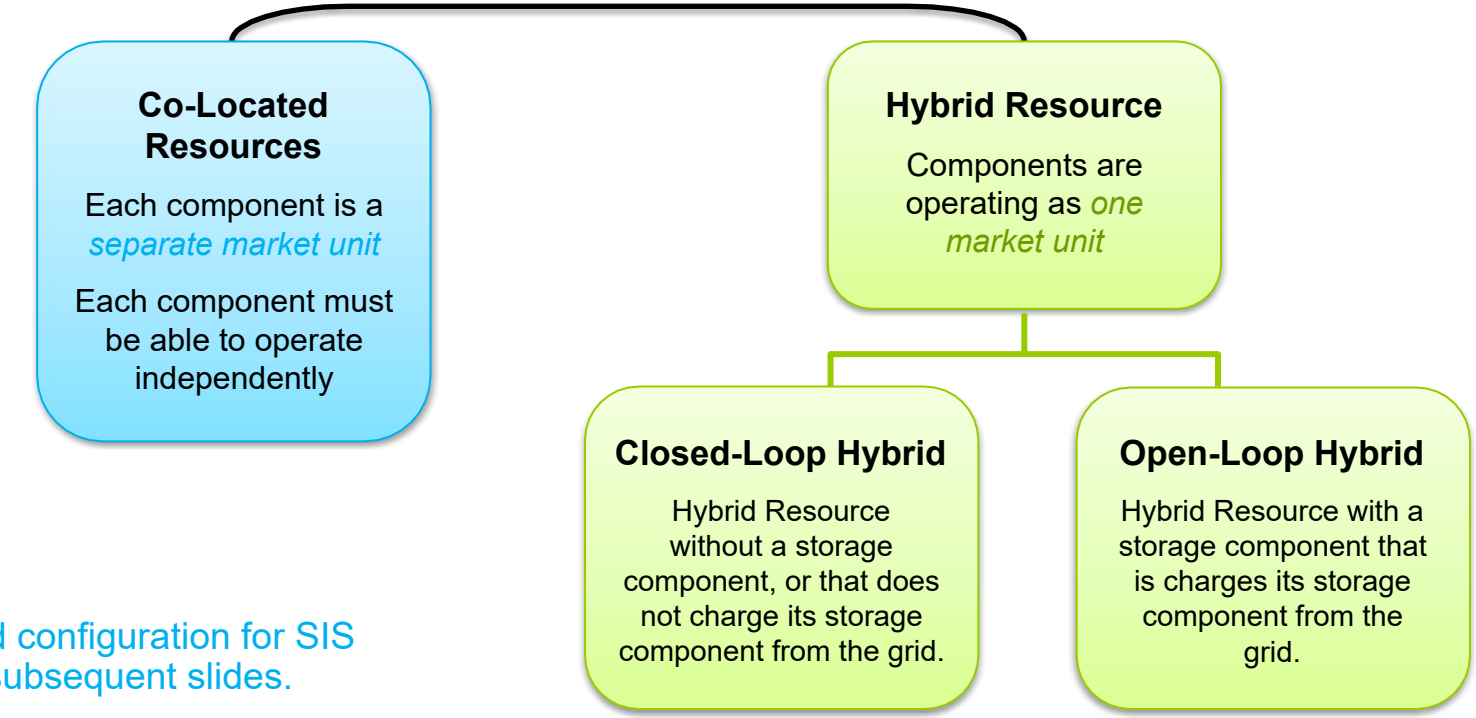
Mixed Technology Facility (MTF):

- A facility that features multiple technology types behind the same point of interconnection.
- A MTF can be formed via any interconnection process (regular queue cycle, surplus interconnection service, etc.).

Mixed Technology Facilities

Each component in a **Mixed Technology Facility** can participate in PJM markets as either an independent **Co-Located Resource*** or as part of a **Hybrid Resource**.

MARKET PARTICIPATION OPTIONS



* Limitations to the co-located configuration for SIS resources are discussed on subsequent slides.

MTF Classification Determination & Changes

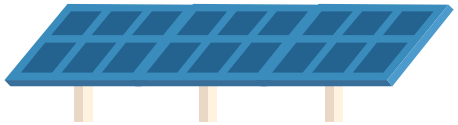
- A MTF with components that can operate independently may select to participate as ***either*** a Hybrid Resource or as multiple Co-Located Resources.
- A MTF with significant interaction between components—for example, a MTF with a storage component that cannot physically charge from the grid—may participate as a Hybrid Resource ***only***.

Selecting and updating classification:

- *All:* New resources must inform PJM of their desired participation model at least 6 months ahead of their planned in-service date by contacting Member Relations at custsvc@pjm.com.
- *Capacity resources:*
  - Classification elections and changes must be made in accordance with existing processes and deadlines as outlined in RAA Schedule 9.2.
  - The same classification must be chosen in both the capacity and energy markets for an applicable delivery year.
- *Energy-only resources:* Once elected, classification can be changed 1x per calendar year with notice to PJM by May 30 for the upcoming Jan 1 to Dec 31 participation months.

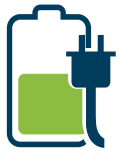
SIS Use Case 1: Inverter gen + storage

Original resource: Solar



MFO: 200 MW
CIRs: 100 MW

SIS Resource: Battery



Capability: 50 MW/200 MWh

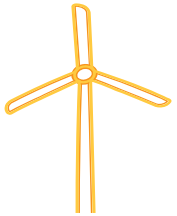
MFO: 200 MW
Capability: 250 MW
CIRs: 100 MW

- **Co-located Resources:** Solar and battery are independent market units and follow market rules for the resource type.
  - If the solar is a capacity resource, the battery may participate as energy-only OR form a Hybrid Resource with the solar.
  - The battery cannot provide capacity as a co-located resource.*
  - The site has a capacity must offer obligation based on the amount of its CIRs. The offered capacity, in ICAP, cannot exceed site MFO.
  - The site MFO cannot be exceeded in real time and must be managed by market participant.
- **Hybrid Resource:** Solar and battery operate as one market unit.
  - Hybrid Resource receives unit-specific accreditation.
  - Energy/AS market rules follow those of the ESR Participation Model.
  - PJM will not dispatch hybrid above MFO (EcoMax =< MFO).

** The original CIRs are never "unused". If the original resource is online/previously cleared in an auction, it has a capacity must offer requirement. If it is not yet online, its CIRs are not yet effective.*

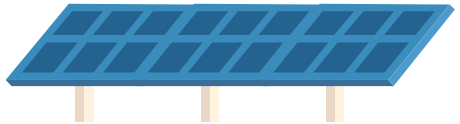
SIS Use Case 2: Inverter gen + inverter gen

Original resource: Wind



MFO: 200 MW
CIRs: 100 MW

SIS Resource: Solar



Capability: 100 MW

MFO: 200 MW
Capability: 300 MW
CIRs: 100 MW

- **Co-located Resources:** Wind and solar are independent market units and follow market rules for the resource type.
  - If the wind is a capacity resource, the solar may participate as energy-only OR form a Hybrid Resource with the wind.
  - The solar cannot provide capacity as a co-located resource.*
  - The site has a capacity must offer obligation based on the amount of its CIRs. The offered capacity, in ICAP, cannot exceed site MFO.
  - The site MFO cannot be exceeded in real time and must be managed by market participant.
- **Hybrid Resource:** Wind and solar operate as one market unit.
  - Hybrid Resource receives unit-specific accreditation.
  - Energy/AS market rules follow those of standalone wind/solar.
  - PJM will not dispatch hybrid above MFO (EcoMax =< MFO).

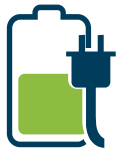
** The original CIRs are never "unused". If the original resource is online/previously cleared in an auction, it has a capacity must offer requirement. If it is not yet online, its CIRs are not yet effective.*

SIS Use Case 3: Non-inverter gen + storage

Original resource: Gas

MFO: 200 MW
CIRs: 200 MW

SIS Resource: Battery



Capability: 50 MW/200 MWh

MFO: 200 MW
Capability: 250 MW
CIRs: 200 MW

- **Co-located Resources:** Gas and battery are independent market units and follow market rules for the resource type.
  - If the gas is a capacity resource, the battery may participate as energy-only OR form a Hybrid Resource with the gas.
  - The battery cannot provide capacity as a co-located resource.*
  - The site has a capacity must offer obligation based on the amount of its CIRs. The offered capacity, in ICAP, cannot exceed site MFO.
  - The site MFO cannot be exceeded in real time and must be managed by market participant.
- **Hybrid Resource:** Gas and battery operate as one market unit.
  - Hybrid Resource receives unit-specific accreditation.
  - Energy/AS market rules follow those of the ESR Participation Model.
  - PJM will not dispatch hybrid above MFO (EcoMax =< MFO).

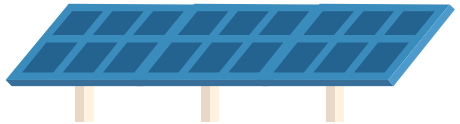
** The original CIRs are never "unused". If the original resource is online/previously cleared in an auction, it has a capacity must offer requirement. If it is not yet online, its CIRs are not yet effective.*

SIS Use Case 4: Non-inverter gen + inverter gen

Original resource: Gas

MFO: 200 MW
CIRs: 200 MW

SIS Resource: Solar



Capability: 100 MW

MFO: 200 MW
Capability: 300 MW
CIRs: 200 MW

- **This configuration can participate as co-located resources *only*.**
- **Co-located Resources:** Gas and solar are independent market units and follow market rules for the underlying resource type.
  - If the gas is a capacity resource, the solar may participate as energy-only.
  - The solar cannot provide capacity.*
  - The site has a capacity must offer obligation based on the amount of its CIRs. The offered capacity, in ICAP, cannot exceed site MFO.
  - The site MFO cannot be exceeded in real time and must be managed by market participant.

** The original CIRs are never "unused". If the original resource is online/previously cleared in an auction, it has a capacity must offer requirement. If it is not yet online, its CIRs are not yet effective.*

Contact

Chair:
Amanda Martin,
Amanda.Martin@pjm.com

Secretary:
Dave Miscavage,
Dave.Miscavage@pjm.com

SME/Presenter:
Maria Belenky,
maria.belenky@pjm.com

Interconnection Process Subcommittee

Member Hotline

(610) 666 – 8980

(866) 400 – 8980

custsvc@pjm.com

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