SRP IBR Integration and Operations Challenges

NASPI Work Group Meeting October 2024

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IBR Integration Challenges (Third Party Owned and Operated)

Background IBR Integration

- Earlier experience with small must take stand alone energy storage (20MW) and energy storage + solar (20MW solar, 10MW battery)
- September 2021 **(SRP owned and operated, Tesla maintained)**
  - 25MW/100MWhr Battery for peak shaving and energy arbitrage with added ancillary benefits.
- December 2023 **(All PPA, Third party owned and operated)**
  - Sonoran Hybrid - 260 MW solar + 260MW/1,040 MWh, 4-hour battery
  - Storey Hybrid - 88 MW solar + 88MW/264 MWh, 3-hour battery
  - Saint Hybrid – 100MW solar + 100MW/400MWh, 4-hour battery
- Summer 2024 **(All PPA, Third party owned and operated)**
  - Sierra Estrella Battery – 250MW/1000MWh, 4-hour battery
  - Superstition Battery – 90MW/360MWh, 4-hour battery
  - Granja Eleven Mile Co-Located – 300MW Solar + 300MW/1200MWh – 4-hour battery.

PMU Monitoring Value

- Early monitoring of oscillatory and abnormal behavior during commissioning.
- Controller tuning – Critical SCADA Integration – Operational vs. Monitoring
  - Particularly critical with BESS and PV plants
    - Complicated staged commissioning
    - Complicated BESS and PV controller interaction during commissioning
- Post-COD oscillation monitoring, still evaluating if there are more advanced methods for monitoring plant performance
- Need for more granular and more diverse data (possibly POW?)
  - Granular – Understand dynamic impact of commission testing
  - Diverse – Plant level data to understand dynamics of plant faults

Do utilities need internal IBR plant data from third-party owned and operated sites for reliable oversight?

IBR Integration Challenges (Third Party Owned and Operated)

SCADA Integration

- Reliable SCADA data is required before COD. SRP encountered many instances where plant SCADA data was not accurate and was interrupted after the IBR site was in operation.

Contractual Limits Accounting

- SRP working on monitoring metrics to ensure each site's Power Purchase Agreement warranty limits are tracked and accounted for.

EMT modeling challenges

- Ensuring accurate and reliable site settings and EMT models for dynamic system studies for SSO and other interactions with other IBR plants and system equipment (such as series capacitors)
- Good practice conformance to IEEE2800

Metering

- Complicated metering configuration scenarios with battery and solar hybrid or co-located sites have complicated energy accounting metering needs.
- Controller configurations not vetted and not tested (HIL) prior to field energization.

Robust IBR plant data is needed for utility reliability and contractual compliance

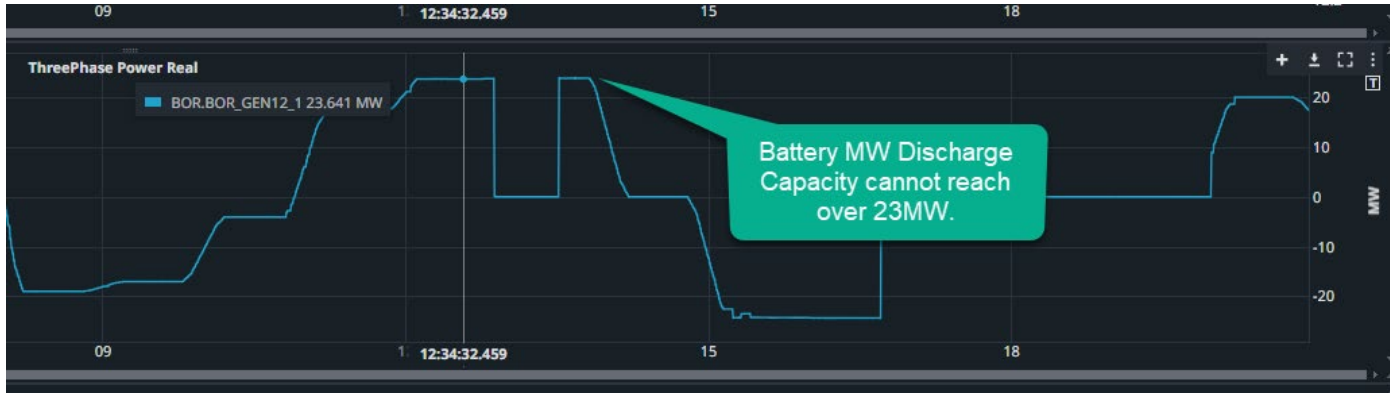
IBR Operations Challenges

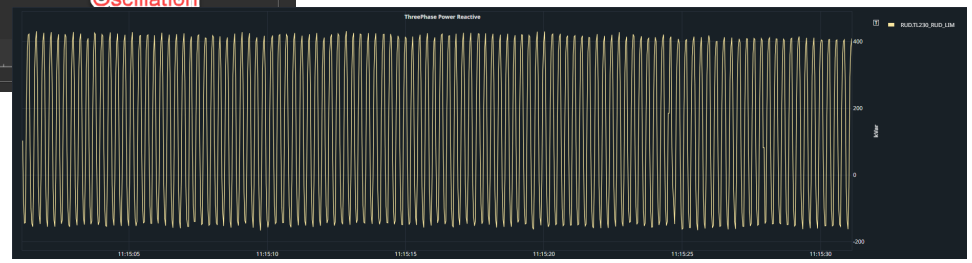
Owned and Operated

- Energy Retention and Round-Trip Efficiency challenges
- Real Power Capacity Short-Falls
  - Artificially Derate Battery to 20MW (from 25MW expected capacity)
- Numerous Summer Maintenance by Tesla – Possible Heat Related Challenges

Power Purchase Agreement (Third Party Owned and Operated)

- Large Battery Oscillations – Triggered SRP Operational Readiness project to:
  - Develop AGC Operating Procedure for Addressing Oscillations
  - Develop Online and Offline Oscillation Monitoring
- Ongoing small scale MVAR oscillations at a battery only site
- Other operating issues:
  - SRP developing contractual limit tracking
  - Telemetry outages
  - Vegetation management
  - Natural critter management – Gnats getting into inverter vents
  - Temperature settings on inverters





Dedicated Unit Managers to identify, facilitate, and mitigate IBR operational challenges

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Questions?