NASPI Novel Applications for Synchronized Power Instrumentation

A DOE-EPRI Joint Initiative

IBR Performance Response and Analytics Monitoring (IPRAM) Task Force

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Inverter-Based Resource Performance Monitoring and Analysis Overview

Shift in Grid Dynamics

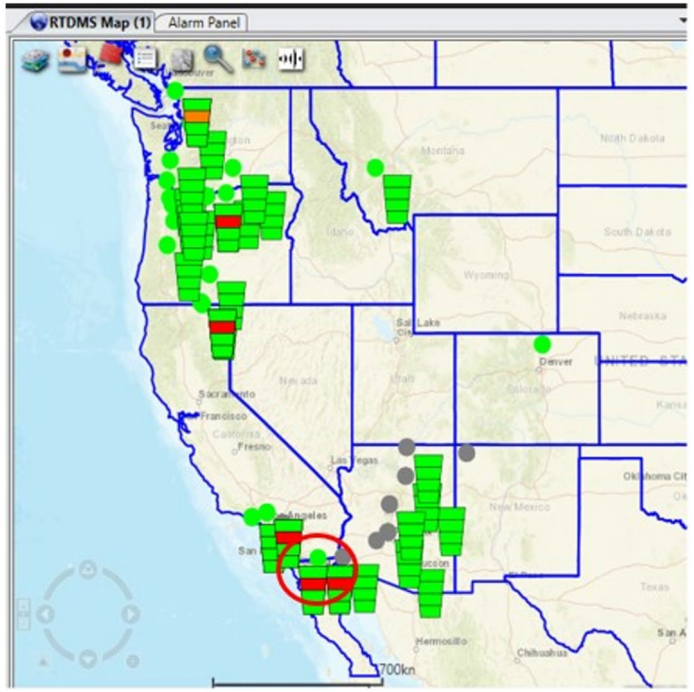
Increasing renewable energy penetration changes grid behavior, requiring new monitoring approaches for inverter-based resources.

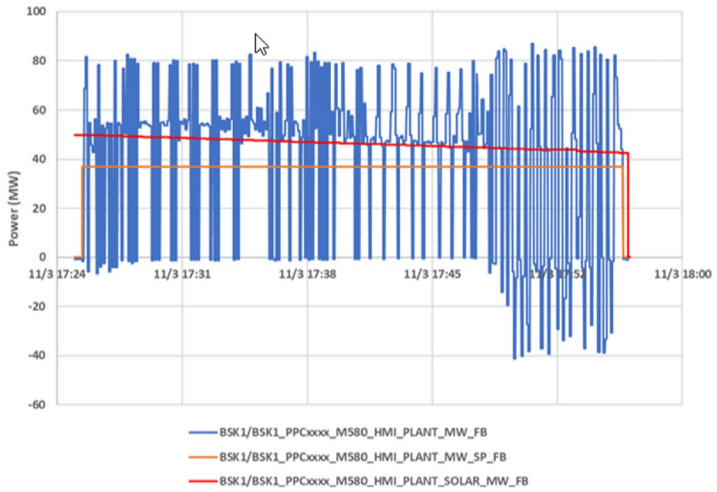
Operational and Regulatory Necessity

Advanced IBR performance monitoring is essential for compliance, situational awareness, and grid reliability.

Post-event Analysis and Mitigation

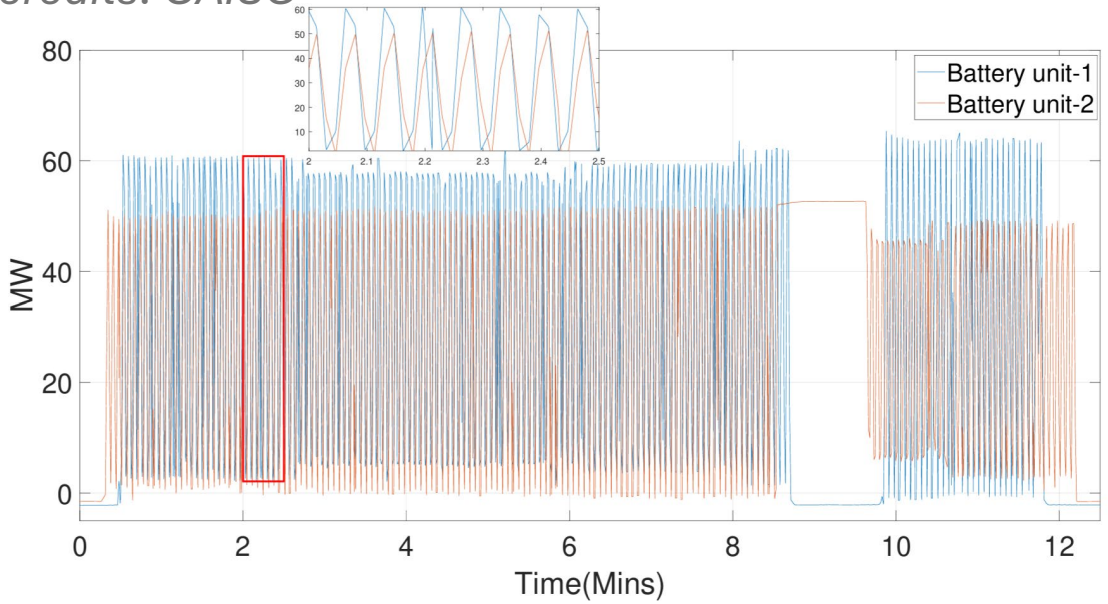
Post-event NERC analyses indicate gaps in the availability of high-resolution, time-synchronized measurements at both plant-side and grid-side POIs, which delayed root-cause analysis and the design of effective mitigation measures.





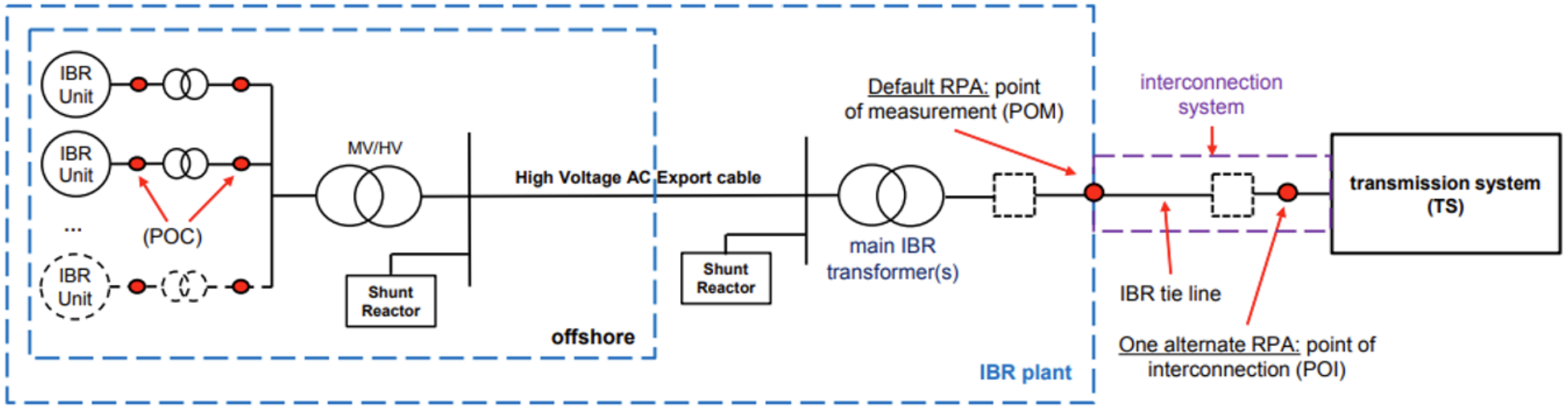
BESS induced oscillation, 2023. Image credits: SRP

BESS induced forced oscillation in WI, 2022. Image credits: CAISO

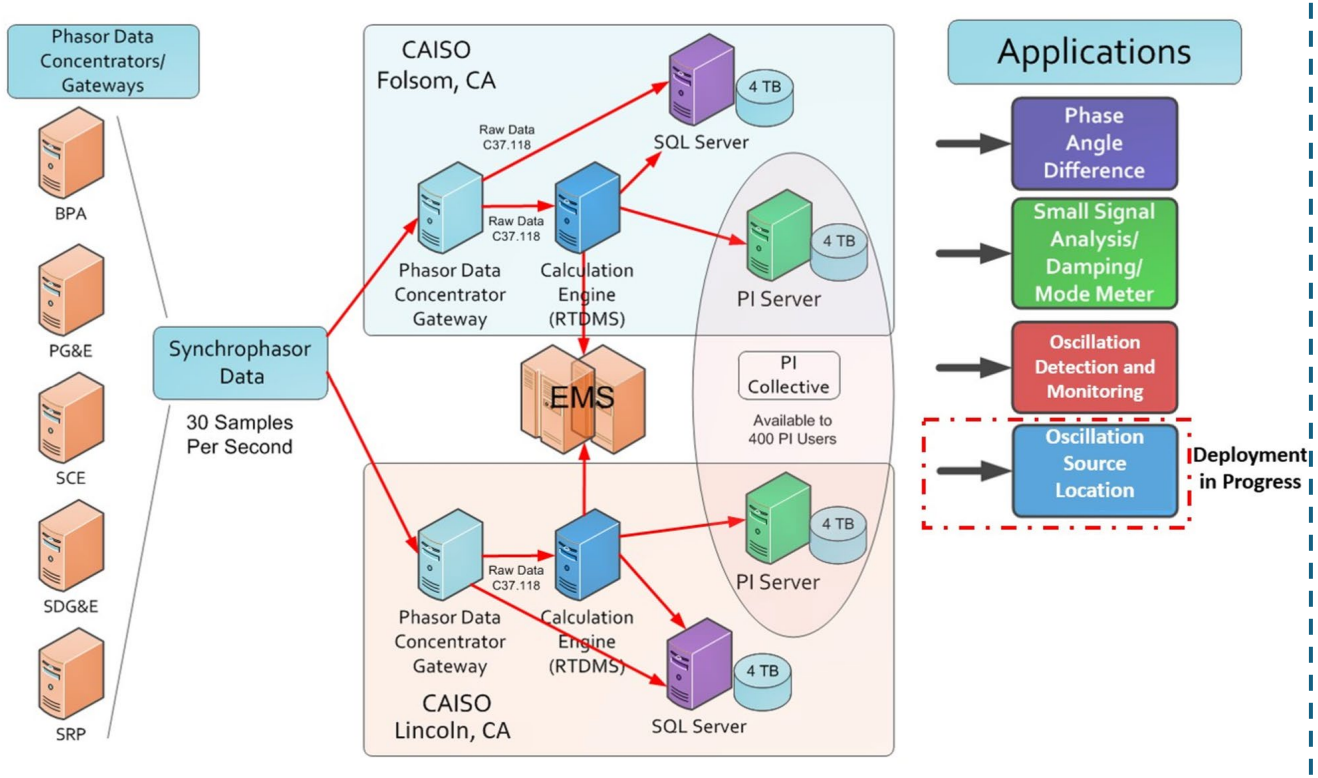


Monitoring Locations and Sampling considerations

- Distinctions between the point of measurement (POM), point of interconnection (POI), and reference point of applicability (RPA) for IBR performance requirements.
- Measurement Types and Sensors – effective monitoring requires multiple measurement types - namely phasor, waveform, and status signals
- Measurement Resolution – PMUs 30/60 frames per second, waveform measurement (in variations of kHz)
- Continuous vs triggered Data acquisition – setting of triggers to monitor waveform data.



Utility Perspectives – Case Studies in Measuring IBR-Driven Grid Behavior



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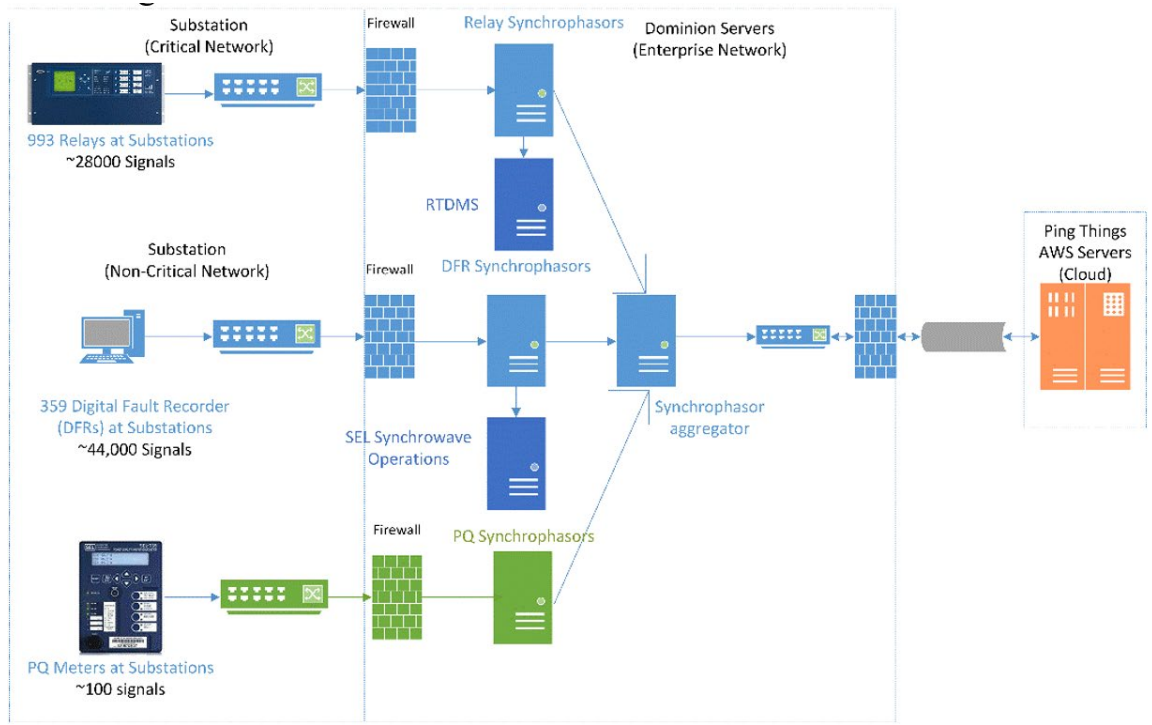
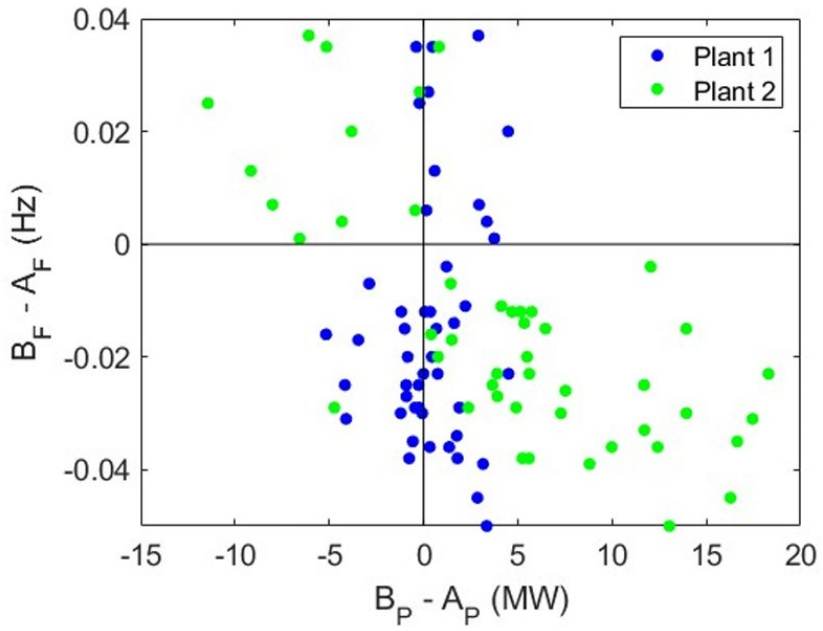


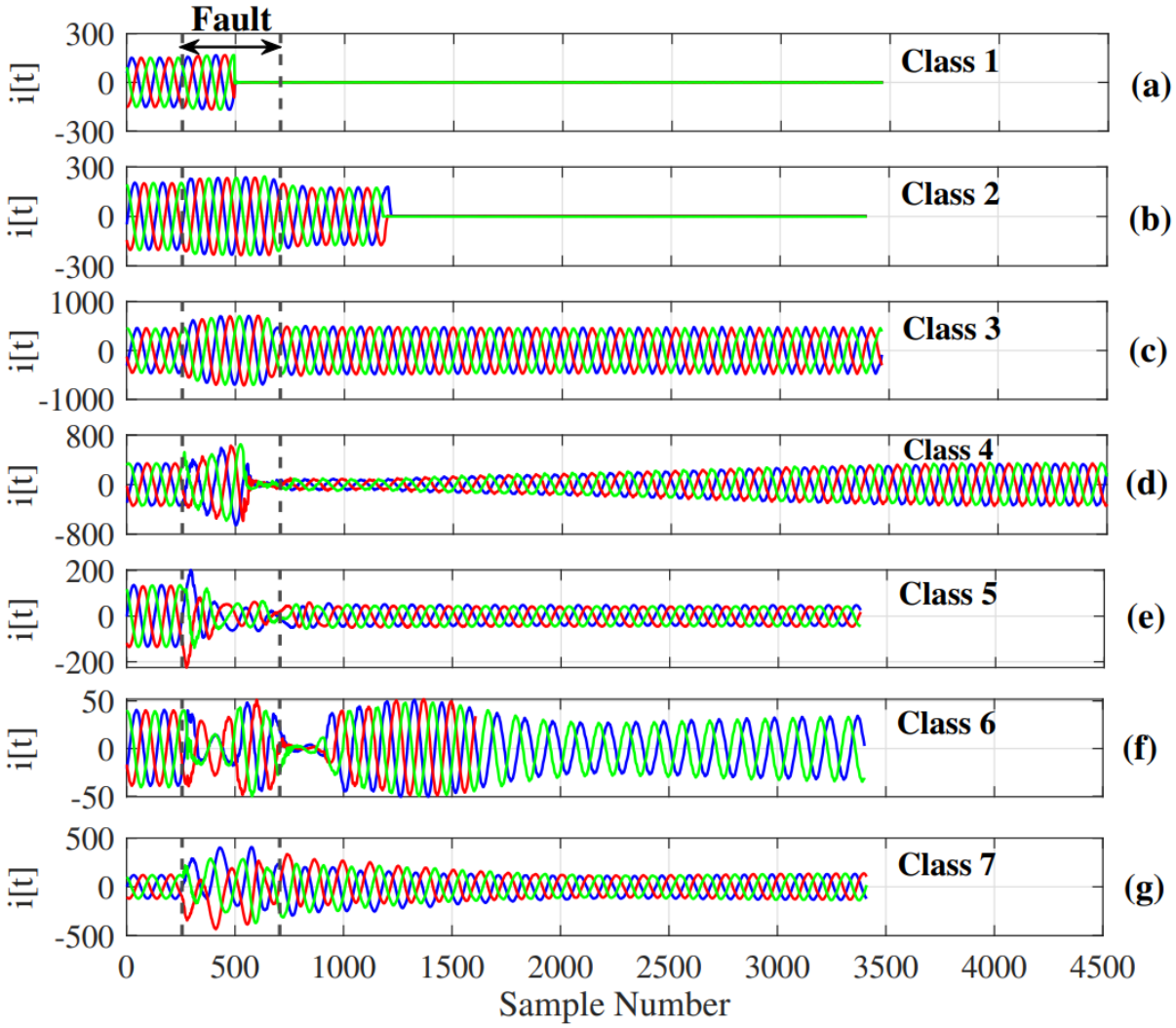
Image credits: Dominion Energy

Analytical methods for IBR performance evaluation

Use of pattern recognition to observe IBR response to faults using POW data (across)

Generator scorecard to observe plant performance using PMU data (below)





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Thank you

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