

GRID EMT

SIMULATION INITIATIVE

Streamlining EMT Studies Using PSAPPS

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About Nayak

- Established in 1999, located in Princeton, New Jersey, USA
- Independent representatives for



PSCAD EMT Simulator from Manitoba Hydro International



RTDS real-time digital simulator from RTDS Technologies



DSATools from PowerTech Labs



Linear Power Amplifiers from Spitzenberger and Spies

- Provides sales, support, and training
- PSCAD and RTDS System study consulting services

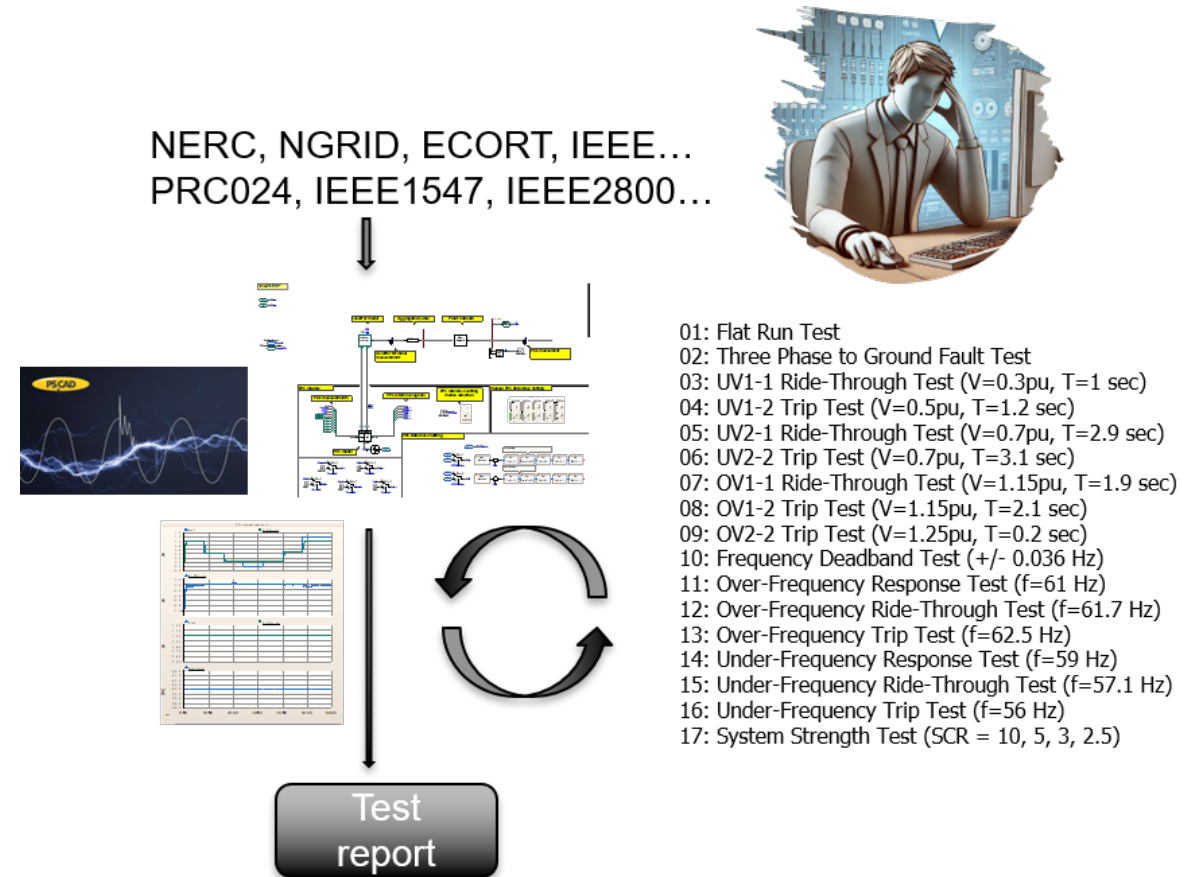


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Motivation

- EMT studies are becoming a repeatable workload
 - The challenge is not one simulation — it is the repeated process around it. IBR interconnection study
 - ERCOT, PJM, IEEE 2800
 - PSCAD, PSSE Benchmark
 - OEM Model Development etc.
- Goal: Convert repeatable engineering operations into preconfigured, reviewable, and reusable workflows.



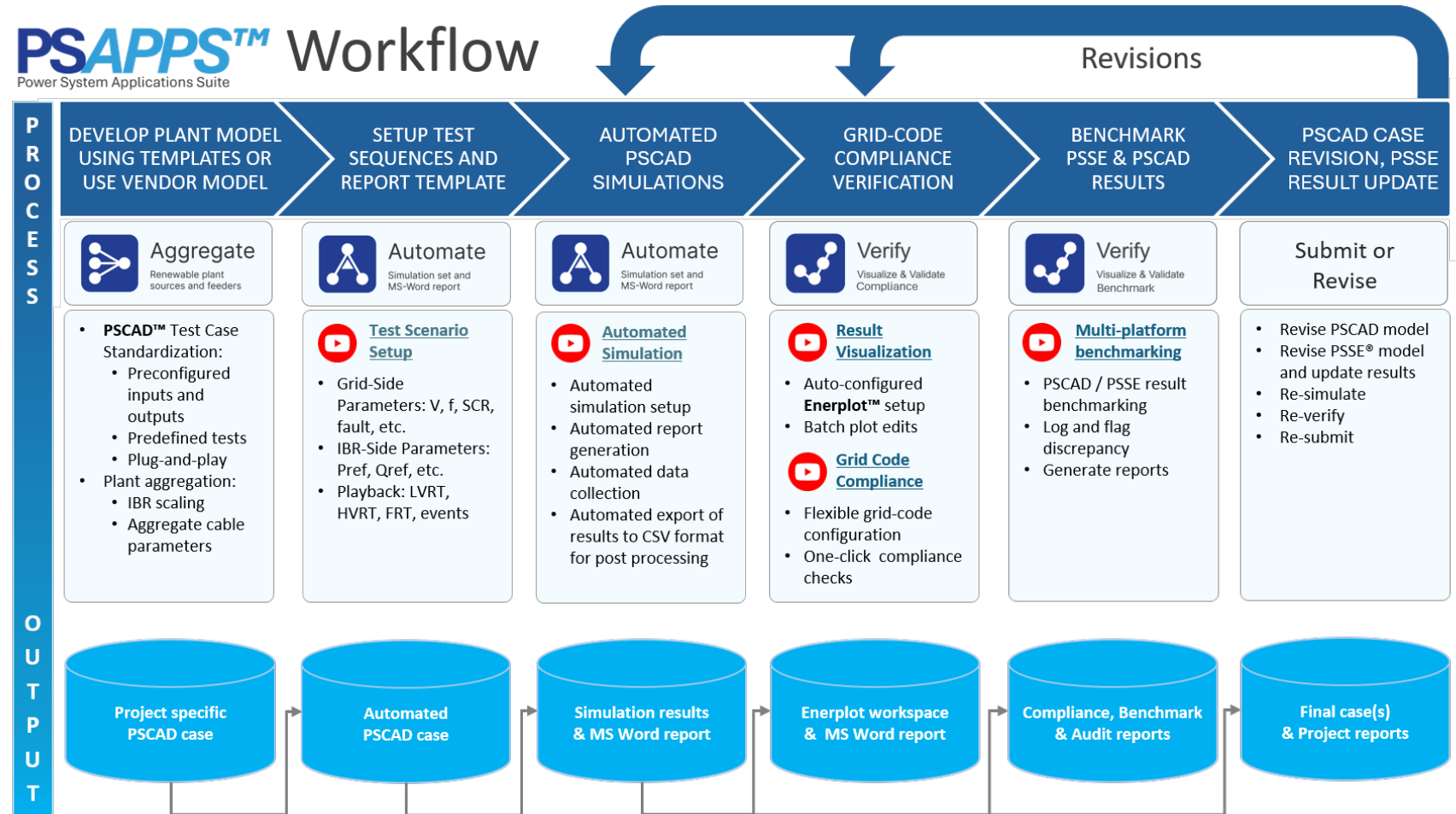
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Approach

A single workflow connects:

1. Model preparation
2. Automated PSCAD™ simulations
3. Results Visualization
4. Grid-code verification
5. Multi-platform benchmarking, and revisions

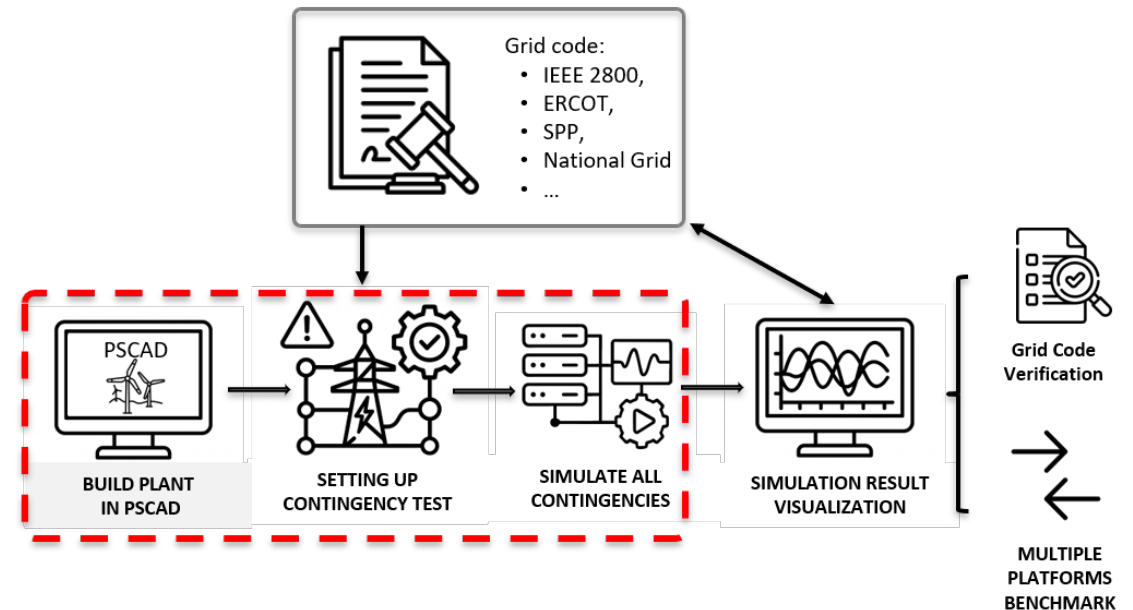


PSCAD™ is a trademark of Manitoba Hydro International Ltd. used under trademark license
PSS®E is a trademark of Siemens Technologies



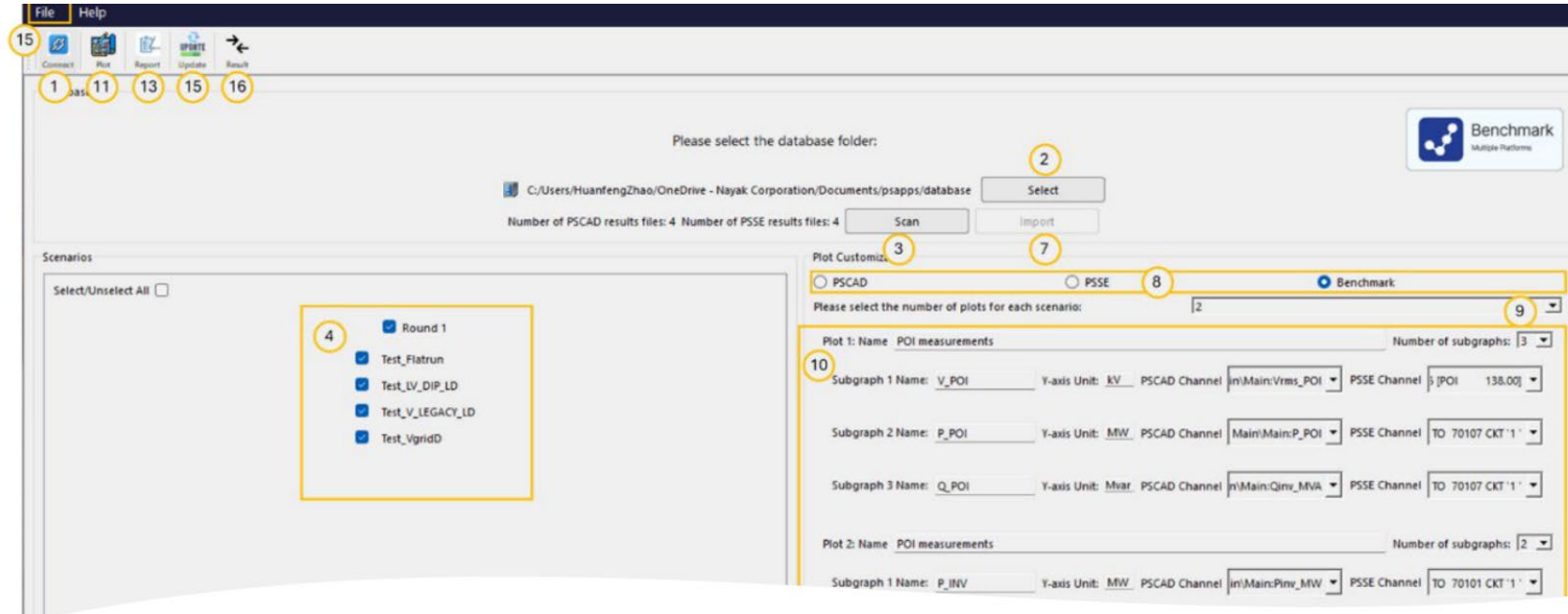
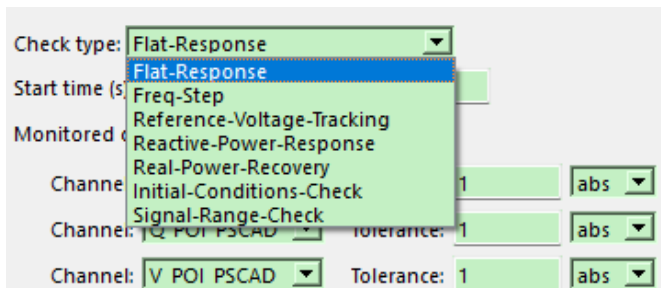
Approach - Automate

- Develop Plant Model
 - Use **standardized** templates or vendor-provided models
 - Include IBR scaling and cable aggregation (via PSAPPS-Aggregate)
- Configure Test Sequences & Report Template
 - Setup **preconfigured** inputs, outputs, and predefined tests
 - Define project-specific PSCAD test cases
- Automated PSCAD Simulations
 - **Auto-generate** simulation setup
 - Enable test scenario setup (grid parameters, LVRT, HVRT playback)
 - Execute **parallel simulation** runs and batch operations



Approach - Verify

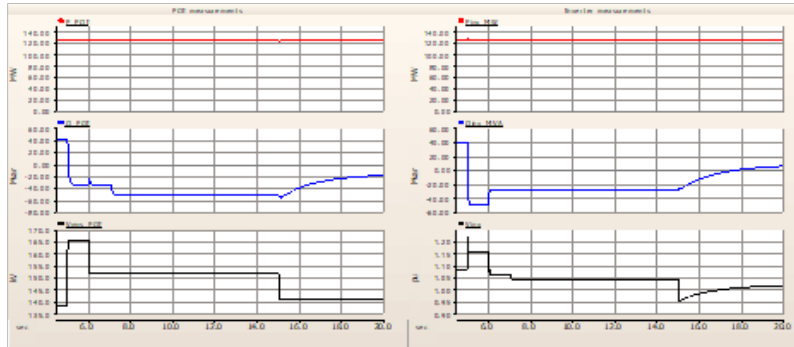
- Visualization & Reporting
 - GUI-driven Enerplot configuration
 - Batch plot edits and CSV data export
 - Generate and revise MS Word or compliance reports effortlessly
- Grid Code Compliance Verification
 - Modular test “blocks”
 - Drag-and-drop configuration:
 - Shareable templates (.vrf files):
 - Ongoing maintenance in your hands.
 - Generate audit and compliance reports



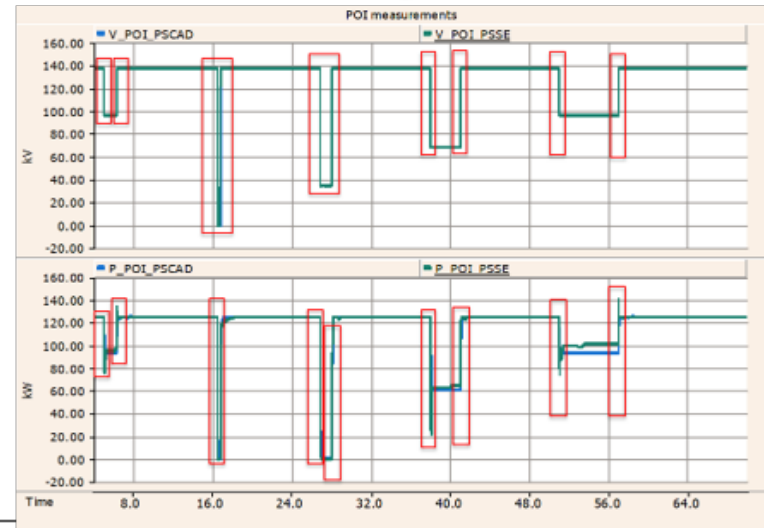
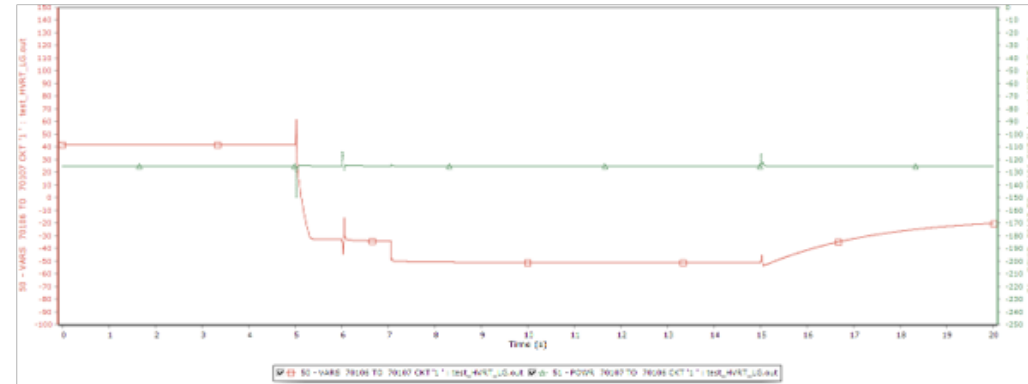
**Automatic Result
Visualization with Enerplot**

Approach - Benchmark

PSCAD

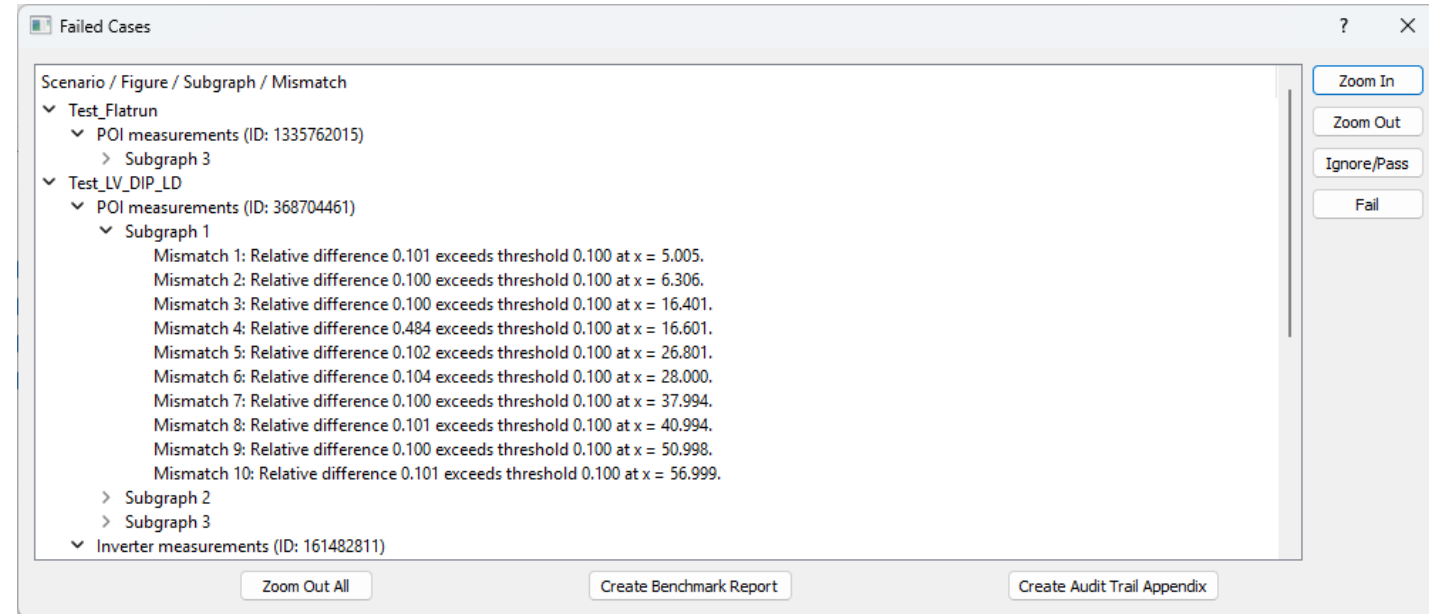


PSSE



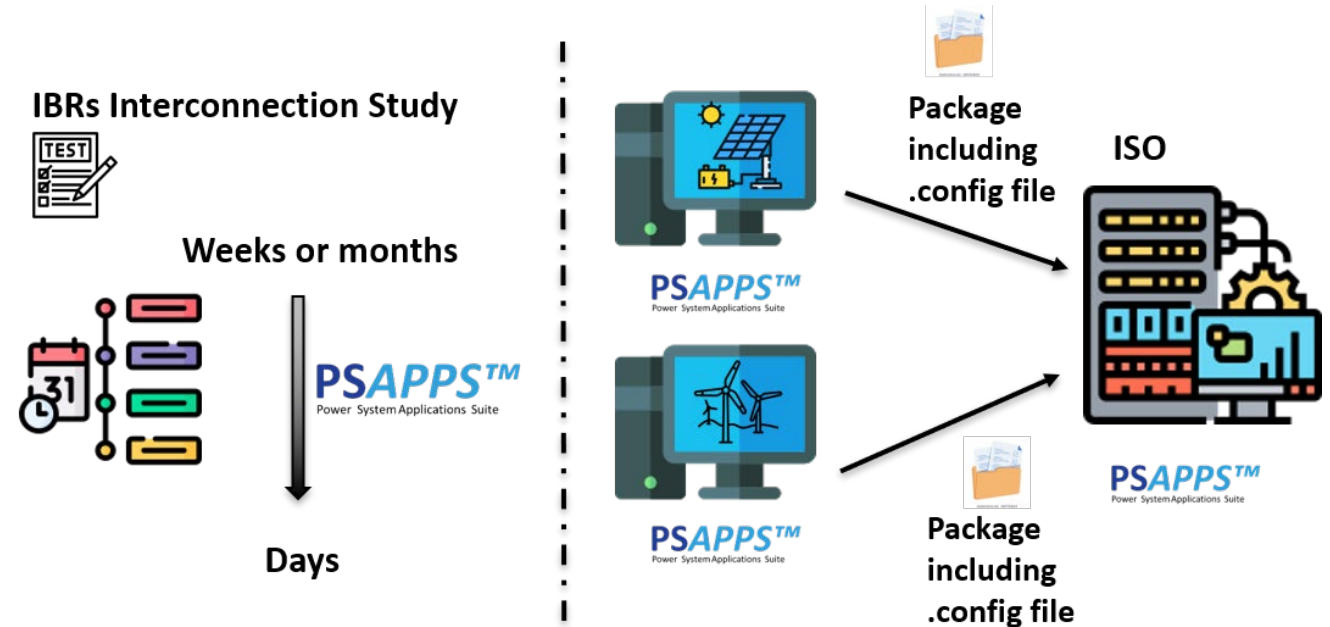
Approach – *Benchmark contd...*

- Discrepancy-finding engine.
 1. Import PSCAD and PSSE results using shared channels and naming logic.
 2. Overlay comparable responses and flag mismatches automatically.
 3. Generate benchmark and audit reports for review.
 4. Update PSCAD/PSSE models, re-run, re-verify, and resubmit.



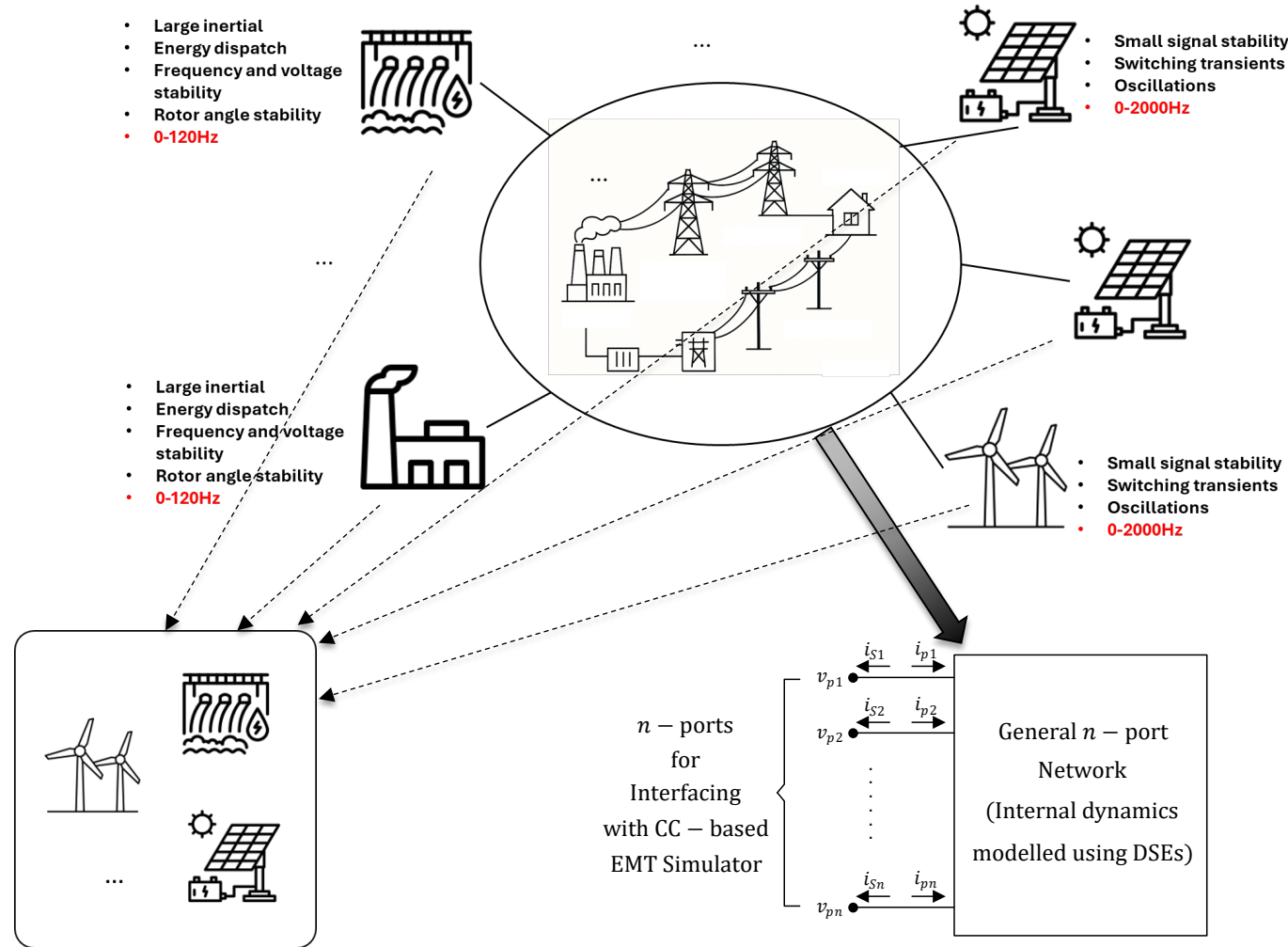
Results

- The workflow changes the engineering effort profile.
 1. Study turnaround can move from weeks/months toward days when templates and configurations are mature.
 2. Engineers spend less time on repetitive setup, plotting, and formatting.
 3. Saved configurations create a reproducible audit trail for future revisions.
 4. Vendors and ISOs can exchange a package that includes models, results, and configuration files.



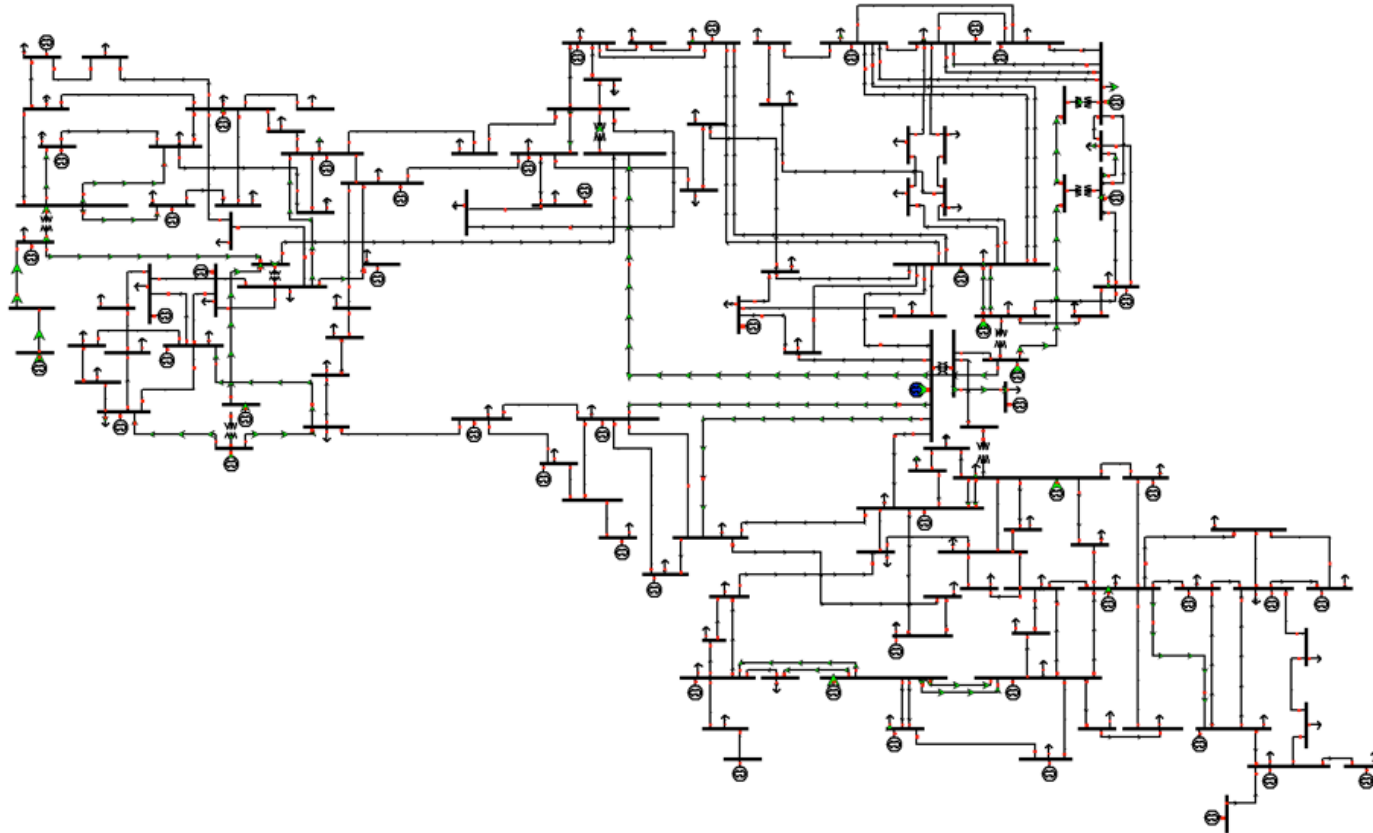
- Vendors: Can simply submit the PSCAD and PSSE files to the ISO along with the package including .config files.
- ISO: Regenerate the results using PSAPPS and export them to the data folder. Then, use the preconfigured benchmark tool (by .config file) to verify grid code compliance identify all mismatches and provide the vendor with a report of deficiencies automatically recorded in the audit trail.

Approach - Frequency Selective Network Reduction

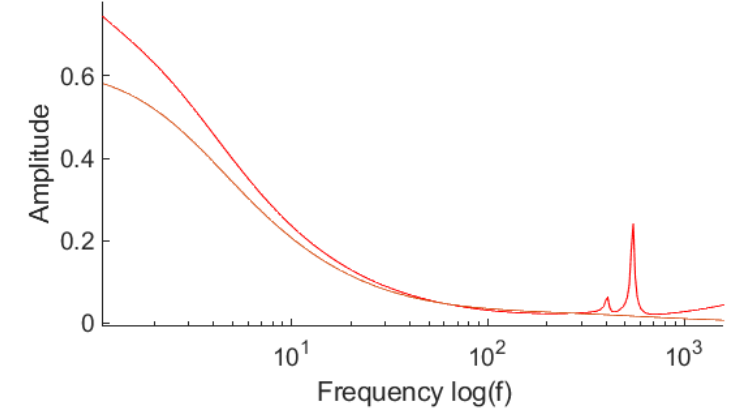


Test Case

IEEE 118 BUS

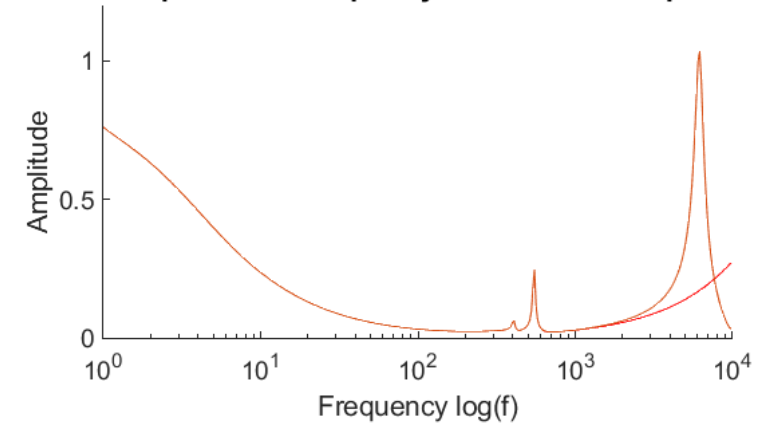


Amplitude vs Frequency for The Selected port



60 Hz

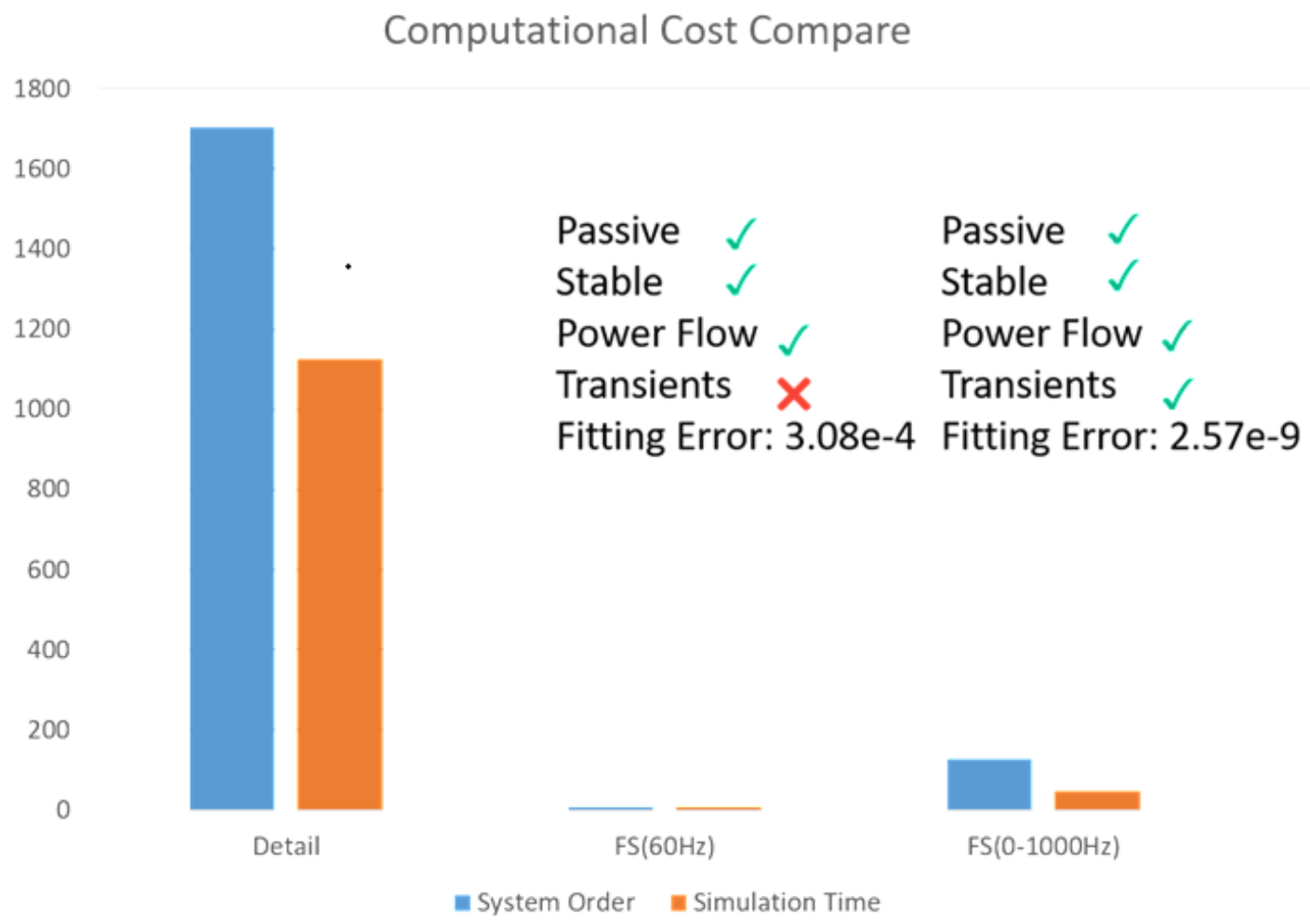
Amplitude vs Frequency for The Selected port



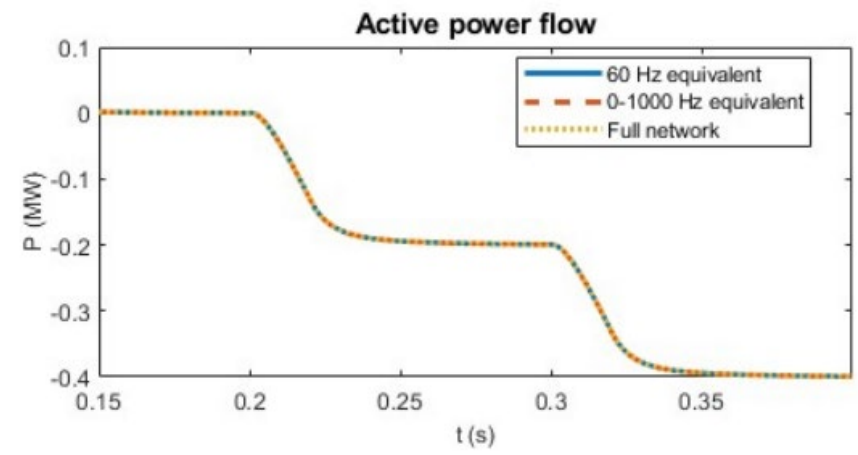
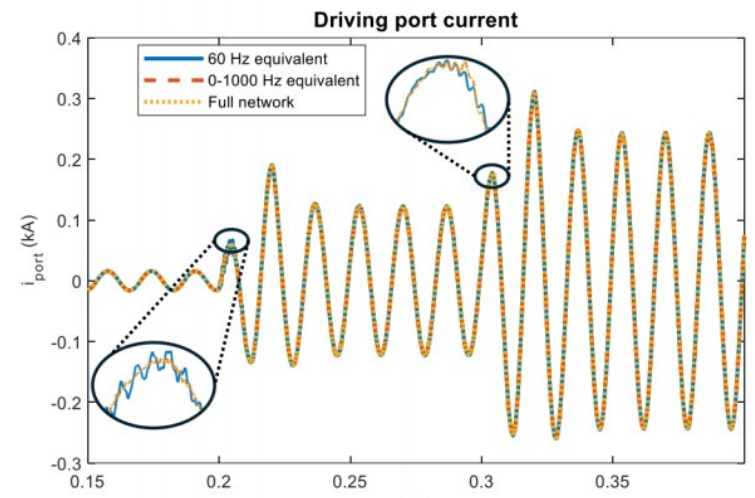
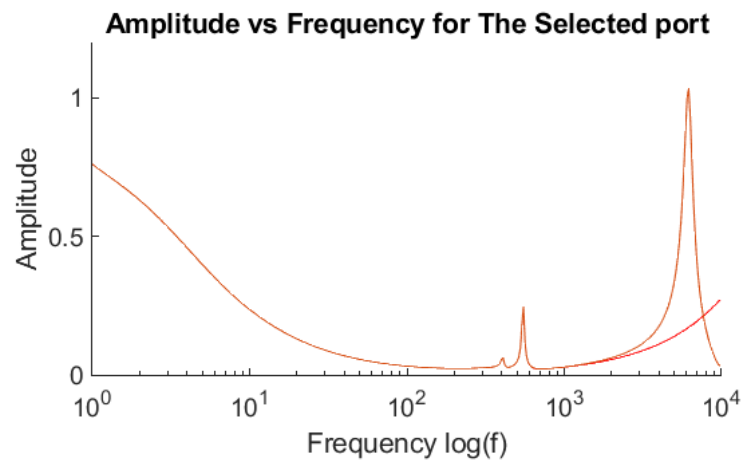
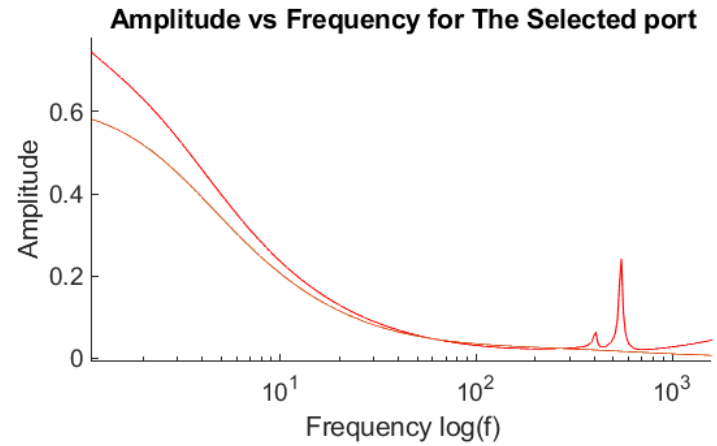
0-1000 Hz



CPU Time Comparison Results



Simulation Results



Conclusions

- PSAPPS turns EMT studies into a managed workflow
 1. Standardization enables automation
 2. Automation improves repeatability
 3. Verification creates auditable evidence
- Best fit: Recurring interconnection model quality tests, compliance checks, and platform benchmarking.
- Important:
 - Engineering judgment remains essential for model assumptions.
 - Empower power system engineers to focus on solving critical power system problems.



Lesson Learned

- Understand real needs
 - Actively participate in practical projects
 - Engage in working group discussions
 - Listen to utility feedback
- Communicate with software developers
 - Very helpful for overcoming technical challenges
 - Report suggestions and bugs to help improve the tool for the broader community



Thank you

<https://www.nayakcorp.com/psapps>

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