

**NERC**

NORTH AMERICAN ELECTRIC  
RELIABILITY CORPORATION

# Project 2022-04 EMT Modeling

Dan Kell, Global Director - eGRID

Session 3A: FERC 901

March 18<sup>th</sup>, 2025

- **Background**

- The bulk power system (BPS) in North America is undergoing a rapid transformation towards high penetrations of inverter-based resources.
- Transmission Planners (TP) and Planning Coordinators (PC) are concerned about the lack of accurate modeling data and the need to perform electromagnetic transient (EMT) studies during the interconnection process and long-term planning horizon.
- The growth of inverter technology has pushed conventional planning tools to their limits in many ways, and TPs and PCs are now faced with the need to conduct more detailed studies using EMT models for issues related to inverter-based resource integration issues.

- Purpose/Industry Need

- As the scope of this project relates to Milestone 3 Standards Development projects, but has no assigned FERC directives from Order No. 901, this project will be developed in tandem with Milestone 3 projects, but is not considered a Milestone 3 project.
- This project is to address the reliability risks presented to the BPS due to the observed systemic deficiencies in IBR performance and modeling, as well as creating opportunities for improvement to enhance generator interconnection requirements and study processes through enhancements to FAC-001 and FAC-002.
- This project will continue to address the reliability-related need and benefit by ensuring TPs and PCs have the models and tools necessary to adequately conduct reliability assessments under increasing levels of inverter-based resources. This requires the collection of EMT models by applicable entities and TPs and PCs to conduct EMT studies where needed.

- SAR accepted on July.19th, 2023
- Great team from all sectors (and countries)

| Name                     | Entity                                 |
|--------------------------|--|
| Dan Kell(chair)          | Hatch Ltd                              |
| Michael Marz(vice-chair) | American Transmission Company, LLC     |
| Tayeb Meridji            | Orsted                                 |
| Nandaka Jayasekara       | Manitoba Hydro                         |
| Lukas Unruh              | Electranix Corp                        |
| Ali Goharrizi            | ERCOT                                  |
| Martin Fecteau           | Hydro Quebec                           |
| Christian Jegues         | RTDS Technologies, Inc.                |
| Byoungkon Choi           | PJM Interconnection, LLC               |
| Babak Badrzadeh          | Aurecon Group                          |
| Ebrahim Rahimi           | California Independent System Operator |

- Submitted FAC-002 for industry feedback Q1/2025
- The drafting team to move ahead to start making revisions to MOD-32
- Other items that came up during the drafting team efforts:
  - IRPS submitted to the RSTC a SAR for Revisions to FAC-001-4 and FAC-002-4 (see attachment from RSTC agenda) on September 11, 2024. The SAR is currently in commenting period. The SAR is anticipated to be presented to the SC in December 2024 instead of November 2024. Upon approval the SAR is expected to be assigned to Project 2022-04 EMT Modeling Drafting Team in December.
    - Our team declined this SAR given the teams lack of experience in commissioning
- As part of FERC 901, Project 2022-04 is anticipated to be a Milestone 3 project

- Have circulated FAC-002 Feedback Questions for Industry review:
- Do the proposed edits to FAC-002 ensure that the interconnection study process is clear on the modeling and study requirements needed to ensure reliable operation of the BPS, inclusive of EMT modeling and studies? If you do not agree, or if you agree but have comments or suggestions, please provide your explanation.
- Do the proposed edits to FAC-002 address the need to collect EMT models and perform EMT studies without impacting the existing FAC-002 requirements? If you do not agree, or if you agree but have comments or suggestions, please provide your explanation.
- Do the proposed edits to FAC-002 Requirement R7 ensure that EMT models are made available to TPs and PCs during the interconnection study process? If you do not agree, or if you agree but have comments or suggestions, please provide your explanation.
- Do the proposed edits to FAC-002 Requirements R8 and R9 ensure that EMT model quality issues are resolved prior to commercial operation? If you do not agree, or if you agree but have comments or suggestions, please provide your explanation.

- Mostly favourable comments
- Most concerns are around the timing of the models and the impact on including EMT modeling into the process

- We have been doing this in HVDC & FACTS for years
  - SVC PSCAD Model Validation Testing in Manitoba
    - D. Kell, D. Jacobson, G. Oheidhin, Cigre Canada, 2007

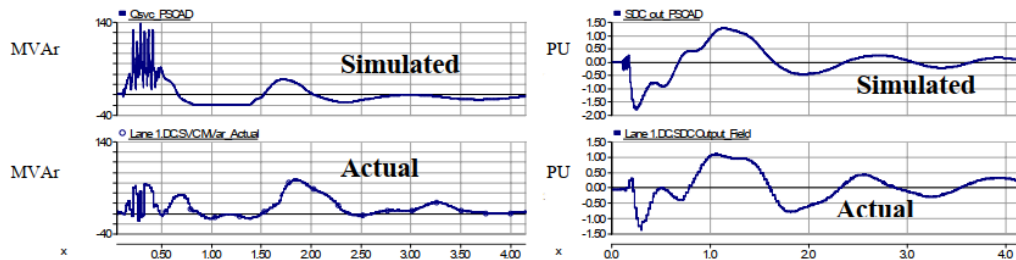


Figure 6. P18H staged line fault test results with protection modeled.

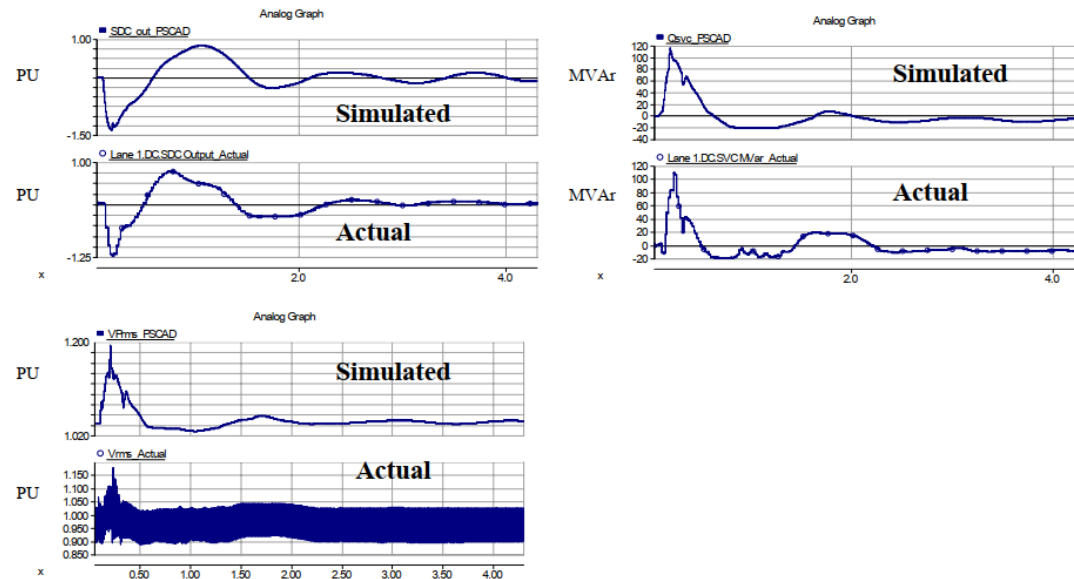


Figure 4. P18H open line test results.

- NEW ZEALAND HVDC POLE 3 PROJECT TESTING APPROACH AND CHALLENGES
  - Daniel Crawshay, Willie Otto, Richard Sherry Dan Kell, Cigre Canada 2015

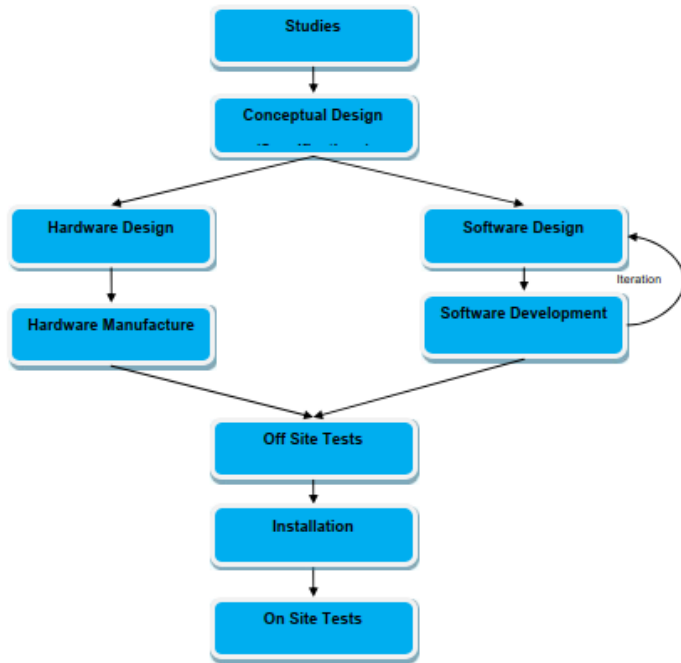


Figure 2 Testing Approach

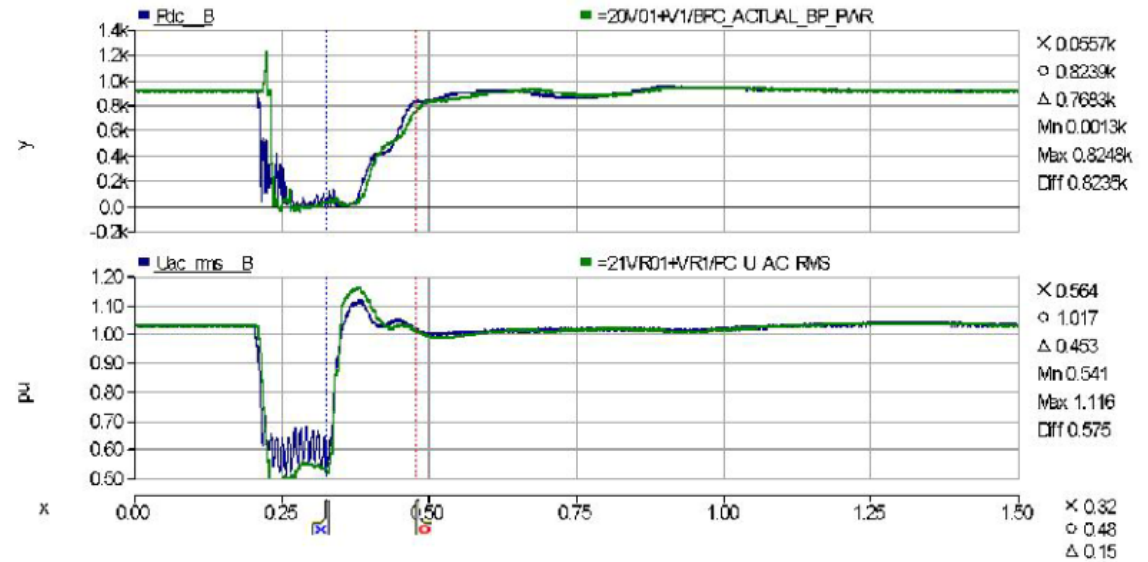


Fig. 8 : Bipole DC Power flow and inverter AC voltage- comparison of actual control system and PSCAD model response : for a phase to phase fault at the Inverter converter substation



# Questions and Answers