NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

EMT Modeling

NERC Project 2022-04

NERC Project 2022-04 Webinar
Project 2022-04 Drafting Team Members
June 2025

Administrative

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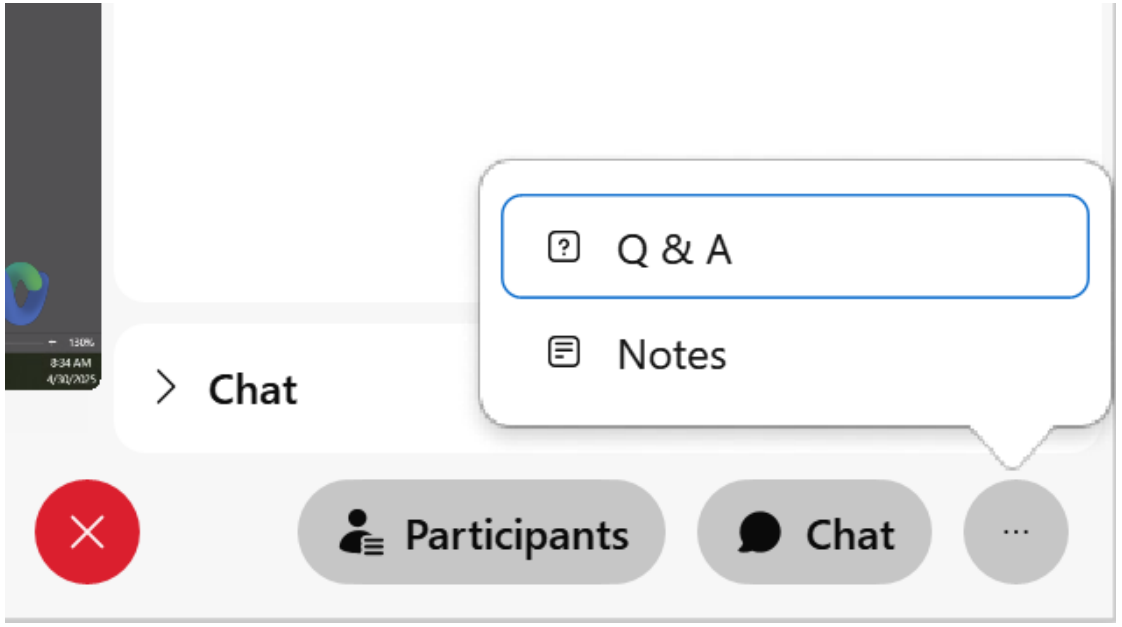
- Webinar Recording
  - This webinar is being recorded and will be posted to the NERC website.

Agenda

- Drafting Team Member Introduction
- Project Overview
- FAC-002 Revisions
- Implementation Plan
- Resources
- Q&A

Q&A



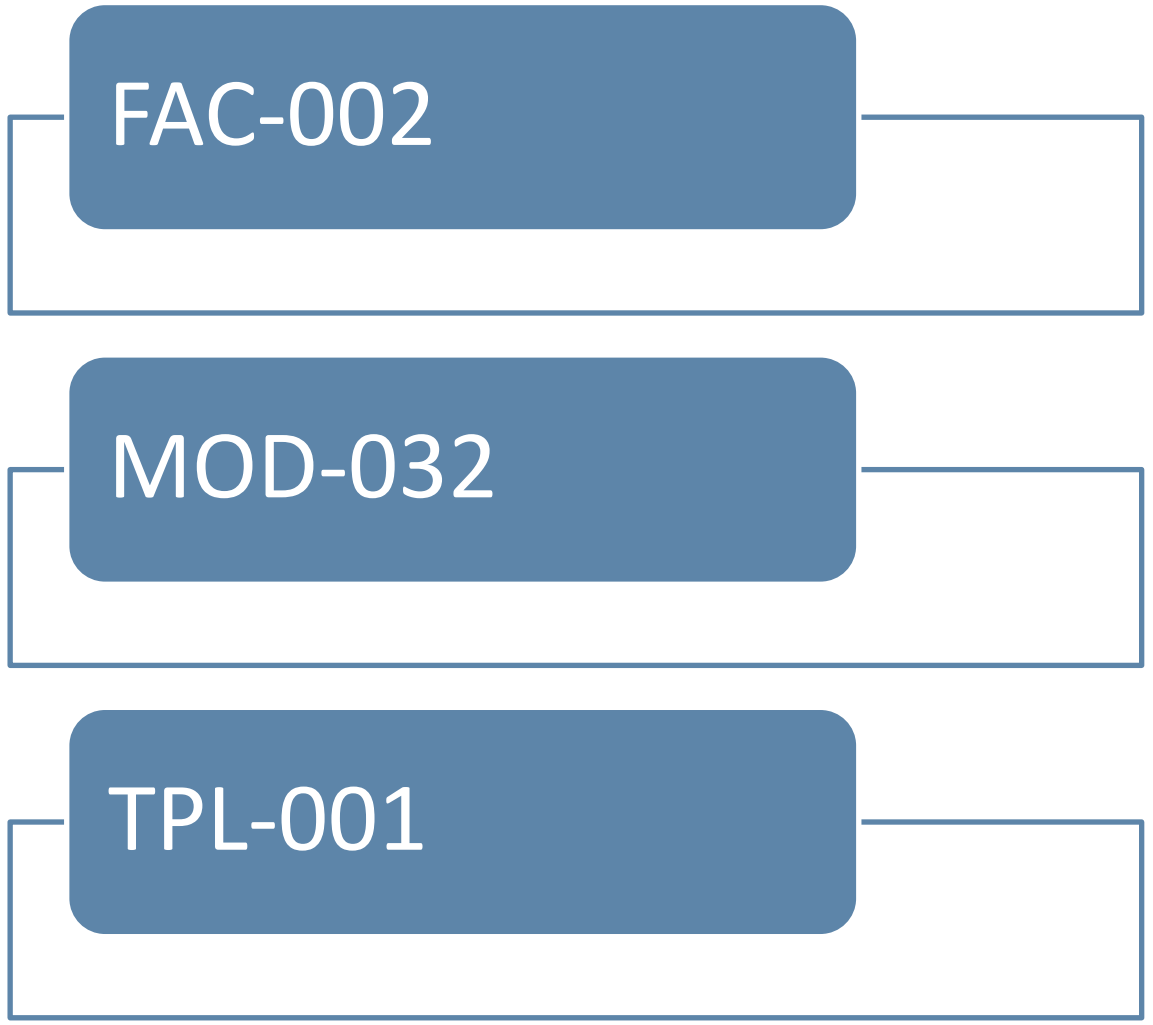
Enter ALL questions in the Q&A box

Drafting Team Members

	Name	Entity
Chair	Dan Kell	**Hatch Ltd**
Vice Chair	Michael Marz	**American Transmission Company, LLC**
Members	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	**Etik Energy**
	Ebrahim Rahimi	**California Independent System Operator**

Project Summary

- June 2022 - NERC Inverter Based Resource Performance Subcommittee (IRPS) SAR
  - Perform electromagnetic transient (EMT) studies during the interconnection process and long-term planning horizon
  - Specify requirements to incorporate EMT modeling and EMT studies, where needed
  - Ensure accurate models are provided by applicable entities and corrections to modeling errors are addressed in a timely manner.



Enhancements

- TP and PC Conduct EMT Studies Where Necessary
- Ensure Accurate Models are Provided and Verified Prior to Commercial Operation
- Clarify Requirements on Applicable Entities Providing Accurate Models

A. Introduction

1. **Title:** **Facility Interconnection Studies**

2. **Number:** FAC-002-~~4~~5

3. **Purpose:** To study the impact of interconnecting new or changed Facilities on the Bulk Electric System.

4. **Applicability:**

   4.1. Functional Entities:

   4.1.1. Planning Coordinator

   4.1.2. Transmission Planner

   4.1.3. Transmission Owner

   4.1.4. Distribution Provider

   4.1.5. Generator Owner

   4.1.6. Applicable Generator Owner

   4.1.6.1. Generator Owner with a fully executed Agreement to conduct a study on the reliability impact of interconnecting a third party Facility to the Generator Owner's existing Facility that is used to interconnect to the Transmission system.

   4.2. Facilities:

   4.2.1. BES Facilities

5. **Effective Date:** See Implementation Plan for Project ~~2020-05~~2022-04.

FAC-002-5 Requirement R1

R1. Each Transmission Planner (TP) and each Planning Coordinator (PC) shall jointly study the reliability impact of: (i) interconnecting new generation, transmission, or electricity end-user Facilities and (ii) existing interconnections of generation, transmission, or electricity end-user Facilities seeking to make a qualified change as defined by the Planning Coordinator under Requirement R6. Each Transmission Planner and Planning Coordinator shall jointly~~The following shall be studied~~: *[Violation Risk Factor: Medium] [Time Horizon: Long-term Planning]*

1.1. Specify steady-state, short-circuit, phasor-domain dynamics, and electromagnetic transient (EMT) modeling requirements, as applicable, for generation, transmission, and electricity end-user Facilities.

1.1.1. a documented process for collecting models, and

1.1.2. documentation needed to support EMT model review per Requirement R8.

1.2. Establish and maintain a documented process to determine the necessity of steady-state, short-circuit, and phasor-domain-based and/or EMT-based dynamic studies for evaluating the reliability impact of the new interconnection, or existing interconnection seeking to make a qualified change as defined by the Planning Coordinator under Requirement R6;

FAC-002-5 Requirement R1 con't

~~1.1.~~1.3. Evaluate the reliability impact of the new interconnection, or existing interconnection seeking to make a qualified change as defined by the Planning Coordinator under Requirement R6, on affected system(s);

~~1.2.~~1.4. Evaluate ~~A~~adherence to ~~applicable NERC Reliability Standards; regional and~~the Transmission Owner ~~planning criteria; and~~ Facility interconnection requirements for coordinated studies;

~~1.3.~~1.5. Perform ~~S~~steady-state, short-circuit, and dynamics studies, utilizing phasor domain and/or electromagnetic transient (EMT) simulation tools as necessary per TP's and PC's defined processes, to evaluate system performance under both normal and contingency conditions; and

~~1.4.~~1.6. Document ~~S~~study assumptions, system performance, alternatives considered, and coordinated recommendations. While these studies may be performed independently, the results shall be evaluated and coordinated by the entities involved.

FAC-002-5 Requirement R7

R7. Each Generator Owner or Transmission Owner seeking to interconnect new generation Facilities or transmission Facilities, or existing Facilities seeking to make a qualified change to existing Facilities as determined by the Planning Coordinator under Requirement R6, shall: *[Violation Risk Factor: Lower] [Time Horizon: Long-term Planning]*

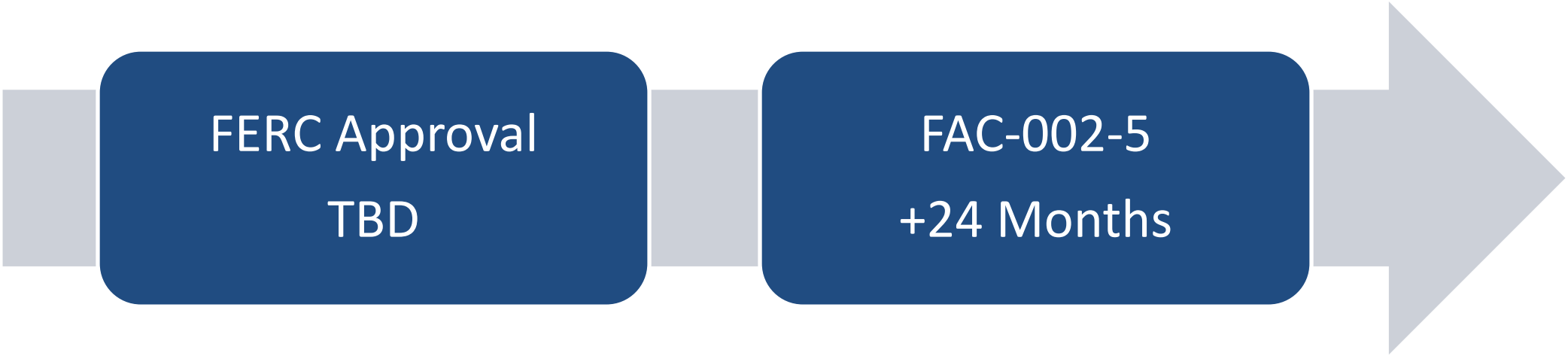
7.1. provide EMT models in accordance with the Transmission Planner and Planning Coordinator's modeling requirements per required schedule as set in Requirement R7, and

7.2. issue a final attestation to the Transmission Planner and Planning Coordinator based on their required schedule, stating that the EMT models studied match the control modes, settings, protections, and performance of the installed equipment[1]. This attestation shall include a report (subject to the approval of the Planning Coordinator) that demonstrates the testing or monitoring of the equipment behavior aligns with the EMT model simulated response.

FAC-002-5 Requirement R8

R8. Each Transmission Planner and Planning Coordinator shall review the EMT models submitted by Generator Owner or Transmission Owner seeking to interconnect new generation Facilities or transmission Facilities, or electricity end-user Facilities to verify that the models meet the Transmission Planner and Planning Coordinator's modeling requirements. *[Violation Risk Factor: Lower] [Time Horizon: Long-term Planning]*

Implementation Plan



Next Steps

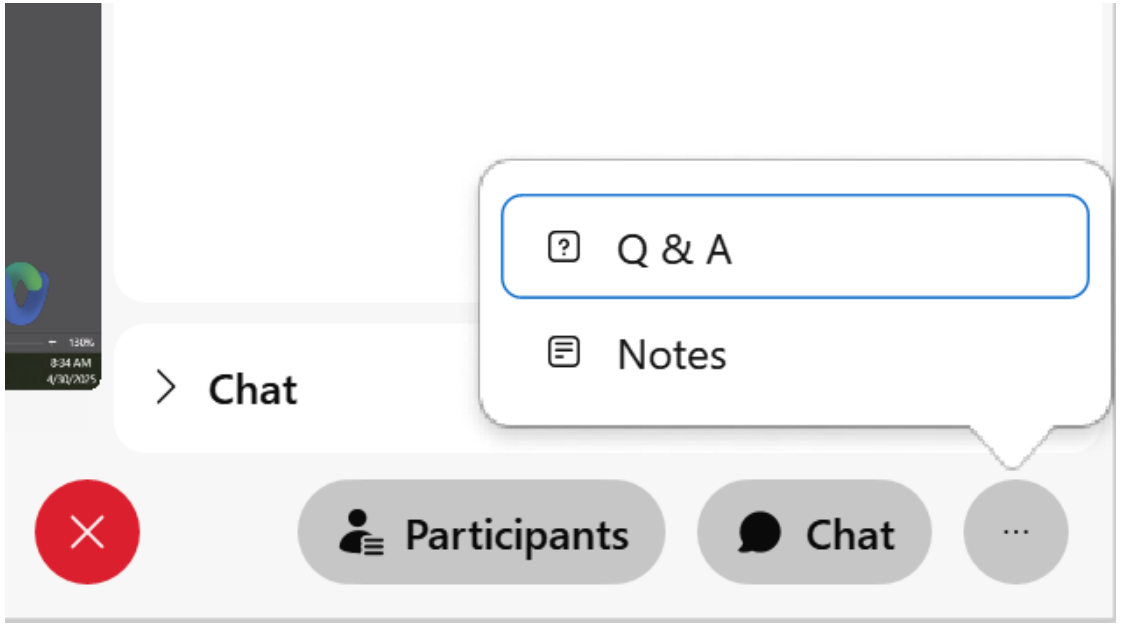
- July 16 – Request authorization to post from the Standards Committee for FAC-002-5 and Implementation Plan
- 45-day Initial Formal Comment Period July 29, 2025 thru September 11, 2025
- Ballot Pools Forming through September 1, 2025

Resources

- NERC Project 2022-04 Project Page (link).
- NERC Project 2022-01 Standards Authorization Request (link).
- IRPS Supporting Paper (link).

Questions and Answers

Q&A



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