OAK RIDGE National Laboratory

EMT Initiative: Working Group 1 – Applications & Pilots

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U.S. DEPARTMENT OF ENERGY

EMT Traditional and Newer Usage

	Traditional Use	Newer Use
Focus	Detailed studies on smaller footprint or specific components	Grid-scale for systems with increased penetration of power electronics
Example of Studies	- Fault analysis - Insulation coordination and lightning - Switching transients - Power electronics behavior	- System-wide stability - Controller interaction and grid strength - Resonance and harmonic analysis - System-wide fault-ride-through and reliability analysis
Scope	Small scale	Expanded to medium and large-scale grid (US-specific needs) and detailed component models
Tools	Tools used at detailed component level	New tools being researched upon to scale to US-specific needs

Introduction

- **EMT Initiative: Working Group 1 – Applications & Pilots**
- **Scope:** This Working Group collects information on current, emerging, and future applications and pilots for Electromagnetic Transient (EMT) modeling in power systems.
- **Current Activities:**
  - Drafted WG road map report
  - Working on a white paper on EMT modeling for large load integration
  - 2 webinars in March and September 2026

State of the Art: Applications and Pilots

- Interconnection
  - Generation and HVdc – EMT models required (planners, NERC, FERC 901)
  - Large loads (LL), such as datacenters – emerging
- Planning
  - Flow controllers, regional expansion, grid strength
  - Pilots: Unified EMT database - Collaborative online studies
- Design
  - Plant and inverter control design, control hardware in the loop
- Protection
- Event replication (emerging for EMT models)
- Operation (future) - assist and active decision-making
- Harmonics

Gaps and Challenges

- Need EMT model requirements
- Lack of standardized models
- EMT model database at utility, system operator, RTO, and interconnection levels – modelers could extract portion of interest
- Lack of guidance/procedure for when and where EMT is needed
- Lack of model validation and re-validation procedures
  - OEM models may not match what is installed
  - Firmware changes after commissioning
- Insufficient field data for event replication
- Computational challenges when required size of EMT model is large
- Lack of robust library of analytical tools
- Lack of well-defined processes for large load integration

Collecting Information on Large Electric Load Interconnection Process

- LEL interconnection process, EMT modeling and data requirements
  - SPP, IESO (completed)
  - In progress: Dominion, ERCOT
  - Reaching out to other utilities, RTOs, and ISO
- WG1 will create use cases and define pilots

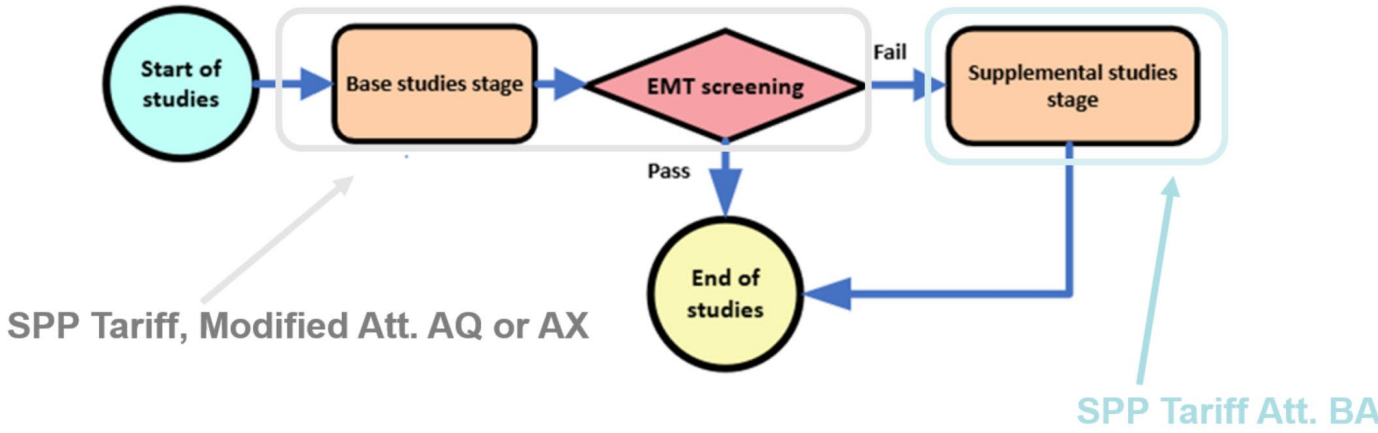

Figure source: SPP

Next Webinar

- April 21, 2026
  - Thomas McDermott, "Electromagnetic Transient Model Interoperability"
  - Nilanjan Ray Chaudhuri, "Updates from WG2, Input Data Structures & Models"

Thank you