

NERC MOD B: Proposals and discussion regarding improvements to NERC Reliability Standards MOD-010 through MOD-015

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- Introductions of panelists and overview
- Standards informal development background, MOD-010 through MOD-015 recommendations
- Walkthrough of standards and changes in proposals
- Roles of the PC and TP
- Roles of BA, GO, LSE, RP, TO, TSP
- Interconnection model building impact
- Distinction between responsibilities in these proposals and the generator verification standards
- Relationship to entity responsibilities under TPL-001-4
- Implementation Plan (timeframes)

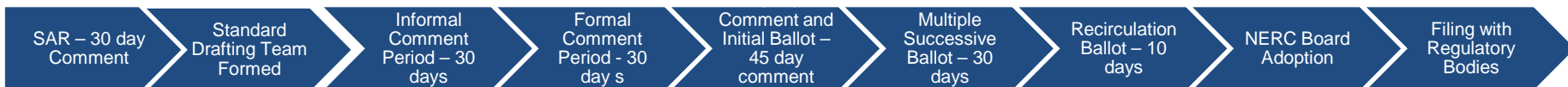
Development Process and Informal Efforts

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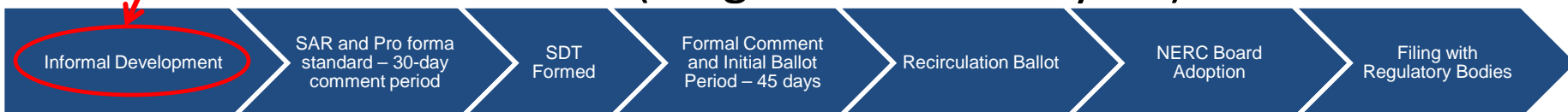
- August 2012 NERC Board of Trustees Meeting
 - FERC commissioners urged the industry to focus on creating a more efficient standards development process
 - NERC CEO focused on revamping the standards process for more efficiency and efficacy
 - NERC Board issued a resolution instructing the SPIG, MRC, SC, NERC staff and industry stakeholders to reform its standards program (November 2012)

Old Standards Process (1 to 3 years)

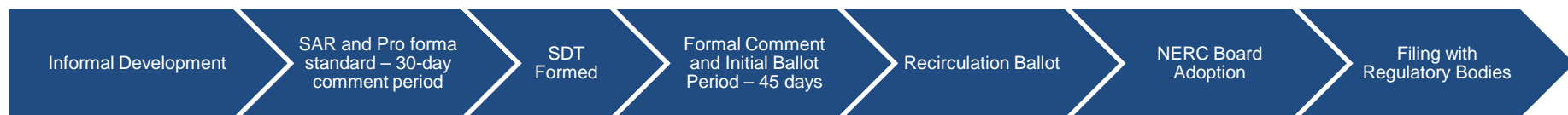


Resolving issues starts early

Revised Standards Process (Target: less than 1 year)



Revised Standards Process (Target: less than 1 year)



- Informal development - revised portion of the development process:
 - Ad-hoc group
 - Identify issues and possible solutions
 - Create pro forma Standard or proposed approaches
 - Create Standards Authorization Request (SAR)
- Post SAR and accompanying proposals
- Formal development (SDT formation through Filing)

- Three Separate Informal Efforts related to MOD standards:
 - MOD A: ATC/TTC/CBM (MOD-001, -004, -028, -029, and -030)
 - MOD B: Modeling Data (MOD-010 through MOD-015)
 - MOD C: Demand Data (MOD-016 through MOD-021)
- Emphasis on proposals to address outstanding FERC directives, mostly from FERC Order No. 693
- Outreach and Engagement:
 - Use industry subject matter experts
 - Work on issues related to consensus early
 - Maximize efficiency and use of resources during formal development
 - Support transition to formal development
 - Reduce breadth of issues requiring significant comment and resolution
 - Workshops and other opportunities for involvement

- Use Experts and Resources throughout project – pull in as needed
- Extended group members
 - Internal SMEs
 - Legal staff
 - ERO Compliance Operations
 - Standards Committee Member
 - Regional Entities
 - ERO Event Analysis
- Industry Experts
 - Researchers
 - Trades
 - FERC
 - NERC Committees
 - Standards Committee Member
 - Regional Entities

- Proposals include mechanisms to support “Results Based Standards” (RBS) format. Three types of RBS requirements:
 - Performance-based
 - Risk-based (preventive)
 - Capability-based
- Consider “Paragraph 81” (P81) criteria to ensure elimination of requirements that require responsible entities to conduct an activity or task that does little, if anything, to benefit or protect reliable operation of the Bulk Electric System (BES)
- Involving compliance and enforcement considerations early (e.g., concurrent Reliability Standard Audit Worksheet (RSAW) development, etc).

- FERC Directives remain outstanding
- August 14, 2003 and subsequent blackout recommendations
- IVGTF recommendations (April 2009)
- MVTF (MWG) whitepaper recommendations (Dec 2010)
- NERC SAMS whitepaper recommendations (Dec 2012)
- Status of Current Modeling Data Standards (Not all approved; “fill in the blank”)
- Why the MOD standards are necessary as standards and not as a data request:
 - Section 1600 data request not applicable outside of U.S.
 - Section 1600 data request not mandatory and no mechanism to compel participation without pursuing as federal action under section 215

- Directives Summary:
 - 1 Directive from FERC Order No. 890
 - 14 Directives from FERC Order No. 693
- FERC Order 890 Directive:
 - Paragraph 290: incorporate periodic review and modification of models, with certain criteria

- FERC Order 693 Directives:
 - Paragraph 1148: Require filing of all contingencies used in performing steady-state system operation and planning studies.
 - Paragraph 1152, 1181: address confidentiality issues
 - Paragraph 1154: include TOP as an applicable entity
 - Paragraphs 1155, 1162, 1184, 1199 : include PA/PC as an applicable entity “because (it) is the entity responsible for the coordination and integration of transmission facilities and resource plans, as well as one of the entities responsible for the integrity and consistency of the data.”
 - Paragraph 1178, 1183: add requirement to provide a list of the faults and disturbances used in performing dynamics system studies for system operation and planning, and require TSP to provide the lists

- FERC Order 693 Directives continued:
 - Paragraph 1197: permit entities to estimate dynamics data if they are unable to obtain unit specific data . . . But require that the results of these dynamics models be compared with actual disturbance data to verify accuracy
 - Paragraph 1210: require models be validated against actual system responses
 - Paragraph 1211: require actual system events be simulated and if model output is not within the accuracy required, the model shall be modified to achieve the necessary accuracy
 - Paragraph 1220: require actual system events be simulated and dynamics system model output be validated against actual system responses

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Event Recommendations

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- **NERC Recommendation 14:** “The regional reliability councils shall within one year establish and begin implementing criteria and procedures for validating data used in power flow models and dynamic simulations by benchmarking model data with actual system performance.”
- **Task Force Recommendation 24:** Improve quality of system modeling data and data exchange practices. “The Task Force supports these requirements strongly. The Task Force also recommends that FERC and appropriate authorities in Canada require all generators, regardless of ownership, to collect and submit generator data to NERC, using a regulator-approved template.”

- September 18, 2007 (MRO)
 - Develop efficient translation of telemetry data for model benchmarking
 - Initiate a dynamic model validation regime to benchmark models
 - “develop a standard/requirement regarding reporting electrical, dynamics and machine and plant protection characteristics of non-conventional (e.g., wind, solar, small hydro) generation data”
- September 8, 2011 (Pacific Southwest)
 - Recommendation 10: Benchmark WECC dynamic models against actual performance
 - Recommendation 16: Ensure consistencies in model parameters between planning and RTCA models

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Other Recommendations

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- IVGTF (Integration of Variable Generation Task Force) Special Report titled "Accommodating High Levels of Variable Generation" (April 2009)
 - Standard, valid, generic, non-confidential, and public power flow and stability models (variable generation) are needed and must be developed, enabling planners to maintain bulk power system reliability.
 - IVGTF Work Plan: Review the Modeling, Data and Analysis Standards (MOD) for improvements required to support simulation of power systems with high amounts of variable generation.

- Improve and Strengthen MOD-010 through MOD-015
- Standardization of functional requirements, including data exchange formats
 - Standardized Component Models
- Industry should make periodic model validation and benchmarking an integral part of off-line study model maintenance
- Industry should validate operational planning (offline) models by comparing them with models developed from real-time data

- Reduce the quantity of the MOD standards
- Add short circuit data to MOD standards
- Add to the Requirement to Supply Data and Models:
 - Identify responsibility to provide and receive data (who provides what data to whom)
 - Provision for acceptability of data
 - Require specification and use of standard format
 - Consider how to deal with new technology
 - Shareability

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Proposed Approach

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- Modeling Data standard:
 - Require PC to develop data requirements and reporting procedures
 - Data owners to submit data according to those procedures
 - Clarified requirement to address technical concerns with data
 - Eliminated reference to (proposed) list of modeling organizations and require PCs to submit data for interconnection model to NERC or its designee
 - Clarified several Attachment 1 criteria

- Validation Standard:
 - Transitioned requirement to “implement a documented process” that meets the criteria specified
- TPL-001-4:
 - Conforming change to update cross-reference to MOD-010 and MOD-012

- Consolidation into single modeling standard for data collection for steady-state, dynamics, and short circuit
- Requires Planning Coordinators to develop data requirements and reporting procedures for data owners in their planning area
- Attachment approach for data requirements
- Separate standard for validation (ties-in to FERC Directives from Order No. 693)

- Proposed single standard (R1):
 - Requires each Planning Coordinator, in conjunction with each of its Transmission Planners, to develop data requirements and reporting procedures, including specification of data required (Attachment 1), data format, shareability, level of detail, case types, and schedule.
 - Attachment 1: Specifies a three column detailed matrix of data requirements for steady-state, dynamics, and short-circuit data

- Proposed single standard (R2):
 - Requirement R2: Each Planning Coordinator shall provide its data requirements and reporting procedures developed under Requirement R1 (to any data owner) within 30 calendar days of a written request

- Proposed single standard (R3):
 - Requirement R3: provide steady-state, dynamics, and short circuit data to Planning Coordinator(s) and Transmission Planner(s) according to the data requirements developed in Requirement R1.

- Proposed single standard (R4):
 - Requirement R4: Provides a requirement for entities that submit data to provide responses to certain technical concerns when notified by Planning Coordinator or Transmission Planner
 - Provide either updated data or an explanation with a technical basis for maintaining the current data;
 - If requested by the notifying Planning Coordinator or Transmission Planner, provide additional dynamics data describing the characteristics of the model, including block diagrams, values and names for all model parameters, and a list of all state variables; and
 - Provide the response within 30 calendar days (unless a longer time period agreed upon with PC or TP)
 - Uses format similar to MOD-26-1 requirements (*see, e.g., MOD-26-1, Requirement R3*)

- Proposed single standard (R5):
 - To facilitate creation of interconnection-specific models, a requirement for Planning Coordinator to submit data collected under Requirement R2 NERC or NERC's designee

- Validation standard
 - Not duplicate other standards like MOD-025, -026, -027
 - Focus on what PC could reasonably do
 - Interconnection-wide phenomena outside PC's purview
- How prescriptive should the standard be?
 - Focus on results
 - Leave judgment to the PC
 - Added some information in the guidance section at the bottom of the standard

- How close is close enough for a validation?
 - For load flow comparison to EMS case – should flows on major lines be within 10%?
 - Or be within 10% or within 100 MW whichever is larger; make it specific to voltage level?
 - Empower the judgment of the PC

- Validation of dynamic load models?
 - Validate the magnitude/percent of the induction motors used in load models on a regular basis but no less than every two years. The validation can be made using End Use surveys, actual load shapes at substations, or customer load data.
 - There's still too much unknown about the dynamic behavior of the loads to require some kind of validation. This falls into the good utility practice but not into the standards arena yet.

- What system condition should be used to validate power flow models?
 - Peak load condition?
 - Stressed condition that gives unexpected results?

- What system condition should be used to validate dynamics models?
 - NERC reportable event?
 - Significant system disturbance?
 - Dynamic local event

- Old language
 - R1. Each Planning Coordinator must **validate the data** used for steady state and dynamic analyses
- New language
 - R1. Each Planning Coordinator must **implement a documented process to validate** the data used for steady state and dynamic analyses

- Old language
 - 1.1 Validate its portion of the system in the power flow model by comparing it to a state estimator case to check for discrepancies that the Planning Coordinator determines are large or unexplained at least once every 24 calendar months and through simulation of a local event, if any.
- New language
 - 1.1 Validate its portion of the system in the power flow model by comparing it to ~~a state estimator case~~ **actual system data** to check for discrepancies that the Planning Coordinator determines are large or unexplained at least once every 24 calendar months ~~and~~ through simulation ~~of a local event, if any.~~

- Guidance section:
 - For the validation in part 1.1 the state estimator case should be taken as close to system peak as possible. However, other snapshots of the system could be utilized if deemed to be more appropriate by the Planning Coordinator. While the requirement specifies “once every 24 calendar months,” entities are encouraged to perform the comparison on a more frequent basis.
 - In performing the comparison required in Part 1.1, the PC should consider, among other considerations:
 - System load;
 - Transmission topology and parameters;
 - Voltage at major buses; and
 - Flows on major transmission elements.

- Guidance section:
 - The validation in 1.1 would include consideration of the load distribution and load power factors used in its power flow models.
 - The comparison of system load distribution and load power factors shall be made on an aggregate company or power flow zone level at a minimum but may also be made on a bus by bus, load pocket (e.g., within a Balancing Authority), or smaller area basis as deemed appropriate by the Planning Coordinator.

- Old language
 - 1.2 Validate its portion of the system in the dynamic models through simulation of a dynamic local event, if any. Complete the simulation within 12 calendar months of the system event.
- New language
 - 1.2 Validate its portion of the system in the dynamic models at least **once every 24 calendar months** through simulation of a dynamic local event, if any. Complete the simulation within 12 calendar months of the local event.

- Guidance:
 - The validation required in part 1.2 should include simulations which are to be compared with actual system data and may include comparisons of:
 - Voltages oscillations at major buses
 - System frequency (for events with frequency excursions)
 - Real and reactive power oscillations on generating units and major inter-area ties

- Old language
 - 1.3 **Correct** the model for accuracy in coordination with the data owner when the Planning Coordinator determines the discrepancy between actual system response and expected system performance is too large.
- New language
 - 1.3 **Confirm or correct** the model for accuracy in coordination with the data owner(s) when the Planning Coordinator determines the discrepancy between actual system response and expected system performance is too large

- What if the PC cannot match an event with the model?
- In the guidance section of the standard:
 - However, for some disturbances, the data in the PC's area may not be what is causing the simulations to not match actual responses. These situations should be reported to the ERO.

- Old language
 - R2. Each Reliability Coordinator shall provide data to its Planning Coordinator within 30 calendar days of receiving written notification from its Planning Coordinator requesting data necessary to perform validation under Requirement 1, such as, but not limited to, Real-time data necessary for actual system response validation.
- New language
 - R2. Each Reliability Coordinator **and Transmission Operator** shall provide data **(or notice that it does not have the requested data)** to any Planning Coordinator that is necessary for the Planning Coordinator to perform validation under Requirement 1 within 30 calendar days of a written request, such as, but not limited to, **Real-time-actual system data (including disturbance data recordings)** necessary for actual system response validation.

Questions on Validation?

- TPL-001-4 references MOD-010 and MOD-012
- Proposed conforming change to correct the cross reference so that it corresponds to the changes made in the MOD proposals

- Roles of the PC and TP
- Roles of BA, GO, LSE, RP, TO, TSP
- Interconnection model building impact
- Distinction between responsibilities in these proposals and the generator verification standards (MOD-025-2, MOD-026-1, and MOD-027-1)
- Relationship to entity responsibilities under TPL-001-4
- Implementation Plan (timeframes)

- Key Dates (for planning purposes; subject to change)
 - July 2013 – Posting of the SAR for 30 day comment
 - July/August 2013 – Initial ballot posting: Pro-forma Standard and RSAW for 45 day comment
 - October 2013 – Recirculation Ballot
 - November 2013 – Board of Trustees Adoption
 - December 2013 – File with FERC

- Email list for information distribution specific to MOD B effort
 - To be added to the list, contact Steven Noess, steven.noess@nerc.net
- MOD B Web site:
http://www.nerc.com/filez/standards/MOD_B_Informal_Development_Project-RF.html



Questions and Answers