NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

System Model Validation with IBRs

NERC Standards Project 2021-01

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What is a System Model per Order 901?

- **P42** Bulk-Power System planners and operators need accurate planning, operations, and interconnection-wide models to ensure the reliable operation of the Bulk-Power System. … … … … … … Each of the planning, operations, and interconnection-wide models consist separately of steady state, dynamic, and short circuit models.
- **P43** Without planning, operations, and interconnection-wide models that accurately reflect resource (e.g., generation and load) behavior in steady state and dynamic conditions, Bulk-Power System planners' and operators' system models[92] are unable to adequately predict resource behavior, … … … and their subsequent impacts on the Bulk-Power System.

92: This final rule uses the term "system models" to refer collectively to planning and operations transmission area models and interconnection-wide models.

What is System Model Validation per Order 901?

- **P46** Once the generator owners for registered IBRs, transmission owners for unregistered IBRs, and distribution providers for IBR-DERs in the aggregate verify plant models, *Bulk-Power System planners and operators must validate and update system models (i.e., planning and operation transmission area models as well as interconnection-wide models) by comparing the provided data and resulting system models against actual system operational behavior.*

System Model Validation – Applicable Directives

- Pursuant to section 215(d)(5) of the FPA, we adopt the NOPR proposal and **direct NERC to submit new or modified Reliability Standards that require Bulk-Power System planners and operators to validate, coordinate, and update in a timely manner the system models by comparing all generator owner, transmission owner, and distribution provider verified IBR models** (i.e., models of registered IBRs, unregistered IBRs, and IBR-DERs that in the aggregate have a material impact on the Bulk-Power System) **and resulting system models against actual system operational behavior**." (P 156)
- **Specifically, we direct NERC to develop new or modified Reliability Standards that require** planning coordinators, transmission planners, reliability coordinators, transmission operators, and balancing authorities to establish for each interconnection a uniform framework with modeling criteria, a registered modeling designee, and necessary data exchange requirements both between themselves and with the generator owners, transmission owners, and distribution providers to coordinate the creation of transmission planning, operations, and interconnection-wide models (i.e., system models) and **the validation of each respective system model.** (P161)
- **NERC may implement this directive by modifying Reliability Standard**s MOD-032-1 and **MOD-033-2 or by developing new Reliability Standards to** establish requirements mandating an annual process to **coordinate, validate, and keep up-to-date the transmission planning, operations, and interconnection-wide models.** (P161)

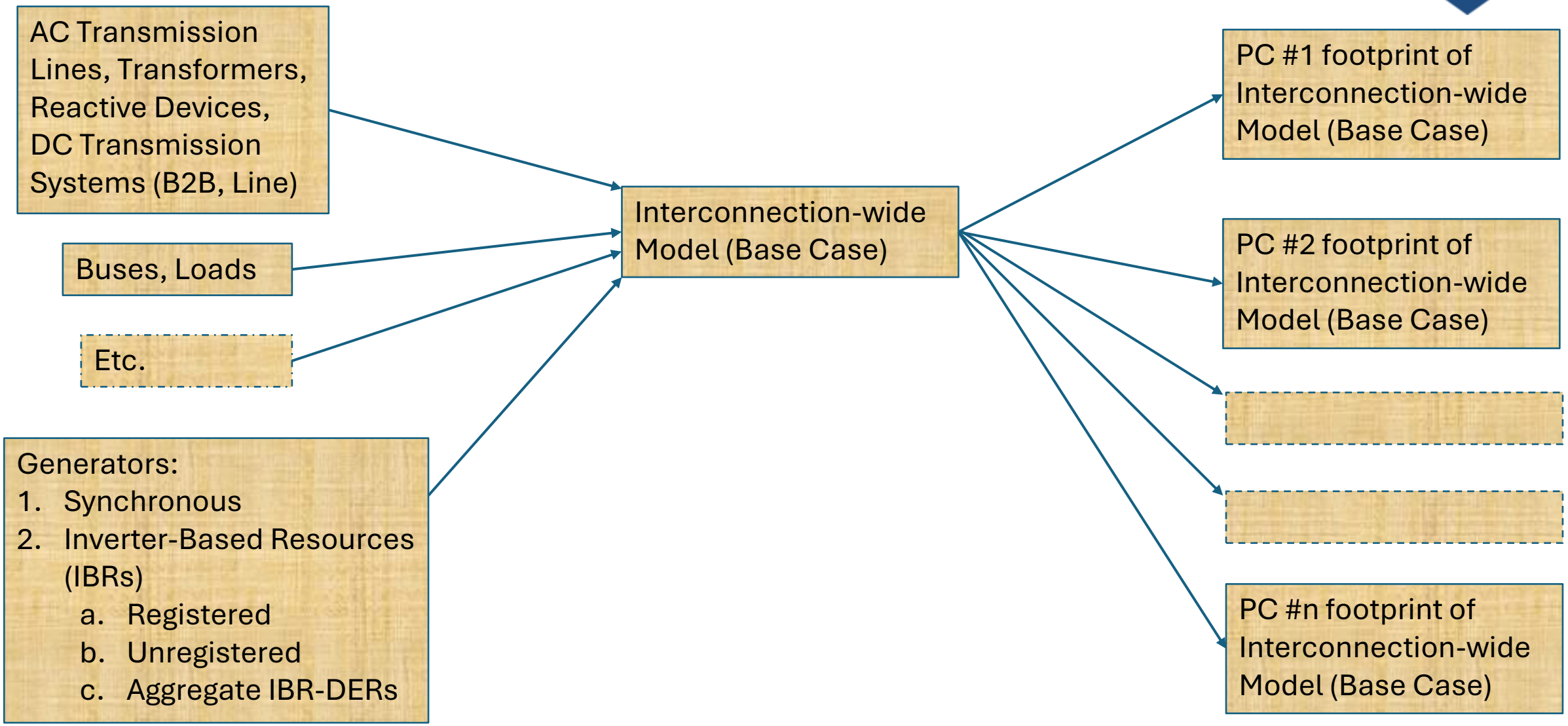
System Model Validation – SDT Approach

Are existing MOD-033 Requirements inadequate for System Model Validation with high penetration of IBRs?

- Existing MOD-033 requires system model validation of each Planning Coordinator's transmission system footprint…
  can this be squared with the "scope" of system model in Order 901?
- Does MOD-033 Applicability need to be augmented to Operations entities (Transmission Operator and/or Reliability Coordinator)?
- How to address interconnection-wide model validation?
- Assuming system model "scope" issues are resolved, would any of the existing requirements become inadequate for a system with higher penetration of IBRs (including IBR-DERs)? How about at 100% penetration?
- How to ensure any modifications are IBR penetration-level agnostic?

MOD-032 Attachment 1 (Component Model Data)

MOD-033 System Model Validation (Steady-State and Dynamic)



System Model Validation – SDT Approach

Are existing MOD-033 Requirements inadequate for System Model Validation with high penetration of IBRs?

- Existing MOD-033 requires system model validation of each Planning Coordinator's transmission system footprint…
  can this be squared with the "scope" of system model in Order 901? Yes
- Does MOD-033 Applicability need to be augmented to Operations entities (Transmission Operator and/or Reliability Coordinator)?

  No, validation is applicable to off-line (not real-time) system models
- How to address interconnection-wide model validation?

  System Model Validation of each Planning Coordinator's area within an Interconnection accomplishes it

System Model Validation – SDT Approach

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- How to ensure any modifications are IBR penetration-level agnostic?

Existing requirements are adequate since the "what" of system model validation is (and must be) fundamentally agnostic to the technology of facilities comprising the BES… and the premise of system model validation is that each component model assembled into the system model (aka base-case) has been verified and validated by respective model owners in accordance with MOD-032 and MOD-026/-027 requirements

Project 2021-01 Work Products

- Editorial modifications to MOD-033 Requirements & Measures to improve clarity and consistency… no substantive changes
- Develop/Enhance Guidance on the "How" to support the "What"
- Technical Rationale & Guidelines for MOD-033 implementation
  - Steady-state System Model Validation (R1, Part 1.1)
  - Dynamic System Model Validation (R1, Part 1.2)
  - Acceptable (mismatch) Criteria for Model Performance (R1, Part 1.3)
  - Collaborative Model Improvement Process with Model Owner (R1, Part 1.4)
  - Access to System Operational Behavior (Real-Time) Data Sources (R2)
    - Leverage Order 901 Milestone 2 Deliverables such as PRC-028 and PRC-002
- Demonstrate that applicable Order 901 Directives are met

Questions and Answers