



Dynamic Model Improvements Proposals

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ERCOT Dynamic Studies

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Proposal is all about ensuring model quality

Planning Guide 6.2 (1)

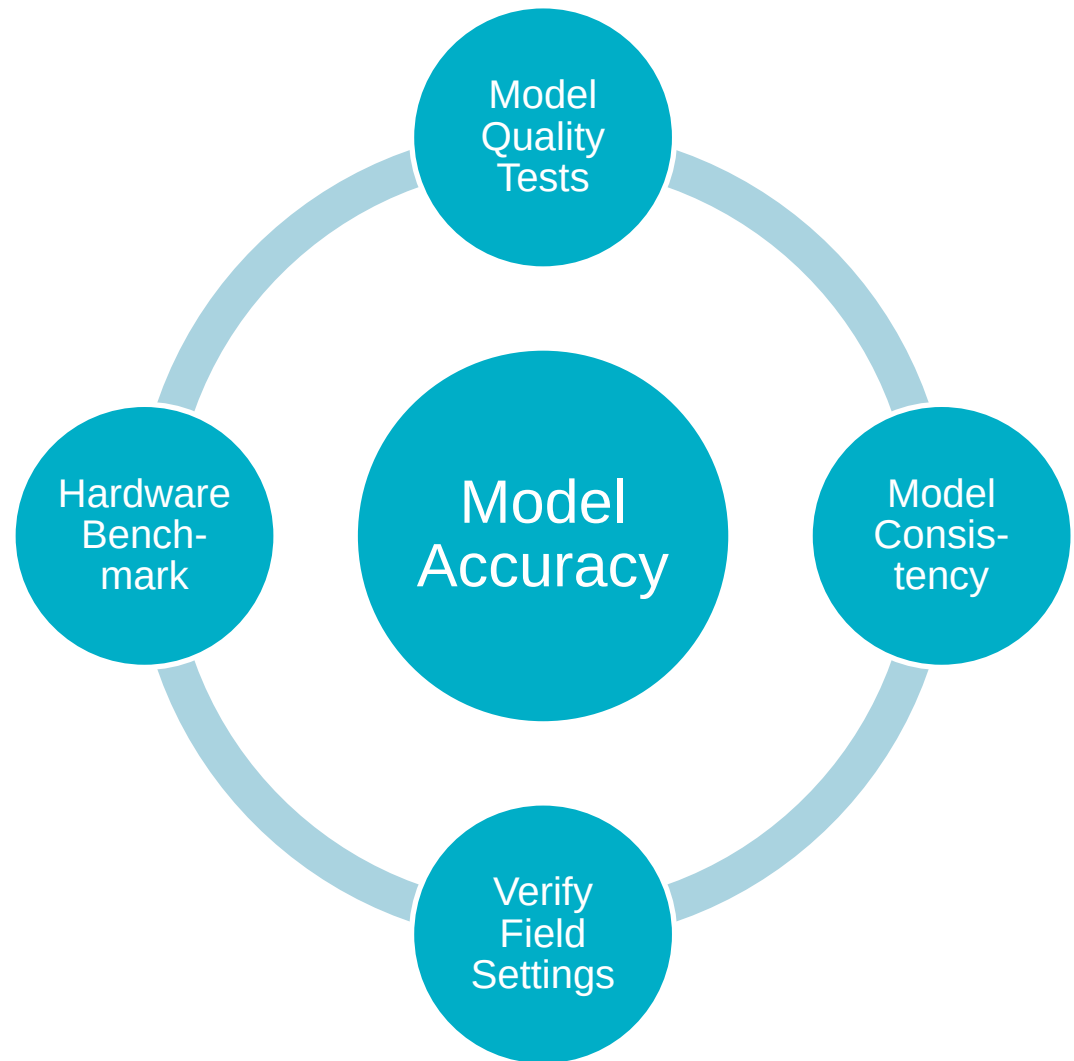
To adequately simulate dynamic and transient events in the ERCOT System, it is necessary to establish and maintain dynamics data and simulation-ready study cases representing the dynamic capability and frequency characteristics of machines and equipment connected to the ERCOT System.

Planning Guide 6.2 (5)

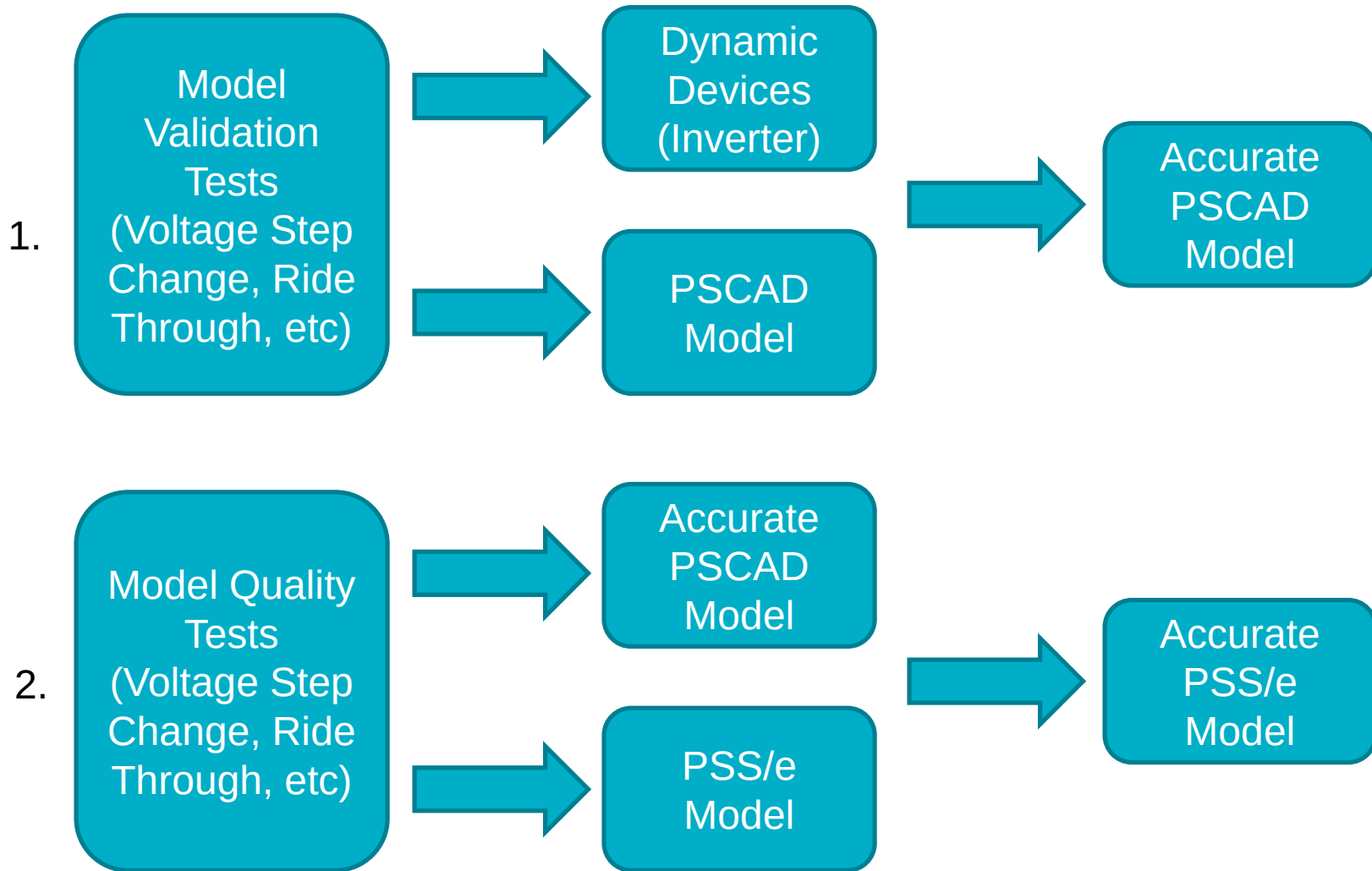
(a) A model with parameters that accurately represent the dynamics of the device and that is compatible with the current version of the planning and operations model software as described in the Dynamics Working Group Procedure Manual....

Goal: Improved Model Accuracy & Confidence

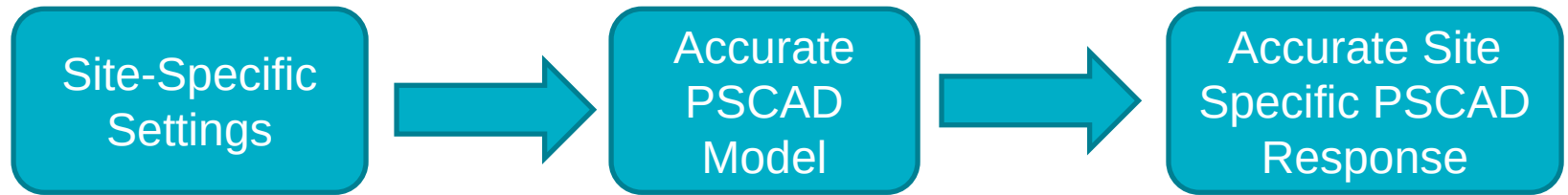
Challenge
<i>Model performance</i>
<i>PSCAD and PSSE model fidelity</i>
<i>Model settings do not match settings applied in the field</i>
<i>Consistency between PSSE and PSCAD models</i>



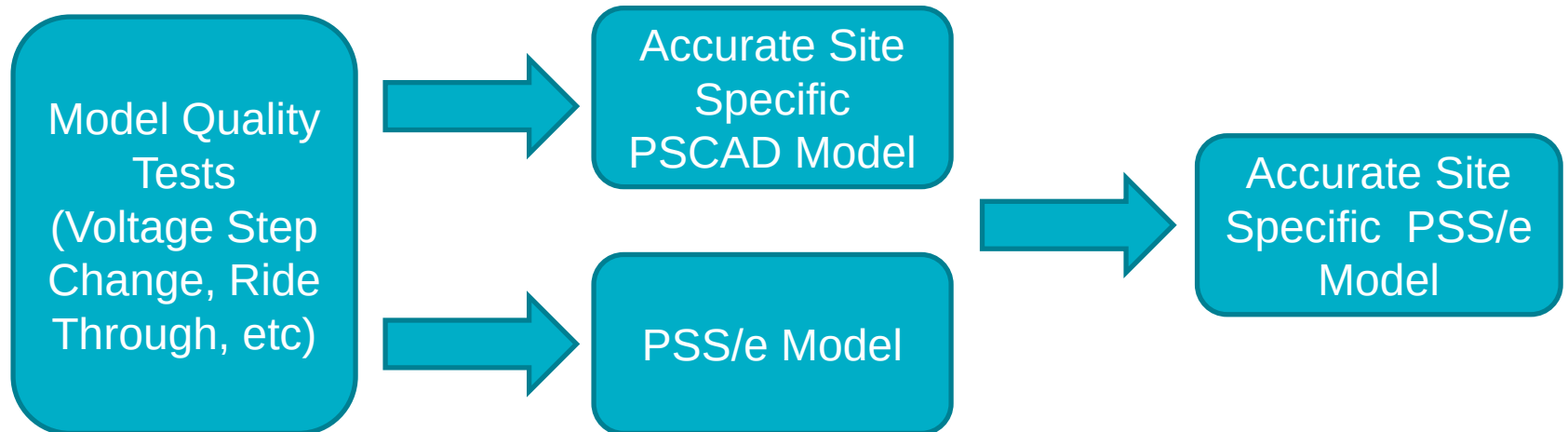
How Proposal Achieves Goals



3.



4.



Leveraging to Reduce Additional Work

Challenge	Proposed Solution
<i>Model performance</i>	Model quality tests (PGRR75 for PSSE)
<i>PSCAD model fidelity</i>	Hardware benchmark (unit validation)
<i>Model settings do not match settings applied in the field</i>	Plant verification (periodic setting check)
<i>Consistency between PSSE and PSCAD models</i>	Model quality tests

Ways we are trying to economize:

- **Hardware benchmark:** Not site-specific and only requires testing the inverter/dynamic device not the entire plant. Benchmark is good for a type of inverter hardware & controls; possible to perform once and use for several sites with the same inverter.
- **Plant verification** is just a setting check. No testing required!
- **Consistency check** leverages already-performed model quality tests!

Language Proposals

- Hardware Benchmark (“Unit Model Validation”)
 - (For IBR / PSCAD models only)
 - Hardware specific not site specific
- PSCAD model quality tests
 - Similar to PSSE model quality tests
- Plant Model Verification
 - Periodically verify key parameters & settings
 - No physical testing required; just verification
 - At commissioning and every two years

Section

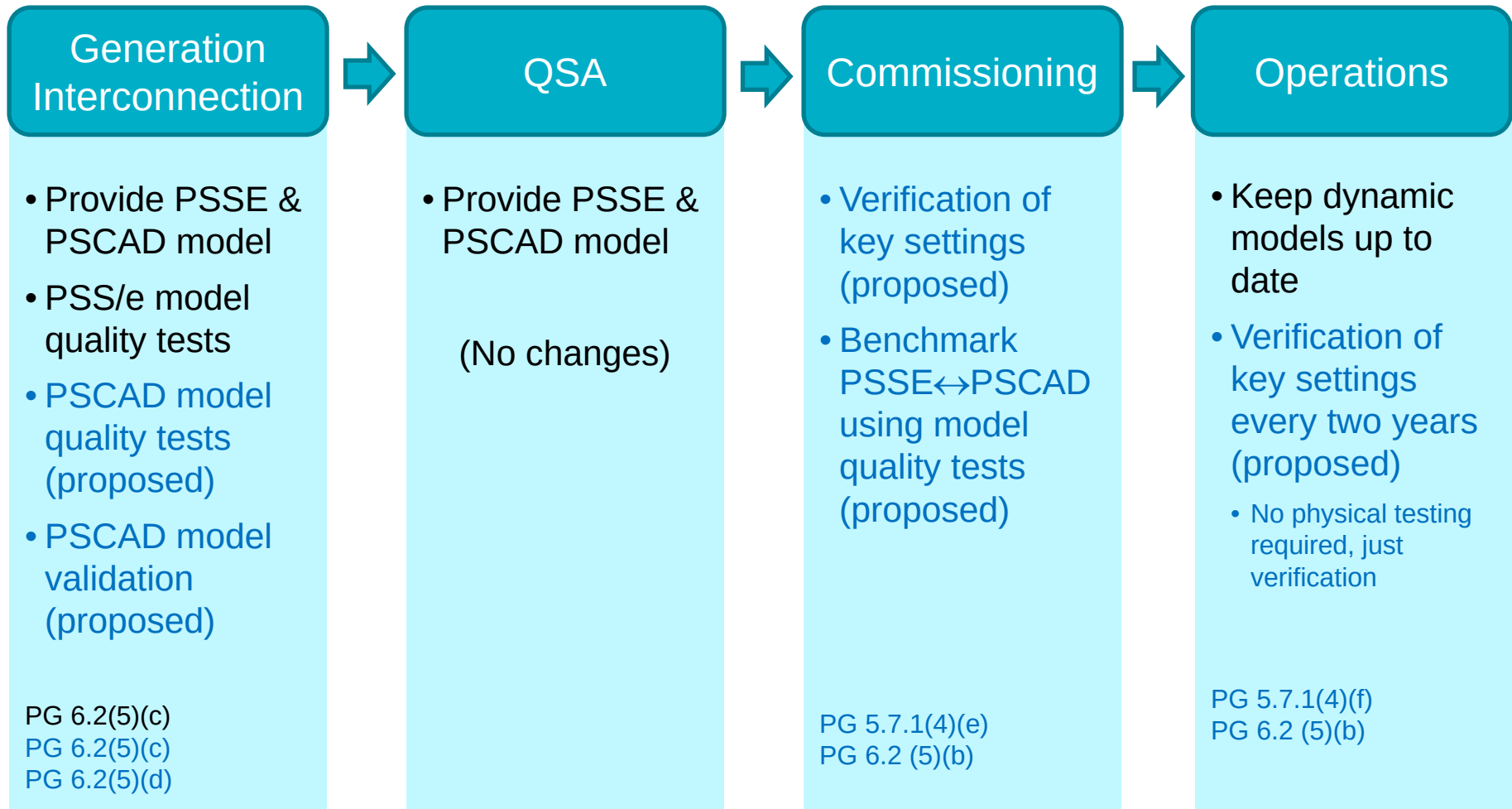
PG 6.2(5)(d)

PG 6.2(5)(c)

PG 5.7.1(4)
PG 6.2 (5)(b)

Process for Generators

Blue = new
Black = existing



- Goal is to verify model fidelity against actual hardware
- PSCAD models only required for inverter-based resources

What about model updates? (IBRs)

Blue = new
Black = existing

- If updating model parameters (settings), then:
 - ✓ Update PSSE model
 - ✓ Provide PSSE model quality report
 - ✓ Update PSCAD model
 - ✓ Provide PSCAD model quality report (proposed)

- If updating model structure (e.g. control/hardware changes) then:
 - ✓ Update PSSE & model quality report
 - ✓ Update PSCAD model & quality report (proposed)
 - ✓ Unit model validation (hardware benchmarking) (proposed)

What about model updates? (conventional)

- If updating model parameters (settings), then:
 - ✓ Update PSSE model
 - ✓ Provide PSSE model quality report

- If updating model structure then:
 - ✓ Update PSSE
 - ✓ Provide PSSE model quality report

Parameter Verification (all resources)

- Periodically verify key parameters (proposed)
 - During commissioning, within 30 days of approval for commercial operations
 - Periodically every two years
- What it requires
 - Verify site key parameter settings match model settings
 - For example, screenshots, commissioning / delivery reports, manufacturer attestation, etc.
- What it doesn't require
 - Testing

Miscellaneous Improvements

- Similar testing requirements for each situation (PSSE model quality, PSCAD model quality, hardware validation)
 - HVRT, LVRT, Step Change, SCR (existing model quality tests)
 - A few differences:
 - Add Phase Angle Step test for PSCAD model quality
 - Add SSR Frequency Scan for IBR hardware validation
- UDM Model Manuals shall contain:
 - Control block diagrams and parameter descriptions
 - Listing of parameters which are commonly tuned (proposed)
- DWG Procedure Manual definition of planning model
 - References PSSE, now add PSCAD

Next Steps and Tentative Schedules

- Draft language and discuss with RIW and DWG
- Submit Guides revision requests in Q2, 2020

Comments are welcome to:

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