



Transient Security Assessment Tool (TSAT) Data Requirement Update

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ROS Meeting

Real-time TSAT Background

- The recent increase in renewable generation penetration has increased the number and complexity of Generic Transmission Constraints (GTCs), and associated Outage Coordination is becoming difficult to manage using the current off-line study process
- The current process for calculating Generic Transmission Limits (GTLs) involves off-line planning studies using a limited number of system conditions/topologies that are representative for all system operating conditions
- TSAT will be used to calculate dynamic stability-related GTLs in Real-Time and help the operators maintain system reliability and effectively manage GTCs in changing system conditions

RRGRR021 TSAT Requirement

- Effective August 1, 2020, Resource Entities for all existing and new Generation Resource or Settlement Only Generator (SOG), including a storage device are required to submit TSAT dynamic models for the ERCOT operations model
- Resource Entities with IRRs that have PSSE user-defined models are required to review these models and submit TSAT user-defined dynamic models
- TSPs are required to review the PSSE user-defined models for existing transmission equipment (dynamic reactive devices etc.) and submit TSAT user-defined dynamic models

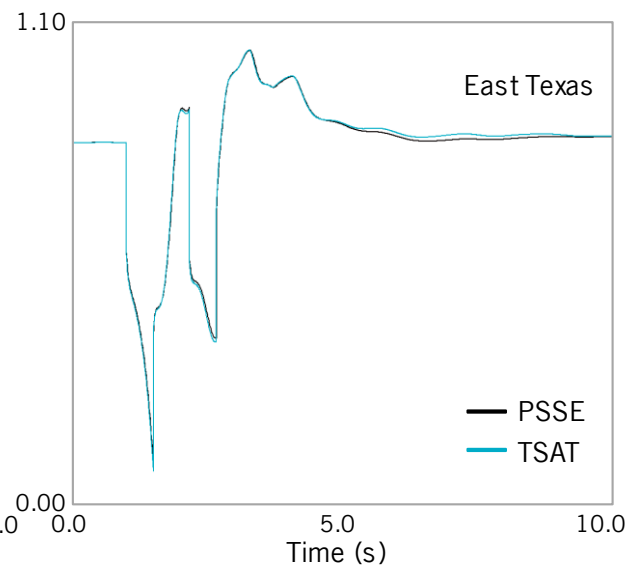
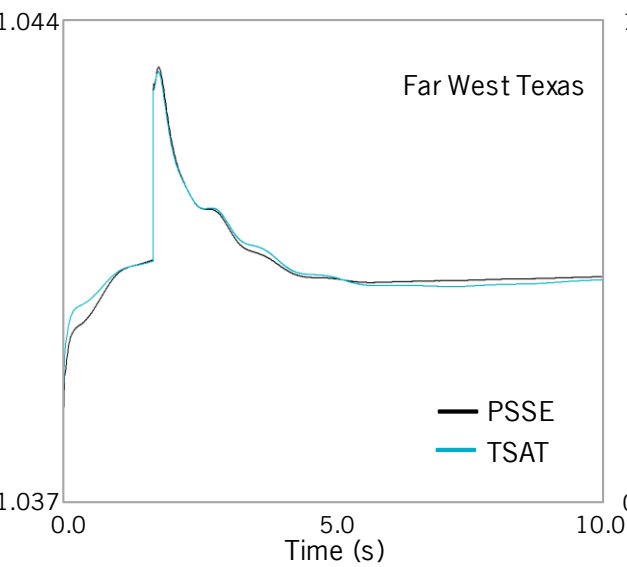
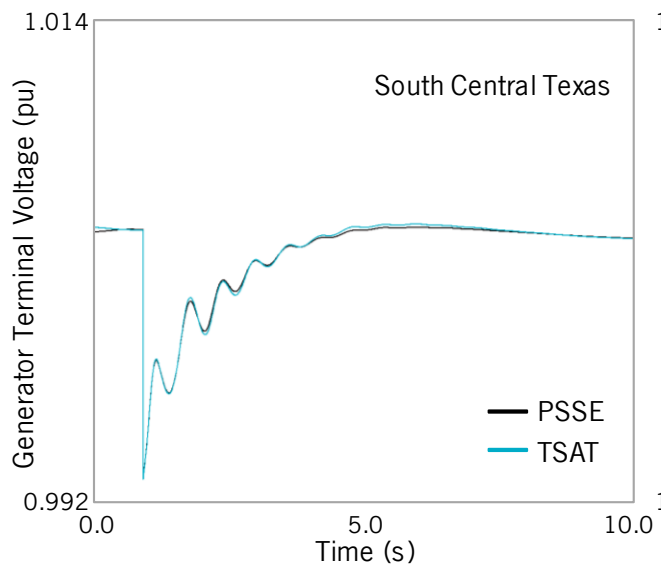
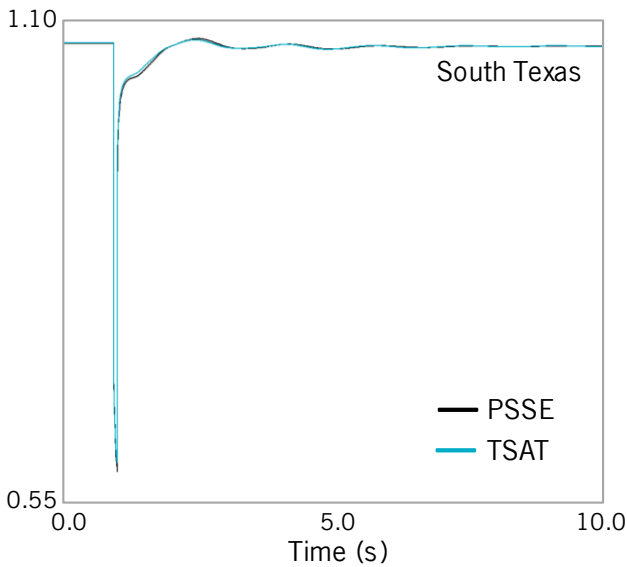
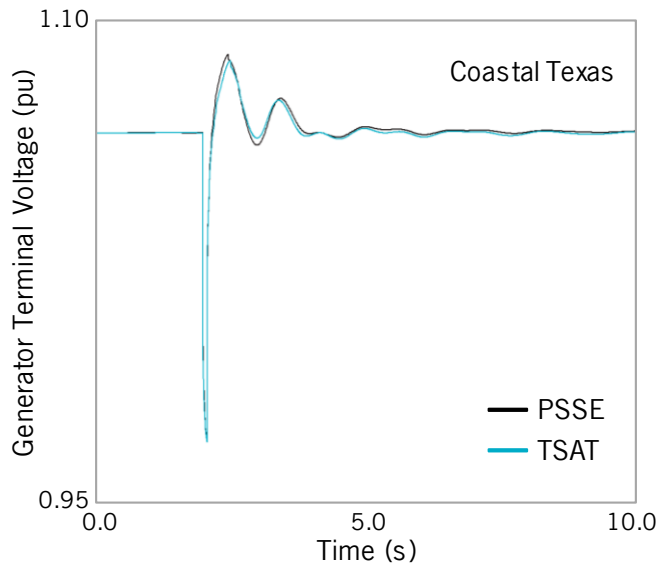
TSAT User-Defined models

- Generation Resources or SOGs, including a storage device that have provided a user-defined planning model (in PSSE) are required to provide the same user-defined model for TSAT operations model
- Generic TSAT models are **NOT acceptable** where GRs have submitted user-defined models for planning model (PSSE)
- Both planning (PSSE) and operations (TSAT) user-defined model should use (read) the same dynamic model parameters (dynamic data format dyr file)

Real-time TSAT Implementation Progress

- ERCOT is in the process of implementing TSAT for Real-Time operations
- The ERCOT conventional generator (coal, nuclear, combined cycle, etc.) dynamic models implemented in PSSE are available in TSAT standard dynamic model
- The ERCOT conventional generator fleet has been implemented in TSAT and validated/benchmarked against PSSE planning model

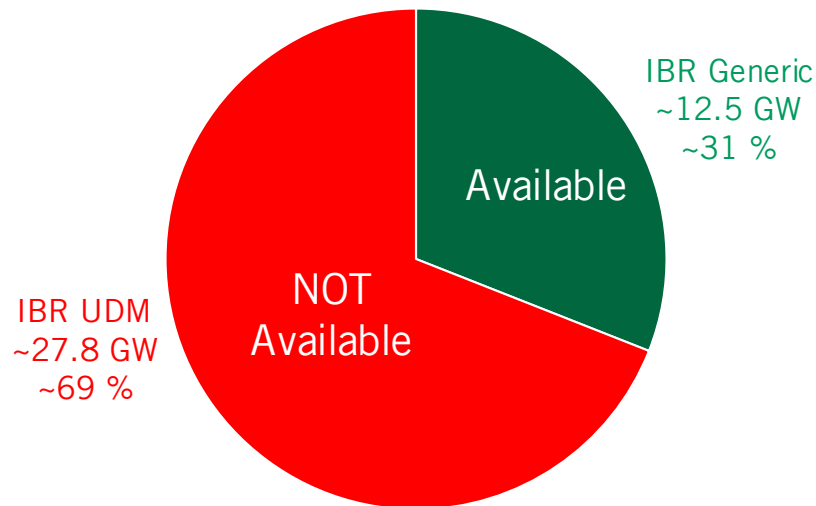
TSAT Conventional model Vs PSS[®]E Benchmark



Real-time TSAT – Model Deficiencies (as of 2021 Q2 QSA)

- Models for Inverter-Based Resources (wind, solar, battery) often use user-defined code (those user-defined models submitted for PSSE)
 - Generic equivalent representations in TSAT are not suitable for ERCOT regions with low system strength
 - Total Inverter-Based Resources (IBR) capacity ~ 40.3 GW

IBR Model Availability in TSAT



ERCOT PSSE user-defined models (as of 2021 Q2 QSA)

PSSE User-defined Models (UDM)	Capacity (GW) (Total IBR UDM = ~27.8 GW)	% of Total IBR UDM
GEWTG2, SWTGU1, VWCOR6, SWTGU2, GXX043, M24G1, CP17093300, A1530U1	18.9	68.1
VC18084500, VC18084700, GMD041308, GELV5G1, A1530T, PEGEN_H1001A, AWWTG_100, A1530U2, VC18084901, GSCORE	4.5	16.2
VWCOR8, BP1000IN, CP18084500, GSCOR1, VC18084911, GEWTA0705, CP17083200, GMD041302, GWPM41, VS17073200, AWWTG_103, VWCOR7, NXK8BJ, GMD0353, GMD0201, GWPM34, AWWTG_105, GD0810, GEPVG, PEGEN_HM1007A, GEPVG_LV5, VS3102, VC19065401, NXK8CE, SWTEU2, SMASC, GD0811	4.4	15.7

ERCOT TSAT UDMs Received (as of Feb. 16, 2021)

PSSE Gen User-defined Model (UDM)	TSAT Gen User-defined Model (UDM)
PEGEN_HM1007a	PEGEN
PEGEN_HM1008	PEGEN
GMD041308	SG_5_145
BESTES137_1	BESTES137_1
GSCOR1	CP20065800
VC200451001	VC200451001
CP20065718	CP20065718
CP20065800	CP20065800

- ERCOT has a total of 263 units that have user-defined models in the planning model (PSSE)
- Less than 10 units have submitted TSAT UDMs. Some of these models represent future generation (QSA). Models received are being validated
- Some have submitted a generic model as a substitute for a user-defined model. This is not acceptable

TSAT user-defined model development update

Major Vendor	PSSE User-defined Models (UDM)	TSAT UDM Status (as of Feb. 16, 2021)
Acciona (Nordex)	6 different generator models	No model will be available in short/medium term.
Nordex	2 generator models	
AMSC	2 STATCOM models	No update is available.
Bonus (Siemens)	1 generator model	Certain type 3 WTGs will be available by May 2021. No updates on the rest.
Gamesa (Siemens)	8 generator models	
Siemens	3 generator models	
GE	5 generator models	Working on one old model and the newest model which will be available by May 2021 and August 2021, respectively.
Goldwind	2 generator models	No update is available.
Kaco	1 generator model	No update is available.
Mitsubishi	1 generator model	No update is available.
Power Electronics	3 generator models	1 model provided. No timeline for the rest.
SMA	1 generator model	No update is available.
Vestas	15 generator models	3 models provided. No timeline for the rest.

RRGRR021 Timeline

- Based on the feedback received from the OEMs and other TSAT UDM developers, ERCOT is adopting a mitigation plan for all Generation Resources or SOGs, including a storage device. Under this plan, ERCOT will refrain from reporting non-compliance with the TSAT model submission requirement until November 1, 2021
- All existing and new Generation Resources (qualifying for QSA) will be required to submit TSAT UDMs by November 1, 2021

Real-Time TSAT Implementation Plan

- Since August 2020, Powertech Labs has been working on enhancements to the TSAT software and UDM modeling capabilities
- ERCOT plans to upgrade the current EMS TSAT version (17) to the upcoming version 21, which is anticipated to be released June/July 2021. This will enable ERCOT to use TSAT UDM updates submitted under that version
- ERCOT will need additional time to process UDM model submissions after they are submitted, which will significantly impact original TSAT implementation timeline
- ERCOT will continue to calculate GTC limits using off-line PSSE studies until real-time TSAT implementation

Questions?