



Proposed Process and Benefits

Dynamic Model Task Force Workshop

January 23, 2018

For a new generation project, consider

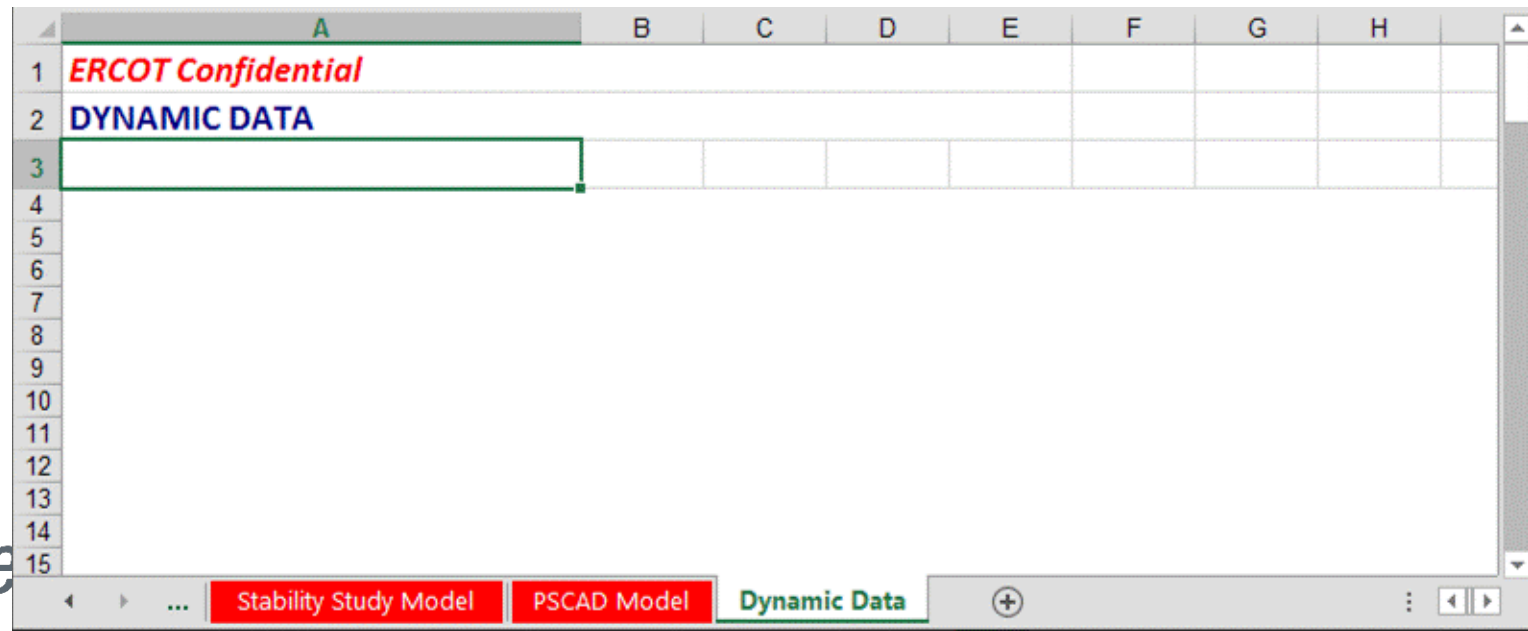
- IE submits dynamic model to TSP.
- TSP notes model issues.
- IE reaches out to manufacturer.
 - Relays shortcomings but confusion on what was shared
 - Conference call
- Manufacturer replaces preliminary model with better model.
 - IE sends to TSP; TSP continues analysis
- Project submits a RARF
- ERCOT notes additional model issues
- Process starts again...

Communication



Current Process

- RARF Free-format dynamic model submission
 - Word document
 - PDF document
 - Test reports
 - Zip files
 - Data files, etc



Challenges in the current process

- No generic way to automatically review and check the submitted RARF models
 - Various model formats and data files
 - One generator can require 3~6 models with up to hundreds parameter settings
 - REs may not be familiar model requirements listed in the DWG manual
- Takes time to communicate back and forth with REs/manufactures/consultants
- No clear indication if RARF update includes dynamic model update
- Requires tremendous manual review effort

DMTF Suggestions

Introducing...

Dynamic Model Template

GENROU: ROUND ROTOR GENERATOR M			
1			
2	<--Go back to Home page		
3	Unit 1		
4	AAES_UNIT1		
5	All parameters have been entered?		TRUE
6	Unit MVA Size	MVA	10
7	d-axis OC Transient time constnat	T'do	0.0
8	Subtransient	T"do	

Envisioned Process for RE

1.

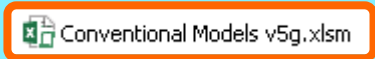
DOWNLOAD

Dynamic Template Package from ercot website.



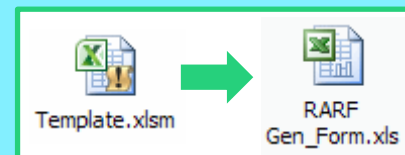
2.

LOCATE template matching your unit (conventional, wind, solar)



3.

Fill out and attach to your RARF

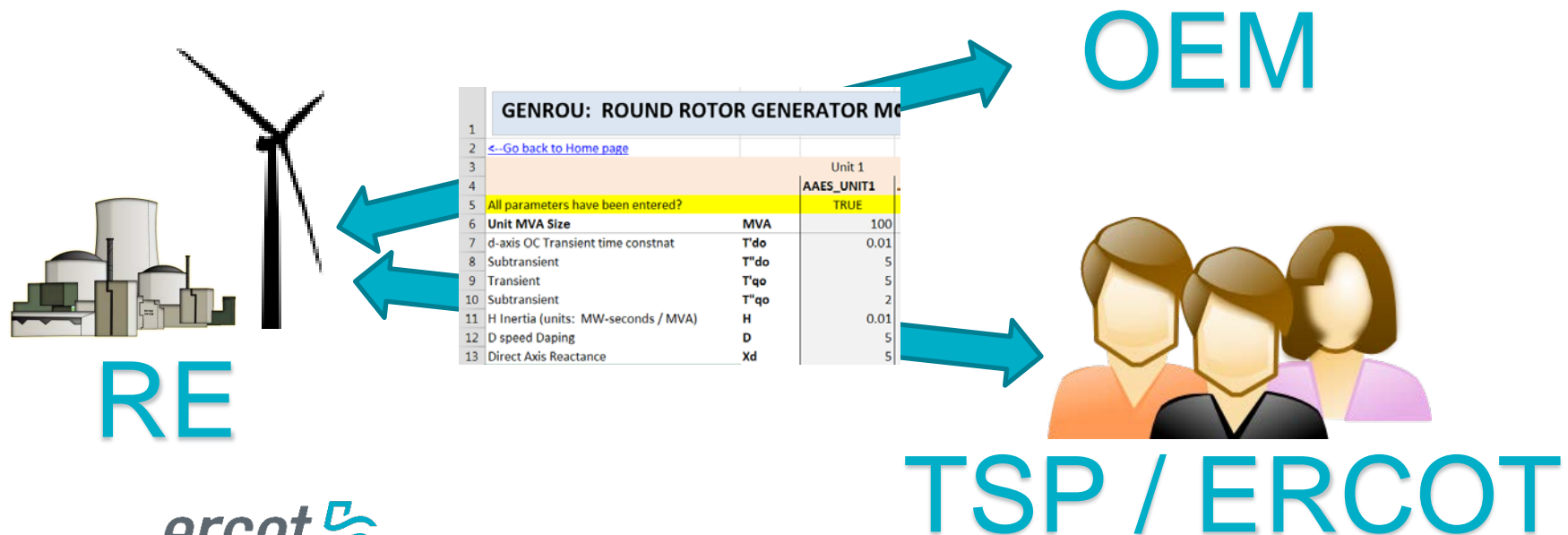


Advantages:
Better Guidance.
More structure.

Send to TSP for MOD 26/27 review.
Upload to ERCOT RARF hub

Templates Improve Communication

- Form identifies what is required
 - Easily share with your OEM or engineering team to have them fill out exactly what is needed
 - Standardized format much easier to maintain
 - Much easier for TSPs and ERCOT to load your model into our cases. Less back-and-forth. More understanding.



Benefits of templates

- ✓ Communicate what model components are needed
- ✓ Some basic error checking (completeness)
- ✓ Avoid transcription & formatting errors in .dyr files
- ✓ Easier to understand model parameters
- ✓ Easy to extract data for studies
 - ✓ Better communication prior to a study?
 - ✓ Faster feedback of model issues?

Template Demonstration

GENTPJ_{U1}: ROUND ROTOR GENERATOR MODEL

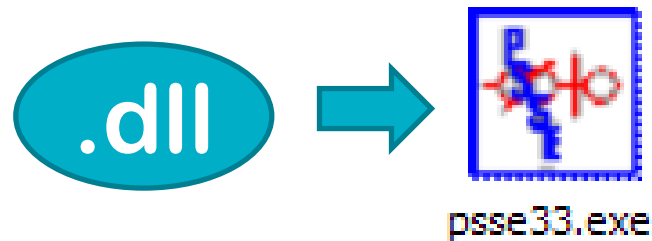
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		Unit 1	Unit 2
		AAES_UNIT1	AAES_UNIT2
All parameters have been entered?		TRUE	TRUE
Unit MVA Size	MVA	200	200
d-axis OC Transient time constant	T'do	6	6
Subtransient	T"do	0.05	0.05
Transient	T'qo	0.63	0.63
Subtransient	T"qo	0.07	0.07
H Inertia (units: MW-seconds / MVA)	H	2.17	2.17
D speed Daping	D	0	0
Direct Axis Reactance	Xd	2.05	2.05

Rolling out templates

- ERCOT will maintain, update, and create new templates.
- Template does not request any new information. Requests only what is already needed.
- Discussion
 - Process to deploy these proposed templates in the RARF

Generic vs. User-Defined Models



What is a generic model?

Generic

- Built into PSSE
- Automatically updated w/ new versions of PSSE
- Generally fewer compatibility issues
- (Often used by Fossil)

User-Defined (UDM)

- Require additional code (.dll, .lib, .obj) and user/design document
- Requires contacting manufacturer for new versions of PSSE
- Compatibility issues
- (Often used by Renewables)

- DMTF proposal: Either is acceptable, assuming plant is adequately represented.

UDM Model Quality

Issues and Solutions

Need help from manufacturers

- Make integrating models into PSSE as simple as possible
- Typically provided as a black-box model.
 - Sufficient document and description of the controls, settings, limitations, development of the model.
 - Document which .dlls go with which models
- How to better organize and communicate model updates?



Manufacturers: Making UDM Models Easy to Integrate into PSSE



- .dll ✓ ~~.obj~~ ~~.lib~~

- ~~Special procedures~~
 - ~~– .dll in a specific folder~~
 - ~~– Parameters set by powerflow solution~~

- ✓ Good documentation
- ✓ Limited number of parameters
- ✓ Easy to understand model families and updates

Some UDM annoyances

- >400 parameters; many of them are for internal use
- Requiring single-character unit IDs
- Requiring unload and reload .dll after a simulation
- Requiring disable the model if GNET

Document which DLLs go with which models

- A manufacturer makes 7 families of wind turbines
 - Some have their own .dll
 - Some share .dll files
 - Power Plant Controllers have their own .dll files, which connect with certain turbines and their .dll files



Model Recommendations

- Don't forget the PPC (Power Plant Controller)
 - This is usually the Voltage Regulator (AVR)
 - Sometimes is a separate component and .dll file
- Don't forget the statcom if present
- Provide an example case (.raw, .sav)
 - With PPC, statcom, switched shunts, etc. set up for a dynamic run
 - Especially helpful if switched shunts or statcom present

Understanding Model Updates

- A manufacturer rolling out new models for all its turbines
 - Fix some model issues
 - Combine all previous turbine families into a new updated .dll
- Communication
 - How inform ERCOT of updated model?
 - Help ERCOT understand model revisions

PSSE Dynamic Model Guidelines

- Identify previously observed issues and promote usable models
- Can help meet the MOD-026/-027 usability requirements. Also help studies.
- <http://www.ercot.com/calendar/2017/10/9/122658-DMTF>
 - http://www.ercot.com/content/wcm/key_documents_lists/122659/ERCOT_User_Defined_Model_Submittal_Guideline_draft_10_052017.docx
- Discussion?



Help from Resource Entities

- Welcome any feedback on Model templates
- Better understand process improvements

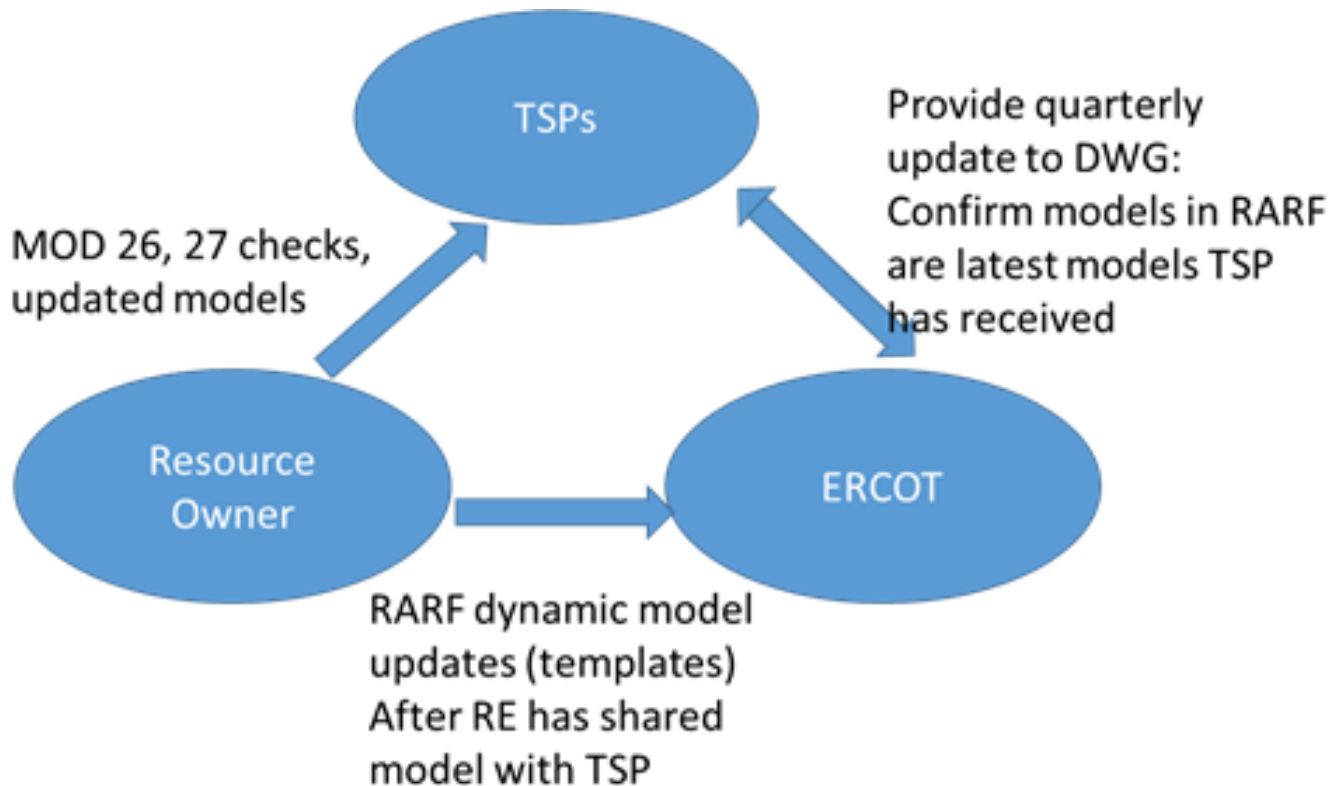
MOD 26 / 27

Brief discussion how MOD26/27 reviews might tie into the process

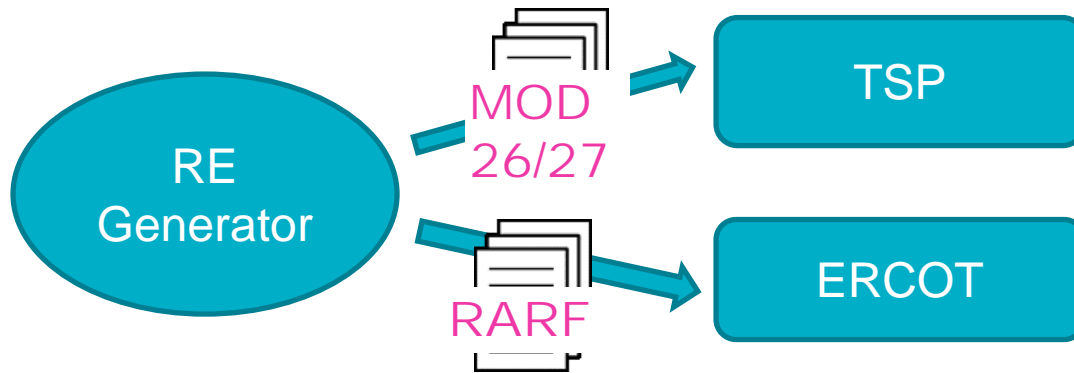
What is NERC MOD-026, MOD-027?

- Requirements for Gen Owner and Transmission Planner
 - Verify generator models accurately represent the generator behavior in studies
 - Verify model is usable
- MOD-026: Verify excitation, voltage, or VAR system
- MOD-027: Verify governor or frequency control
- <http://www.nerc.com/pa/Stand/Reliability%20Standards/MOD-026-1.pdf>
- <http://www.nerc.com/pa/Stand/Project%20200709%20%20Generator%20Verification%20%20PRC0241/MOD-027-1.pdf>

Process

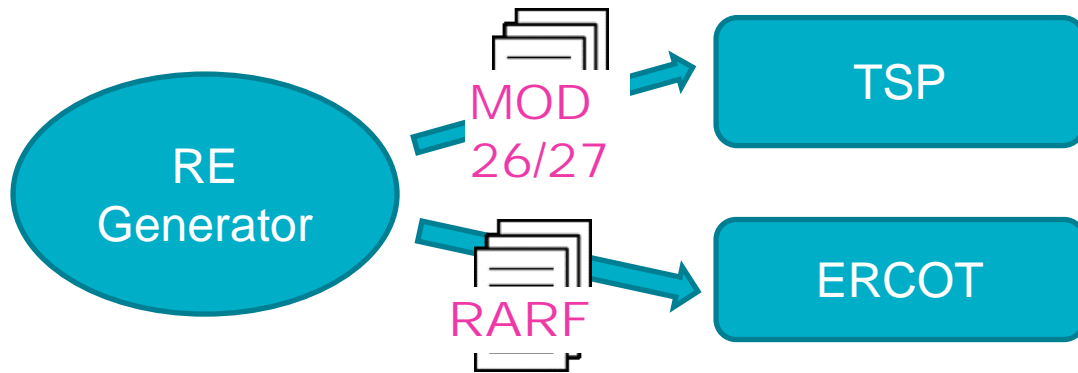


Data Flow



- Periodically or following a change to the generator model, RE submits
 - MOD 26/27 documentation
 - a new RARF
- Consistency challenge. However, templates may help
 - RE could submit same documents (RARF+Templates) to both ERCOT and TSP.

Data Flow



- Ideally, RARF should reflect fully vetted models
 - Coordinate RARF update with MOD 26/27 review?
 - Discussion?

Discussion



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