ERCOT NMM

- The ERCOT System
- NMMS Overview & Key Functionality
- Stakeholder Model Update Submissions
ERCOT Models

Network Operations Model
- Energy MS
- Market MS
- Steady State Analysis
- State Estimator
- Day Ahead
- Outage Coordination
- Voltage Stability

Planning Model
- Future Year Analysis
- Production Cost Analysis
- Voltage Stability

CRR Model
- Congestion Auction

Dynamics Model
- Stability Analysis

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What is NMMS? In Short:

*One* system manages all model data for up to one year into the future

The Network Model Management System (NMMS)
What Does NMMS Do?

- Resource Asset Registration Forms - CSV Generation data
- Network Operations Model Change Requests (NOMCR) - CIM/XML
- Planning Model Change Requests (PMCR) - RAWD, IDEV, Python
- Special Action Model Requests (SAMR) - Word Doc, Excel, txt
- Equipment Outages/Outage Records - CSV

NMMS

- MMS Topology, Contingencies, Ratings, Settlement points - CIM/XML
- Market Participant Notifications - Auto email
- Outage Scheduling - Equipment List, Ownership Info, Effective Dates - XML
- EMS Topology, Contingencies, Ratings, SCADA - CIM/XML - One Lines
- Settlements - Model data, Dates, Hub information, Settlement Point reports
- ERCOT Working Groups, Independent Market Monitor, Texas Reliability Entity (TRE)
- Market Information System - Redacted CIM/XML model Reports
- Outage Evaluation Future Topologies, Contingencies, Ratings, SCADA - CIM/XML
- System Planning Future Cases - RAWD Files
- CRR TP Cases (Outages Incorporated) - RAWD Files
- CRR Auction Info
- Metering - One Lines
- ERCOT Polled Settlement Meter Locations, Topology changes
NMMS - Key Requirements

- Time-based modeling
  - A change that will happen in 5 months can be modeled today.
  - A model that represents all changes 5 months into the future or from the past can be created today.

- Generate all models for all processes
  - Repository for all model information
  - Both full and incremental CIM files

- Accept incremental modeling updates.
  - Submitted by the Market Participants (TSP, QSE, LSE, RE)
  - QSE, LSE and REs must submit data to an ERCOT representative.
Time-Based Modeling

- Incremental Changes - All model updates are stored as a packet of database modification commands

- Effective Date - Each incremental change is given an energization date

- Future Models - Applying dated incremental changes to a base model creates a model representing a future date
PTC: Create NOMCR Screen (Details)
PTC: Create NOMCR Screen (Details)

NOMCR Information Section

- NOMCR Name
- Energization Date
- Description
- Interim Update Information
- View History
- Dynamic Rating Changes Only Option
  - (Maybe ICCP Data only)
PTC: Create NOMCR Screen (Details)

Dependency Section:
- Dependent NOMCRs
- Dependent SAMRs
PTC: Create NOMCR Screen (Details)

Upload Section:
- CIM XML Import
- Related Information
- Launch Model Editor(IMM)
PTC: Create NOMCR Screen (Details)

Submit NOMCR Section:
- Validate IMM Data
- Submit NOMCR
- Validation Log
- Create View Comments
- Remove Private Changes
- Withdraw
- Delete
- Save
PTC’s Case Builder

- **Model Generator** in PTC’s Case Builder is used to
  - Build a model for a target build date (one day prior to next model load)
Exporting a Model

- **Test Model Generator** in PTC’s Case Builder is used to:
  - Build a model for a target build date (one day prior to next model load)
  - Export CIM/XML profiles from the model that is built.
Future Model Creation

Creating an Operations Model
- The model is created by applying all the incremental changes that occur between the current and future dates to the base model

Creating a Planning Model
- An Operational model is created for the future date
- This model is passed through a “topology processor” to change the breaker/switch model into a bus/branch Planning model
- Planning incremental changes are then applied to the model to make it reflect the future date

Consistent Data - Converting an Operational model guarantees consistency
ERCOT Network Model Build Process

- All activities are executed in a Test Model Development environment using the latest available Production data snapshot.
ERCOT Steady State Planning Model Creation Process

Network Model Management System (NMMS)

Topology Processor

Model On Demand (MoD)

Iterative

Review

Gen Dispatch Profiles

Load, Voltage Profiles

Future PMCR

Standard PMCR

TSP

QSE

RARF

RE

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ERCOT Dynamic Model Creation Process

Temporal Network Operations Models CIM/XML used by EMS, MMS, OS, S&B

Topography Processor RAW

Model On Demand (MoD)

Future 1 to 7 Year Steady State Planning Models RAW

RE Submitted Dynamic Data

Real-Time Dynamic Analysis

Model Parameters

Future Dynamic Case Analysis
ERCOT Model Re-creation for Validation

CIM XML for desired Time Frame

Off - Line Network Model Management System (NMMS)

Topology Processor

Off - Line Model On Demand (MoD)

PI Gen Historical Data

PI Load Historical Data

PI Switch Status Historical Data

PI XF LTC Tap Historical Data

Outages for desired day/hour*

*If not reflected by switch status
Stakeholder Submissions

- ERCOT Stakeholders include:
  - Transmission/Distribution Service Provider (TSP)
  - Qualified Scheduling Entity (QSE)
  - Resource Entity (RE or Generators)

- QSEs and REs must submit their data through an ERCOT representative and do not have access to the NMMS directly. The ERCOT network modelers take their data and input it into the NMM system.

- TSPs may submit their data in one of 2 ways:
  - Online through the Portal using a One-Line Editor
  - Submission of CIM/XML incremental instance files per the IEC standards.
NMMS Stakeholder Submissions

Market Participant (Operations)
- Incremental Ops File
  - Make Changes Directly
  - Import

Market Participant (Planning)
- Incremental Planning File
  - Upload

Web-Based UI
- Operational Data
  - Base Ops Model
  - Dated Job
  - Incremental Ops File

Planning Data
- Operational Model
  - EMS (AREVA)
  - MMS (ABB)
  - Outage Scheduler (ABB)

Case Builder
- Planning Model
  - Dated Project
  - Planning (Siemens PTI)
  - CRR (Nexant)
Summary

- The set of requirements faced by ERCOT is not exactly the same as for other ISO/RTOS.
- ISO/RTO requirements are not the same as TSO requirements.
- However, there is a lot of overlap and the same underlying design principles can be applied.

- ERCOT NMMS did not do everything right, but it is a success!
- It demonstrates that planning, operations and markets can share common modeling source data to their mutual benefit.
- It demonstrates that a group of entities in an interconnection can coordinate modeling, to everyone’s benefit.
Thanks!

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