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AEP Transmission breaks new ground in network model management

System coordination improvements are underway with help from Siemens PTI

Long an innovator in the electric power transmission market, AEP Transmission continuously seeks to ensure a more reliable electric grid. It relies on sophisticated modeling and analytical tools to optimize the planning, operations, and long-term protection of its rapidly growing and increasingly complex transmission network infrastructure assets. When manual aspects of the modeling process became increasingly unsustainable, efforts to improve and modernize the approach became a priority.

A new initiative was launched in 2015 with two primary goals: to better coordinate network model information across several business functional domains, and to centralize management of that information.

In early 2017, AEP Transmission selected Siemens PTI to help provide and facilitate the transition to a new Network Model Manager (NMM) solution – part of AEP's greater T-Nexus Network Model Management Improvement Program.

Siemens PTI in collaboration with American Electric Power (AEP) Transmission.

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Pressing challenges compelled improvements

AEP Transmission, a division of American Electric Power, owns and operates the largest transmission network in the nation, with more than 40,000 miles of lines serving more than 5.4 million customers across 11 states. It manages operations, engineering, and planning network models, each of which involves preparation and input of data from multiple internal and external systems.

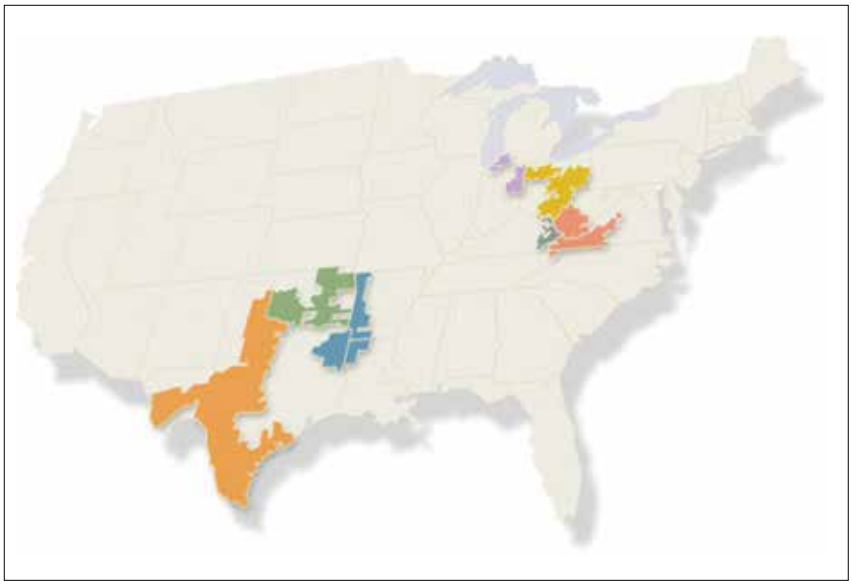
Wide-ranging analysis systems are at stake, including power flow, state estimator, contingency analysis, short circuit, dynamics, transients, geomagnetically induced current, geomagnetic disturbances, power systems computer aided design (PSCAD), electro-magnetic transients program (EMTP), and more.

Over the past two decades, model sizes and complexity increased significantly and model coordination was a mounting challenge. In that time, AEP Transmission merged with the former Central and South West Corporation, increasing its service coverage to 11 states; a new state estimator platform was deployed; regulatory reliability and compliance mandates were increasing; and the industry as a whole was dealing with an aging infrastructure.

In addition, AEP's transmission planning and operations models had to be coordinated with three regional transmission operators (RTOs): PJM, SPP, and ERCOT. The combined state estimator cases exceed 16,000 substations and 22,000 buses.

Within AEP Transmission, organizational and technology limitations were becoming more evident. The basic transmission network models for planning, operations, and protection were maintained by different business units within the company, and coordinating models between the business units was a largely manual process. Resultant technical challenges included:

- Dealing with different internal modeling topologies
- Identifying systems of record for data ownership as well as necessary business process changes
- Developing an overall data governance strategy
- Developing a technical vision based on standards-based integration



AEP Transmission service territory

Proposed solution answers the needs

To streamline its modeling processes and better adapt to ongoing industry changes, in 2015 AEP Transmission established a set of system requirements based on *EPRI Network Model Manager Technical Market Requirements: The Transmission Perspective*. In February 2016, a Request for Proposal was issued, and in January 2017, Siemens PTI was chosen as its solution partner.

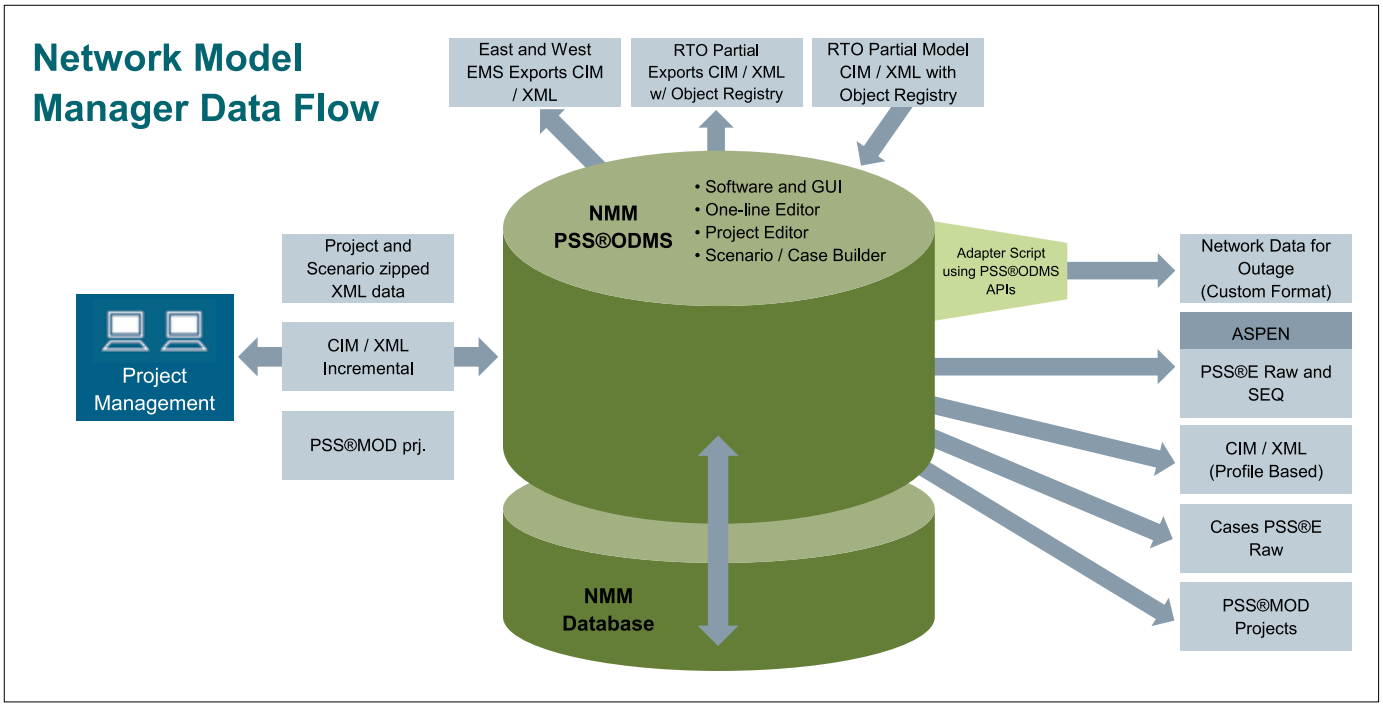
Siemens PTI recommended implementing PSS®ODMS, its electrical power transmission system modeling and analysis software product. Built upon the industry-approved Common Information Model (CIM) open standard, the solution would allow AEP Transmission to convert, manage, and exchange network model data, and produce short-term and long-term cases.

PSS®ODMS allows system engineers and operators to quickly and easily maintain, analyze, and exchange network data. It includes built-in functions for importing and exporting data in PSS®E and CIM/XML format compliant with the IEC 61970 CIM standard and NERC CPSM and ENTSO-E profiles.

With the ability to model and analyze transmission networks down to the node-breaker level of detail, combined with historical change tracking and planned future project modeling features, PSS®ODMS fully supports maintenance of a unified transmission operations-and-planning network model.

Designed for usability, PSS®ODMS has a highly intuitive graphical user interface for creating, deleting, and reconnecting equipment and modifying attributes. It provides fully integrated topology processing and power flow model validation along with contingency analysis functions. Graphical results visualization capabilities include flow arrow animation, color contouring, and use of one-line and tabular displays.

Solved snapshot cases from PSS®ODMS can be both manually and automatically exported to PSS®E format and used for planning studies. To facilitate longer-term changes in AEP Transmission's network, a project modeling function supports unlimited multi-phase projects and interchangeable alternative future network scenarios. This provides a work area to store and test modifications to the model before they are committed permanently to the base model.



Envisioned T-NEXUS Network Model Management Data Flow

For added flexibility, the PSS®ODMS database schema can be extended to include custom user-defined classes and attributes supported with inclusion of these extensions in the CIM viewer and import/export functions. Using Python and .NET APIs, AEP Transmission can create its own user interface extensions and/or integrate PSS®ODMS with other systems, such as its enterprise asset management system (EAM), energy management system (EMS), outage management, engineering platforms, and geographic information system (GIS).

New solution benefits customers and America's electric grid

Siemens PTI is working with AEP Transmission to help provide and facilitate a transition to a new NMM solution - part of AEP's greater T-Nexus Network Model Management.

T-Nexus

With the PSS®ODMS-based NMM implementation now underway, AEP Transmission and Siemens PTI are setting the stage for a more reliable and sustainable electric grid. "By designing and deploying a standards-based network model management solution, AEP can leverage emerging industry technologies around data management and data analytics," says Eric Hatter, T-Nexus Program Manager at American Electric Power.

As a result, Hatter explains, AEP Transmission will:

- Greatly reduce the time and costs associated with manual model coordination efforts, both internally as well as with external entities
- Establish the infrastructure and data governance foundation to support AEP's strategy of capital investment in transmission improvements and expansion
- Provide a model alignment solution that will help drive the implementation of advanced technologies, such as predictive asset health analytics, synchrophasors, etc.

The core NMM implementation and incremental integrations are expected to be completed in late 2018.

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