AEP T Nexus – Benefit Summary / White Paper

T Nexus Narrative

Modern electric utilities are required to maintain numerous applications that rely on accurate electrical power system models. As one of the largest electric utilities in the North America, AEP is dependent on some of the most complex modeling and analytical tools in the industry. The purpose of the modeling and analytical tools is to allow AEP to optimize the planning, operations, and to properly coordinate protection and control systems of its rapidly growing and increasingly complex transmission network. When AEP Transmission recognized the manual aspects of the modeling process were becoming unsustainable, efforts to improve and modernize the approach were made a priority. An AEP Transmission modeling optimization initiative was launched in 2015 with **two primary goals:** 1) to better coordinate network model information across several business functional domains, and; 2) to centralize management of that data / information. In early 2017, AEP Transmission approved and funded a $9M capital project to coordinate and optimize all Transmission modeling efforts. The project titled T-Nexus centers around a Siemens ODMS CIM compliant database.

T-Nexus integrates multiple systems and databases that require subsets of the same data. T Nexus also defines the activities required to generate or update data for these systems in a centralized application. The updating process is currently repeated by each department independently. Today, Engineers often spend significant amounts of time entering, synchronizing, validating, and correcting duplicate information. The current approach leads to process inefficiencies and data inconsistencies that are beginning to show adverse effects, both in terms of reliability and cost. Upon full implementation the T-Nexus program will alleviate all of these challenging complications.

T-Nexus Background and Functionality

The concept of a Network Model Manager that uses the Common Information Model (CIM) is the foundation to provide a single repository to house a coordinated network model for departments across the utility enterprise. The growing reliance on network analysis, the advent of new regulatory requirements related to model validation and the need for network model sharing between transmission applications, has made the management of transmission network models a required fact of life in utilities and RTOs. The T-Nexus program fulfills this need and utilizes the following functionality:

- Aligns the models used in Transmission Planning (PSSE), Protection and Control Engineering (ASPEN) and Transmission Operations (EMS)
- Defines, manages and distributes connectivity for all AEP elements of substation and transmission lines that make up Transmission facilities
  - This includes a module that will calculate the Most Limiting Series Element (Kremlin Replacement) required to determine operating limits for all Transmission facilities
- Ensures the real time system can be easily assessed using bus-branch or breaker-node models
- Enables CIM data exchange with RTOs (ERCOT is a CIM based model today, which is based on a system very similar to T Nexus and PJM is using a CIM model today)
  - Move all modeling into the Common Information Model (CIM) format
    - In electric power transmission and distribution, the **Common Information Model** (CIM), a standard developed by the electric power industry that has been officially adopted by the International Electrotechnical Commission (IEC), aims to allow application software to exchange **information** about an electrical network.

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Vision

Move from loosely structured, inconsistently triggered data flows…
…to effective network model data management

Project Drivers

1. Allows management of the increasing model size and complexity of the power system model
2. Increases model reliability to assist with NERC and RTO compliance mandates
3. Aggregates data to provide a cohesive strategy for data analytics and governance.
4. Improves efficiency and effectiveness of business processes and aligns business units into a strategic workflow.
5. Streamlines all modeling processes for all business units and aligns all internal modeling topologies.
6. Identifies the system of record and data ownership through the modeling lifecycle.
7. Assists in the implementation of a data governance strategy
8. Provides a standards-based integration platform.

Benefits

1. Reduces manual modeling efforts resulting in O&M savings.
    a. Eliminates manual updating by each business unit
2. Uniform business processes provide the company with efficient resource allocation
3. Eliminates redundant data entry
4. Provides efficiencies in the following areas: data, models, processes and workforce
5. T-Nexus will give AEP an advantage in a competitive business environment by enhancing the companies' ability to utilize data.
    a. Data consistency leads to pragmatic decision-making
    b. Hasten response to dynamic business needs
    c. Accelerate the ability to capture value
    d. Improve the ability to manage growth in the number and mix of transmission projects
    e. Improves the time to integrate existing or new systems