Key Attributes of Xcel Energy’s Transmission Asset Health Analytics (TAHA) Program

Minnesota Power Systems Conference
November 3, 2020
TAHA Vision

• Dependable, reliable, transactional data with complete health analysis and state of assets
• Cognitive, predictive abilities to understand Xcel Energy assets with immediate situational awareness
• Adaptable and expandable enterprise capabilities with agility across the company
• Ability to measure asset performance within Xcel Energy and compare industry wide
Goals of TAHA Project

SUBSTATIONS:
Approx. 75,000 substation assets analyzed for quantity, age, and condition

TRANSMISSION LINES:
Approx. 20,000 line miles analyzed for extent, age, and condition
Goals of TAHA Project

• Utilize money/resources at the right place and the right time
• Provide visibility and awareness of assets
• Prioritized maintenance within and among asset classes
• Automation of manual processes
• Promote a process of continuous data improvement
• Self-service Analytics and Reporting
Keeping Customer Bills Low and Improving Reliability

From:
- Manual Collection
- Data
- SME Ranking
- Budget Process
- Portfolio

To:
- More Automated and centralized data processing
- Data-driven, real-time decision making
- Proactive asset management
- Improved long-term planning

- 7 Unconnected data systems
- Manual data processing
- Qualitative decision making
- Reactive asset management

TAHA Strategic View
Work Streams

• ARCM and DGA using OSI-PI
• Data Lake
• Advanced Analytics (New vendor platform)
Workstream 1: ARCM & DGA

• Challenge
  – Manual processes used for Dissolved Gas Analysis (DGA) and Adaptive Reliability Centered Maintenance (ARCM)

• Solution
  – Automate by leveraging existing technology (OSI-PI) and streamlining data uploading from labs and other sources

• ARCM
  – New OSI-PI Software Solution
  – Performance data
  – Operational data
  – User interface
  – Repeatable solutions
Workstream 1: ARCM & DGA

• DGA
  – OSI-PI Dashboard provides overall conditions of oil-filled transformers @ substations.
  – Gas concentration trending
  – User interface
  – Repeatable Solutions

• NEXT STEP
  – Continue implementing User-generated enhancements
## ARCM Preventive Maintenance Scoring

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Pi System Transformer DGA Analysis

Transmission Asset Health Analytics

Last Sample: 4/26/2029
 Required Sample Interval: Condition not set

Key Gas Ratios
Ratio 1: 0.499 (Methane/Hydrogen)
Ratio 2: 0.701 (Kerosene/Butane)
Rogers Ratio: 2.3 (Kerosene/Butane)

Total Dissolved Combustible Gas
TDGC vol%: 7.288

Condition Result: Normal Condition

Key Gas Result: Normal Condition

Condition 4 = Excessive Decomposition
Condition 3 = High Level of Decomposition
Condition 2 = Normal Operation
Condition 1 = Normal Operation

Workstream 2: DATA LAKE

• Challenge
  – Data scattered among many systems, different formats, recorded at different time intervals from various groups and no common key for asset information.

• Solution
  – Create series of “data pipelines” to a central staging and processing data base to create conformance

• Data
  – Identified data quality issues
  – Started cleaning process
Workstream 2: DATA LAKE

• DGA & Power Transformer Expert (EPRI)
  – Housed data from sources to complete calcs
  – Enabled EPRI PTX health models for Transformers

• Next Steps
  – Allow selected vendor to access data for TAHA
  – Enable internal data science and analytics on data
  – Continued Data Quality improvements to ensure trustworthiness of data
Data Lake: TAHA Foundation

- Optimized Asset Management
- Situational Awareness
- Prioritization & Justification for Long and Short Term Planning

Artificial intelligence
Machine Learning (Photos)
Natural Language Processing

“Engine” for TAHA
Algorithm Based Tools & Reporting

Foundation for TAHA
- Dependable
- Reliable
Workstream 3: Advanced Analytics

• Challenges
  – Lack of situational awareness of asset health and risk.
  – Manual inputs required to build and maintain assets
  – Inconsistent criteria application across OpCos
  – Lack of real time reporting

• Solution
  – Use advanced analytics (algorithms and AI)
  – Consistently report on the state of the asset across all asset categories
  – Enable long and short-term planning and execution
  – Deliver high levels of service, control costs, and balance risk
Workstream 3: Advanced Analytics

• RFP
  – Generated 250 questions based on use cases
  – Interviewed peers from multiple proposals and scored for comparison
  – Narrowed to two vendors, then selected GE’s Asset Performance Management platform

• Next Steps
  – Vendor recommendation
  – Build phase, implementation, continuous improvement phase, etc.
General Purpose of TAHA

• Combine different types of asset data
• Explore capabilities
• Provide analytics for maintaining, replacing right equipment at right time with operational awareness
• GE Asset Performance Management (APM) system: explore data by introducing algorithms for different assets
A continuous loop of improvement

Xcel Energy seeks to optimize the performance of our assets. Increasing asset reliability and availability while optimizing maintenance costs, mitigating operational risks and reducing total cost of ownership.

By optimizing our data for our assets in one tool, TAHA will allow us to reduce costs, understand our assets and failures and manage risks.
APM Grid Health Dashboard
## TAHA APM Plan/Vision

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2022 & Beyond:
- Advanced Analytics
- Cloud Migration
- Automation
- Additional Assets Onboarded
- Integration With Unmanned Aerial Vehicles