Digitizing Distribution System Model Validation

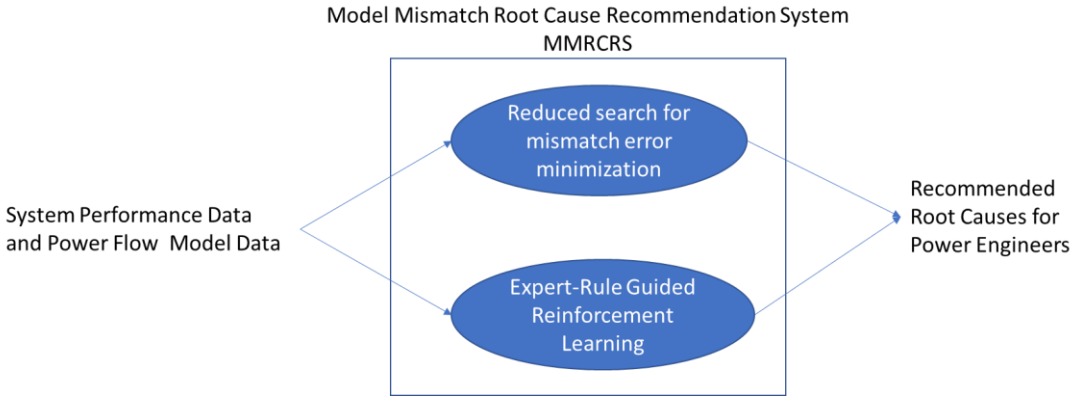
Project Goal: To significantly reduce the manhours in tracing the root causes of model mismatch through developing an automated tool to digitize the model validation process

Project Outcome: A model **mismatch root cause recommendation system (MMRCRS)** for utility engineers

Model Mismatch Issue

- Foundation for ADMS functions
- Large amount of power components and sparse measurement
- Different categories of root causes
- Extreme labor-intensive effort
- No guidelines or tools

Proposed Solution



- Establish the foundation from first principles and measurement data
- Model-based optimization with search space reduction and data clustering
- Date-driven classification and expert-rule guided machine learning with embedded domain knowledge
- Combined recommendations for possible root causes

Project Schedule

- Task 1. Generate synthetic data and develop algorithms
- Task 2. Scale up the prototype to Duke Energy System
- Task 3. Develop user interface and technology transfer
- Three **milestones** to deliver prototype, model, code, tool
- **Success value**: utility buy-in
- **Performance Metrics**: 1) model mismatch error < 2V; 2) computational time < 1hour for each substation