Distribution System Planning
Supply-Side Efficiency Study Advisory Committee Meeting
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About Xcel Energy

Northern States Power Company
- Minnesota

Northern States Power Company
- Wisconsin

Public Service Company of Colorado

Southwestern Public Service Company

Gas Customers: 2 Million
Electric Customers: 3.5 Million
Electric Power System Overview

Integrated Resource Planning and Transmission Planning

1. Power generation
2. Transmission structure
3. Serves one or multiple communities
4. Serves 1,500 to 8,000 customers
5. Serves 40 to 400 customers
6. Serves 4 to 12 customers

Distribution Planning
Distribution System Planning Process

Special Initiatives
- ADMS Design
- Hosting Capacity
- Long range plans
- Asset Health projects
- AGIS support
Reliable Feeder Design

Feeder Breaker
Feeder #1

Feeder 1
Section 1
Loading = 25%

Feeder 1
Section 2
Loading = 25%

Feeder 1
Section 3
Loading = 25%

Tie to
Feeder
#2

Tie to
Feeder
#3

Tie to
Feeder
#4

Fault

Switch

Key
- Switch - Normally Open
- Switch - Normally Closed
Distribution System Planning for the Future

- Forecasting impacts
  - Quantity and dependability of Distributed Energy Resources (DER)
  - Electric vehicle adoption
  - New types of conservation & load control
- Move from “peak only” forecasting to 24/7
- Improve planning & forecasting tools
Hosting Capacity Analysis

- Definition of hosting capacity
- History
  - Other utilities
  - NSPM
- Possible future enhancements
Intelligent Distribution System

- Advanced Distribution Management System (ADMS)
- Secure Field Area Network (FAN)
- Expand SCADA coverage
- Advanced Field Devices
  - Monitoring & Control Equipment
    - Capacitor Controls
    - Smart inverters
  - Automated field switches (FLISR)
- Dispatchable Resources (DG, Storage, DER)
Distribution Planning Future

- The integrated grid of the future will be robust & reliable, serving energy users and producers alike
- Distribution planning is becoming more complex
- We face a challenge of funding capacity needs, asset refreshment, and modernization – finding the right balance
Energy Efficiency – Surge Arresters

• Xcel Energy utilizes Cooper Power Systems’ Evolution Arresters for all overhead line applications
• Approximately 90% lower energy losses vs the 2 major competitor products.
  – 2 watts vs 25 watts
Energy Efficiency – Outdoor lighting

• Large project to convert from high pressure sodium to LED outdoor lighting in all 8 states that we serve
  – Equivalent LED lights consume between 38% and 61% less energy than the high pressure sodium lights
Energy Efficiency - Transformers

• Major utilities assign equivalent present value for:
  – costs of no-load losses
  – costs of load losses
• Transformer manufacturers select designs and core materials that reduce losses in an economic manner
• Present value for the cost of losses is added to the prices in order to select the unit with the lowest total cost of ownership
Energy Efficiency - Transformers

• In recent years the federal Department of Energy (DOE) has implemented efficiency regulations that dictate minimum efficiency levels.
• These energy conservation standards are specified in the Code of Federal Regulations at 10 CFR 431.196.
• For Xcel Energy and most Midwest utilities the DOE requirements significantly exceed the efficiency level that would be selected based on the previously mentioned economic calculations.