



Distribution System Planning

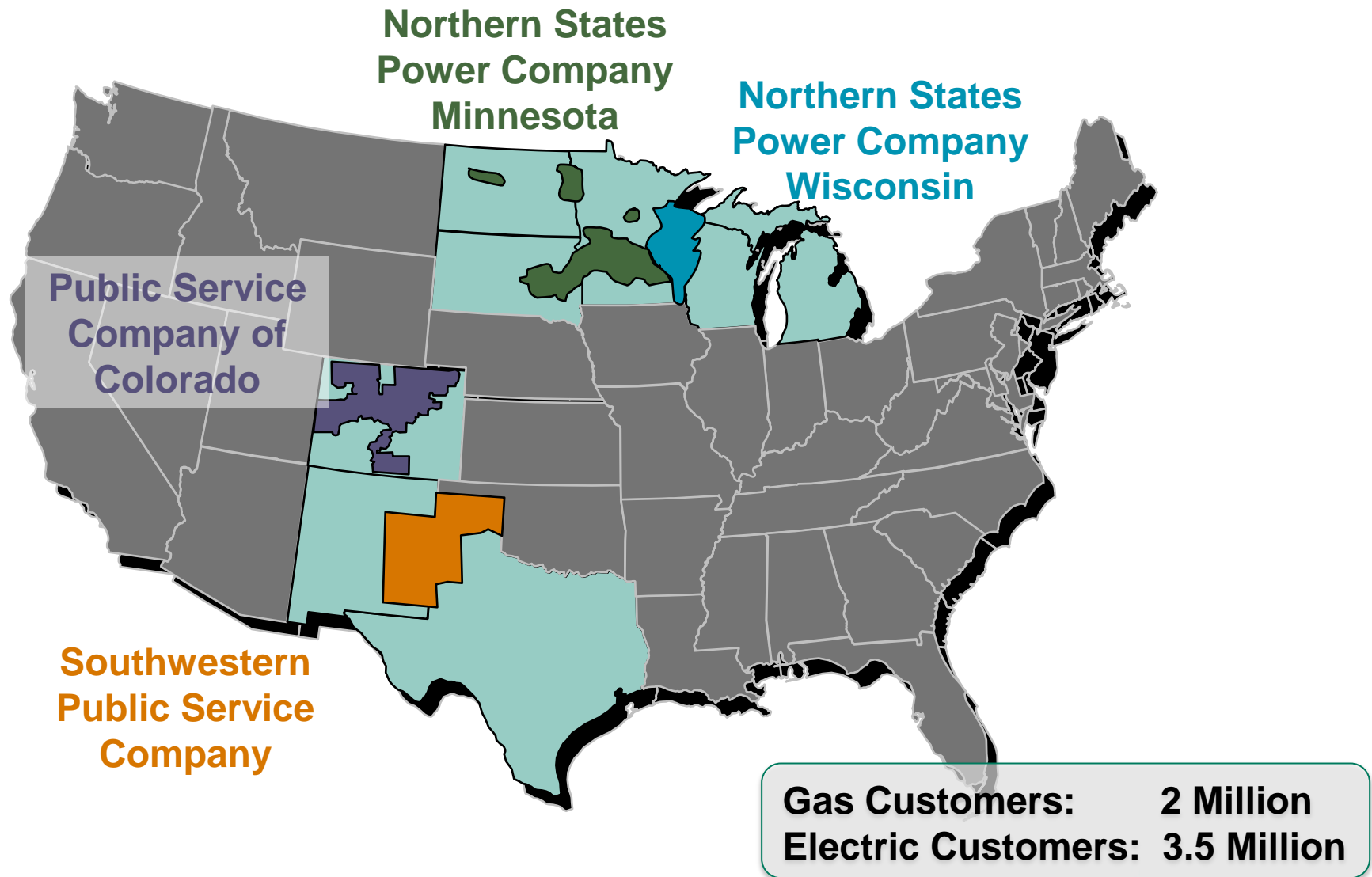
Supply-Side Efficiency Study Advisory Committee Meeting

October 2, 2017

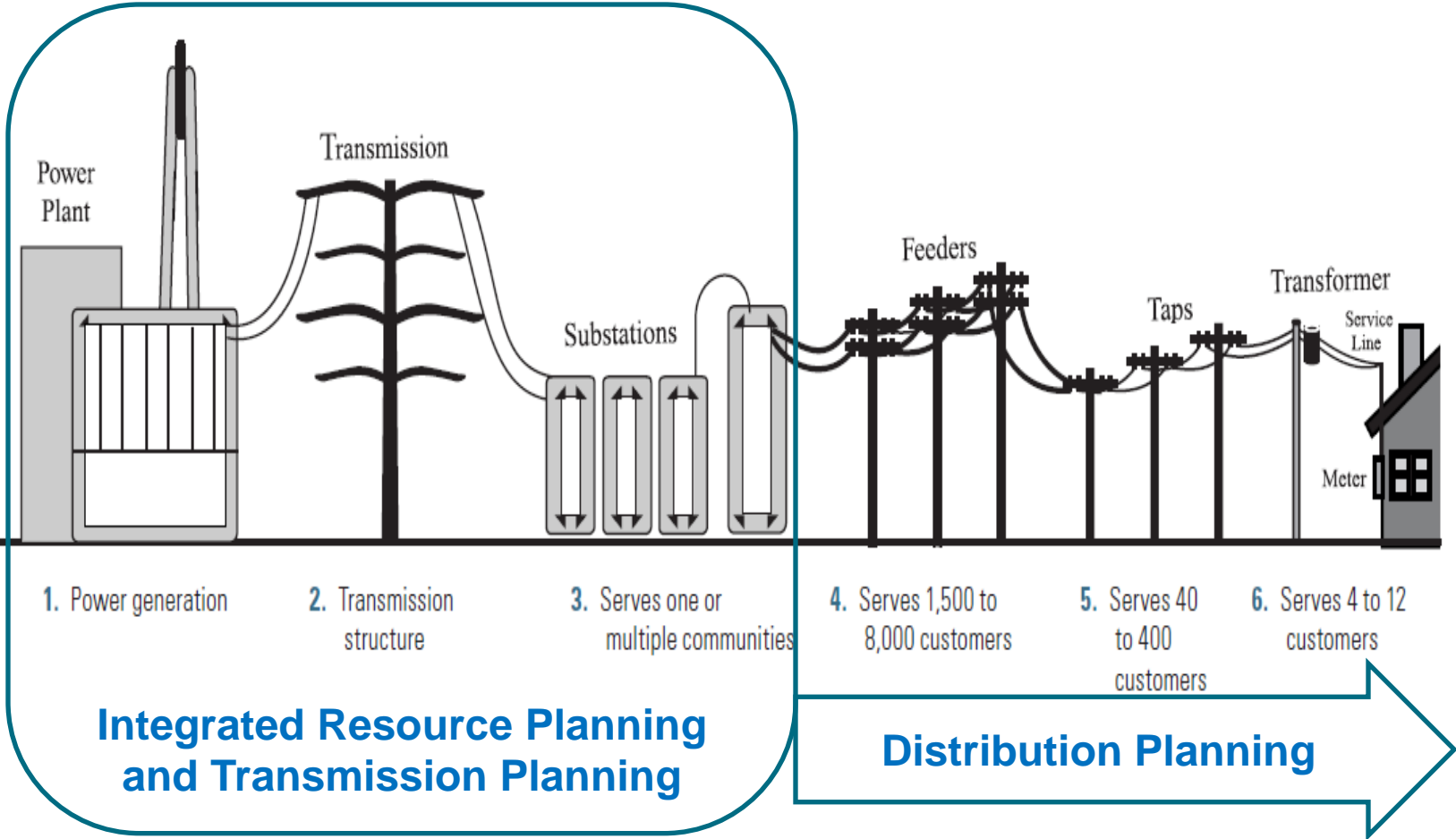
Mary Santori, Manager, Distribution System Planning & Strategy



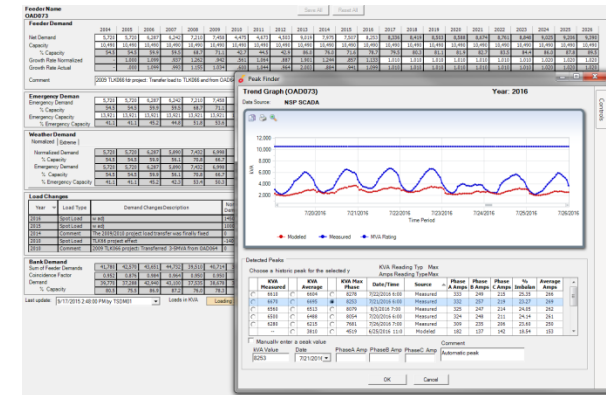
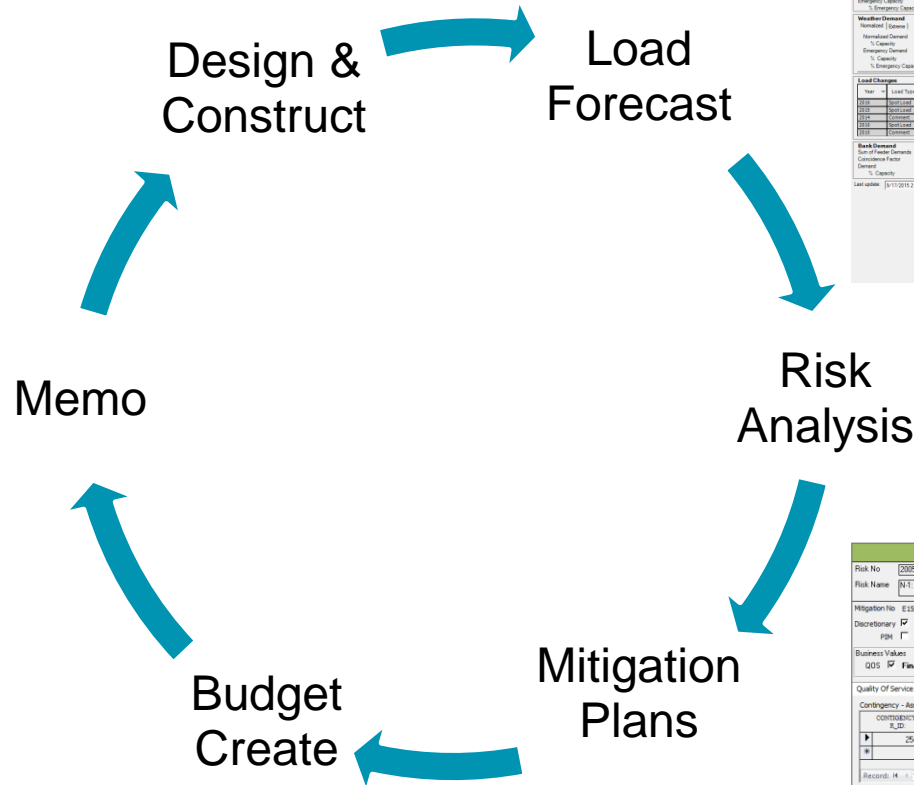
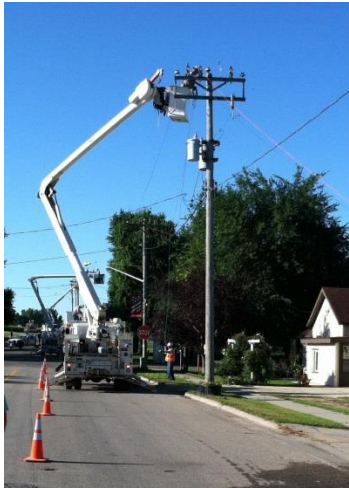
About Xcel Energy



Electric Power System Overview



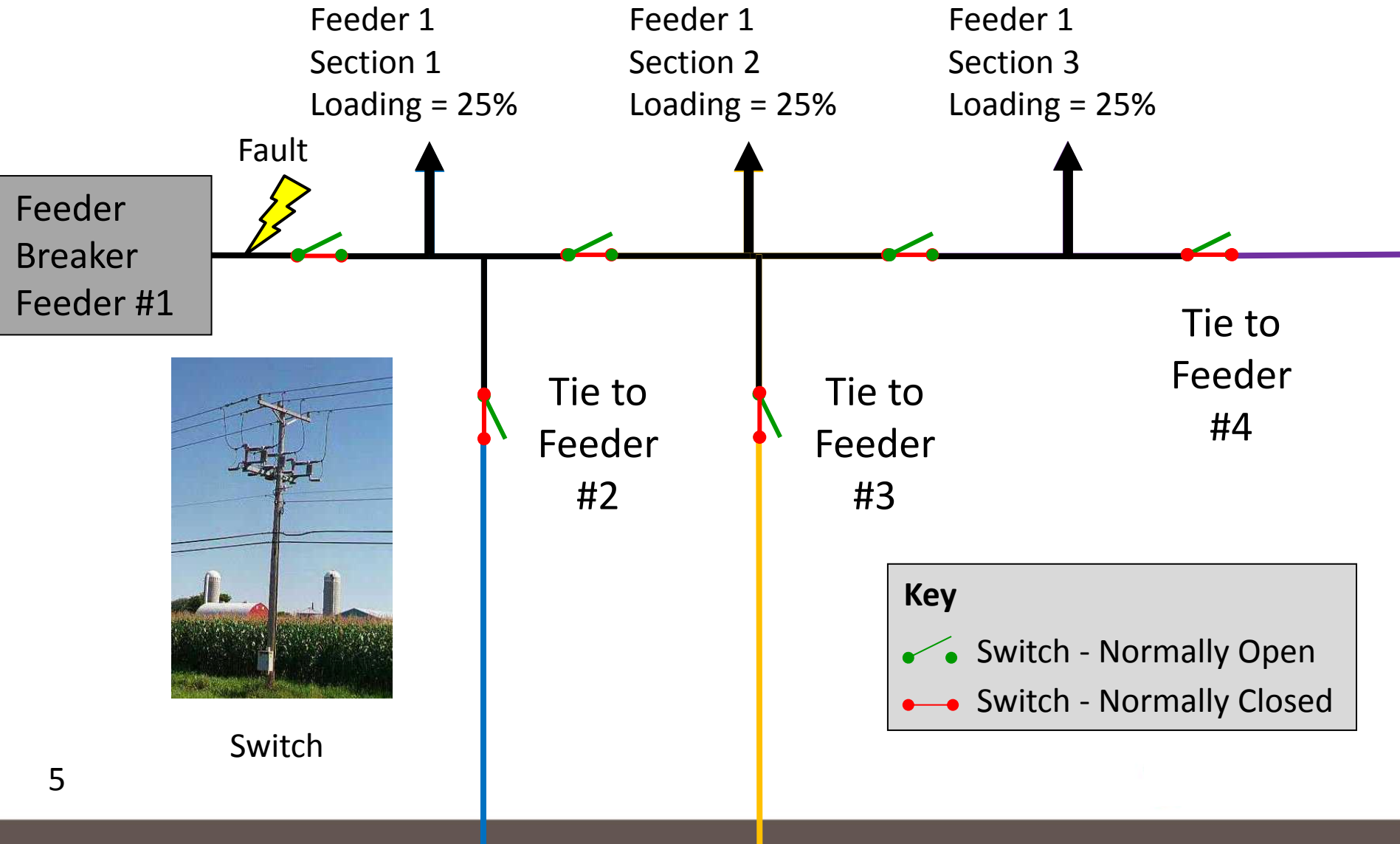
Distribution System Planning Process



Risk ID	Contingency	Pre Load	Post Load	Availability	Customers	Pre Day	Time To	Annual No.	Age Off/Exp	Link Off/Exp	Trans	Transformer	Follow Bus Of	Cost Off/Exp
2006.0214	lv	11,068	6,909	164	15.1	12	641	48	22	2143				
2006.0196	lv	12,738	2,248	120	24	13	8760	49		1,081				

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

Reliable Feeder Design



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

