NRECA’s Technical Focus

- Over 900 Electric Cooperatives
- Serve 42 million Americans in 47 States
- Cover >70% of Nation’s land mass
- Own 42% of all Distribution Line
- Totals 2.4 Million Line Miles

Not for Profit, Consumer Owned, Consumer Controlled

Identify and Adopt Beneficial Technologies:
- Improve Productivity
- Enhance Service
- Control Cost
Choosing the Right Technologies

Motivations & Methods
Uncovering Smart Grid ROI

- Technology Investments Hinge on Cost Benefit
- Accelerate Beneficial Adoption Rate
- Precision
Modular Evaluation Tool

- Run cost-benefit analyses on smart grid investments, either individually or in arbitrary combinations.
- Available via the Internet, it will integrate and extend all of the best grid modeling tools available.
Underway – CVR in Smart Grid Demo Study

- Impact of Volt/VAR Optimization on power factor, peak demand and revenue?
- What feeder characteristics are correlated with high return on investment?
- What influences performance?

**PARTICIPATING COOPERATIVES**

Adams, Menard, Owen, Iowa Lakes
Optimizing Systems

Controlling Costs - Enhancing Service
Distribution Efficiency

Improve distribution efficiency, including:

• circuit diversity;
• energy and peak demand losses;
• voltage optimization;
• phase balancing and reactive power improvements; and
• economic optimization
Smart Feeder Switching

Smart Grid Demonstration
- Data & Communications Intensive
- Lessons Learned
- Advanced Distribution Automation
- Advanced Sectionalizing Scheme
Wise Energy & Strategic Use

Efficient Delivery & Use
Complementing the Existing Portfolio

- Integration Challenges
- Utility Ownership Advantages
- Potential for Energy Storage

Impacts of Increased Intermittent Generation on Baseloaded Coal Operations

Strategic Solar Development Opportunities for Electric Cooperatives
Energy storage has huge potential, but there are too many choices and not enough knowledge.
Energy Storage & Demand Response

*NRECA Demonstration*

- Thermal Storage Demo
- Battery Storage Pilot
- Energy Arbitrage
- Frequency Regulation
- Distributed Scale
- Bridge Renewables in an era of mixed results for energy storage
Advanced Analytics

Raising the Bar
Distribution Fault Anticipator

The Challenge

- Failures are dangerous and costly
- Interruptions in power can harm customers, physically and financially
- But ... interruptions can be avoided and costs of repair reduced if failure can be anticipated

Typical notices

- Line recloser* tripped 8% of phase-A load twice, but reclosed and did not cause outage
- Failed 1200 kVAR line capacitor* (phase B inoperable)
- Failing hot-line clamp on phase B*

Substation CT and PT waveforms

DFA
On-Line Signal Processing and Pattern Recognition Algorithms
DFA reported four individual faults, with recloser operations.

DFA then identified that these four faults were the same fault.

DFA also provided location information.
Another Role for Analytics

Research Practices and Opportunities to Use AMI systems to Identify Losses

Develop a Series of Recommended Practices

Highlight Success Stories

Solid State Sensors
Interoperability

Timely – Affordable - Secure
Interoperability – Can You go the Distance Without It?

- AMI
- Sensors
- MDM
- HAN
- Remote Disconnect
- DA
- Auto Switching
- Volt/VAR
- Pre-Pay
- Consumer Portal
- Mobile Dispatch
- DSM
Keys to Modernization of the Grid

Advanced IT & The Cloud
Cyber Security
Interoperability
Dynamic & Self-Configuring Fractal Grid

Intact grid is interrupted by severe storm

Two areas island, several loads are un-served

Using peer-to-peer connection, islands expand and reconfigure

Islands reconnect restoring grid
Challenges Ahead

- Cost Benefit Tools
- Analytics
- Secure Interoperability
- Telecommunications
- Energy Storage
NRECA Focus: Deployment

Accelerating The Path to Commercialization & Adoption Thru Demonstration - Hard Data - Analysis
Powering Electric Cooperatives

www.nreca.org