Planning and Analysis Tools to Evaluate Distribution Automation Implementation and Benefits

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History of Distribution Automation

- The concept originated in the 70s
  - Use evolving computer and communications technology to improve operating performance
  - A few small pilot projects
- Several major pilot projects in the 80s
- Some large and many small projects in the 90s

DA at Crossroads

- Difficult to justify using hard cost/benefit numbers
- Business uncertainties due to deregulation and restructuring
- Consolidation and focus on cutting operating expenses
- Equipment reliability and obsolescence

Renewed Interest in DA

- Emergence of new technologies
- New measuring devices and sensors
- Powerful and refined communications equipment
- Highly advanced computing equipment
- Advanced power electronics
- Advanced protection equipment

Drivers for Advanced DA

- Enhancements in efficiency, reliability, and quality
- Performance-based rates
- Sensitive loads
- Need to do more with less

Advanced Automation Devices

- Perform multiple tasks
  - Data logging
  - Control
  - Protection
  - Intelligence
- Cost of these devices must be allocated to different functions

Value of Reliability and Quality

- Different customers need different levels of reliability and quality
- Power quality parks
- Potential customers and their willingness to pay higher rates for premium service

Probabilistic Nature of Failures

- Failures on distribution systems are random
- Several factors increase the probability of failure
  - Trees, wind, lightning, animals
- Map effects of these factors to identify feeders with higher probability of failure
- Target these feeders for automation

Analysis Tools

- Real-time analysis for fast decisions
- Distribution state estimator
- Input data
  - System topology
  - Parameters of system components
  - Status of switches and breakers
  - Other measured data

Computational Intelligence

- Central vs. Distributed
- Data transmission bottlenecks
- Distributed intelligence to alleviate bottlenecks
- Hierarchical communication and computation
- Balance between central and local

New Sensors

- Advances in sensor technology
- New information
- New applications
- Lower cost with higher quantities

Asset Management

- Important for utilities
- Enhance with advanced DA
- Monitor condition
- Manage real-time loading
- Schedule maintenance
- Increase utilization

Advanced Communication Technology

- Better communication equipment
  - Fiber optics
  - Radio
  - Satellite
- Integrate the Internet
- Appropriate media for the application

Conclusions

- Distribution Automation is entering a new era
- More robust and reliable equipment
- Higher computing power
- Higher emphasis on reliability
- Utilities must consider DA as a planning option
- Advanced planning and analysis tools are needed for DA implementation