Northeast Utilities operates New England’s largest utility system serving more than 3.5 million electric and natural gas customers in Connecticut, Massachusetts and New Hampshire.
PROJECT DEFINITION

Current State:
- Substation P&C system design is 30 years old
  - Digital relay functionality
  - Significant advances in technology (ex. fiber, IEC 61850)

Needs:
- Engineering
  - Regulatory requirements (NERC, CIP)
  - System protection
  - Disturbance analysis
- Operations
  - Control (remote & local)
  - Data acquisition
- Test & Maintenance
- Asset Management
CONCEPTUAL DESIGN

- Maintains present Protection & Control functionality
- Adopt standard IEC 61850 interfaces
- Install LAN
  - Fiber optic
- Use standard protocol services
  - Client-server
  - GOOSE message (Generic Object Oriented Substation Event)
- Shift field construction into the factory
  - Yard equipment – circuit breakers & MODs
  - Control panels
- Reduce substation footprint
  - Control house
  - Copper
No additional cyber-security risks
• Design security into system
• Control access
• Configuration management

A “Smarter Grid” is worth protecting
COSTS & BENEFITS

Traditional Construction
IEC 61850 Design

- Reduce construction variables
- Reduce outage duration
- Reduce cost variables
COSTS & BENEFITS

Wiring Reduction

**Scobie Pond**
100% Control
79% Indication

**East Devon**
94% Control
87% Indication

Scobie Pond S/S

East Devon S/S
Control house – 110’ x 32’

Reduce by 45% – 80’ x 25’
COSTS & BENEFITS

• Quantifiable
  – Control house
  – Field wiring (materials and labor)
  – Change orders

• Intangible
  – Field construction time (risk of delay)
  – Human performance – switching errors
CHALLENGES & SOLUTIONS

Challenges
• Configuration management
• Engineering process changes
• Workforce training

Solutions
• System integrator
• IEC 61850 simulator
• Change Management Process
IEC 61850 SIMULATOR

- **Complete substation control system**
  - Simulates a 5 breaker ring bus
  - Most common relaying applications

- **Training tool**
  - System development
  - Testing and Maintenance
  - Operations

- **Commissioning simulation**
IEC 61850 SIMULATOR
WHAT'S GONE?

**Mimic-Board:**
No control switches
No sync switches

**Lockout Relays:**
Lockout implemented through relay logic
SIMULATOR BENEFITS

- **Complete substation control system**
  - Most common relaying applications
- **Training tool**
  - System development
  - Testing and Maintenance
  - Operations
- **Commissioning simulation**
  - New devices
  - Firmware Upgrades
CHANGE MANAGEMENT

IEC 61850 PROGRAM MANAGEMENT

61850 Simulator

Training & Development

Process & Configuration Control

Project Implementation

Communication & Outreach

Information Technology
WHERE WE ARE TODAY

- New (green field) substations are designed using 61850.
  - 4- 61850 based Substations in service to date
  - 4- 61850 based Substations in the design phase
  - 5- 61850 based Substations in the planning phase
- Beginning to do our own integration
- Continue to have challenges with software (vendor specific)
- Continued need to focus on change management
- Resources – skillset of P&C & Automation Engineers