



VERMONT'S TRANSMISSION RELIABILITY RESOURCE

System Assessment Project

Status Update

August 4, 2011



System Assessment Project

In response to three system problems that negatively affected key facilities (i.e., Vermont Yankee and IBM), VELCO is conducting an in depth evaluation of its Protection and Control systems associated with work completed since 2005.

Project involves:

- confirming relay settings in the field
- completing “as built” drawings
- evaluating protective system designs at key substations
- validating protection system functionality
- engaging multiple engineering firms supported by VELCO personnel

Project will last approximately one year at an estimated cost of \$5.6 million (88% capital/12% expense)

Goal: Confirm the reliability of the design and construction of the work completed since 2005 and enhance the commissioning process for future work.

System Assessment Project

Assessment Overview

Four Phases

- Phase I: Confirm relay settings at 25 substations - underway
- Phase II: Complete “as built” drawings at 31 substations - underway
- Phase III: Review protection & control designs at Essex, Vernon and Vermont Yankee substations - requires completion of Phase II
- Phase IV: Field verification - scope of work under development

Issues/Findings:

- Incorrect relay setting found at the Stowe substation
 - Change made during construction w/o engineering review & approval
 - Addressed by new commissioning process
- Identified 230 “items” during the drawing preparation that require clarification or field verification
 - No field corrections required to date
- Found a “runback scheme” at Essex substation disabled
 - Fuses removed ~2003 in association with work at the Highgate converter
 - Unapproved design change bypassed alarms
 - Addressed by new Commissioning Process
- Resource coordination and work prioritization an ongoing challenge

System Assessment Project

Project Resource Overview

External Resources

- Phase One
 - PLM Engineering
 - Stacom Engineering
- Phase Two
 - PLM Engineering
 - Commonwealth Engineers
 - Ulteig Engineers
 - TRC Engineers
 - Electric Power Systems
 - Burns & McDonnell Engineering
 - Potentially others
- Phase Three
 - PLM Engineering
 - Stacom Engineering
- Phase Four
 - TRC Engineers
 - VELCO Engineering
 - EPS

Key Internal Resources

- Tom Dunn – VP of Transmission Services
- Ernie Hiatt – General Manager
- Paul Renaud – Director of Engineering, System Planning and Telecommunications
- Dan Poulin – Manager of Engineering
- Doug Best – Project Manager
- Jose Sebastiao – Project Management
- Ed McGann - Engineering
- Gian Pauletto - Engineering
- Jacob Wernhoff – Engineering
- Matt Dale – Contracts
- Jason Davis – Contracts
- Randy Buswell – System Protection
- Dave Haas – Operations
- Aurelie Eybalin - Project Controls

System Assessment Project

Project Schedule Review

Project Timeline:

Information Field
Gathering Completed
Fri 5/6/11



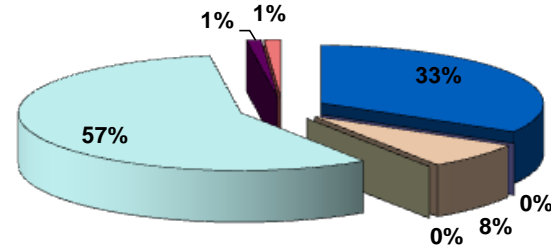
System Assessment Project

Project Cost Estimate

Project Cost Summary	
Material	\$ -
Labor	\$ 411,600
Equipment	\$ -
Indirects	\$ 3,169,400
Escalation	\$ 57,400
Capital Interests	\$ 66,400
Contingency (50%)	\$ 1,852,400
Total Project Cost	\$ 5,557,200

Note: Cost in thousands

- Material
- Labor
- Equipment
- Indirects
- Escalation
- Capital Interests
- Contingency (50%)



Description	Material	Labor	Equipment	Indirects	Escalation	Capital Interests	Contingency	Total
Capitalized Costs	\$ -	\$ 381,700	\$ -	\$ 2,939,300	\$ 53,200	\$ 66,400	\$ 1,720,300	\$ 5,160,900
Expense Costs	\$ -	\$ 29,900	\$ -	\$ 230,100	\$ 4,200	\$ -	\$ 132,100	\$ 396,300
Total	\$ -	\$ 411,600	\$ -	\$ 3,169,400	\$ 57,400	\$ 66,400	\$ 1,852,400	\$ 5,557,200

Note: Project cost estimate will be updated after the definition of the scope for Phase 4 is completed

System Assessment Project

Lessons Learned

Commissioning Process

- Adopted improved commissioning process in March 2011
 - More comprehensive process
 - More thorough testing scripts
 - Enhanced change management and communication process
 - Clear lines of authority and accountability
- Introduced end-to-end satellite testing

Steps Taken To Date

- Vermont Yankee differential scheme CT tap corrected & commissioned
- Middlesex K24 Line wiring error corrected & commissioned
- Redesigned IBM tap structures on K21 & K24 lines replaced
- Vernon 381 Line high speed protection scheme being reviewed by VELCO & NU
- Strengthened contractual requirements for record drawings
- Improved substation NERC testing

Additional Advantages

- New engineering firms on board for future capital projects
- Reduced reliance on overloaded in-house design team
- Opportunity to learn about and adopt industry best practices

K-41 Structure Replacements



NERC Alert

- In October 2010 NERC issued a recommendation that all TOs confirm that the field conditions of transmission lines (i.e., line to line/line to ground clearances) are consistent with line designs as determined by each TO's Facilities Rating Methodology
- VELCO performed a comprehensive system analysis (LIDAR) to develop detailed models of its system in PLS CAD for all of its transmission lines. VELCO identified locations where potential clearance issues existed
- After completing this work and conducting field verifications it was determined that the K-41 line (Highgate to Irasburg) had multiple National Electric Safety Code (NESC) clearance violations

K-41 Structure Replacements

- K-41 line was acquired by VELCO from Citizens utilities in 2003
 - The portion of the line where the clearance issues were identified (Highgate to Richford) was constructed in the early 1960s
- It was determined that 15 structures needed to be installed:
 - 12 were replacements of existing structures (10-20' height increases)
 - 3 were new mid-span structures in long spans (e.g., ~1,200')
- Due to public safety concerns (i.e., insufficient line to ground clearances in several spans), the line was taken out of service on June 16, 2011. This exposed a large portion of northern Vermont to a first contingency outage
- VELCO filed a petition with the PSB for a waiver pursuant to 30 V.S.A. § 248(k) to allow VELCO to take immediate corrective measures
 - The PSB granted VELCO's request after a hearing on June 24

K-41 Structure Replacements

- A combination of VELCO and contract crews began construction on June 27
- VELCO also contracted excavation and ledge removal crews and environmental crews to complete this project
- The line was restored to service on July 8 with a new 103 MVA rating
- The PSB directed VELCO to submit a regular § 248 filing within one year (June 2012)
 - Scope of work for this filing is still being developed
 - Approximately 35 additional structures need to be replaced to meet design criteria loading