

**Vermont System Operators Committee
Quarterly Update
Presented to the
VELCO Operating Committee**

January 17, 2013

In Attendance

- BED - Mike Giroux, Dave Kresock
- GMP-R – Brian Perkins, Doug Boynton, Kim Jones, Rip Kirby
- GMP-C – Nick Stanhope, Jeff Brosseau
- Swanton - NA
- VEC - Mike Allard, Scott Rockwood, Mel Butler
- VELCO – Mary Coombs, Furqan Ahmad, Ron Welch, Dan Nelson, Mark Atkins, Hantz Presume, Dave Haas

Nov 8, 2012 Meeting Agenda

- Hot topics, items of interest, and awareness items
 - *Subtransmission ratings, SCADA limits, and monitoring*
 - *Responsibilities of a Designated Entity, ISO-NE OP-14*
 - *Standards of Conduct review, roles, and what information can be shared*
 - *Lamoille County area operating jurisdiction review*
 - *VELCO seasonal assessment review*
 - *Copper thefts, utility actions*
 - *Lyndonville plans to open tie at Industrial Park*
- Utility project updates
- Review of operating incidents/events and any associated lessons-learned
 - *VELCO St. Albans station service failure on 6/20/2012*
- Outage coordination, impact analysis/studies, and notifications – any issues

Nov 8, 2012 Meeting Agenda (cont.)

- Protocols and procedures, operational data sharing (e.g. op procedures, one-line diagrams, relay settings)
- Operating tools (e.g. SCADA, load flow studies, weather service, and etc.)
- System Planning updates
 - *Standard Offer Program, renewable energy impact on VT loads and forecasting*
- Operations regulatory compliance, information sharing and awareness of changes (FERC, NERC, NPCC, ISO-NE, and Other)
 - *Overview of new NE and VT restoration plans*
 - *NERC EOP-005-2, R11, training for VDU switchmen*
- Training requirements and plans
- Best practices sharing and open round-table for anyone seeking ideas and support

Subtransmission ratings, SCADA limits, and monitoring

- VT Distribution Utility (VDU) thermal overload limits rolled out in EMS, August 2012
- VELCO and VDU Operators not fully clear on rollout
- Used GMP-C rating data provided by GMP Engineering
- Used the GMP-R summer and winter rating information based on conductor size, provided by GMP Planning
- Operators experienced B24 alarm limit
 - Did not consider tapped loads and being served from different sources and with different conductor sizes
 - In this case the most limiting element for the entire line was used

Need for Subtransmission Monitoring

- Real-Time Contingency Analysis (RTCA)
 - Predictive tool is a NPCC area and ISO-NE requirement for a local control center like VELCO
 - In the control room runs every 5 minutes
 - RTCA application outages over 300 transmission contingencies (element outages) within VT and with our neighboring utilities
 - Ranks thermal and voltage limit violations by severity for the operators to monitor
 - The VELCO Operator must know the risk to the system at all times with this application, and if necessary take pre-contingency actions to prevent a transmission limit violation

Need for Subtransmission Monitoring

- ISO-NE Transmission Operating Guides (TOGs) for monitoring interface limits
 - Studies performed by ISO-NE determine the thermal and voltage operating limits for the VT and NE areas
 - The load-flow model used by ISO-NE for studies completely models the VT subtransmission system and distribution loads
 - ISO-NE ensures that for all transmission system contingencies, the area customer loads and transfers can be supported, i.e. both thermal loading and voltage
 - Since we have a looped VT subtransmission system that is critical to supporting load and is impacted by the overlying transmission system, ISO-NE makes it clear in the TOGs that it is VELCO's responsibility to monitor the subtransmission that they do not fully model or monitor in their SCADA EMS

Subtransmission Monitoring Benefit

- Both VELCO and ISO-NE monitor the VELCO transmission system and run RTCA
- Both VELCO and ISO-NE have what NERC requires, a “wide-area view” within our geographic areas
- VELCO has better detail of the VT system SCADA modeling and monitoring than ISO-NE
- ISO-NE looks to VELCO for ensuring local area reliability
- Consider the VELCO and VDU relationships the similar
- Using the VDU and VELCO operating tools we can watch either other’s back

Subtransmission Monitoring Refinements

- Understand the concern with getting nuisance calls
- Working toward getting the subtransmission thermal overloads programmed correctly
- Consider the new thermal limits are no different than the subtransmission bus voltage limits that we have had modeled for many years
 - Every day in the control center the VELCO Operators see several RTCA voltage violations in the GMP system, e.g. loss of the VELCO K42 causes severe voltage problems in the St. Albans area
 - Known problem where the pre-contingency voltage is too high to allow the GMP Operators to switch on caps in preventing a potential voltage collapse
 - The VELCO Operators are aware of this, and the only time they may call is if something is different in the VT system

Subtransmission Monitoring

- Regional survey to understand if Transmission Operators are monitoring the subtransmission following the NERC/FERC report on the Arizona-Southern California Outages on September 8, 2011



Arizona-S. California Outages Sept 8, 2011

Synopsis of the Disturbance

- 11 minute system disturbance
- All of San Diego area lost power some for up to 12 hours
- Event was initiated by the loss of a single 500kV transmission line
- Transformers, transmission lines, and generating units tripped offline resulting in automatic load shedding
- San Onofre Nuclear Generating station (SONGS) shut down
- During the 11 minute event, WECC RC issued no directives



Arizona-S. California Outages Sept 8, 2011

Results of the Disturbance

- SDG& E lost 4,293 MW of firm load, affecting approximately 1.4 million customers.
- CFE lost 2,150 MW of firm load, affecting approximately 1.1 million customers
- IID lost 929 MW of firm load, affecting approximately 146,000 customers
- APS lost 389 MW of firm load, affecting approximately 70,000 customers
- WALC lost 74MW of firm load, 64MW affecting APS's customers, remaining affected 5 WALC





Arizona-S. California Outages Sept 8, 2011

Key Findings

- System not being operated in secure N-1 state
- Failure stemmed from weaknesses in operational planning and real-time situational awareness
- Underlying factors include:
 - Not identifying and studying the impact on BPS reliability of **sub-100kV** facilities in planning and operations
 - Failure to recognize IROLs in Western Interconnection
 - Not studying and coordinating effects of protection systems during plausible contingency scenarios
 - Not providing effective tools and operating instructions

KEY FINDINGS



Arizona-S. California Outages Sept 8, 2011

Recommendations

- All TOPs should conduct next-day studies and share results with neighboring TOPs and the RC (before the next day) to ensure that all contingencies that could impact the BPS are studied.
- TOPs and BAs should ensure that their next-day studies are updated to reflect next-day operating conditions external to their systems, such as generation and transmission outages and scheduled interchanges, which can significantly impact the operation of their systems. TOPs and BAs should take the necessary steps, such as executing nondisclosure agreements, to allow the free exchange of next-day operations data between operating entities. Also, RCs should review the procedures in the region for coordinating next-day studies, ensure adequate data exchange among BAs and TOPs, and facilitate the next-day studies of BAs and TOPs.



Arizona-S. California Outages Sept 8, 2011

Recommendations

- **TOPs and RCs should ensure that their next-day studies include all internal and external facilities (including those below 100 kV) that can impact BPS reliability**
- WECC RC should improve its process for predicting interchanges in the day-ahead timeframe
- WECC RE should ensure better integration and coordination of the various subregions' seasonal studies for the entire WECC system. To ensure a thorough seasonal planning process, at a minimum, WECC RE should require a full contingency analysis of the entire WECC system, using one integrated seasonal study, and should identify and eliminate gaps between subregional studies. Individual TOPs should also conduct a full contingency analysis to identify contingencies outside their own systems that can impact the reliability of the BPS within their system and should share their seasonal studies with TOPs shown to affect or be affected by their contingencies.

Arizona-S. California Outages Sept 8, 2011

Recommendations

- **TOPs should expand the focus of their seasonal planning to include external facilities and internal and external sub-100 kV facilities that impact BPS reliability.**
- TOPs should expand the cases on which they run their individual planning studies to include multiple base cases, as well as generation maintenance outages and dispatch scenarios during high load shoulder periods.



Arizona-S. California Outages Sept 8, 2011

Recommendations

- TOPs should expand the focus of their seasonal planning to include external facilities and internal and external sub-100 kV facilities that impact BPS reliability.
- TOPs and RCs should ensure that their next-day studies include all internal and external facilities (including those below 100 kV) that can impact BPS reliability



Special items and hot topics

- Responsibilities of a Designated Entity
 - Reviewed recent event of changing KCW dispatch in support VEC subtransmission activity
 - Reviewed the dispatch of the KCW facility and coordinating outages of assets within the KCW facility and with the VEC subtransmission assets serving the facility
 - All participants follow ISO-NE OP-14 for generator assets
 - VELCO is the DE for KCW, and all dispatch instructions for the generation output goes through the VELCO control center
 - Typical communication protocol
 - VEC notifies GMP-C of their intentions that will curtail KCW output
 - GMP-C then reports to VELCO
 - VELCO informs ISO-NE and receives approval

Special items and hot topics

- Standards of Conduct review, roles, and what information can be shared:
 - VELCO Legal review of the ISO-NE information policy and has interpreted its meaning to be, VELCO is unable to share transmission operating guides with the VDU's
 - VELCO to investigate the possibility of VELCO Legal, along with possibly ISO-NE, GMP and others, pulling together a presentation regarding the ISO-NE information policy with the intention of providing clarity on this subject
- Lamoille County area operating jurisdiction review:
 - During Tropical Storm Sandy an event at the Stowe substation required the deployment of a switchman
 - It was confirmed that GMP-C has operating oversight of Stowe 34.5kV system area
 - For any 34.5kV outages, VELCO contacts the GMP-C control center, and they will make distribution utility contacts and dispatch a qualified VELCO switchman

Special items and hot topics

- VELCO Seasonal assessment review:
 - Reviewed the VELCO Operations Winter seasonal assessment study, November 1st through March 31st
 - Assessment provides compliance with NERC TOP-002
 - VELCO performs seasonal load-flow assessments of the Vermont transmission system and the load-serving points of service to the Vermont distribution utilities
 - Thermal overload, voltage and defined interface system operating limits are observed during the analysis covering N-1 system contingencies
 - During the seasonal period different load profiles are studied, i.e. light, peak and shoulder loads
 - Planned system upgrades during the study period are analyzed to understand their impact
 - SOL exceedances identified during the analysis are discussed in the report and both pre and post-contingency mitigation guidance is provided for the System Operators

Special items and hot topics

- Copper thefts, utility actions:
 - VELCO experienced thefts at Newfane, Highgate Converter and Duxbury Tap
 - VELCO looking at cameras, fence motion detection and switched lighting
 - GMP-R investigating installing security cameras and using copper clad ground equipment since it is difficult to cut through
- Lyndonville plans to open tie at Industrial Park:
 - Reviewed event during Hurricane Sandy with Lyndonville Industrial Park switch being open without notification
 - Permanently opening of the Lyndonville-GMP tie at Industrial Park will be addressed at the December 2012 Operating Committee

Utility Projects

- BED projects update:
 - Upgrading the SCADA system which will include a back-up system at Lake Street
 - The back-up system will be totally independent of the main control center
 - System startup and running within six months
- GMP-Colchester projects update:
 - Have received 248 permit for re-constructing the McNeil to Lime Kiln 3307 34.5kV line from Hurricane Irene damage
 - May file for construction of a White River sub in 2013 and construct in 2014
 - Marshfield's distribution conversion is currently scheduled for 2013
 - Possibility of some work on the hydro in West Danville

Utility Projects

- GMP-Rutland projects update:
 - Have received a CPG for the 46kV and 115kV Vernon Road breaker installations in 2013
 - Joint VELCO and GMP Pickett Hill substation installations in 2013
 - Received the CPG for re-conductoring the South Rutland to North Rutland line 46kV line
 - Plan to file for St. Johnsbury Center substation upgrade before the end of 2012
 - Rebuild of the Proctor distribution substation recently purchased Vermont Marble sub
 - Rebuild of the Randolph substation

Utility Projects

- VEC projects update:
 - The Mosher's Tap 359 switch toward Newport is now operated open and the ring bus is closed at Newport
 - The 359 switch does not have LA's installed, and will be before next year's lightning season, LA's are on order
 - The quick-switch scheme will no longer be used although it is still available if needed
 - The last phase of Jay cap banks have been commissioned
 - Looking to re-build two substations, Madonna and Derby
 - Work continuing on the SCADA system

Utility Projects

- VELCO projects that have been recently completed or in progress:
 - Ascutney Substation Upgrade
 - Bennington Substation Upgrade
 - Vermont Radio Projects
 - Vermont Fiber Optic Project
 - System Assessment Project
 - Jay Substation
 - Georgia Substation
 - Highgate Converter Controls Upgrade
 - Reactor Installations/Upgrades

Utility Projects

- VELCO projects in the construction queue or planning stages:
 - Ascutney to Coolidge 345kV parallel transmission line
 - Champlain-Hudson Power Express
 - Highgate - Jay K41 Upgrade
 - Newport T3 transformer replacement
 - System Impact Assessment (SIS) reviews and support for renewable energy projects
 - Substation condition assessment project
 - Line condition assessment project

VELCO Highgate – Jay K41 & Jay Upgrade



LIDAR Identified Deficiencies

Six Week Line Outages

Construction & Commissioning -
Spring 2013

Support for Renewable Energy Projects



Fair Haven Energy Center

- 29.5 MW Woody Biomass Power Plant
- Connection new VELCO substation between Blissville and Whitehall, NY



beaverwoodenergy.com/project/

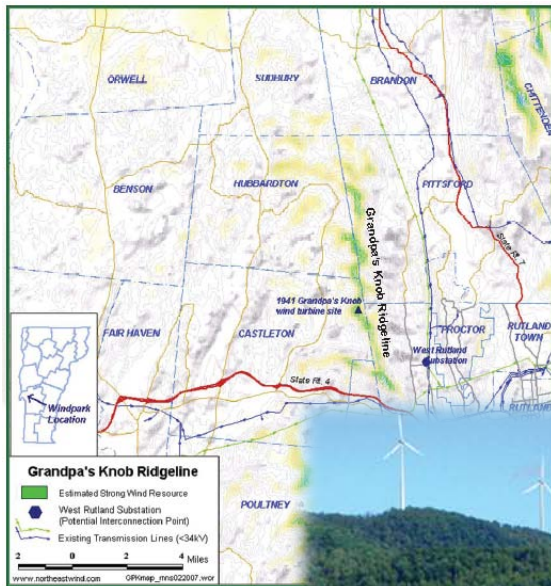
3-D Aerial Rendering of Fair Haven Energy Center, Beaverwood Energy LLC

Support for Renewable Energy Projects



Grandpa's Knob Windpark

- 50 MW
- Connection VELCO West Rutland Substation



The wind resource along the Grandpa's Knob Ridgeline



Computer-generated visual simulation created by Vermont Environmental Research Associates (VERA)

Support for Renewable Energy Projects

Seneca Mountain Wind Project

- 100 MW
- Connection VELCO Lyndonville Substation



This painting by B. Mitchell shows the Northeast's first wind turbine on Grandpa's Knob in Castleton, Vermont.

B. Mitchell's painting of the historic turbine

SENECA MOUNTAIN WIND
A co-development project between
Eolian Renewable Energy, LLC and
Nordex USA, Inc

Substation Condition Assessment Project

- Substations include: Barre, Berlin, St. Albans, Florence, Windsor and Newport
- Perform a condition assessment of the older substations that were not upgraded during the recent VELCO build-outs over the past 12 years
- Define upgrade scopes and priorities
- Assessment completion and priorities set by Q3 2013



Compliance Update

- Reviewed upcoming changes to the VT and NE restorations plans
- VELCO will be training on new plans with all VDU's over six week period starting week of 1/14
- Black-start units that remain in the ISO-NE program, will have CIP compliance requirements
- Three units will remain compensated by ISO-NE, however part of new restoration approach
- BED and GMP plan to maintain existing black-start units following removal from ISO-NE Schedule 16
 - Maintained as part of VT “local area” restoration plan
- New EOP-005-2, will be providing special switchmen training for several GMP, BED, Swanton districts

Operating Incidents/Events & Lessons Learned

- VELCO Incidents/Events
 - 6/20 = St. Albans 34.5kV Bus Differential due to failed station service transformer, GMP-R shed load with severe low voltage
 - 6/25 = Queen City T2 Differential during testing of the K33-69 breaker, new tester was employed
 - 7/4 = Stowe X32 and X35 breakers operated to lock-out due to blown metering pot in MW&L system
 - 7/12 = East Fairfax X19 operation due to crop fabric on 800 line conductor, GMP-R shed local load for taking line outage
 - 8/31 = Highgate H200 and H210 breakers operated to lockout during an electrical storm, setting issue for SOTF application
 - 8/31 = Irasburg H15 opened during an electrical storm, did not auto reclose, incorrect relay logic setting was applied
 - 10/29 = The Stowe X30 & X31 breakers operated to lockout during a high wind event (Hurricane Sandy)
- Other Utilities (none)

Future Meeting Plans

- Next quarterly meeting
 - Date – February 14, 2013, to be confirmed
 - Host Company – VELCO, to be confirmed

Questions?