

# 2018 Operations and Construction Highlights



VELCO Operating  
Committee  
December 20, 2018

# Accidents & injuries

- **Zero** employee lost time injuries YTD
- **One** minor (no injuries) at-fault vehicle incident YTD
- **Three** safety accidents
  - May 31 – employee tripped; tool in hand caused laceration on low cut stump while walking to structure base during a x-brace replacement - first aid provided on-site - stitches given at hospital - returned to work same day and fully recovered
  - June 20 - contractor tipped front-end loader on its side while working on K4 Line - no injuries, no environmental impact - safety stand down implement - VELCO staff and Casella investigated and completed Root Cause Analysis (RCA) - mitigation: new Job Hazard Analysis created focused on reviewing equipment selection and work practices
  - October 17 - line contractor had near-miss while changing out structure on 340 line - crane operator two-blocked crane, resulting in load block falling to ground - no injuries or other damage - safety stand down implemented - VELCO staff and contractor to investigate and complete RCA - safety bulletin developed to communicate near-miss and lessons learned to all contractors and VELCO crews

# Third-party reviews

Continue independent safety audits on VELCO and contractor work

- **Purpose:** ensure continuous improvement by assessing risk, integrating emerging best practices
- 68 audits conducted to date
- **Follow-up:** audits communicated, reviewed, logged in safety database to track and trend performance

# Health & safety

- Good catch/near miss program
  - 31 good catches and 4 near misses to date
  - VELCO encourages employees to report on “operational experiences” including: work practices needing improvement, efficiencies gained through new and better practices, and hazards to avoid when performing similar work
  - Information entered in database and broadcast to frontline supervisors and managers and discussed during Field Safety Meetings to promote learning culture
  - Good catch/near miss information critical to creating a proactive safety improvement program
- Training program enhancement
  - Upgraded VELCO’s Learning Management System (LMS) to add a suite of safety, health and environmental training programs
  - Enhancement provides efficiencies in maintaining compliance with OSHA and other regulatory training requirements; increases efficiency of training and refresher recordkeeping
  - Employees access comprehensive training library for professional development

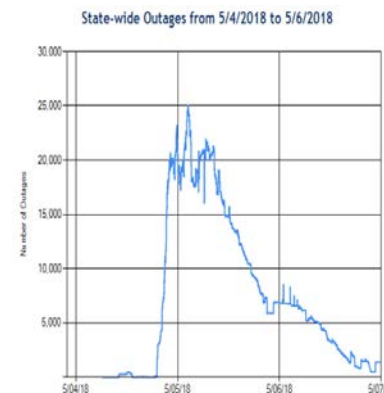
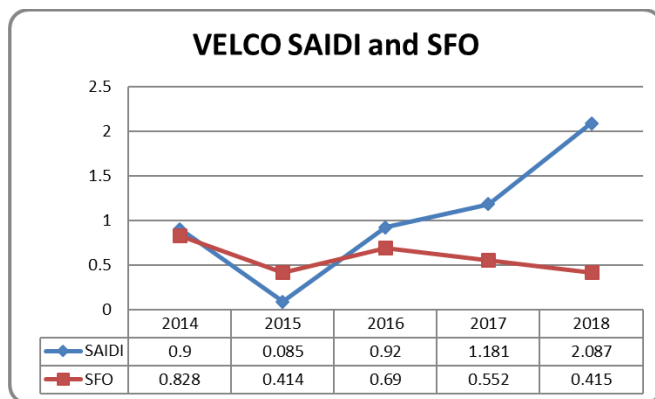
# System Performance 2018

Customers impact YD (*SAIDI KPI = Target*), two events

- May 5<sup>th</sup> tree contact on K24 (Duxbury to Stowe) 115kV and GMP (Little River to Stowe) during severe weather event (1,680 Stowe customers OOS for 5 hours and 34 minutes)
- December 15<sup>th</sup> voltage transformer failure at St. Johnsbury causing loss of 34.5kV service (7,137 GMP customers OOS for up to 1 hour and 33 minutes)

Transmission reliability YTD (*SFO KPI = Distinguished*), three events

- May 5<sup>th</sup> tree contact on the K24 (Duxbury to Stowe) 115kV line causing permanent fault
- November 16<sup>th</sup> ice and snow unloading of conductors on K46 (Jay-Irasburg-Newport) 115kV line causing the line to trip and lockout on reclose
- December 15<sup>th</sup> protection/control system failures at St. Johnsbury causing loss of 115kV transmission lines from St. Johnsbury to both Littleton (K60) and Lyndonville (K28)





*Tree contact on the K24 (Duxbury to Stowe)*



# NERC Compliance year in review

- NPCC Internal Controls Evaluation (ICE) - resulted in reduced TOP audit scope
- NPCC Transmission Operator (TOP) Audit
  - Potential non-compliance: 0
  - Areas of concern: 0
  - Recommendations: 0
  - Positive observations: 6
- NPCC Cyber and Physical Security Assessment – NPCC *“Appreciated VELCO’s willingness to share their experience and knowledge and the interest they have in increasing the security of their facilities.”*
- NATF Peer Review – reviewed principles of excellence in Operations, Operations Training, System Protection, and Physical Security
  - Strengths = 23
  - Noteworthy Practices = 6
  - Suggested improvement themes: process documentation, connectivity/automation of applications, leverage technology to reduce manual processes



# 2018 field crew highlights

## Line crew

- Replaced 68 structures and 48 arms
- Installed new structures and wire to support Chelsea substation reconstruction
- Certified in live-line bare hand techniques
- K24 #187 installed “ClampStar” shunt sleeve using live-line bare hand techniques
- Completed above-grade construction, wiring, and commissioning of St Albans Tap Station and Substation
- Replaced Granite capacitor breakers
- Replaced Vergennes T2 Transformer
- Installing East Avenue and Queen City reactors (December 18)
- Connected 115kV to Coolidge 20M PV plant

## Substation and technician crew

- Chelsea substation installation, commissioning, transformer move and 46kv breaker replacements
- Installed Green Jacket on 5 substation low voltage locations
- Technician crew provided significant support at Ascutney SVC Installation
- Participated in NATF peer review

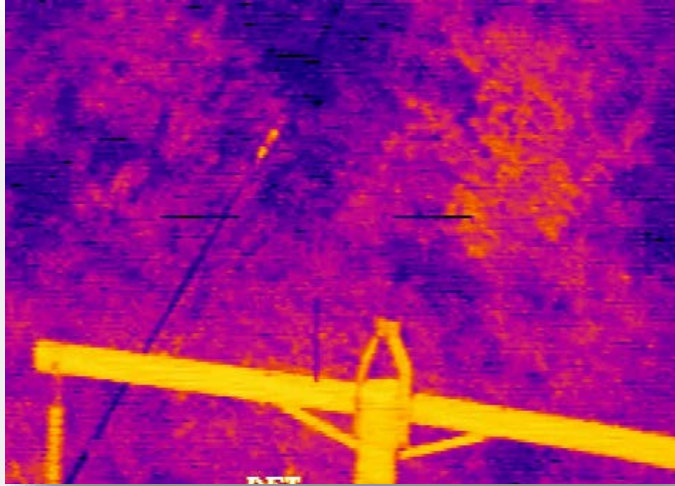


# Maintenance

- Completed all high-priority line maintenance identified during routine inspections - replaced condemned poles identified by Osmose Utilities Services, Inc.
- All NPCC-driven system protection work at required substations scheduled for completion by year end
- Four dissolved-gas monitors on system critical transformers to be commissioned by year end, allowing for remote oil analysis at Granite T1, Shelburne, Charlotte, and North Ferrisburg
- Repaired leak on Sandbar phase shifting transformer - additional leak repairs scheduled for December
- Addressed six hot spots identified in annual transmission line infrared inspection
- ABB Type V Vacuum Breakers (14) found to have a close adjustment bolt improperly installed from factory - now inspecting and readjusting as necessary all similar breakers

# Maintenance work

## K24 hot spot clamp repair

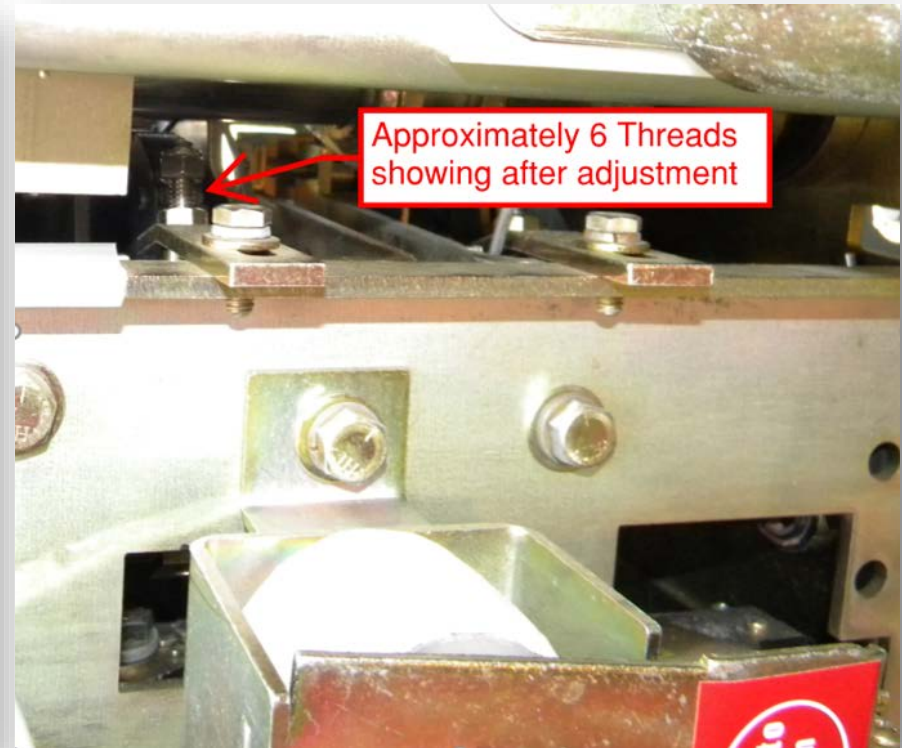
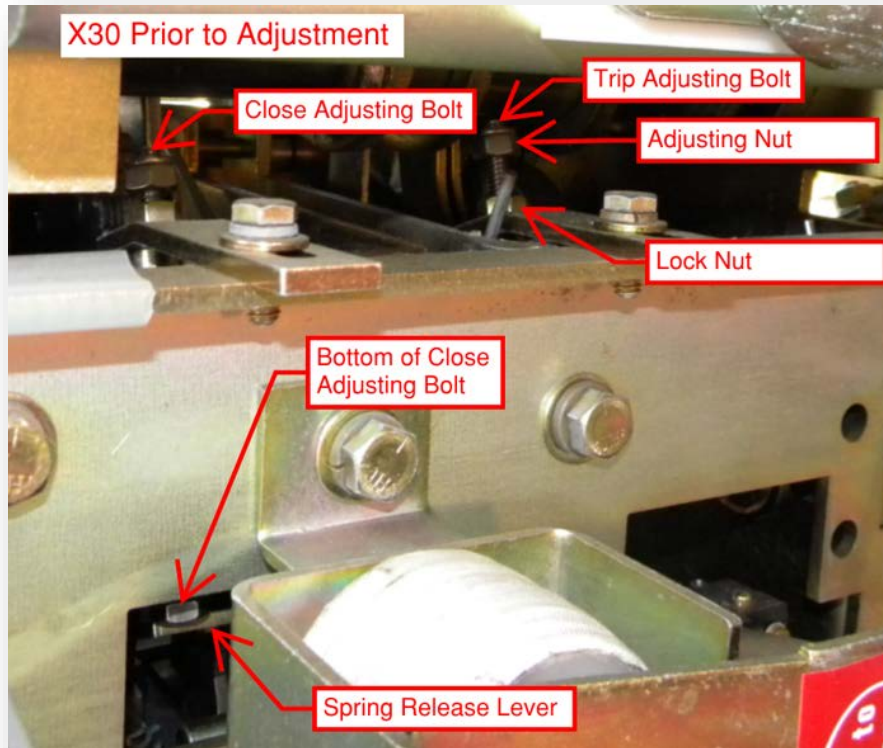


## Sandbar PST leak repair



# Maintenance work

## ABB type V vacuum breaker





# St. Albans substation



## St. Albans tap



# Chelsea





# Coolidge and NextEra





# Bare handing 2018

- Onsite certified trainer educated line crew in bare handing techniques and best practices
- VELCO linemen certified as bare hand specialists
- 105' track bucket retrofitted with all protective measures for bare handing
- Expecting Q2 2019 delivery of 80' track bucket fully equipped with protective measures for bare handing



# Other operations highlights

- Managed vegetation on ~3,200 right-of-way acres; removed > 2,200 danger trees
- Experienced first tree outage in 11 years - off-ROW tree struck line in wind storm (Stowe)
- Constructed >25 miles of access roads in support of structure maintenance program - used >17 miles of construction mats to support access needs and reduce costs
  - Enhanced costs tracking tools to provide greater insight into cost and areas for improvements
  - Reduced average access costs by ~40% through program enhancements and access investments
- In collaboration with DUs, developing strategies to respond to detection of Emerald Ash Borer in Vermont
- Resolved ANR's concern regarding vegetation management work and endangered species protection
- 32-year veteran of forestry team retired
  - Replacement joined team in October
- Reorganized material handling department and reduced staff by one
- Assisted DUs with storm restoration 5 times

# Capital project program overview

## Financial/schedule performance

- Placed capital assets > \$85M in service to improve transmission network reliability

## Capital project program improvements

- Improved project management practices and increased collaboration with functional managers
- Continued to develop project control capabilities and have “absorbed” scheduler position within team
- Rolled-out “products and services” process, and have executed several billable engagements to provide value to Vermont





# Significant project accomplishments

## Line work

- Replaced > 300 inadequate transmission structures
- Removed old PV20 cables in Lake Champlain

## Substation work

- Commissioned Ascutney SVC installation
- Commissioned Saint Albans Substation Project
- Completed Chelsea Substation Project
- Completed data center building at Pinnacle Ridge campus
- Completed construction of new Redmond Road support building
- Will commission East Ave and Queen City reactors by year end

- Started construction at Barre substation
- Started construction to reinforce river bank to protect K149 structure

## Regulatory accomplishments

- Received Barre substation CPG on schedule
- Increased collaboration with DPS and ANR through update meetings and workshop
- Received permits to address bank erosion on K149 Line





# Significant project accomplishments



*Ascutney SVC*

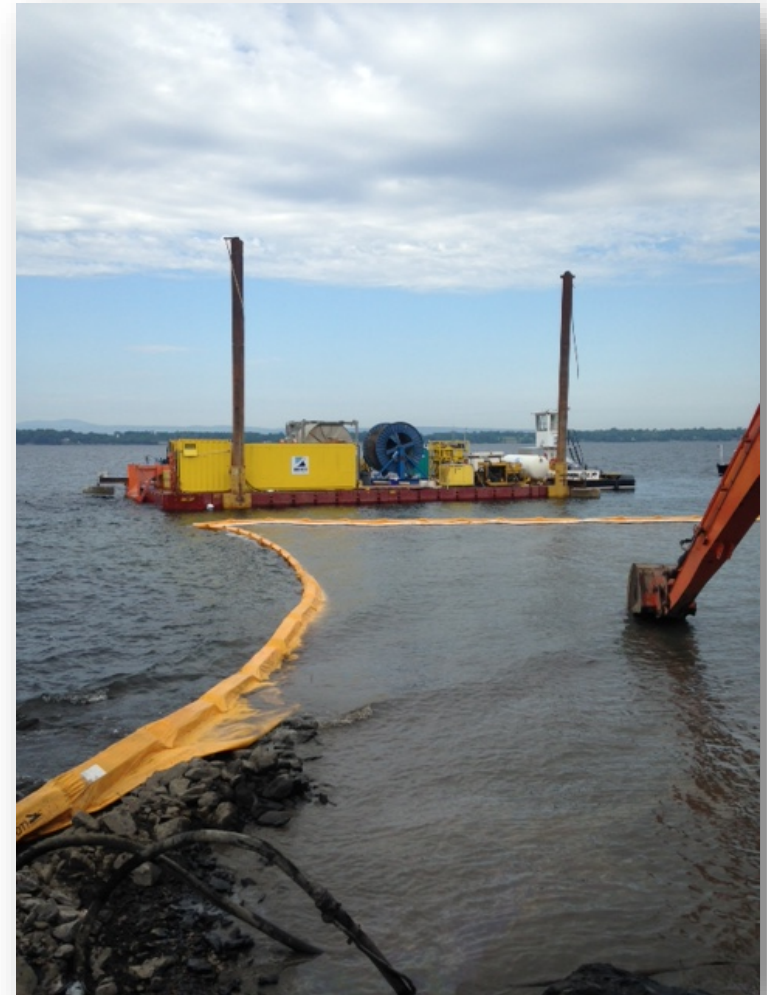


*Chelsea substation*

# Significant project accomplishments



*PV20 cable removal*



*PV20 cable removal*



# Significant project accomplishments



*Structure replacement*



*Structure damage*

# System planning accomplishments

- Extensive outreach for the 2018 VT Long-Range Transmission Plan
  - Public meetings in Brattleboro and Montpelier before publication
  - Six meetings with regional planning commission
  - Webinar for REV
  - After publication meetings with: VEIC, ISO-NE, PUC workshop
- Assisting DUs in SHEI evaluation - performing analysis for ISO-NE to update export limits
- Project support for St. Albans, Barre, Berlin, Ascutey, Sand Bar and PV20
  - Documented system impacts supporting need for Ascutey SVC switch
  - Completed analysis to avoid dismantling Barre temporary sub and constructing a temporary sub for Berlin
  - Responded to ISO-NE questions regarding justification for PV20 230kV insulation
- Helped ISO-NE develop new operation procedure for protection coordination
- Reviewed system impact studies for projects that may affect VT - estimated future impacts of proposed HVDC projects on existing gen resources
- Created several summer and winter cases for Operations
- Monitoring ISO-NE Interconnection Studies for 8 PV plants (>20MW)

# Telecommunication & cyber security

- Radio
  - Added 3 new sites
  - Rebuilt 2 existing sites
  - Completed 2 system loading tests
- Fiber
  - Eliminated 2 leased lines with fiber saving \$45,000 annually
  - Upgraded core packet switching system
  - Replaced core transport system at 50 sites
  - Connected Northern University Lyndonville and Johnson campuses
- Microwave - upgraded 11 microwave backhaul links
- Cyber security enhancements
  - Added 2 cyber security resources
  - Implemented application white listing allowing only approved applications
  - Centralized credential management with automatic password updates
  - Implemented forensics enabling threat hunting analytics
  - Installed next generation antivirus which monitors system behavior vs file signature
- Pinnacle Ridge new data center building and infrastructure to be completed by year end



# Conclusion

- 2018 was a productive year
- Key permits received - agency relationships being reinforced
- 2018 challenges - major construction projects
  - PV20 cables have been removed
  - CRVP is nearly complete (Ascutney SVC, Chelsea)
  - Structure Condition Improvement project is complete
    - Establishing an on-going capital replacement program
  - Substation Condition Assessment Projects are underway (St. Albans, Barre)
- Data center building is nearly complete, work continues to install IT equipment
- Continue to increase live line capability
- Continue to develop products and services initiatives with learnings from NGRID and TDI engagements
- Expanding project management practices and increasing collaboration across organization
- Increasing utilization of company field crews to support capital projects