

2021 Operations and Construction Highlights

vermont electric power company



February 10, 2022
VELCO Board of Directors

2021 Operations and construction highlights

- Safety performance and initiatives
 - Accidents and security
 - KPI review
 - Safety and health
- System performance
- Operations
- EMS
- North American Electric Reliability Corporation (NERC) compliance
- Maintenance
- Capital project program
 - Substation Condition Assessment Program (SCAP)
 - Transmission Line Refurbishment Program (TLR)
 - Other capital work
- Engineering
- System planning

Chris Root reflections on the last 8 years

Safety: accidents and security

Accidents

- **One** employee lost-time injury in 2021 due to an ergonomic lifting injury
 - Two lost-time accidents in the past seven years
- **One** at-fault vehicle incident in 2021, no injuries and minor damage to third-party vehicle

Security

- Physical security Initiatives
 - Installed perimeter fencing and gated access at Pinnacle campus
 - Additional physical security measures implemented at Substations including camera surveillance, fence detection, SCADA controlled, and badge access for controls buildings
 - 24/7 Security staffing with ongoing performance initiatives and updates to our Security Officer Procedures

Safety KPI: OSHA recordable injuries and illnesses

	2021	2020	2019	2018
Cases with days away from work / # of days away	1 (7 days away)	0	1 (26 days away)	0
Cases with days of job transfer or restriction	0	0	0	0
Other Recordable Cases	1	1	0	1
Total Recordable Incident Rate (TRIR)	1.3 (300,408 labor hours)	0.68 (294,029 labor hours)	0.66 (303,462 labor hours)	0.65 (307,549 labor hours)
Days Away Restrictions or Transfers (DART)	0.7	0	0.66	0
BLS Data for Electric Transmission Utility	Bureau of Labor Statistics calculating	TRIR = 1.7 DART = 1.1	TRIR = 2.3 DART = 1.1	TRIR = 2.1 DART = 1.2

Safety and health

Learning Opportunity process advancements

- Multi-disciplinary team reviewed internal and industry Learning Opportunities monthly, supported communication through frontline supervisors, and monthly Safety meetings. Result: 33 safety-related Learning Opportunities reported

Training program enhancements

- All new hires attended Skid School Driving Class
- All employees completed annual safe driving awareness training
- Annual Expert Safety Training week held for all employees
- Safety manual reviewed and updated with employee review, new safety manuals issued

COVID-19 protocols

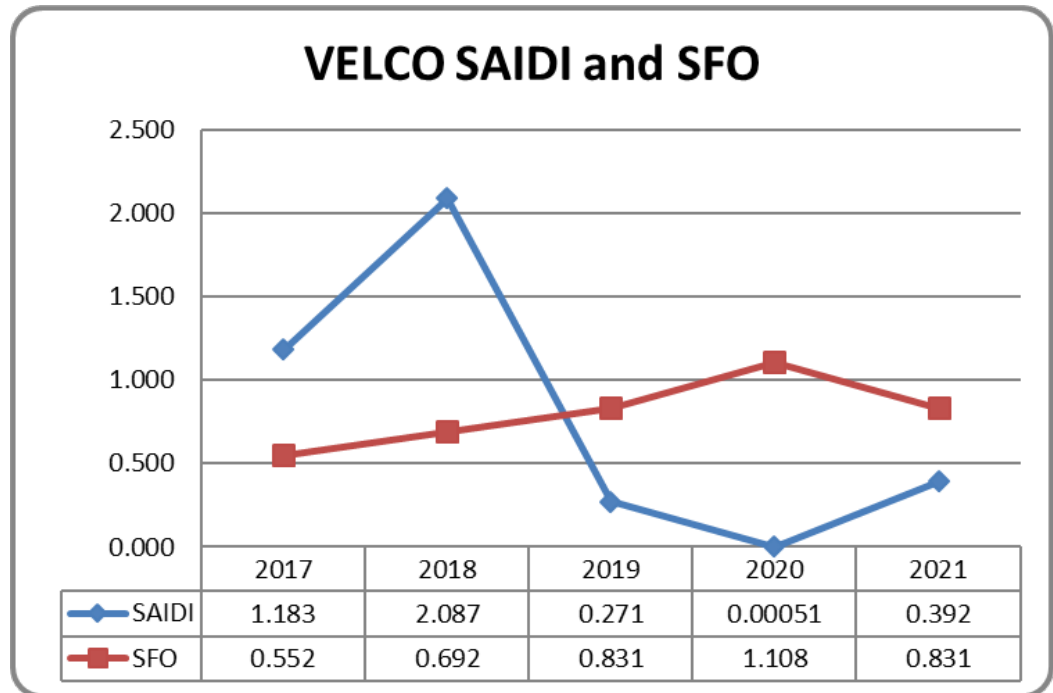
- Collaborative effort to advance company-wide health and safety policies and guidance to minimize impacts from COVID-19 in order to maintain business continuity and maintain a healthy and safe workplace. Result: Zero work-related COVID-19 exposures

System performance

VELCO System Average Interruption Duration Index (SAIDI) and Sustained Forced Outage (SFO) five-year KPI performance

2021 Results

KPI	Result
SAIDI	Distinguished
SFO	Target



- SAIDI: sustained distribution customer outages caused by transmission lasting longer than five minutes
- SFO: forced transmission line outages equal to or greater than five minutes in duration

Operations

People

- Welcomed Arriane Conde, new Associate Operations Engineer
- Welcoming Brian DallaCosta and Nate Aberle, Operator Trainees
- Succession planning for 2022 retirement of Control Room Supervisor

Highlights

- Successful GridEx VI exercise, by many reports the “best one yet!”
- Main Control Center renovation including transforming the Training Room for operators’ use
- Remote training and testing abilities advanced and implemented for:
 - Refresher switching and tagging
 - VDU Operator participation for periodic training
- Outage coordination created 1,108 maintenance applications
- Significant project support: Sandbar and Irasburg substations, Training Room and Main Control Center renovations
- Operations Engineers reviewed and/or revised:
 - 130 VELCO Operating documents
 - 179 ISO NE Operating documents

EMS

People

- Welcomed Isaac Nichols, EMS Associate Engineer

Highlights

- Operations Training Simulator supporting System Restoration and scenario specific operator training and used extensively in support of GridEx as coordinated with each New England Control Center
- Support of several PI Community Agreement initiatives, allowing non-operating data to be accessed and alarmed
- Significant project support requiring remote terminal unit point revisions; several iterations for SCAP Sandbar and Irasburg projects
- Excellent SCADA and EMS performance

Process	2021 Uptime %
SCADA	99.97
Real-Time Contingency Analysis Program	99.98

Compliance

People

- Promoted Randy Buswell to Compliance Manager
- Welcomed Dan Kopin, Compliance Analyst

Highlights

- NERC/NPCC Audit results: no non-compliance findings, twenty-three recommendations, thirteen positive observations
- CIP-002 program review
 - 120 devices will be reclassified from medium to low
 - Relieve monthly and annual compliance work to Engineering and Security
- Compliance department process mapping updated
- Risk assessments and linkages to NERC compliance with select departments: Engineering, Operations, Planning, IT, Vegetation
- Compliance minimums as evidence and fact-based focus moving forward to identify separate from business best practices
- Transitioning to annual risks, standard reviews, testing of evidence and controls, to flatten compliance work curve

Maintenance

- Performed mandatory system maintenance and responded to emergent repairs and alarms
- Responded, moved spare, and repaired failed phase shifting transformer (PST) at Sandbar substation
- Installed remote monitoring equipment in substations
- Developed a plan for purchase of GlobalFoundries transmission assets and completed condition assessments and improvement plans
- Managed vegetation on 2,681 right-of-way acres; removed 2,848 danger trees, including preemptively removed 1,575 ash trees due to Emerald Ash Borer (EAB) infestation
- Continuing to monitor advancement of EAB statewide and adjust response strategies with Vermont utilities and state agencies
- Re-accredited by Right-of-Way Stewardship Council, one of only seven utilities nationally

Capital project program

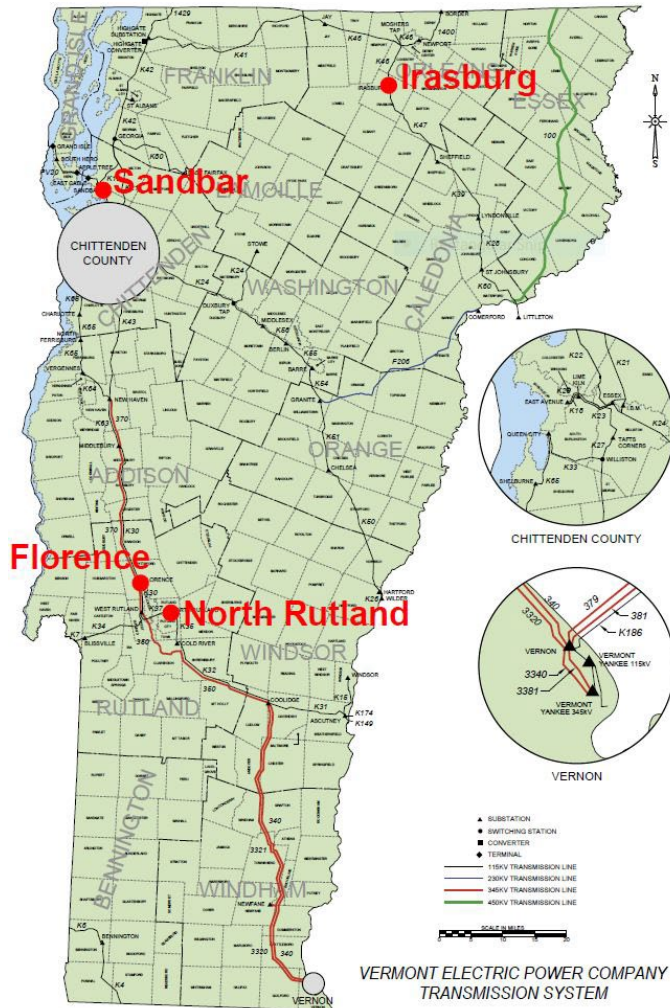
Financial/schedule performance

- Met 2021 capital budget performance goals: \$84.9M against Board-approved budget of \$89M
- Achieved 2021 capital construction milestones despite significant adjustments to the Transmission Line Replacement (TLR) work plan impacted by PST failure
- Managed increasing project costs and material delays due to pandemic-related supply chain issues

Capital project program improvements

- Leveraged scenario planning tools to assess impact to planned work due to PST failure
- Incorporated procurement actions into work management process to monitor and respond to supply chain issues
- Secured new engagement to construct access and provide mats for GMP transmission project

Substation Condition Assessment Program



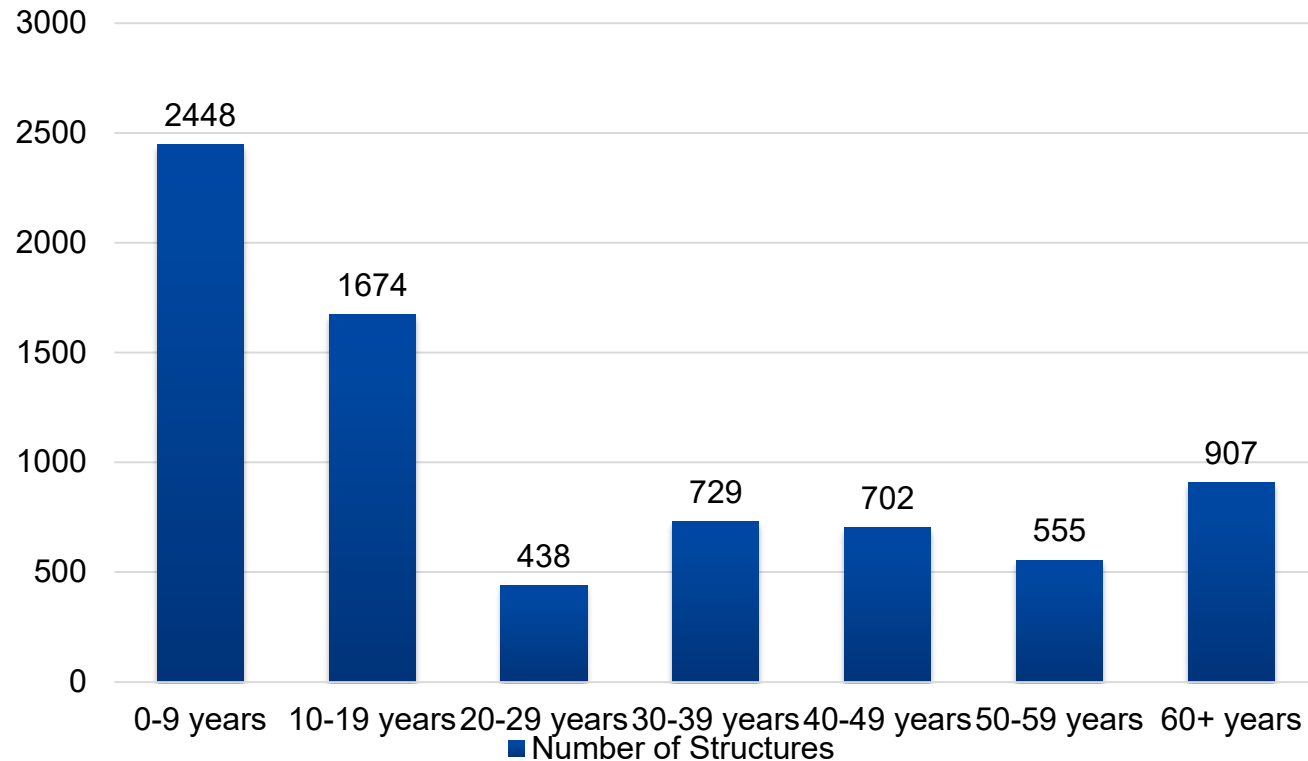
- SCAP program accounted for about 12% of 2021 capital spend
- Met construction and commissioning goals at Sandbar and Irasburg Substations using VELCO crews
- Prepared and filed Certificate of Public Good petitions for the North Rutland and Florence Substation projects

Transmission Line Refurbishment program

Transmission Line Refurbishment Program (TLR) is the major line maintenance program, about 38% of 2021 capital spend

- Replaced 256 inadequate transmission structures
- Leveraged VELCO line workers
- Performed energized line work on 58% of structures minimizing system and generation impacts
- Transitioned to replacing existing wood structures with steel structures
 - Developed strategy to utilize wood pole inventory
- Moved over 18,000 mats to support equipment access for TLR
- Incorporated K42 (Highgate – Georgia) rebuild into program of work planned for 2024-2025

Age of structures as of Fall 2021



Other capital work

New Haven Operations Facility

- Significant construction completed
- Managed IT/Telecom design changes
- 24% of 2021 capital spend

Pinnacle Main Control Center renovation

- Renovation of control center is nearly complete, commissioning expected Q1 2022

K42 Line Replacement project

- Developed project to replace inadequate line
 - Allows for existing line to be energized while new line is construction
 - Proposing new larger conductor to reduce line losses and increase capacity
- Continuing to align regional and state support

Engineering

People

- Welcomed Megyn Spafford, Associate Drafter Designer, John Olsen, Civil Engineer, and soon will welcome Aaron Needy, Electrical Engineer

Highlights

- Replaced home-grown thermal rating program with database application
- Expanded substation analytics and PI visualization tools: Pilot circuit breaker monitoring, battery monitoring, transformer DGA/criticality indexing
- Multi-discipline asset management pilot: transformers
- SCAP design/commissioning: Sandbar, Irasburg, North Rutland, Florence
- Assessed GlobalFoundries transmission equipment condition
- Utilized computer modelling to identify galloping/ice jumping to correct K46/VEC double circuit single poles problem
- Continued efficient multi-pole common top section length, allowing standard two material mated with various lower lengths
- Improved PRC-027, FAC-008, CIP-012 program compliance
- Automated CIP automatic password changes at medium sites
- Refined schematic templates to streamline drawing development /maintenance

System planning

- Published 2021 Vermont Long-Range Transmission Plan
- Performed K42 loss study and presented K42 rebuild plan to ISO NE and Planning Advisory Committee (PAC)
- Advanced SHEI improvements
 - Reviewed ISO NE SHEI limit study
 - Helped GMP and Vestas develop and submit KCW model to ISO NE
 - Assisted with Sheffield AVR test, and recommended voltage schedule and operating approach for Lyndonville cap bank
- Commented on Department of Public Service draft Comprehensive Energy Plan
- Engaged in Vermont Climate Council work
- Performed study supporting use of SmartWires technology for Sandbar PST
- Presented multiple projects to ISO NE PAC
- Confirmed VT non-PTF is not BES, resulting in no need for VELCO TPL-001 assessments (time saving)
- Reviewed ISO NE ten-year needs studies
- Supported Operations with outage planning, ratings, and loading issues
- Presented at CIGRE US conference
- Supported PV generation projects by both our customer/owners, ISO, and developers
- Completed pre-application reports for two storage projects (20 MW)
- Commented on ISO NE Regional System Plan, Planning Technical Guide, and studies
- Improved time series power flow software developed by UVM for VELCO

Summary

- Safety and health remain highest priority (1 lost time injury)
- Succession planning advanced in light of over 20% of VELCO's workforce retiring or leaving
- Refreshed approach to Compliance that will reduce risk and save money
- System performance was excellent considering major challenges of pandemic
- Reliability continues to be one of the best in the country despite PST failure
- PST failure was significant disruption to planned work and was handled extremely well with no material impacts to construction and maintenance work
- Team united to successfully execute expense and capital projects
- VELCO's asset plan to replace structures advancing smoothly and mat rental business is an additional benefit
- Innovation is everywhere:
 - Keeping budgets level
 - Reducing work
 - Improving designs
 - Strengthening strategies

Chris Root: Eight-year retrospective

- Significant focus on succession planning and people development (added families of titles)
- Expanded and professionalized internship program
- Started focus on professional development, IEEE PES Chapter, Conferences, WPI Masters Program
- Call-out pay for engineers, rationalized the on-call pay for field forces
- Purchase of the Operations Training Simulator
- Guidance on the creation of the Business Continuity Plan; has since been incorporated into our Emergency Response Plan
- Began asset management program for long-term sustainability
- Executive support of GridEX exercises has matured and elevated our participation in the region
- Support of workforce diversity, development of a scholarship
- Added focus on the need for DER data to assist in future-proofing the system model, studies, real-time monitoring, and situational awareness
- *Thank you for the opportunity to be part of the VELCO family.*