CITY LIGHT & POWER

Utility Privatization System Owner Improves Resiliency and Efficiency at Aberdeen Proving Ground

Aberdeen Proving Ground (APG), established in 1917, is the Army's oldest active proving ground covering over 72,500 acres in Harford County, Maryland located approximately 35 miles northeast of Baltimore along and into the Chesapeake Bay.

The Challenge

- APG had approximately 2 million linear feet (nearly 380 miles) of power lines and 26 small substations that were outdated and did not meet current industry standards. Additionally, due to growth, primarily as a result of base realignments, the distribution system lacked the capacity to effectively meet the demand for power distribution. A majority of the distribution grid was legacy 5kV system supplied by small (7.5MVA or smaller) substation transformers that could not support newer facility loads. As a result, all recent large facilities were directly connected to 35kV transmission backbone, making it very unreliable. The system had exceeded its design capacity with no room for future expansion. Prolonged outages and component failures were common. With too many small substation transformers and 5kV distribution grid, the system was highly inefficient.
- Historically, military installations have been unable to fully upgrade and maintain reliable utility systems due to inadequate funding and competing installation management priorities.

The Solution

- APG turned to its Utilities Privatization (UP) system owner, City Light & Power for a solution. The Department of Defense's (DOD) UP program has privatized more than 600 utility systems on military bases over the past 20 years.
- UP allows installation commanders to focus on core defense missions and functions by relieving them of activities that can be done more efficiently and effectively by others.
- CLP redesigned and upgraded the existing system at APG to address existing deficiencies and make it more resilient and microgrid ready.

Key Scope of Work

- Increase grid capacity
- Reduce substation numbers and increase their capacity
- Standardize system components and features
- Build redundant system
- Integrate state-of-the-art technologies
- Underground systems where it makes sense (hybrid construction approach)
- CLP was able to provide the Government with an attractive long-term financing option

he Results

CLP completed its upgrades ahead of schedule and on budget for the Government.
The upgrades enhanced system capacity, reliability, safety, efficiency, visibility, redundancy, power quality, and resilience.

DEFICIENCIES	BEFORE	AFTER
CAPACITY	• Load growth exceeded system capacity	• System has room for future growth of ~28MVA at Aberdeen and ~16MVA at Edgewood
RELIABILITY	• 2013 - 2014 annual rolling System Average Interruption Duration Index (SAIDI) was between 450- 750	• 2020 – 2021 annual rolling SAIDI is less than 20
SAFETY	• High arc flash hazards • Inconsistent grounding • Unsafe working clearances	• Arc flash hazards mitigated • Consistent and tested grounding system • Proper and safe working clarences
EFFICIENCY	• Estimated annual system loss – 16,488 MWH	• Estimated annual system losses – 8,744 MWH • Estimated annual energy saving – 7,744 MWH
VISIBILITY	• Manual system operations • No historic data to support planning, engineering, and maintenance activities	• SCADA system to support operations • Years' worth of data storage and trending capabilities to aid system planning, design, and maintenance activities
REDUNDANCY	• Radial feeders • Limited substation interties or redundancy • Limited interties between major 35kV lines	• Fully looped and sectionalized main feeders • Fully redundant substation transformers and switchgear • Dedicated intertie lines between substations • All 35kV lines have multiple intertie points
POWER QUALITY	• Poor voltage levels or flickers • Poor power factor	• Proper voltage regulation • Volts and vars optimization with strategically located capacitor banks, voltage regulators, and load tap changers (LTCs)
RESILIENCE	• Temporary faults caused hours of outages for large number of customers • System could not accommodate on-site generation, energy storage, or microgrid operations	• System automatically detects faults, isolates affected area, restores unaffected area, and informs operators • System is microgrid-ready to accommodate on-site generations, storage, and microgrid operations.

Key Features

- Hybrid construction approach
- Standardized, safer, more reliable, and redundant system
- State-of-the-art technology integration
- Dedicated and cyber-secured fiber optic communications backbone featuring software defined network (SDN) switches
- Enhanced fault protection, monitoring, and metering capabilities
- Distribution automation – communication assisted fast tripping, auto-reclosing, and FLISR
- Advanced distribution SCADA system
- Complete N-1 redundancy at every critical facility
- Integration of 7.5MW CHP plant and 5MW of Solar PVs
- Ready for future integration of additional on-site energy resources
- Microgrid ready