



TRANSMISSION & DISTRIBUTION WORLD

Helicopter Live Work Requires a Safe Platform

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In today's environment, utilities such as Public Service Electric & Gas Co. (PSE&G; Newark, New Jersey) are continually looking for ways to perform maintenance without outages. The demand in densely populated areas such as New Jersey have made it next to impossible to take a transmission line out of service for maintenance. De-energizing lines is not an option. So, performing live work has become critical. These facts of life have led PSE&G to develop live work practices for all voltage levels beginning in the late 1970s.

Electrified Barehand Workforce

Hotsticking methods were first performed on the Pennsylvania-New Jersey-Maryland (PJM) Interconnection 500-kV system, which led to the development of barehand procedures. A group composed of live-line chiefs and a live-line coordinator is responsible for running the program. The group is active in R&D and writing detailed work procedures for the live-line group. In addition, it participates in industry-standards groups such as the IEEE, NESC, ASTM, EEI and IEC.

PSE&G has a team of 30 specialists who play an invaluable role in PSE&G's statewide reconductoring of vintage 138-kV lines, which is a 10-year program. These highly trained crews complete an average of 25 miles per year while keeping outages to a minimum. Live-line specialists go through a seven-year training program before achieving the journeyman level. The training consists of classroom and on-the-job training in hotstick, barehand and construction. At the end of their training, PSE&G linemen can do it all: string wire, build structures and work live on all voltage classes.

Energized Line Access

PSE&G has various ways to safely place workers on a structure or energized transmission line conductor. Work can be performed from the structure (hotstick), insulated ladders and insulated aerial lifts (barehand).

In addition to the 30 specialists, PSE&G has three employees assigned to helicopter work, conducting detailed inspections of the utility's transmission infrastructure and vegetation. The obvious next step for the live-line worker group was to use helicopters for live-line work. More than a decade ago, extensive tests conducted at the EPRI lab in Lenox, Massachusetts, confirmed that helicopters could safely bond to energized outside and middle phases of EHV and HV lines. The PSE&G helicopter group began talking to contractors and other utilities that were benefiting from helicopter assistance for maintenance and upgrades to its system. The demand and necessity for live work warranted investing the time and resources necessary to find the best equipment and procedures for helicopter work, without compromising safety standards and live work barehand practices.

Existing Helicopter Platforms

When we started looking at existing helicopter methods and platforms in the industry, we noticed that the two platforms currently available were designed to mount on the landing gear of the helicopter. This posed an immediate concern because of the position of the lineman during takeoff and landing: His legs could be injured easily.

We also found that existing platforms were large, heavy and require a counter balance to maintain stability on the platform. The added weight also limits the amount of fuel that can be carried by the helicopter, possibly creating the need for additional flights. Given the aerodynamics at speeds over 30 knots, the platform would create lift, making the helicopter unstable. The lineman's comfort during travel also was a concern.

Thinking Outside the Box

The team decided to do some out-of-the-box thinking. We went to George Washington University in Washington, D.C., and met with professors Roger Kaufman and Ryan Vallance, experts in mechanical and aerospace engineering work

practices. The professors asked students in their program to develop a safe working platform independent of the landing gear that was lightweight and user-friendly. By the end of the semester, the students came up with five designs. This gave us the innovative thinking we needed to develop a safe, suitable live-work helicopter platform.

While researching the industry for platform solutions, we also met with Tyler Camera Systems (Van Nuys, California), which specializes in designing camera mounts for helicopters. The company also has worked with the Los Angeles Police Department to design a sniper platform that attaches to a helicopter used by the city's SWAT team. The sniper platform looked like some of the designs of the George Washington University students. We contacted Tyler, told them what we needed and asked if they would work with us. Their decision to work with PSE&G put us both in the live-line platform business.

Field and Lab Testing

Under an experimental permit from the FAA, we did extensive testing on the prototype unit. A number of minor recommendations were noted, which Tyler incorporated into the platform to our satisfaction. After the modifications, linemen reported increased freedom of movement. They can ride the platform safely without sliding or losing their grip during flight. In addition, the platform always remains at a sufficient clearance to ground to prevent leg injury on hard landings, which are not always avoidable.

All parts of the platform had to be sufficiently bonded together and to the transmission line conductor, presenting no sparking or shock hazard to the worker. The next step was to validate these design requirements through third-party, industry-accepted testing.

EPRI's high-voltage lab, the Lenox Test Center (Lenox, Massachusetts) operated by EPRIolutions, was chosen for the electrical tests. The Lenox lab performs extensive electrical phase-to-phase and phase-to-ground breakdown tests on full-scale helicopter-based live-work methods, with a helicopter in full operation.

This past summer, a weeklong series of tests was conducted at the Lenox labs. The helicopter, with a full load of fuel, was flown to the top of a 40-ft-high insulated tower and bolted down. The live-line work platform was attached to the helicopter and a full-size, metal-mesh mannequin was placed on the platform. To simulate live working conditions, the helicopter turbine engine was started and brought to flight-idle, the line was energized phase-to-phase to 500 kV, and a bonding wand in the mannequin's hand was repeatedly touched to the cable. All tests were done at 500 kV. The Tyler/PSE&G platform passed both the electrical qualification and bonding continuity tests.

Training and Procedures Standards

With the new platform testing and documentation complete, we were still missing credible training procedures for our barehand linemen. When we went to the industry for helicopter platform standards, we encountered another challenge — there were no standards. This did not bode well with our safety director, not to mention our linemen who are schooled to respect and comply with uniform standards for themselves and fellow workers.

Only a few companies are doing live helicopter work. This work is being performed under patents, which expired Oct. 5, 2004. In the big picture, PSE&G plans to make the platform widely available to the entire industry. To add these missing pages to our safety manual and assist the industry in establishing guidelines and training procedures, we again took the lead, working with the IEEE and OSHA to come up with a solution.

PSE&G currently chairs a working group made up of representatives from IEEE, EEI, IBEW, OSHA and the Helicopter Association International, which is addressing new standards. In October 2004, the task force approved training standards and is working through the IEEE for publication. The paper is now out for peer review and is expected to be referenced in future OSHA standards. FAA certification also has been completed.

PSE&G will now start developing helicopter-assisted live-line work methods, first on de-energized lines and then on energized lines. These new procedures will be deployed on several upcoming projects, including pulling wire and installing cell phone antennas on high-voltage transmission towers.

Conclusion

PSE&G's out-of-the-box thinking on the helicopter live-work platform design will benefit both the company and the customers we serve. Involving George Washington University has resulted in both original ideas and a short time line from the idea stage to a working model. PSE&G's decision to take the lead on the training and procedure standards for the industry will benefit not only our workers, but also the industry as a whole, keeping line crews safe.