CASE STUDY

A Towering Achievement for Transmission Reliability

Through testing and maintenance, Baltimore Gas and Electric (BGE) detected that critical underwater 230-kV transmission cables were nearing the end of their useful life. Challenges associated with replacing the underwater cables in-kind drove BGE to innovate a plan for new overhead circuit segments spanning the Patapsco River — and the city's main shipping channel — that would require analysis and careful construction.

Challenge

Baltimore Gas and Electric (BGE), an Exelon company, maintains vital electrical and natural gas infrastructure to support customers in Baltimore and throughout central Maryland. The electrical transmission system included a 2.25-mile segment that crosses under the Patapsco River, parallel to the Francis Scott Key Bridge (Interstate 695). BGE began detecting symptoms of deterioration, indicating that the high-voltage cables installed in the 1970s were nearing the end of their useful lives. Maintaining system reliability would require BGE to repair or replace this critical segment between the Hawkins Point Terminal Station on the west side of the river and Sollers Point Terminal Station on the east side.

Project Stats

Client
Baltimore Gas and Electric
Location
Baltimore, Maryland
Project Budget
$232 million

8
towers built, including five in the Patapsco River

397
height above water, in feet, of two tallest towers

2.25
miles of river crossing of the Baltimore Harbor

The utility began to assess the feasibility of replacing the circuits, analyzing several underground and overhead options, including:

- Installing replacement cables in the existing underground pipes.
- Installing replacement underground cables parallel to the existing cables.
- Installing a replacement overhead transmission line across the river.

Each option required consideration of environmental impacts, cost calculations and effects on the mid-river shipping channel, which is the only access to most of the ports in Baltimore. Potential for job creation and ability to meet operational requirements were also evaluated.

Solution

BGE selected Burns & McDonnell to evaluate its options and manage the design and implementation of a solution. After a year of analysis, it was determined that installing new overhead lines would be highly favorable compared to pursuing an underground replacement. Building underground would cost approximately twice as much, create significantly greater environmental impact, and affect port operations to a greater degree.

Crossing any river is challenging for transmission lines because of the difficult logistics, planning and coordination. After consultations with the environmental community, the team chose to proceed with the overhead alternative.

The team took proactive measures to communicate with all interested parties, including the Port of Baltimore, the National Park Service, the U.S. Coast Guard and the Association of Maryland Pilots. Planning included the use of construction techniques and timing that would minimize environmental impacts.

The overhead line design included eight towers, five of them in the river. The in-river towers and associated foundation structures had to be designed to withstand the energy from a ship's impact. To support their foundations, the team drove almost 4 miles of steel pipe pile, totaling about 7 million pounds, to support the precast sections. Each of those towers also required Vessel Collision Protection structures. For towers 3 and 4, which straddle the main shipping channel into the Baltimore Harbor, these structures measured approximately 246 feet long by 156 feet wide.

Construction and installation of the line required deploying diverse specialists and equipment, including helicopters, boats, commercial divers and pile drivers. Running the transmission wires by helicopter also required river shipping and recreational traffic to be shut down temporarily by the Coast Guard. The team worked closely with interested parties to manage and minimize the shipping lane closures for wire stringing activities.

Results

The new double-circuit 230-kV transmission line segment was placed in service on schedule in May 2022, two years after construction began.

Proactive outreach efforts enabled an early permit scenario to be realized for the environmental permits and certification of public convenience and necessity (CPCN) order, reducing the overall cost for BGE and its customers. The outreach also helped guide the selection of an approach that minimized impacts for the region while achieving the necessary improvements for system reliability.

The project created several positive economic impacts for the regional economy. Construction was performed by a local marine construction contractor with waterside facilities close at hand in Curtis Bay. Additionally, 8,200 cubic yards of concrete were provided by a local diverse batch plant and 1,110 tons of rebar were installed by a diverse specialty subcontractor.

Towers 3 and 4 are currently the tallest transmission monopoles on the continent, standing 397 feet above the river. The use of high-strength, low-sag conductor allowed the monopole heights to be minimized while maintaining channel clearance for ship navigation.

About Burns & McDonnell

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