

Project of the Year Submissions

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Title: **Riazzi Substation**

Company / Owner: Duquesne Light

2825 New Beaver Ave,

Pittsburgh, PA 15233

Category

Commercial

Education

Energy

Environment

Industrial

Innovation

Medical

Modernization

Sustainable

Transportation

Water / Wastewater

Other:

Lead Agents

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Technical Affiliation:



Riazzi Substation

Project of the Year – Energy Nomination

Duquesne Light Company (DLC) is the City of Pittsburgh's local electric utility. We provide transmission and distribution service to approximately 606,000 residential, commercial and industrial customers in an 817-square-mile territory encompassing most of Allegheny and Beaver counties in Pennsylvania. As our communities grow and thrive, DLC is committed to safely providing a high level of service and reliability while increasing the overall resiliency of the electric grid.

The Oakland community within DLC's service territory is home to vibrant neighborhoods, celebrated cultural destinations, and world-renowned hospitals, universities and research facilities, including the University of Pittsburgh, Carnegie Mellon University and the University of Pittsburgh Medical Centers. In order to continue meeting local electric demands that help drive these vital customers, DLC initiated the construction of the Riazzi Substation Project.

Background/Purpose:

Aside from downtown Pittsburgh, the Oakland area is the most highly concentrated load center on the DLC system. This area is served by mostly underground facilities which, because of their close proximity, tend to thermally derate each other. With significant load growth projected for the Oakland area from the new construction, DLC had to find another way to serve the anticipated load and alleviate the circuit rating limitations resulting from the thermal derating of cables in close proximity to each other.

To solve this problem, the project team looked for available property on the other side of the Oakland load block so that the load could be divided between the substations. It was desired to find a property in close proximity to an underground transmission source to alleviate the significant cost of extending an underground transmission circuit to the substation.

Design:

Property was identified at the intersection of Boundary and Joncaire Streets. Boundary Street already had 138 kV underground transmission in the street along with other utilities, including a 68-inch aged brick sewer line that ran through the property. The existing utilities and physical constraints added challenges which were overcome as part of the design. All of the equipment with the exception of the transformers are located inside a two-story precast concrete structure.

The final design of the substation includes two (2) 138 kV High Pressure Fluid Filled (HPFF) transmission sources, feeding a four (4) breaker 138 kV Gas Insulated Substation (GIS); two (2) 138-23 kV 100 MVA transformers; and three (3) 23 kV busses, which can accommodate fifteen (15) 23 kV sub-transmission and distribution circuits.

The substation is sourced from an underground 138 kV transmission HPFF circuit. Two new manholes were installed in Boundary Street around the existing pipe to splice into the existing HPFF cables. Two 8-inch steel pipes were installed from the manholes to the substation and three single conductor Laminated Paper Polypropylene (LPP) 3000 MCM copper cables were installed in each pipe. To tie into



the existing HPFF cables, the dielectric fluid had to be frozen using a liquid nitrogen blanket. Upon completion of the splices and terminations, the freeze was broken and the pipe was filled with dielectric fluid.

With the limited availability and high cost of land in the Oakland area, a GIS substation was chosen for this application since it has the advantage of having a small footprint (about 25%) as compared to a traditional outdoor substation. Also, all the equipment can be installed indoors, which will ease long-term maintenance and increase life expectancy. A contract was initiated with Siemens for a 138 kV four breaker ring bus. The ring bus design was chosen for its resilience and reliability.

The substation was designed to accommodate (15) 23 kV circuits exiting the substation. As such, it was important to diversify the circuits as they exit the substation. Four diverse routes were chosen to minimize thermal derating caused by multiple circuits in a common duct bank. Conduit has been installed for exits up the hillside to Schenley Avenue; to the south on Joncaire Street; and to the north with two diverse conduit paths up Boundary Street toward Fifth Avenue.

Cost:

The Riazzi Substation cost \$65 million to design, build and commission.

Schedule:

The Riazzi Substation was originally scheduled to be completed by the end of 2020, but due to COVID, some delays were experienced. The substation structure and all transmission-related work were completed in April 2021. The substation became fully operational in July 2021.

Beyond the scope for the substation, distribution circuit connections will continue in the surrounding streets and neighborhoods, with full completion expected in 2024.

Engineer:

Burns & McDonnell

Contractor:

Burns & McDonnell

Conclusion:

DLC's new Riazzi Substation will play an important role in enhancing service and reliability in Oakland as that community grows and thrives. Home to Pittsburgh's Innovation District, which includes world-renowned universities (CMU, Pitt) and health care facilities (UPMC), the Oakland area enables innovators to thrive by uniting research, technology, culture, amenities and more.

Aside from being critical infrastructure, the substation is an investment in Oakland and will enable DLC to continue providing safe, affordable and reliable service to this flourishing community. It will also help increase the overall resilience of the electric grid.



Figure 1 - The site shortly after breaking ground



Figure 2 - The site during construction



Figure 3 - The Gas Insulated Substation (GIS) equipment



Figure 4- The 23 kV switchgear



Figure 5 - The site post construction