DOCKET NO. 483 - The United Illuminating Company application for a Certificate of Environmental Compatibility and Public Need for the Pequonnock Substation Rebuild Project that entails construction, maintenance, and operation of a 115/13.8-kilovolt (kV) gas insulated replacement substation facility located 700 feet southwest of UI's existing Pequonnock substation on an approximately 3.7 acre parcel owned by PSEG Power Connecticut, LLC at 1 Kiefer Street, Bridgeport, Connecticut, and related transmission structure and interconnection improvements.	}	Connecticut
	}	Siting
	}	Council
		October 11, 2018

Opinion

Introduction

On April 26, 2018, The United Illuminating Company (UI or Applicant) applied to the Connecticut Siting Council (Council) for a Certificate of Environmental Compatibility and Public Need (Certificate) for the construction, maintenance, and operation of a replacement 115/13.8 kilovolt (kV) gas insulated substation at 1 Kiefer Street, Bridgeport, Connecticut. The purpose of the proposed replacement substation facility is to mitigate coastal flood risks and asset condition issues at the existing Pequonnock Substation and to improve the reliability of service to customers in the Bridgeport area (service area) and to the New England power grid. UI is a party and PSEG Power Connecticut LLC is an intervenor in this proceeding.

UI provides electrical distribution service to 17 municipalities in Connecticut including Bridgeport. UI's existing 115-kV/13.8-kV air-insulated Pequonnock Substation is located on a 1.5-acre property at 1 Atlantic Street, Bridgeport. This existing substation is connected to various distribution lines and serves the southern and western portions of the City of Bridgeport. This substation also serves emergency facilities including, but not limited to, firehouses, police stations, and hospitals.

Jurisdiction

The Council's jurisdiction under Connecticut General Statutes (C.G.S) §16-50i(a) extends over electric substation facilities designed to regulate the voltage of electricity at 69-kV or more. Under the Public Utility Environmental Standards Act (PUESA), the Council's charge is to balance the need for adequate and reliable public utility services at the lowest reasonable cost to consumers with the need to protect the environment and ecology of the state. A public need exists when a facility is necessary for the reliability of the electric power supply of the state.

Under C.G.S §16-50p, the Council shall not grant a Certificate, either as proposed or modified by the Council, unless it shall find and determine the nature of the probable environmental impact of the facility alone and cumulatively with other existing facilities, including a specification of every significant adverse effect relative to electric and magnetic fields, impact on and conflict with the policies of the state concerning the natural environment, ecological balance, public health and safety, scenic, historic and recreational values, agriculture, forests and parks, air and water purity and fish, aquaculture and wildlife, and why the adverse effects are not sufficient reason to deny the application.

Public Need

Transmission System

Eight existing 115-kV UI transmission lines (five overhead and three underground) feed the existing Pequonnock substation, which was initially placed into service in 1956 and has since undergone various modifications. Four of the overhead transmission lines are aligned along the Metro-North Railroad (MNRR) corridor.

The fifth overhead line is located on PSEG property. It connects Bridgeport Harbor Unit (BHU) #3 and BHU #4 to Pequonnock Substation. The record in this proceeding (via administrative notice of Petition No. 1218) indicates that BHU #3 is expected to retire by July 1, 2021 as part of a Community Environmental Benefit Agreement associated with the approved BHU #5. There is no evidence in the record to indicate a pending retirement of BHU #4 at this time. Furthermore, UI, as a transmission owner, is obligated to preserve the interconnection of existing commercially active generators (including BHU #4) when substation upgrades are performed. Thus, Council finds that the need to preserve this transmission connection still stands, irrespective of the future of BHU #3.

Three underground lines link the existing Pequonnock Substation UI's Trumbull Substation, Old Town Substation, and Singer Substation. Two are high pressure gas filled (HPGF) pipe-type cables, and one is a cross-linked polyethylene (XLPE) cable system.

Asset Conditions

The existing substation has asset condition issues, including settling of enclosure and yard foundations, structural concerns, inadequate space inside the control room, and no access for the emergency mobile transformer units.

Evidence of uneven settling among the control enclosure's foundation is present and indicated by measurements taken within the enclosure in recent years. This settling has caused misalignment within the equipment housed in the enclosure as well as foundation and wall cracks. Also, the substation's 115-kV steel box structure has shown signs of foundation settling and twisting of steel supports causing misalignment of 115-kV disconnect switches.

Flood Risk

The existing Pequonnock Substation has a yard elevation of approximately 10 feet, which is equal to the previous 2010 Federal Emergency Management Agency (FEMA) 100-year flood elevation. Due to its elevation and proximity to Bridgeport Harbor, the existing Pequonnock Substation has been adversely affected by coastal flooding and storm damage such as from Tropical Storm Irene in August 2011 and Hurricane (Superstorm) Sandy in October 2012. During Tropical Storm Irene, the existing substation experienced flooding one to two feet above the yard elevation. During Hurricane Sandy, the existing Pequonnock Substation was preemptively de-energized due to the risk of catastrophic failure and associated long-term recovery issues, and thus, all customers served by that substation were without power at that time. Water levels during that storm rose to within inches of the control room floor.

Subsequently, as a short-term solution at the existing Pequonnock Substation, UI installed HESCO block flood barriers, enclosure door seals, sump pumps, additional interior cameras for flood monitoring, a backup station service generator, and Supervisory Control and Data Acquisition (SCADA) alarm monitoring. UI also raised substation battery chargers and sealed all conduits under the substation.

Flood Design Rules

Historically, utilities have utilized the "100 plus 1" flood design elevation rule, which meant that equipment was elevated one foot above the base flood elevation (BFE or 100-year flood elevation). However, in light of recent storms, flood design standards have become increasingly stringent or conservative.

In 2013, FEMA issued significantly revised BFE maps for Fairfield County, including the City of Bridgeport. The FEMA BFE for the vicinity of Pequonnock Substation is 14 feet NAVD88, or about four feet higher than the previous 2010 BFE. The American Society of Civil Engineers (ASCE) 24-14 currently requires two

feet of freeboard above the BFE. FEMA currently recommends a minimum of one foot of additional freeboard beyond the code requirements to account for a continuation of the historical rate of sea level rise. ISO New England, Inc. (ISO-NE) currently recommends that substations be elevated to the higher of the BFE plus two feet or the 500-year flood elevation. Connecticut Public Act 18-82 (PA-18-82), An Act Concerning Climate Change Planning and Resiliency, requires flood-proofing for properties located within the coastal boundary of not less than two feet freeboard above the BFE and any additional "freeboard" necessary to account for the most recent sea level change scenario published by the Marine Sciences Division of the University of Connecticut (UCONN) based on sea level change scenarios published by National Oceanic and Atmospheric Administration.

Transformer Capacity

UI's most recent 90/10 load forecast for loads served by Pequonnock Substation for 2018–2027 indicates a projected load of 38.5 megavolt-amperes (MVA) for 2018 that would grow at a compound annual growth rate of about 1.12 percent per year, reaching 42.55 MVA by 2027. Pequonnock Substation's existing power transformers are 42/56/70 MVA each with an expected overload or "firm rating" of 77.0 MVA. The firm rating is based on one transformer only in the event that one of the two transformers is out of service.

Thus, from a purely MVA capacity standpoint, the Council notes that the existing Pequonnock Substation has sufficient MVA capacity to meet the forecasted loads. However, in order to address the unrelated flooding and asset design issues via a full substation replacement, it has to be designed for adequate capacity.

Assets and Flood Mitigation

UI proposes a replacement substation with two power transformers that would be 30/40/50 MVA each, for an expected overload or firm rating of 72.0 MVA. While the proposed transformers would be smaller (in MVA capacity) than the existing transformers, this is due to significantly lower projected loads than in the past. Specifically, station service power for the Bridgeport Harbor Station used to be supplied by the distribution system. Today, it is supplied by the transmission system, so this resulted in a significant decline in distribution loads. There exists potential for a major load increase in this area in the near future, including a proposed casino in Bridgeport, which would significantly increase the load on this substation. However, UI believes that the proposed capacity is sufficient to serve the area needs for the foreseeable future. Furthermore, the Council notes that the proposed replacement substation would also be designed to accommodate a mobile transformer for emergency conditions.

The existing Pequonnock Substation asset condition issues including, but not limited to, those related to the 115-kV (transmission) side of the substation, would be resolved by a full replacement of the substation. The existing substation with its equipment/asset issues would be decommissioned after the proposed replacement substation is in service.

With respect to flood risks, the Council notes that, as proposed, the replacement substation would have a design flood elevation (DFE) of 17 feet NAVD88. This would be three feet above the current BFE or about 1.1 feet above the current 500-year flood elevation. Thus, the proposed design would comply with the flood design requirements of the ASCE, ISO-NE, FEMA, and PA 18-82. Furthermore, in its comments dated August 8, 2018, DEEP noted that the proposed replacement substation project exceeds the (minimum) requirements of PA 18-82.

New England's electric power grid has been planned and operated as a unified system of transmission owners and market participants. The New England system integrates resources with the transmission system to serve all regional load regardless of state boundaries. Most of the transmission lines are relatively short and networked as a grid. Therefore, electrical performance in one part of the system affects all areas of the

system. Thus, the Council finds that by mitigating coastal flood risks and asset condition issues at the existing Pequonnock Substation, the proposed replacement substation would improve the reliability of service to customers in the Bridgeport area (service area) and to the New England power grid. Thus, by improving electric reliability in the Bridgeport area and the New England area (as transmission would pass through the proposed replacement substation with the 115-kV asset issues resolved), the Council finds the proposed project is necessary for the electric reliability of Connecticut.

Project Alternatives

UI considered five system alternatives. The "No Action" alternative was deemed unacceptable because the existing Pequonnock Substation would remain vulnerable to damage from coastal storms, or to the failure of structural components, either of which could lead to extended duration outages affecting customers and the bulk power system. Neither installing a perimeter flood wall system nor raising the existing substation above the 14-foot BFE was deemed practical. Raising the existing substation would not resolve other deficiencies such as site settling or inadequate space for a mobile transformer. Installing a perimeter flood wall would not address asset condition deficiencies. Existing substation components would have to be rebuilt and replaced, thus making the flood wall cost-ineffective and effectively requiring rebuilding the substation in place.

Rebuilding the substation in (the same) place would result in construction challenges, a redevelopment time line of potentially more than five years, and it would cost about $269.6M, which is considerably more expensive than the proposed replacement substation. Finally, the full replacement substation was deemed the only viable system alternative option. Specifically, UI's August 17, 2016 Asset Condition Assessment Summary of Pequonnock Substation indicates that the best solution would be to rebuild the entire substation on an adjacent property at a higher elevation, addressing all of the noted deficiencies.

With respect to the location of a full replacement substation, UI identified two viable sites for development of the project: 375 Main Street, Bridgeport, and the proposed site at 1 Kiefer Street, Bridgeport. The 375 Main Street was not selected because it would be more costly to develop than the proposed site. The underground HPGF 115-kV lines that connect to the existing Pequonnock Substation would have to be extended by approximately 1,300 feet to reach the 375 Main Street site. This would be about 570 feet longer than the HPGF extensions to the proposed site. In addition, the overhead 115-kV line that connects the existing Pequonnock Substation to BHU #3 would have to be extended to reach the 375 Main Street site. Lastly, the 375 Main Street site is identified by the City as a potential location for major redevelopment, and it is within a mixed land use area with residences, churches and two sites on the National Register of Historic Places. Thus, after examining both sites, UI selected the proposed site for a replacement substation.

Finally, after system alternatives and location alternatives were explored, UI also considered the replacement substation configuration options. Specifically, UI evaluated whether a gas-insulated substation (GIS) or an air-insulated substation (AIS) would be more suitable. However, an AIS design would require a larger area than could be accommodated at the proposed site located at Bridgeport Harbor Station. Thus, UI selected the GIS design.

Proposed Project

The proposed replacement substation would have an irregular shape with an interior fenced area of 1.8 acres or approximately 77,400 square feet. It would be enclosed by a 14-foot high chain link fence with one foot of barbed wire on top. The interior surface of the proposed replacement substation would consist of approximately one-inch grade stone on top, with the exception of the access drives, which would be paved. Access to the substation would be via a new paved access inside the fenced substation from three gates: one off of Ferry Access Road (the primary entrance gate); one off of Singer Avenue; and one off of an existing (internal) PSEG access drive.

The GIS would be housed within an enclosure with dimensions of approximately 92 feet long by 87 feet wide by 34 feet high. The control and relaying equipment (to be located within the southern portion of the fenced substation) would be housed within an enclosure with dimensions of approximately 72 feet long by 36 feet wide by 14 feet high. North of the GIS enclosure, a small portion of the AIS would connect the GIS equipment to distribution transformers in order to step the voltage down from 115-kV to 13.8-kV. This portion of the proposed replacement substation would include the following:

a) Two 115-kV/13.8-kV power transformers;
b) 115-kV disconnect switches mounted on steel structures;
c) Associated insulators, tubular aluminum bus, surge arrestors, and connectors;
d) 90-foot wood telecommunications pole; and
e) An additional equipment enclosure (with dimensions of approximately 75 feet long by 30 feet wide by 13 feet high) would be located within the northern portion of the fenced substation to house the 13.8-kV distribution circuit breakers and associated outgoing distribution cable circuits.

UI would redirect the eight 115-kV transmission lines that presently feed the existing Pequonnock Substaton to connect to the proposed replacement substation. To route the five overheard transmission lines into the proposed replacement substation, 17 new galvanized tubular steel monopole structures, ranging in height from 75 feet to 100 feet, would be installed.

The three underground transmission lines (consisting of conduits and conductors) that feed the existing substation would be re-routed or extended to connect to the proposed replacement substation. These underground transmission connections are noted as follows:

a) Two HPGF underground transmission cables (Line Nos. 1697 and 1710) would connect to the proposed replacement substation to the east by extending the existing steel pipes approximately 730 feet to the southwest, crossing PSEG and UI property. The new buried splice chamber for the HPGF lines will be located on UI property at the existing Pequonnock Substation site; and

b) An XLPE cable (Line No. 1995), which extends along Ferry Access Road to the existing substation, would be intercepted at an existing transmission splice chamber (located beneath Ferry Access Road) and, from there, it would be redirected to the proposed replacement substation. Approximately 500 feet of new concrete-encased PVC duct bank would be constructed.

Environmental Considerations

The proposed site is currently located on 3.7 acres owned by PSEG and located at 1 Kiefer Street. Approximately two of these acres is vacant land located within PSEG's fenced Bridgeport Harbor Station property. The portion of the property containing the proposed replacement substation site is zoned Industrial Heavy (IH). The northern portion of the project site (that includes areas for transmission interconnections) is located within the Downtown Village District (DVD-WF). The site is located approximately 700 feet southwest of the existing Pequonnock Substation. The site is located in a highly developed industrial area south of Interstate 95 (I-95) and west of the Pequonnock River. Surrounding and nearby land uses include the Bridgeport Harbor Station generating facility, electrical utilities, oil storage facilities, storage yards, warehouses, commercial office buildings and the I-95 and MNRR/Amtrak railroad corridors.

Post-construction, the replacement substation would be consistent with surrounding land uses. Portions of the replacement substation would be visible from abutting northern and western locations along Ferry Access

Road and Singer Avenue, as well as from a short stretch of elevated I-95 farther to the northwest. In addition to these locations, views of the new transmission structures would extend out to ¼-mile west and north. However, the presence of large, existing utility and industrial infrastructure will serve to obstruct new equipment from several surrounding residences. Thus, the proposed project would not adversely affect views in the surrounding community.

The proposed replacement substation would use low-level lighting for safety and security purposes. The illumination would be visible in the immediate vicinity of the substation. However, such lighting would be consistent with the illumination of other industrial facilities in the vicinity. UI would employ additional lighting only for work at night under abnormal or emergency conditions. The lights would incorporate UI's standard design for illumination of substation yards such as the use of area lights mounted on equipment support structures, perimeter fence posts and enclosures.

Wetland soils are not present at the site. There are also no watercourses at the site.

Groundwater in the project area is classified by DEEP as GB. Water with a GB classification includes industrial process and cooling waters and base flows for hydraulically connected water bodies. Such water is presumed to be not suitable for human consumption without treatment. The classification of groundwater as GB is consistent with the historical industrial uses in the project area. The depth to groundwater in the project area ranges from five to nine feet below grade. UI would have a dewatering plan related to the DEEP General Permit process. If contaminated groundwater is discovered, UI would work with DEEP and have a treatment system to address that issue. The proposed replacement substation site is not located within a DEEP-designated Aquifer Protection Area (APA).

No trees greater than six inches in diameter would be removed to construct the proposed project.

By letter dated March 30, 2017, DEEP reviewed the Natural Diversity Database (NDDB) and found that the peregrine falcon, a state-designated Threatened Species, occurs in close proximity to the proposed site. To protect the peregrine falcon, UI would comply with DEEP's modified/updated best management practices (BMPs) dated June 5, 2018.

Connecticut is within the range of the northern long-eared bat (NLEB), a federally-listed Threatened species and State-listed Endangered species. However, there are no known northern NLEB hibernacula in Bridgeport. There are also no known NLEB maternity roost trees within 150 feet of the proposed project. No impacts to the NLEB would be expected.

Also with respect to federally-listed species, the U.S. Fish and Wildlife Service indicated that while the red knot, a federally-listed Threatened species, should be considered, there are no critical habitats within the project area.

Although the entire proposed project site is located within a coastal boundary, the proposed project would not conflict with any defined coastal policies (under Connecticut's Coastal Management Act) that provide guidelines for uses and activities subject to Connecticut's Coastal Management Program.

No historic properties would be affected by the proposed replacement substation project.

The Council is satisfied that the proposed project's electric and magnetic fields have been demonstrated to be well below recommended exposure standards established by the International Commission on Non-Ionizing Radiation Protection and the International Committee on Electromagnetic Safety and are not of a concern.

Cost

The cost of the Proposed Project is approximately $171.3M. The cost allocation breakdown for the proposed project is as follows:

Pool Transmission Facilities (PTF) Costs for Connecticut	$32.0M
PTF Costs for rest of New England	$96.2M
Distribution and Non-PTF Costs for UI customers	$43.1M
Total	$171.3M

Flood Design Considerations

While the proposed substation design would comply with the ASCE, ISO-NE, FEMA, and PA 18-82 requirements, UI is also willing to raise the substation by up to two feet higher if required by the Council. Notwithstanding the code compliance, out of an abundance of caution and for prudent future planning with respect to both storm and climate change resiliency considerations, the Council will require that the substation DFE be increased by two feet from 17 feet NAVD88 to 19 feet NAVD88. UI estimates that the incremental cost to elevate the substation by two feet above the originally proposed DFE is about $1.7M. UI would ultimately submit the proposed project through the ISO-NE Transmission Cost Allocation process for a regional cost recovery determination, but preliminary indications are that incremental flood protection costs beyond the current proposal would likely be borne by Connecticut ratepayers. However, for a substation that would have a roughly 50-year projected service life, the Council believes that, at the present, there is an opportunity to further enhance the resiliency of the substation compared to a fairly negligible one percent increase in total project cost. Such an opportunity to set the substation's initial DFE will only present itself once, during the final design phase as a result of this certification proceeding.

Conclusion

The Council finds the project is necessary for the reliability of the electric power supply of the state, serving the interests of electric system economy and reliability, and as such, conforms to a long-range plan for expansion of the electric system serving the state and related interconnected utility systems. The project is consistent with the Connecticut's Comprehensive Energy Strategy which proposes further improvements in grid reliability and resiliency through state and regional efforts. This includes ensuring substation coastal resiliency.

Based on the record of this proceeding, the Council finds and determines that there is a public need for the facility. The Council also finds and determines that the Proposed Project is not in conflict with the policies of the state concerning the natural environment, ecological balance, public health and safety, scenic, historic and recreational values, agriculture, forest and parks, air and water purity, and fish, aquaculture and wildlife, together with all other environmental concerns, including EMF, and balanced the interests in accordance with C.G.S §16-50p(a)(3)(B) and C.G.S §16-50p(a)(3)(C). The environmental effects that are the subject of C.G.S §16-50p (a)(3)(B) can be sufficiently mitigated and do not overcome the public need for the facility.

The Council will require UI to submit a Development and Management (D&M) Plan for the proposed project to include, but not be limited to, provisions for municipal comment and review; detailed site plans identifying structure and equipment locations as well as temporary and permanent facilities and roadways; an erosion and sediment control plan consistent with the *2002 Connecticut Guidelines for Soil Erosion and Sediment Control*; a Spill Prevention, Control, and Countermeasures Plan; and a decommissioning plan for the existing Pequonnock Substation with or without the removal of the foundations.

With the conditions listed above, the Council will issue a Certificate of Environmental Compatibility and Public Need for the construction, maintenance, and operation of a replacement 115-kV/13.8-kV gas-insulated substation located at 1 Kiefer Street, Bridgeport, Connecticut.