

**BEFORE THE  
PUBLIC SERVICE COMMISSION  
OF MARYLAND**

**IN THE MATTER OF THE APPLICATION OF  
CP CRANE, LLC FOR A CERTIFICATE OF  
PUBLIC CONVENIENCE AND NECESSITY  
AUTHORIZING THE MODIFICATION OF  
THE CHARLES P. CRANE GENERATION  
STATION IN BALTIMORE COUNTY,  
MARYLAND**

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**CASE NO: 9482**

**DIRECT TESTIMONY AND EXHIBITS**

**OF**

**KEVIN H. ZHONG**

**ON BEHALF OF THE STAFF**

**OF THE**

**PUBLIC SERVICE COMMISSION OF MARYLAND**

**MARCH 4, 2019**

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## **INTRODUCTION**

**Q. Please state your name and business address.**

A. My name is Kevin Zhong. My business address is 6 St. Paul Street, Baltimore, Maryland 21202.

**Q. What is your occupation?**

A. I am employed by the Public Service Commission of Maryland (“Commission”) as an Engineer in the Commission’s Division of Engineering.

**Q. Please describe your educational background and professional experience.**

A. I hold a Master of Science degree in Chemical Engineering from the Ohio State University and a Master of Science degree in Technical Management from the Johns Hopkins University. Before joining the Maryland Public Service Commission, I had more than ten years of experience in process engineering and managing the construction of air pollution control equipment for process and power plants.

**Q. Have you previously testified before the Commission?**

A. Yes. I have previously testified before the Maryland Public Service Commission in Case Number 9353, In the Matter of Annual Performance Reports on Electric Service Reliability, which examines electric company reliability performance under COMAR 20.50.12 on August 9, 2016 , July 25, 2017, July 27 and August 28, 2018. I have provided direct testimonies to the Commission on two Delmarva Power & Light base rate cases (Case Nos. 9424, 9455), the CPV Maryland St. Charles Generating Station CPCN (Case No. 9437), and the Cherrywood Solar CPCN (Case No. 9477). I testified on Pepco’s public purpose Microgrid proposal, in Case No. 9361, and also on Rule Making 63 on June 20, 2018 and September 18, 2018.

**Q. What is the purpose of your testimony?**

A. The purpose of this testimony is to make a recommendation regarding the effect of the repowering project (the “Project”) proposed by C. P. Crane, LLC. (“CP Crane” or “the Company”) will have on the reliability and stability of the electric system in the State of

Maryland. Reliability and stability are two factors the Commission is required to consider prior to issuing a Certificate of Public Convenience and Necessity (“CPCN”) pursuant to §§ 7-207 and 7-208 of the Public Utilities Article of the Annotated Code of Maryland.

## **CONCLUSIONS AND RECOMMENDATIONS**

**Q. Please summarize your conclusions.**

A. After reading the testimony of the Company’s witnesses and performing my own analysis, I am recommending that the Commission Grant a CPCN to CP Crane for 150 Megawatts (“MW”) of new power generating facility, in accordance with the following conditions:

- (1) Require completion and compliance with all studies for all PJM Generation Interconnection Request Queue positions;
- (2) Require the filing of a request for CPCN amendment with the Commission for any generation capacity in excess of 150 MW;
- (3) Require the signed ISA and CSA<sup>1</sup> executed by CP Crane, Baltimore Gas & Electric Co. (“BGE”) and PJM be filed with the Commission prior to the commencement of construction;
- (4) Require that CP Crane, its successors and assigns, provide sixty (60) days written notice to the Commission of any non-wholesale electricity sale to a Maryland retail electric customer and comply with all regulations regarding such sale including obtaining any requisite Interconnection Agreement(s) and retail supplier approval(s) prior to delivering electricity into the respective systems of Maryland electric companies;
- (5) Require that CP Crane, its successors and assigns, provide written notice of any change in ownership of all, or any portion of the Project, at least thirty (30) days prior to the closing date of any sale to a third party. The written notice should include, but

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<sup>1</sup> Interconnection Service Agreement (“ISA”); Construction Service Agreement (“CSA”).

- not be limited to identifying the third party, providing contract information to receive any Commission inquiries, providing the proposed effective date of any change in ownership, and providing documentation that demonstrates the capability of the prospective owner to operate and maintain the Project to perform in accordance with any CPCN issued in this proceeding; and
- (6) Include any additional conditions proposed by the other State agencies having jurisdiction in this proceeding.

## **TESTIMONY**

**Q. Who is the applicant in this case?**

A. CP Crane is the applicant requesting a CPCN in this case.

**Q. Please describe the Project identified in the application.**

A. CP Crane has proposed a nominally rated 150 MW natural gas powered generating facility to be located on approximately 4 acres of a 157-acre parcel located on 1001 Carroll Island Road in Baltimore County, Maryland. The property was once occupied by CP Crane units 1 and 2, two coal fired units, and a remaining small combustion turbine generator, all built in the 1960s.

CP Crane reported that as of June 1, 2018, the existing electric generating equipment [related to units 1 and 2] has been retired from operation and decommissioned<sup>2</sup>. The applicant has removed and disposed of all bags from baghouses, and removed 2,207 tons of coal ash as well as all bottom and fly ash<sup>3</sup>.

The proposed Project known as the repowering project is to construct three (3) new units, Nos. 2, 3 and 4, all of which employs a General Electric LM6000 gas fired combustion turbine ("CT").

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<sup>2</sup> CP Crane response to BGE Data Request ("DR") No. 1-1. *See* Attachment.

<sup>3</sup> CP Crane response to Environmental Group DR No. 1-4. *See* Attachment. Baghouses are an air pollution control device and dust collectors that remove particulates out of gasses released from combustion for electricity generation.

The applicant also proposed a new black start generator. It included an Air Quality Permit to Construct & Registration Application for an Emergency Generator, a Cummins model KTA50-G9 engine capable of producing 1,500 kilowatts-electric (“KWe”) of standby power. On the application, the box “I do not need a CPCN Exemption because the generator is rated at 2000 kW or less” was checked.

**Q. Have you personally inspected the site for the proposed project?**

A. Yes. I toured the site on February 28, 2019. The company representatives were able to answer our questions. Some original structure will remain standing and the site is being prepped for new construction.

**Q. Will the Repowering Project affect the nameplate capacity of the Plant?**

Yes it will. The now decommissioned coal units 1 and 2 were rated at 190 MW and 195 MW, respectively. The repowered plant will have added generation capacity of 150 MW or 50 MW for each new unit<sup>4</sup>. The proposed CTs will serve as peaking units and operate at an annual capacity factor of up to 27 percent. The new black start generator fires on Ultra Low Sulfur Diesel (“ULSD”), and is normally expected to operate only a few hours per year for testing and maintenance.

**Q. Please describe the source of fuel for the Project identified in the application and how it will be supplied.**

CP Crane stated that natural gas to fuel the Project will be supplied through the existing pipeline by agreement with BGE. The CTs are also capable of firing ULSD fuel oil in situations when natural gas will not be available in sufficient quantities. There will also be additional ULSD fuel oil delivery, handling and storage facilities at the site for the CTs to sustain 72 hours of continuous operation.

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<sup>4</sup> Not included in this CPCN application is an existing General Electric Frame 5 combustion turbine rated at 14 MW, which will continue operations upon completion of the Project.

**Q. Why is the coal plant being replaced by a gas fired plant?**

A. This is an economic decision made by the current owner. A previous owner, Constellation, made retrofits for compliance with the Maryland Healthy Air Act of 2006. The legislation required reductions of emissions of mercury, oxides of sulfur (SOx) and oxides of nitrogen (NOx) by 2009. In Commission Case No. 9084, the plant was permitted to use selective non-catalytic reduction, advanced furnace staging, and sorbent to control NOx and mercury. In Commission Case No. 9206, the plant was permitted to use sub-bituminous coal to control SOx. Permits were also required for a pier and dredging for access by sub-bituminous coal barges. The processes required some experimentation and verification through test burns. Baghouses were used to collect particulate matter. Flue Gas Desulfurization (FGD) and Selective Catalytic Reduction (SCR) were considered to be not feasible. These processes added additional expense to an already aging plant. Natural gas has become less expensive and burns cleaner than coal. There is also the issue of dust due to the handling of coal.

The Commission anticipated the retirement or deactivation of the C.P. Crane plant and asked PJM to undertake a reliability evaluation on Dec 7, 2011. PJM complied and provided a list of transmission upgrades that would be required for projected retirement in 2015. According to PJM's website, the Crane units were deactivated on June 1, 2018 with a statement: *"Reliability analysis complete upgrades expected to be completed in future, but interim operating measures identified and unit[s] can be deactivated as scheduled"*.

**Q. Please explain whether the application ought to be considered a modification to the existing generation facility.**

A. As stated in PUA §7-205: (14) Modification.

(a) "Modification" to an electric generating station has the meaning stated in PUA § 7-205, Annotated Code of Maryland:

(a)(1) In this section, "modification" means a physical alteration of, replacement of, or other change to the facilities at a power plant, or a change in the fuel used by the plant that could result in a change of the air emissions from the plant or from a generating unit of the plant.

(2) "Modification" does not include:

(i) routine maintenance or repairs of the facilities of a power plant; or

(ii) a change that the Commission determines will not result in an increase in air emissions from the plant or from a generating unit of the plant.”

Staff will defer to Power Plant Research Program’s (“PPRP”) assessment of (a)(2)(ii), above. That said, as the fuel has changed from coal to natural gas, the CPCN application could also be handled as modification of an existing CPCN in accordance with (a)(1). Nonetheless, Staff will not object to evaluating the three new CTs as a new CPCN.

**Q. Please describe the process by which generators are connected to the regional transmission system.**

A. The Regional Transmission Organization responsible for assessing transmission system reliability and stability in Maryland is PJM. A potential interconnection customer, such as the Project, must comply with the PJM Open Access Transmission Tariff (“OATT”), as approved by the Federal Energy Regulatory Commission (“FERC”), and must become a PJM member.

PJM organizes generation interconnection requests into clusters, or queues, for the purpose of identifying required transmission system improvements. Upon the receipt of an interconnection request, PJM conducts sequential studies, provided the potential customer meets certain requirements to retain its queue position. The studies are dependent on other projects within the geographical area. The studies performed by PJM are the Feasibility Study, the Impact Study, and the Facilities Study. The studies are intended to determine what system enhancements are necessary to accommodate the interconnecting generator and maintain the reliability and stability of the transmission system. PJM and the transmission owner, in this case BGE, require the Project to assume the financial responsibility for any upgrades to the distribution or transmission system. BGE retail electric customers will not have any role, obligation, responsibility or cost in interconnection of the Project to the PJM or BGE electric systems.

**Q. How will the Project be connected to the PJM transmission system?**

- A. The Project will interconnect to the PJM system through BGE's 115 kV transmission system facilities. The interconnection would be undertaken by tapping into the existing Windy Edge – C.P. Crane 115 kV transmission line<sup>5</sup>. The Project will be responsible for all costs of the interconnection upgrades identified in the interconnection studies. BGE customers will not bear responsibility for any costs or work associated with the upgrades. CP Crane will be responsible for constructing a new 115 kV substation.

**Q. What is the current status and PJM queue position of the Project?**

The PJM System Feasibility Study was completed in July 2018 for queue position AD2-104, titled "Crane CT 2-3-4- 115 kV" for a 144.6 MW Maximum Facility Output generating facility, which represents three new CTs. CP Crane explained that at ISO<sup>6</sup> conditions the gross output will be 150 MW. The second queue, AD2-103 seeks to reactivate the existing combustion turbine generator, for 14 MW of Energy/Capacity. Its feasibility study was also completed.

**Q. Please describe the Feasibility Study.**

- A. Computer modeling of the electric system is used by PJM to evaluate the feasibility of new generation with respect to compliance with the Regional Reliability Council, Reliability First, of the North American Electric Reliability Council ("NERC") reliability and stability criteria. Short circuit calculations are performed to ensure that circuit breaker capacities are not exceeded. This report identifies direct connection requirements and network impacts. Once the Feasibility Study is completed, a Feasibility Report is issued. As explained above, PJM has completed Feasibility Study reports for queues AD2-103 and AD2-104.

**Q. Please describe the System Impact Study.**

- A. The intent of the System Impact Study is to determine a plan, with approximate cost and construction time estimates, to connect the Project to the PJM network at a location

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<sup>5</sup> CP Crane Response to Staff DR No. 1-6, Attachment 2.

<sup>6</sup> ISO stands for International Organization of Standardization. CP Crane Response to Staff DR 2-7. *See* Attachment.

specified by the Project owners. The System Impact Study is a continuation of the Feasibility Study with the inclusion of more detailed analysis. Capacity Resources<sup>7</sup> are evaluated for load deliverability and generation deliverability. Load deliverability is a measure of the ability to transfer power to the load in a particular sub-area. Generation deliverability is a measure of the ability to export generation from a sub-area. Stability is evaluated for critical contingencies. Short circuit calculations are performed, taking into consideration all elements of the regional plan, to ensure that circuit breaker capacities are not exceeded. The applicant informed Staff that System Impact Studies are expected at the end of March 2019<sup>8</sup>. Without this report Staff is unable to make a conclusive statement with regards to the reliability and stability of the electric system.

**Q. What are the interconnection and transmission network upgrade facilities and costs identified in the Feasibility and System Impact Studies?**

A. The Feasibility Studies identified no need for any new transmission system reinforcements or transmission network upgrades. The estimated cost of facilities required for attachment, direct connection and non-direct connection of the Project to the BGE system is zero dollars<sup>9</sup>.

This is also consistent with the Applicant's claim that the CTs will take full advantage of the existing units' interconnection to the electrical transmission system. As stated previously, Staff will withhold conclusions at this point until the need for no new transmission system reinforcements or transmission network upgrades is confirmed by System Impact Studies. The CPCN should be conditioned on the completion of the studies and compliance with the requirements.

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<sup>7</sup> A Capacity Resource has the right to schedule both capacity and energy deliveries at a point of interconnection into PJM markets, pursuant to a bilateral contract or through participation in the PJM capacity market.

<sup>8</sup> CP Crane Response to Staff DR No. 2-6. *See* Attachment.

<sup>9</sup> Generation Interconnection Feasibility Study Report for PJM Generation Interconnection Request Queue Position AD2-104, "Crane CT 2-3-4- 115 kV", July 2018, pages 3, 4.

**Q. Please describe the agreements that may be executed upon completion of the PJM studies.**

Upon completion of the studies, if a project owner desires to continue with the project, an Interconnection Service Agreement (“ISA”) is tendered among the Project, PJM, and the transmission owner and filed with the FERC. If the project is to be connected to transmission facilities, PJM executes a Construction Services Agreement (“CSA”) between the Project and the transmission owner, in this case BGE. At the time of this testimony, the PJM website provides no indication when these agreements are expected. The Project-in-Service Dates for both queues are listed as 10.31.2019<sup>10</sup>.

**Q. Why is the stability analysis important for new projects seeking to interconnect in PJM?**

A. Stability is a measure of the transmission’s system ability to recover from changes to its normal operation. Large or sudden changes in load or generation output can have significant impacts on transmission system operations resulting in voltage collapse or cascading outages. Stability Analysis takes into consideration the response of the generator to requests for changes in real (MWs) and reactive power (MVARs)<sup>11</sup> output. According to PJM Manual 14A, New Services Request Process: “*For Generation*

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<sup>10</sup> <https://pjm.com/planning/services-requests/interconnection-queues.aspx>

<sup>11</sup> Reactive power (kVARs) is energy lost in an alternating current circuit when the voltage and current are not in phase. This loss can be recovered as real power (kW) by supplying reactive power to the circuit. Utilities can supply Reactive power by adding capacitors to the circuit. PJM can also dispatch rotating generators such as combustion turbine generators to supply reactive power. Reactive power is lost with inductive loads such as motors, transformers, and long transmission lines. Reactive power losses limit the ability of a distribution system to deliver power. Extreme losses in reactive power can lead to voltage collapse or blackouts. Reactive power losses affect the power factor of a circuit [real power (kW)/apparent power (kVA)]. Ideally the grid functions most efficiently when the power factor is unity. However, in practice the power factor can become 0.9 or less. A power factor of 0.9 is generally considered to be a lower limit. Utilities take steps to maintain the power factor at 0.9 which can be an added expense to maintain grid stability.

*Interconnection Requests a threshold of 20 MW is considered when determining if a stability Analysis is required on a generic basis”<sup>12</sup>.*

**Q. Have the effects of the Project on the reliability and stability of the electric system in Maryland been determined?**

A. Staff believes that the System Impact Study must be finished in order to make this assessment. Prior to operation, CP Crane will be required to comply with BGE’s interconnection requirements and the requisite facility upgrades specified in the ISA. The Project’s compliance with this agreement would assure no adverse impact to the reliability and stability of the electric transmission system, since both BGE and PJM will be parties to the ISA.

**Q. Why are you recommending CPCN conditions regarding reliability and transmission system stability?**

A. The ISA is a crucial document for maintaining the safety, reliability, and stability of the electric transmission system. The ISA along with the CSA should be required as a condition of any issuance of a CPCN and be filed with this Commission prior to starting any construction activities.

**Q. Please describe the services that CP Crane previously offered to the PJM market.**

A. Prior to the decommissioning of the coal combustion generating facility, the plant participated in energy, capacity, reactive supply and voltage control in the PJM market.

**Q. Please describe additional services the new Project will enable the Plant to offer to the PJM market.**

A. CP Crane has indicated that it will offer black start service, spinning reserve (aka. synchronized reserve), and supplemental reserve markets service, which could not be provided by the coal units.

The United States Department of Energy issued a Staff Report to the Secretary on Electricity Markets and Reliability<sup>13</sup>. The report identified various Essential Reliability

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<sup>12</sup> PJM Manual 14A, Revision 24, Effective Date 07/26/2018, page 27

Services (“ERS”). One of the key ERS is the control of frequency. For example, the spinning reserve is considered capable of providing primary frequency response, that is, within 10 minutes of degraded grid frequency after a major generation loss. The supplemental reserve is considered to be available with a lead time of between 10 and 30 minutes. These additional generation capabilities of the Project are beneficial for Maryland and the PJM system.

**Q. Please explain black start service and its significance.**

A. A black start unit is one that can start its own power without support from the grid in the event of a major system collapse or a system-wide blackout. In the U.S., every region within the NERC has its own black start plan and procedures. Each region also designates certain plants as black start units. A recent FERC/NERC study on black start<sup>14</sup> indicated that *“North America’s regional black start restoration plan involves sophisticated sequences of so-called “cranking paths” for each of NERC region’s operating entities, and is also associated with committed contracts with sequences of black start and next-start generation operators.”*

**Q. Please comment on the availability of natural gas supply to the Plant.**

A. In its response to BGE’s DR No. 1-4, the Application stated that it has applied for and expects to receive BGE gas service under BGE’s Interruptible Service Schedule IS. Staff has looked into a study authored by NERC, “Single Point of Disruption to Natural Gas Infrastructure”, November 2017. In this study, 24 natural gas generation “clusters” were identified. Their likelihood of potential electric generation outages were analyzed in an extreme scenario of a large gas supply disruption combined with peak load conditions. The study indicated that 18 of the 24 clusters of generation facilities would experience voltage and stability issues in the absence of additional operational remedies if (>2GW) of natural-gas-fired generation were to be disrupted. Staff notes that although

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<sup>13</sup> Staff Report to the Secretary on Electricity Markets and Reliability, August 2017, pages 70-71 (Available at <https://www.energy.gov>)

<sup>14</sup> Transmission and Distribution World, May 10, 2018 article published at <https://www.tdworld.com/smart-grid/grateful-not-dead-grid-reliability-s-long-strange-trip>

the CP Crane plant is located within one of the 24 clusters, it was not among the 18 that were identified that required additional operational remedies. Hence, Staff feels that the availability of natural gas supply to the Plant is relatively secure. Staff also agrees with the Applicant's claim that "having the flexibility to the use to the use natural gas or ULSD fuel oil will enhance the reliability and resilience of PJM and the BGE locational deliverability area"<sup>15</sup>.

**Q. What are your conclusions regarding this Project?**

A. As the interconnection requirements of PJM and BGE are being handled systematically, in accordance with federal and state law, Staff feels that the Project in its current state does not imperil the stability or reliability of the State's Electric grid. Further, it has the potential of improving fuel flexibility and enabling black start capabilities. These will likely make positive contributions to the resiliency of Maryland's electricity system. The System Impact Study is considered a requirement. Compliance with ISA and CSA is critical for maintaining the reliability and stability of the electric system. Therefore, both are referenced in the proposed CPCN conditions for approval of the Project.

**Q. What is your recommendation in this matter?**

A. Staff recommends that the Commission grant a CPCN to CP Crane, LLC for 150 MW of new power generating facility, in accordance with the following conditions:

- (1) Require completion and compliance with all studies for all PJM Generation Interconnection Request Queue positions;
- (2) Require the filing of a request for CPCN amendment with the Commission for any generation capacity in excess of 150 MW;
- (3) Require the signed ISA and CSA executed by CP Crane, BGE and PJM be filed with the Commission prior to the commencement of construction;
- (4) Require that CP Crane, its successors and assigns, provide sixty (60) days written notice to the Commission of any non-wholesale electricity sale to a Maryland retail

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<sup>15</sup> CP Crane Application, page 3-29. Locational Deliverability Area is defined by PJM as sub-regions used to evaluate locational constraints.

- electric customer and comply with all regulations regarding such sale including obtaining any requisite Interconnection Agreement(s) and retail supplier approval(s) prior to delivering electricity into the respective systems of Maryland electric companies;
- (5) Require that CP Crane, its successors and assigns, provide written notice of any change in ownership of all, or any portion of the Project, at least thirty (30) days prior to the closing date of any sale to a third party. The written notice should include, but not be limited to identifying the third party, providing contract information to receive any Commission inquiries, providing the proposed effective date of any change in ownership, and providing documentation that demonstrates the capability of the prospective owner to operate and maintain the Project to perform in accordance with any CPCN issued in this proceeding;
- (6) Include any additional conditions proposed by the other State agencies having jurisdiction in this proceeding.

**Q. Does this conclude your testimony?**

**A. Yes.**

**ATTACHMENT**