BEFORE THE PUBLIC SERVICE COMMISSION OF UTAH

IN THE MATTER OF THE APPLICATION OF DOMINION ENERGY UTAH FOR APPROVAL OF A NATURAL GAS CLEAN AIR PROJECT AND FUNDING FOR THE INTERMOUNTAIN INDUSTRIAL ASSESSMENT CENTER	Docket No. 19-057-33

DIRECT TESTIMONY OF KODY M. POWELL, PH.D.

FOR DOMINION ENERGY UTAH

DEU Confidential Exhibit 2.0

December 31, 2019

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I. INTRODUCTION

Q. Please state your name and business address.

A. My name is Kody M. Powell. My business address is 50 S. Central Campus Drive, MEB Room 3290, Salt Lake City, Utah.

Q. By whom are you employed and what is your position?

A. I am employed by the University of Utah as an Assistant Professor in the Department of Chemical Engineering. I am also the Director of the U.S. Department of Energy (DOE) funded Intermountain Industrial Assessment Center (IIAC). In addition to directing this center, I am also the principal investigator for several research projects related to energy systems, including projects sponsored by DOE's Office of Energy Efficiency and Renewable Energy, DOE's Office of Fossil Energy, PacifiCorp Energy, and the Utah Governor's Office of Energy Development. I am also a co-Principal Investigator on a project sponsored by DOE's Office of Nuclear Energy.

Q. What is the purpose of your testimony in this proceeding?

A. My testimony supports Dominion Energy Utah's (Dominion Energy or the Company) proposed Natural Gas Clean Air project described in the Application, and discussed briefly in the testimony of Michael A. Orton. The Company's filing respectfully requests the Commission approve the Natural Gas Clean Air project pursuant to Utah Code Ann. §§ 54-4-13.1 and 54-20-105.

II. CHARACTERISTICS OF COMBINED HEAT AND POWER

Q. What is combined heat and power and how does it work?

A. Combined heat and power (CHP), also known as cogeneration, is an efficiency technology that maximizes energy efficiency by the simultaneous production of electricity and heat. Conventionally, power for a facility is generated offsite via combustion of a fuel at a large power plant. This process is roughly 33% efficient. If the facility also has a consistent heating demand, it will also burn fuel onsite in a boiler or furnace. This process is roughly 80% efficient. The net result is an efficiency of roughly 51% overall. CHP, in contrast, combines these two processes. Power is generated onsite, typically with a small turbine. The waste heat from this process is then recovered and used to provide facility or process heat. Essentially, by co-locating these two processes, much less energy is wasted. The overall efficiency for a CHP system is roughly 75%.[1]

Q. What are the benefits of CHP?

A. The aforementioned efficiency gain results in direct energy and cost savings for the facility. The facility can achieve the same useful benefit with much less energy expenditure. The societal benefits are also readily apparent. Energy is conserved as a CHP process would result in roughly 32% less fuel being burned. CO_2 emissions are reduced by 49%. NO_X and particulate matter are also drastically reduced.[2] Often, a CHP installation may be used to replace boilers with no NO_X controls. Modern CHP technology uses low NO_X burners and selective catalytic reduction (SCR) to clean up the

[1] This example analysis is taken from the EPA using the U.S. average fossil fuel mix (https://www.epa.gov/chp/chp-benefits). It assumes a natural gas combustion turbine coupled with a waste heat recovery boiler. CHP applications, technology, and performance may vary, but the analysis presented above is representative of a common application and technology set.
[2] Also from https://www.epa.gov/chp/chp-benefits.

exhaust gas from the process, resulting in drastic NO_X reductions both statewide (93% reduction) and for the facility as a point source (72% reduction).[3] Other benefits of CHP include increased process reliability for the site, increased electric grid flexibility and reliability, and the elimination of transmission and distribution losses, which range from 4.23-to 5.35%.[4]

Cost effective benefits of CHP are also observed when comparing it to other clean energy technologies. For example, CHP is an energy efficiency technology, and energy efficiency is widely viewed as the lowest cost way to reduce emissions.[5] Compared to the increasingly prevalent solar and wind energy technologies, for example, CHP is 90% and 66%, respectively, less expensive per ton of NO_X avoided. CHP is 84% and 47% less expensive than solar and wind, respectively, per ton of CO_2 avoided.[6] One caveat for CHP, however, is that is must be more situationally applied, as it must be deployed at a facility with consistent electric and heat demand.

III. NATURAL GAS AIR QUALITY PROJECT

Q. Can you provide more detail about any specific projects that have been identified?

A. Yes. First, however, it is important to note that the above analysis on the benefits of CHP is done using averaged data for efficiencies and emissions and assumed capacities to

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[3] This example analysis assumes an average NO_x emission factor for Utah (https://www.epa.gov/sites/production/files/2018-02/documents/egrid2016_summarytables.pdf), a boiler with no NO_x controls for the facility (https://www3.epa.gov/ttnchie1/ap42/ch01/final/c01s04.pdf), and a CHP installation with modern NO_x control technology (https://www.epa.gov/sites/production/files/2015-07/documents/catalog_of_chp_technologies_section_3._technology_characterization_-_combustion_turbines.pdf).
[4] https://www.epa.gov/chp/chp-benefits
[5] https://www.edf.org/blog/2014/06/10/cheapest-way-cut-climate-pollution-energy-efficiency
[6] Data from https://www.epa.gov/sites/production/files/2015-07/documents/combined_heat_and_power_frequently_asked_questions.pdf and assuming a 25-year plant life with 7% annual percentage rate for each scenario.

serve as a basic representation of the technology. Individual projects must be much more carefully analyzed using site-specific inputs. This analysis may require several months of engineering and design effort before the numbers can be considered to be firm and reliable. That said, the IIAC has worked closely with a CHP technology contractor to more carefully evaluate one flagship project to commence the program. This project is for a 20 MWe CHP installation in [redacted], UT. The facility is a [redacted]. The facility draws 100% of its power from the grid and combusts natural gas on site to supply process steam for the plant. The NO_x control technology on the existing boilers is not up to modern standards, and replacing the boilers with a modern selective catalytic reduction (SCR)-equipped CHP unit would dramatically reduce the point source NO_x emissions for the facility. The contractor's initial estimate is that this project would remove 253 tons of NO_X annually (a combination of point source and grid emissions) and 95,000 tons of CO_2 annually. The initial capital cost estimate is [redacted], which would be an 8.4 year payback for the company, which currently does not meet their requirements for investment. Incentivizing this project with a [redacted] financial incentive on the capital costs would reduce the payback to [redacted] and would justify the investment. Prior to distributing any funds approved in this docket, a detailed project bid and analysis would be completed to obtain final numbers. Beyond this project, we plan to carefully analyze and thoroughly vet all aspects of projects before working with Dominion Energy to distribute any funds.

Q. Could equipping the existing boilers with SCR technology or replacing them with newer/more efficient boilers, instead of CHP, be a more cost-effective option for air quality improvement?

A. Equipping boilers with SCR technology and/or getting new boilers would be a good option for minimizing local NOx reductions. However, it is not a cost-effective option as it has no payback whatsoever. This option also lacks other substantial benefits that CHP would have, including: 1) vastly improving the energy efficiency of the system; 2) saving the customer money on energy and operating costs; and 3) reducing grid-generated NOx and other emissions.

In reference to point 2, there is no financial incentive for companies to invest in SCR technology unless there are new environmental regulations (like a NOx emissions limit) placed on them. If this program were only incentivizing SCR technology, companies would have no financial motive for following through with recommendations, and none of these projects would actually come to fruition. Regarding point 3, while there is a substantial NOx emissions reduction locally, the majority NOx reductions are coming from the grid (i.e., offsetting NOx generated at a power plant).

Q. Can the IIAC provide the assessment of the customer facility that details the emissions reductions, air quality improvements, and efficiency gains supporting the statements made in this testimony?

A. The analysis that has been done is proprietary information and the result of work that was performed by the IIAC and a 3rd party vendor. Due to its nature as highly confidential work product, the Company will not make the information available in testimony or as an exhibit in this filing, but will make it available for viewing at the Company's offices upon request by interested parties.

Q. Were any other technologies considered for incentive funds?

A. Yes. The IIAC's approach to identifying energy and emissions-saving projects is to survey the entire facility and identify any possible projects that could save the facility energy, cost, or emissions. We then look at each potential project and estimate the annual savings potential as well as the implementation cost required. The IIAC has made hundreds of different energy saving recommendations to a wide variety of different companies. Our mission is to find the technology solution that works best for a particular situation. For the project outlined above, other options considered would be to replace the existing boilers with new (similar) boilers. Doing this does not achieve nearly the same degree of energy, cost, or emissions savings for the facility, as they would still be reliant on grid power. They would basically be maintaining the status quo with this option. Renewable energy, such as solar photovoltaic, could be used to offset some of their grid emissions, but, as mentioned above, solar is a much more expensive option. It also does not meet any of the process heating needs for the facility, and would still need to be coupled with boilers and rely on grid power when no solar energy is available. In terms of finding the lowest cost way to reduce energy consumption, emissions, and cost for the facility, CHP is the best option. Generally speaking, the IIAC always considers all available technologies and tries to find the best match for the particular situation.

IV. BENEFIT OF THE UNIVERSITY OF UTAH IN THE APPLICATION

Q. How was the University of Utah selected for this Application?

A. The University of Utah's IIAC program is a DOE-recognized regional authority on the topic of industrial energy efficiency. This program is the result of a competitive grant program from DOE itself, a process which was open to all universities in the State of Utah.

Q. Is the University of Utah a trusted source?

A. Yes. Our program is not-for-profit and is technology agnostic. Our team is comprised of engineers with advanced degrees and nationally-recognized professional engineering certifications. Our mission is to identify the lowest cost ways to reduce energy usage and operating costs for local businesses. As an independent third party, we will work with technology vendors to find the best technology solutions that result in the most cost-effective use of funds to improve Utah's air quality. We will also use our expertise to verify the savings estimates from each vendor and assure that they are accurate.

Q. Does the University of Utah leverage funding for this Application?

A. Yes. Our program operates on a $1.85M grant from the U.S. DOE. This funding is currently used solely for doing energy assessments at manufacturing facilities. New funding from the Dominion STEP program will utilize and expand the existing infrastructure. The expanded program will do much more than energy assessments, including: identify and facilitate specific installation projects, conduct research on each project, develop markets in Utah for the expansion of these technologies, develop vendor relationships and streamlined processes for technology deployment, publish case studies with the details of each project, analyze the long-term impact of all projects on Utah's air quality, etc.

Q. What is the proposed process of the University of Utah?

A. The University of Utah will promote the opportunity for Dominion customers to receive a no-cost energy assessment from the IIAC. On each assessment, the IIAC will identify energy, emissions, and cost-saving measures for companies. The IIAC will report back these recommendations to each company. High impact projects that may require a subsidy will be considered for an incentive. For each of these projects, the University of Utah will consult with Dominion Energy and will seek STEP funds to incentivize these projects. Approved projects will be overseen by the University of Utah. This includes soliciting competitive bids from vendors, verifying technological claims by each vendor, project management, and ongoing research for each project. The University of Utah will remain involved in each project for its duration and will quantify the long-term air quality benefits, publish case studies, work to streamline processes for new applications, and help develop the technology market so that new applications will not require the same level of incentive.

Q. How does the program interface with other large Utah utilities?

A. The IIAC program is actively engaged with all large Utah utilities. Each is on the program's advisory committee. The IIAC also regularly hosts representatives from the largest electric utility in the state on assessments.

Q. How is workforce development incorporated in the application?

A. While the program is run by degreed professionals, the IIAC works heavily with engineering students as a training program. These students receive regular training, attend assessments, perform calculations, and interface with customers. Nationally speaking, employers actively seek out IAC alumni to hire in professional energy efficiency roles[7].

[7] https://www.energy.gov/eere/amo/industrial-assessment-centers-iacs

IV. CONCLUSION

Q. Does this conclude your testimony?

A. Yes.

State of Utah)
) ss.
County of Salt Lake)

I, Kody M. Powell, being first duly sworn on oath, state that the answers in the foregoing written testimony are true and correct to the best of my knowledge, information and belief. Except as stated in the testimony, the exhibits attached to the testimony were prepared by me or under my direction and supervision, and they are true and correct to the best of my knowledge, information and belief. Any exhibits not prepared by me or under my direction and supervision are true and correct copies of the documents they purport to be.

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Kody M. Powell

SUBSCRIBED AND SWORN TO this 31st day of December, 2019.

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Notary Public