BW Exhibit 24

BEFORE THE STATE OF NORTH DAKOTA`
PUBLIC SERVICE COMMISSION

BOWMAN WIND, LLC
BOWMAN WIND PROJECT – BOWMAN COUNTY
SITING APPLICATION

CASE NO. PU-21-121

PRE-FILED TESTIMONY OF SANDEEP NIMMAGADDA
ON BEHALF OF BOWMAN WIND, LLC

August 4, 2021

I. INTRODUCTION AND QUALIFICATIONS

Q. Please state your name, employer, and business address.

A. My name is Sandeep Nimmagadda. I am employed at Apex Clean Energy, Inc. ("Apex"). My business address is 310 4th St NE, Suite 300, Charlottesville, VA 22902.

Q. What is your position with Apex?

A. I am a Director of Energy Storage Business for Apex.

Q. Briefly describe your work history and education.

A. I have an electrical engineering background. I have worked on execution of renewable energy projects for over seven years. At Apex, I have worked on transmission, interconnection, engineering design and construction of renewable energy projects. In my current role, I focus on origination, development, and power marketing aspects of energy storage projects. Prior to working at Apex as Director for Energy Storage, I led an energy center called GLEAMM at Texas Tech University studying energy storage and impacts of hybrid generation resources on bulk power systems. A copy of my resume is attached as **BW Exhibit 24-A**.

Q. What is your role with respect to the Bowman Wind Project ("Project")?

A. I am supporting the development and execution of the battery storage facility that is part of the Project.

Q. What proposed hearing exhibits are you sponsoring in your testimony?

A. I am sponsoring the following proposed hearing exhibits:

- BW Exhibit 1: Certificate of Site Compatibility Application (Section 4.1.2.6)
- BW Exhibit 24-A: Nimmagadda Resume
- BW Exhibit 28: Battery Storage Facility Illustration

Q. What is the purpose of your Direct Testimony?

A. The purpose of my testimony is to provide an overview of the Project's proposed battery storage facility.

II. OVERVIEW OF ENERGY STORAGE

Q. Please describe the benefits of energy storage.

A. Energy storage facilities provide a variety of benefits. Energy storage technologies help make businesses, municipalities, and utilities more resilient in the face of natural disasters, protect our national security, and facilitate the expanded deployment of renewables. Energy storage facilities ensure that the electricity generated by wind and solar farms—which can only be produced when the sun is shining or the wind is blowing—is available on demand, 24 hours a day. In 2020, 1.46 gigawatts of battery storage were installed in the U.S., and analysts expect new battery storage deployments of more than 4.4 gigawatts per year by 2024.[1]

Battery storage improves the reliability of the grid and helps increase the renewable energy penetration into the grid. Battery storage facilities dispatch power when the grid's needs are the greatest, responding faster than the traditional generation resources. In addition to reliability benefits to the grid, energy storage facilities produce no water or air emissions, and they can reduce the need for new transmission lines. Additionally, battery storage facilities have a minimal aesthetic impact on the landscape, and they are very easy to decommission due to their modularity. They create very little sound, use no water, and can be located adjacent to substations with the other electrical equipment.

[1] *See* https://energystorage.org/resources/thought-leadership/faqs/.

Q. Please describe Apex's experience with energy storage.

A. Apex is currently utilizing lithium-ion batteries in all of its storage projects. Apex is currently working on developing a storage project that is set to achieve commercial operations in 2022. Apex is currently managing 6.4 GW battery storage development portfolio across various independent regional system operators. Apex has an experienced team of storage experts who have worked on storage projects for commercial and industrial applications and for governmental clients.

III. DESCRIPTION OF THE BATTERY STORAGE FACILITY

Q. Could you provide a general description of the Project's battery storage facility, including its location?

A. The Project's proposed battery storage facility would be located within a fenced area and immediately adjacent to the Project substation. The battery storage facility would require up to 16.9 acres. *See* updated Application Figures 2 and 3 (proposed **BW Exhibit 3**) and Summary of Project Adjustments (proposed **BW Exhibit 2**).

The battery storage facility would be capable of up to 100 megawatts ("MW")/400 megawatt hours ("MWh") hours of storage (the battery can store 400 MWh which can then discharge up to 100 MW for four hours). Within the fence, there will be multiple containers that are approximately 60 feet in length oriented in rows approximately 20 feet apart. These battery storage containers will be eight to ten feet tall. Each container will hold 3 MWh - 4.7 MWh of energy. The containers generally look like sleek groups of self-contained shipping containers or cabinets. The containers house lithium ion batteries, which employ the same fundamental technology as used in laptops, cell phones, and hybrid cars. There are typically two heating, ventilation, and air conditioning systems attached to each container for cooling. Additionally, each container has an associated inverter. One transformer is also required for every two containers. Both inverters and transformers measure approximately 8 feet by 8 feet.

Q. How will the battery storage facility work?

A. Collection lines from the wind turbines will run to the Project substation, which will be connected to the battery storage facility. The figure provided as proposed **BW Exhibit 28** illustrates how the battery storage facility will work.

Q. How specifically does the battery storage facility benefit the Project and the grid?

A. The battery storage facility will be capable of storing power generated from the Project when production exceeds system demand (oversupply) or when the wind generation is unable to be delivered to the load due to transmission constraints. The battery storage facility will provide additional reliability for and deliverability to the grid by having the ability to store low-cost excess generation (relative to load) and inject it onto the grid at times of increased demand and when the wind resource is low. The battery storage facility will participate in the spinning reserve and regulation market in addition to the energy market. The battery storage facility will contribute to reserve margin requirements. In other words, the battery storage facility will help provide additional energy reserves in case of energy shortages on the grid.

IV. DECOMMISSIONING

Q. When the Project is decommissioned, what will happen to the battery storage facility?

A. Once the Project reaches the end of its useful life, it is very easy to decommission these battery storage facilities because nearly all project components are located above the ground's surface. Once a battery storage facility is removed, the land will be restored to its prior condition. Technology already exists to recycle lithium-ion batteries and, given the high value of the materials that constitute these batteries, enhanced battery recycling processes are beginning to develop more rapidly.

V. CONCLUSION

Q. Does this conclude your Testimony?

A. Yes.