NJIT
New Jersey Institute of Technology

June 12, 2024

Secretary of the Board of Public Utilities
44 South Clinton Ave., 1st Floor
PO Box 350
Trenton, NJ 08625-0350
Submitted via email to: board.secretary@bpu.nj.gov

Re: **Docket No. QO24020126 – 2024 New Jersey Energy Master Plan**

Dear Board Secretary Sherri L. Golden,

New Jersey Institute of Technology ("NJIT") has substantial research, education, and workforce training programs on power and energy systems, and we have been contributing significantly to the energy development in New Jersey. NJIT would like to provide the following comments in response to the Request for Information in relation to the 2024 update to the State's Energy Master Plan ("EMP"). They integrate NJIT's proposals and contributions across the seven strategies outlined in the EMP, emphasizing NJIT's expertise in power transmission, renewable energy, and advanced grid technologies.

Strategy 1: Reduce Energy Consumption and Emissions from the Transportation Sector

NJIT proposes the development of advanced electric vehicle (EV) charging infrastructure and smart grid integration to support the widespread adoption of EVs. By enhancing charging efficiency and grid reliability, these initiatives aim to significantly reduce transportation emissions. The implementation of smart grid technologies will ensure that EV charging stations operate efficiently, thereby minimizing their impact on the grid and reducing overall energy consumption. This approach aligns with the EMP's goal of reducing emissions from the transportation sector, a major contributor to New Jersey's greenhouse gas emissions.

Strategy 2: Accelerate Deployment of Renewable Energy and Distributed Energy Resources

To support the integration of renewable energy into the grid, NJIT is researching dynamic line rating (DLR) systems and high-temperature superconducting (HTS) cables. These technologies are crucial for increasing the efficiency and capacity of renewable energy transmission. DLR systems allow for real-time adjustment of transmission line ratings based on actual weather conditions, thereby maximizing the use of existing infrastructure. HTS cables, on the other hand, offer the potential to carry significantly more power than conventional cables, which is essential for the large-scale integration of renewable energy sources. These advancements will help New Jersey manage the increased load from renewable energy sources more effectively.

Strategy 3: Maximize Energy Efficiency and Conservation and Reduce Peak Demand

NJIT suggests several innovative approaches to maximize energy efficiency and reduce peak demand. One key proposal is the development of Grid-Interactive Efficient Buildings (GEBs), which can optimize their energy use and grid interaction in real-time. GEBs are capable of adjusting their energy consumption based on grid needs, thus reducing strain during peak times and improving overall efficiency. This can potentially reduce peak demand by up to 20%, offering substantial savings and efficiency improvements.

Additionally, integrating Advanced Distribution Management Systems (ADMS) can enhance the real-time management of electrical distribution systems, reducing distribution losses by 2-5%. Advanced load forecasting techniques using machine learning and big data analytics can further optimize energy use by predicting and managing energy demand more accurately. Accurate load forecasting can reduce the reserve margin by 2-3%, translating to significant savings and improved grid management, especially in a densely populated state like New Jersey.

Strategy 4: Reduce Energy Consumption and Emissions from the Building Sector

NJIT proposes the development and implementation of Smart Building Energy Management Systems (BEMS) that use IoT devices and AI to optimize energy use in real-time. BEMS can monitor and control various building systems to reduce waste and improve efficiency, potentially lowering building energy consumption by 15-20%. This is particularly beneficial for New Jersey, which has a high number of commercial buildings.

The integration of decentralized energy storage systems, such as home and building batteries, is another key area. If 50,000 homes install 10 kWh batteries, this could provide 500 MWh of storage capacity, significantly aiding in balancing supply and demand. Additionally, smart grid-enabled building controls can optimize energy use based on real-time grid conditions and pricing signals, further enhancing energy efficiency and reducing costs.

NJIT also emphasizes the importance of Dynamic Voltage Optimization (DVO) technologies, which can manage and optimize voltage levels on the distribution grid dynamically, potentially reducing energy consumption by 2-4%. NJIT’s reconfigurable microgrid testbed and real-time simulator can serve as an ideal platform for experimenting with and demonstrating these technologies for wider adoption in New Jersey.

Strategy 5: Decarbonize and Modernize New Jersey’s Energy System

A key focus for NJIT is the enhancement of transmission infrastructure to integrate renewable energy. New Jersey's coastal location and central position in the wind energy belt make it particularly suitable for developing renewable energy transmission corridors, especially for offshore wind projects. NJIT proposes the development of technologies such as Dynamic Line Rating (DLR) implementation, High-Temperature Superconducting (HTS) cables, and underground transmission lines to improve transmission capacity and reliability.

Solar energy plays a pivotal role in New Jersey's energy landscape, offering multifaceted benefits that extend beyond mere environmental sustainability. With its abundant sunshine and progressive policies, New Jersey has emerged as a leader in solar energy adoption. Solar installations on residential, commercial, and industrial properties contribute to decentralizing the energy grid, fostering resilience against disruptions and improving grid stability. In addition to its environmental and economic advantages, solar energy helps mitigate energy poverty by offering affordable and accessible electricity options to communities across the state. NJIT proposes to develop advanced robust control techniques and intelligent health monitoring systems to provide autonomy and resiliency to the optimal operation of large-scale arrays of solar PV systems.

For effective bidirectional power flow, NJIT suggests focusing on the development of microgrids and nanogrids, advanced power flow control, and advanced grid monitoring systems. These innovations will ensure a more resilient and efficient power grid. Additionally, NJIT proposes partnering with the Department of Energy's Princeton Plasma Physics Laboratory to make use of their Flywheel Energy Storage Systems to provide robust energy storage solutions critical for stabilizing the energy grid of New Jersey.

Strategy 6: Support Community Energy Planning and Action with an Emphasis on Encouraging and Supporting Participation by Low- and Moderate-Income and Environmental Justice Communities

NJIT highlights the importance of community-based microgrid projects tailored to low- and moderate-income (LMI) and environmental justice (EJ) communities. These projects aim to ensure reliable and resilient power supply for all communities, leveraging NJIT's research and workforce training capabilities.

NJIT also proposes the launch of a High School and Community College Outreach Program to introduce students to the offshore wind sector. This program will highlight career opportunities and educational pathways, encouraging students to join the Offshore Wind Bootcamp Training, participate in the Wind Transmission Conference, and engage in summer research projects related to wind power at NJIT. This initiative will inspire and prepare the next generation of offshore wind professionals.

Strategy 7: Expand the Clean Energy Innovation Economy

NJIT emphasizes the establishment of innovation hubs and incubators to support clean energy startups focusing on power transmission and grid modernization. With its strategic location and access to major markets, New Jersey is ideal for fostering innovation in clean energy. While innovation hubs exist, a specific focus on power transmission and grid modernization tailored to New Jersey’s needs is unique. NJIT can spearhead this initiative, creating a vibrant ecosystem for startups and fostering technological advancements.

Another vital area is workforce training for nuclear fusion. On the international level, the United States is among the few countries capable of advancing nuclear fusion technology. New Jersey, with the Princeton Plasma Physics Laboratory (PPPL), one of the leading fusion research facilities in the world, stands at the forefront of this field. Developing specialized training programs and courses focused on nuclear fusion technologies will prepare a skilled workforce to support the future of clean energy. NJIT can collaborate with PPPL to provide specialized courses and training modules on nuclear fusion, creating a pipeline of talent well-suited for local, national, and even international fusion projects. This positions New Jersey as a leader in spearheading this transformative technology.

Conclusion

NJIT is committed to supporting the New Jersey Board of Public Utilities (NJBPU) in achieving the goals outlined in the Energy Master Plan. By leveraging NJIT's expertise in power transmission, renewable energy, and advanced grid technologies, and through continued collaboration, we can ensure that New Jersey remains at the forefront of clean energy advancements. NJIT offers its resources and expertise to help implement the EMP, fostering innovation and ensuring a sustainable energy future for the State.

Thank you for the opportunity to comment on the 2024 Energy Master Plan. If NJBPU have any questions or want to discuss further, please contact Prof. Philip Pong at philip.pong@njit.edu.