

National Laboratories Collaborating to Create Resilient Infrastructure to Support Clean Energy Solutions to Achieve Net-Zero

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Background/Objectives. As our climate crisis intensifies, more cities, states, and countries are looking for ways to decarbonize. Given the vast differences in climate, geography, and energy resources, the solutions developed to meet growing energy demands must be adaptable, scalable, reliable, and resilient. They must also address energy infrastructure needs, including grid security and stability.

On May 28, 2022, Secretary Grandholm kicked off a net-zero labs pilot with four of the nation's DOE-funded National Labs – INL, NETL, NREL, and PNNL. The four labs have come together to leverage their research findings, processes, and systems to identify challenges in all major emissions categories: facilities, industry, transportation, and energy. The strategies and technologies these labs develop will be essential to the nation and the world securing a realistic path to deep decarbonization.

This collaboration explores how the responses developed can work in various configurations to meet diverse energy needs.

Approach/Activities. Each of the four labs is specializing in a different approach to the collective global problem. INL is working to demonstrate the role of nuclear power in generating carbon-pollution free energy to meet growing energy demands and developing ways to use nuclear to generate clean hydrogen that can fuel clean fleets. PNNL is focused on electrifying buildings—our number one source of carbon emissions—and maximizing efficiency through district energy and data-driven control and optimization strategies. NREL developed a digital twin of its campus to inform investments to decarbonize thermal systems and creation of a campus microgrid that will integrate on-site renewable energy generation and storage, advanced controls of operational loads, and fleet energy needs. NETL is pursuing three complementary thrusts: energy efficiency such as innovative new computing architectures, identifying opportunities to purchase carbon-free electricity for use at each of its three campuses, and carbon dioxide removal by leveraging its new Direct Air Capture Test Center.

Utilizing these various technologies in concert with one another will allow the four pilot labs to develop advanced integrated resilient systems that can be utilized in small villages, major cities, remote islands and in traditionally disadvantaged communities. The collaboration will accelerate the innovations of the four labs to create better solutions to achieve net-zero.

Results/Lessons Learned. While still early in the process, we are learning how the technologies fit together and where gaps exist that need to be filled. In this panel discussion, our pilot labs will discuss the collaborative work they are doing to provide models all 17 national labs. The four pilot labs are leading by example for the DOE lab complex and the federal sector

by testing technologies and solutions through application across varying climates, topographies, and energy intensities.