National Association of State Energy Officials Comments on Request for Information (RFI) DE-FOA-00033663: Transforming Industry: Strategies for Decarbonization

National Association of State Energy Officials (NASEO)
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The National Association of State Energy Officials (NASEO) represents the 56 governor-designated state and territory energy directors and their offices across the nation.[1] We appreciate the opportunity to provide input on the U.S. Department of Energy's (U.S. DOE) Industrial Efficiency and Decarbonization Office (IEDO) Request for Information (RFI) on Transforming Industry.

NASEO's mission is to support the states' efforts to promote energy-related economic development, deliver affordable energy from all energy sources including cost-effective energy efficiency and demand management, meet state environmental objectives, advance innovative energy technologies, and ensure energy system security, reliability, and resilience. This includes working with the states as they support the private sector in enhancing manufacturing and industrial competitiveness, productivity, and environmental performance through improved energy management. Approaches for improving industrial performance span the various pillars and pathways identified in the RFI, range across the research, development, demonstration, and deployment (RDD&D) spectrum, and include technical and business assistance to existing firms as well as bolstering new and emerging firms, industries, and technologies.

NASEO is grateful for our partnership with U.S. DOE IEDO and its support of the NASEO State Industrial/Manufacturing Working Group where we are working with State Energy Offices, economic development agencies, private-sector firms, and technical assistance providers to help improve industrial/manufacturing energy management. As pertinent to our comments below, we also cite with gratitude U.S. DOE Building Technologies Office (BTO), Office of Electricity (OE), Office of Fossil Energy and Carbon Management (FECM), and Office of Nuclear Energy (NE) partnerships and support of NASEO's work with the states and our partnerships with the National Association of Regulatory Utility Commissioners (NARUC) in such areas as demand flexibility, grid-interactive efficient buildings (GEB), distributed energy resources (DERs), virtual power plants (VPPs), and other aspects and manifestations of emerging distributed and "grid-edge" energy management opportunities. This includes BTO support of the NASEO-NARUC Grid-interactive Efficient Buildings (GEB) Working Group.

NASEO applauds U.S. DOE's attention to the industrial sector, including its roadmap and pathway reports, such as the industrial *Pathways to Commercial Liftoff* reports and this RFI

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[1] For convenience, our references to State Energy Offices also include the Energy Offices of the Territories and District of Columbia.

issued to inform a new DOE vision study, *Pathways for U.S. Industrial Transformations: Unlocking American Innovation*.

While many important questions and issues are posed in the RFI, we focus on (1) some points on Category 1 questions and (2) the need to address industrial electricity demand impacts on the electricity grid.

With respect to (2), this includes attention to power supply, including nuclear power, and to amplifying opportunities for demand flexibility (DF – also called load flexibility), energy storage, distributed clean generation, and other grid-edge or distributed energy resources (DERs) to moderate costs, improve reliability, enhance resilience, and support emissions and other environmental objectives. These energy resources are often "behind-the-meter," meaning at the industrial site on its side of the utility energy meter. The DF/grid-edge/DERs topic is also germane to Category 1 as well as other portions of the RFI. If well-designed, integrated, and well-operated, DERs may go beyond mitigating grid stresses to actually help support the grid and wider energy systems while, at times, improving industrial performance.

Category 1: Industrial Decarbonization Challenges, Barriers, and Cross-Cutting Strategies
Regarding Category 1 questions 1A.1 on challenges and barriers and 1A.5 on non-cost barriers to industrial facilities' adopting new technology, we would add to your list (RFI p. 11) of constraints that exist within industrial entities the following:

- Concerns about potential operational disruptions from installing altered or new operations, equipment, and technologies, and
- Risks and concerns about the compatibility of new technologies and processes with existing operations, employee skill sets, and business relationships.

These and other pertinent issues relate not only to the need for industry to perceive benefits from adopting new technologies, techniques, and processes but also the need to define and reduce risks. The adoption and diffusion of technology literature applies here, particularly factors identified in Everett Rogers' Diffusion of Innovations, including *perceived advantage*, *compatibility*, *complexity*, *trialability*, and *observability*.[2,3] Potential adopters of new technologies are often skeptical of performance claims made by vendors and assistance providers, and they are also concerned about compatibility with existing processes, products, skill sets, and business relationships and practices.

[2] Rogers, Everett M., Diffusion of Innovations. 4th ed. New York: The Free Press, 1995.
[3] This and the next paragraph draw from Alliance Commission on National Energy Efficiency Policy, "Advancing Energy Productivity in American Manufacturing," Alliance to Save Energy, Washington, DC, January 2013.
http://www.ase.org/sites/ase.org/files/resources/Media%20browser/commission_manufacturing_2-7-13.pdf

Trialability and observability are important for resolving questions of relative advantage and compatibility of a proposed technology or practice. Being able to try a new approach or technology on a portion of a facility allows the potential user to mitigate risks of disrupting large parts of its operations for something that may not deliver the expected benefits. Observability, meaning the ability for others to discern the results, is also important for diffusing techniques. Seeing a technology or practice work at one facility can give confidence that it will work at the observer's own facility.

The U.S. DOE should consider these diffusion of technology factors in developing its R&D, demonstration and validation, and technical assistance activities.

Industrial Impacts on the Electricity Grid: Need Attention to Power Supply, Demand Flexibility, and Distributed Energy Resources

Electrification of numerous industrial processes and operations combined with transportation and building electrification and growing power demand from data centers will challenge electricity grid capabilities across all grid segments -- generation, transmission, and distribution.

State and industry goals to decarbonize industry as well as buildings and transportation are predicated, to a great extent, on decarbonizing the electricity grid. Grid decarbonization will largely depend upon generation from variable solar and wind energy in the near-to-medium term, with plans for expansion of nuclear, geothermal, hydro, and fossil generation with carbon capture requiring more time to realize. Technological advances in long duration energy storage, for example, may also require a longer time horizon to make significant grid decarbonization contributions. Nevertheless, it is critical to pursue all of these technologies so that the private sector can utilize those that make the most sense for their operations over time.

Given substantial state, utility, and industry interest in advanced nuclear technologies, NASEO partnered with NARUC to form the Advanced Nuclear States Collaborative, which is supported by DOE's Office of Nuclear Energy. A key driver of this work is accelerating the deployment of utility scale and on-site industrial nuclear applications to address the growing need for zero-emission, firm, high-reliability power supplies. The recent DOW – X-energy joint venture supported by DOE will deliver small modular reactor nuclear power on-site at DOW's Seadrift Texas site which will reduce the plant's CO_2 emissions by 440 MT annually. Similarly, Amazon Web Services (AWS) entered a unique 10-year power purchase agreement with Talen, a nuclear plant operator in Pennsylvania, to power an adjacent 960 MW data center owned by Talen and sold to AWS. For industrial operations that require significant, highly-reliable electricity for decarbonization, advanced nuclear applications and innovative off-take agreements can deliver value. NASEO encourages DOE to expand collaboration across various DOE offices to help states and industry to implement multi-prong solutions to power reliability, affordability, and decarbonization challenges.

Even as growth of zero-emission power generation, transmission and utility-level energy storage occurs, it will be increasingly important to develop and integrate DERs (including energy efficiency, demand flexibility, distributed storage, and distributed generation) at the "grid-edge" and behind-the-meter into the electricity system to moderate costs, provide reliable and resilient energy services, and meet environmental objectives (which include reducing criteria and hazardous air pollutants as well as greenhouse gases, and include water, waste, and land impacts).

We urge U.S. DOE in developing *Pathways for U.S. Industrial Transformations: Unlocking American Innovation* and in other relevant plans, initiatives, programs, and RD&D agendas to pay significant attention to grid-industrial facility interactions, impacts, and requirements; support grid-industry-State Energy Office coordination; and bolster DER implementation and integration at industrial facilities to enhance both industrial and electricity system performance, including cost, reliability and resilience, and environmental stewardship.

We note that despite the great importance of coordinating distribution grid capabilities with electrified industrial needs, the RFI mentions demand-side management, peak loads, and load flexibility only in a single sentence (p. 50) in a section on data centers, with no mentions regarding manufacturing or any other industrial sectors.

New technological capabilities accompanied by supportive policies and regulations can go well beyond old-fashioned "DR 1.0" demand response (i.e., curtailment of load during occasional demand response "events"), to encompass routine and ongoing coordination of flexible DERs, including smart electrical and thermal load management, distributed electrical and thermal energy storage, and onsite clean generation, including via microgrids.

From a grid perspective these technologies and approaches can:

- lessen needs for some generation, transmission, and distribution grid upgrades,
- reduce local and system-wide peaks,
- moderate utility ramping of generation,
- make use of otherwise curtailed excess renewable generation, and
- moderate wholesale energy and grid service price volatility
  to lower costs, reduce stresses to the grid, enhance reliability, perhaps support orderly service restoration after an outage, and reduce emissions.

For industrial customers, DER implementation and coordination with the grid can:

- reduce peak demand charges,
- lessen or avoid customer costs for distribution upgrades,
- save money via time-differentiated and dynamic rates, demand response program participation, and, potentially, compensation for other grid service provision, and
- enhance power quality and energy reliability and resilience.

Fortunately, there is growing awareness, interest, and effort to apply industrial demand flexibility to simultaneously serve industry and the electricity system. Indeed, the topic was the focus of a joint NASEO-NARUC Grid-interactive Efficient Buildings (GEB) Working Group and

NASEO Industrial Working Group virtual forum held on June 11, 2024. The forum featured researchers and technical assistance providers from Oak Ridge National Laboratory and the Intermountain Industrial Assessment Center at the University of Utah (which receives support from the Utah Office of Energy Development as well as U.S. DOE) on *Working Smarter, Not Harder: Opportunities and Challenges for Industrial Demand Response to Support the Grid* and California Energy Commission staff presenting on *Industrial Energy Innovation in California*, highlighting that state's industrial load flexibility opportunities and programs.

We urge U.S. DOE to give great attention to challenges posed by industrial electrification to the electricity system and the large, important opportunities offered through energy efficiency, demand flexibility, and DER integration.

Conclusion

NASEO, on behalf of the Nation's State and Territory Energy Offices, appreciates this opportunity to respond to the important RFI. We hope this is useful to the U.S. DOE, welcome additional discussion, and are grateful for our partnership with the Department to support state energy priorities.