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Gateway for Accelerated Innovation in Nuclear
09/25/2024
Florida Public Service Commission

Dear Commissioners, Staff, and Leaders,

Thank you for the opportunity to speak at the Advanced Nuclear Power Technology Workshop held on September 5, 2024 and to submit written comment. We wanted to elaborate on a few questions and topics brought up during the public meeting to deepen the PSC's understanding of advanced nuclear technologies.

Non-Electric Applications

While nuclear energy already plays a role in generating low-carbon electricity, it offers a clean, efficient solution to several non-electric needs:

- District Heating and Cooling: Nuclear power can provide heat to centralized energy systems that supply residential and commercial buildings, reducing reliance on fossil fuels for heating. Countries such as China, Russia, and Switzerland have implemented nuclear district heating projects, demonstrating the feasibility of this application. The heat from nuclear power can also be used to create district cooling by operating heat exchanger pumps. (IAEA)
- Desalination: The desalination of seawater to produce portable water is an energy-intensive process, typically powered by fossil fuels. Nuclear power can serve as a low-carbon alternative by providing the necessary heat and electricity to operate desalination plants. India, Japan, and Kazakhstan have demonstrated successful nuclear desalination projects. (IAEA)
- Hydrogen Production: Hydrogen plays a key role in various sectors, including transportation, industry, and energy storage. Nuclear energy can support low and high-temperature electrolysis to split water and separate the hydrogen from the oxygen to sell as a commodity. (DOE)
- Cogeneration: Nuclear power plants are designed to convert about one-third of the heat they generate into electricity, primarily due to technological limitations related to material properties and performance. The excess heat is then released into the environment. For improved efficiency, nuclear cogeneration offers heat-intensive industrial applications, like plastic, concrete and steel production, with a clean source of process heat. High-temperature reactors are well-suited for these proposed industrial applications.

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Transportation of nuclear materials

During the meeting, a question was raised on the transportation of microreactors and if, in a situation, the microreactor were to fall off the truck, there would be release of radioactive fuel. To answer this question, we must consider the reactor before and after operation. Before operation, there will be essentially no radioactive material in the reactor and it would not be transported in a state that would allow inadvertent criticality (fission chain reaction.) After operation, the fuel and some components of the reactor would be highly radioactive.

We have extensive experience moving radioactive material. Spent Nuclear Fuel from current reactors is transported in the United States ALL the time. It's moved by road, rail, and waterway and shipped in durable containers that are designed to withstand extreme transportation accidents. More than 2,500 SNF shipments have been transported around the country without any radiological incidents over the past 55 years (Source).

The transportation is regulated and monitored by the Nuclear Regulatory Commission and the Department of Transportation. (Source)

Lifetime Costs

A holistic look at lifetime costs including fuel is a big part of analyzing technology costs. Levelized cost of energy (LCOE) measures the lifetime costs of generation resources, and the U.S Energy Information Administration (EIA) 2023 Annual Energy Outlook provides the most recent LCOE values with and without applicable federal tax credits.

Advanced nuclear power plants will not be as affordable as fossil fuels, but it's quite competitive as a non-fossil, reliable (24/7) source of electricity. As the advanced reactor technologies mature in their designs and operations, costs will continue to go down. The EIA chart below provides levelized costs for a 30-year period.

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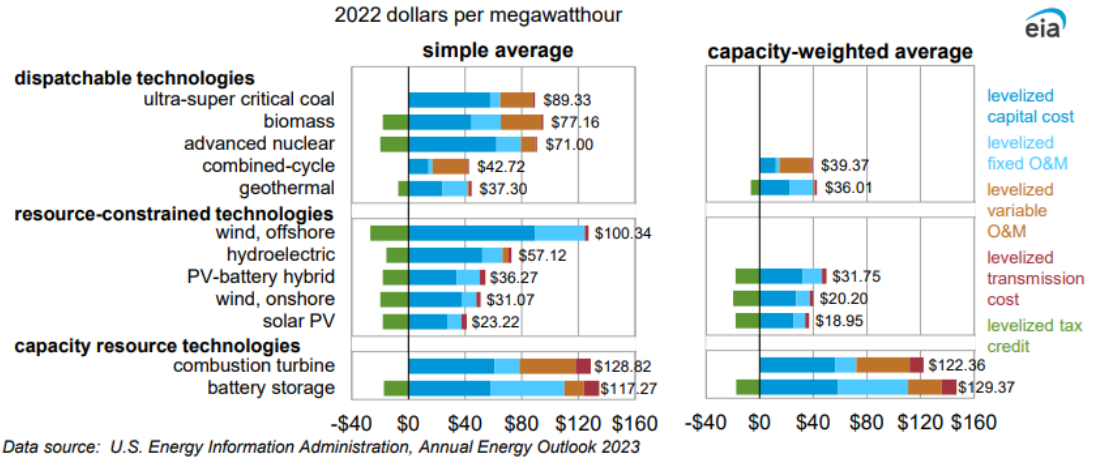
Estimated levelized cost of electricity (LCOE) and levelized cost of storage (LCOS) for new resources entering service in 2028



Data source: U.S. Energy Information Administration, Annual Energy Outlook 2023

Note: PV = photovoltaic, O&M = operations and maintenance; technologies in which capacity additions are not expected in 2028 do not have a capacity-weighted average. The stated LCOE values include the levelized tax credit component for eligible technologies.

(EIA)