COMMITTEE ON
ENERGY & COMMERCE
CHAIRMAN FRANK PALLONE, JR.

MEMORANDUM

February 28, 2020

To: Subcommittee on Energy Members and Staff

Fr: Committee on Energy and Commerce Staff

Re: Hearing on "Building a 100 Percent Clean Economy: Advanced Nuclear Technology and Its Role in a Decarbonized Future"

On **Tuesday, March 3, 2020, at 10:30 a.m. in room 2322 of the Rayburn House Office Building**, the Subcommittee on Energy will hold a hearing entitled, "Building a 100 Percent Clean Economy: Advanced Nuclear Technology and Its Role in a Decarbonized Future."

I. NUCLEAR ENERGY TECHNOLOGY

Existing nuclear power plants in the United States use light water reactor technology (LWR), which employs ordinary water to cool the reactor. Nuclear power reactor designers are currently developing a number of advanced non-light water reactor and light-water small modular reactor (SMR) designs. Advanced reactors can be broadly grouped into three main categories: advanced water-cooled reactors, non-water-cooled reactors, and fusion reactors. SMRs cut across categories of advanced reactors.[1] The goal of these designs is to produce nuclear power more efficiently, with less waste than current technologies.[2]

The Department of Energy (DOE) defines SMR nuclear reactors as having a generating capacity of not more than 300 megawatts (MW). This allows for smaller designs that can be assembled in factories rather than at the reactor site, reducing the overall capital investment for construction.[3] Advanced reactor designs can range in size from 1 MW to 1,000 MW.[4]

Due to their potential smaller size and decreased dependence on external power, advanced reactors can be placed in underserved areas or underground. These features increase

---

[1] Congressional Research Service, *Advanced Nuclear Reactors: Technology Overview and Current Issues* (Apr. 2019) (R45706).

[2] Congressional Research Service, *Nuclear Energy: Overview of Congressional Issues* (Nov. 2019) (R42853).

[3] *See* note 1.

[4] Clean Air Task Force, *Advanced Nuclear Energy: Need, Characteristics, Projected Costs, and Opportunities* (Apr. 2018).

security and provide operational flexibility.[5] The non-water coolant systems used in advanced reactors can enhance reactor safety, and the technologies used in advanced reactors can result in fuel recycling and less waste volume. Additionally, advanced reactors and corresponding developments in plant design can reduce construction time and costs, and result in faster deployment rates.[6]

Advanced nuclear reactors have the added potential of serving multiple purposes beyond providing reliable electricity generation. These reactors can match fluctuating electricity demand. Traditional nuclear power plants typically provide a constant level of power for sustained periods of time. However, with the rise of variable resources, like renewables, there is a role for new technologies like advanced nuclear to meet demand when supply fluctuates.[7] Additionally, due to the high temperature heat produced by advanced reactors, they can serve as a substitute for process heat in the industrial sector for processes like desalination and hydrogen production.[8]

As explained above, advanced reactors offer wider diversity and flexibility than more traditional reactors in terms of their size, siting, speed of construction and deployment, waste profile, and other beneficial characteristics and effects. Countries like Canada, South Korea, the United Kingdom, France, Russia, and China are also working to develop and deploy advanced reactors. Advanced reactor designs will require different proliferation and security precautions from existing nuclear regulatory and governance regimes.[9]

II. ROLE OF THE NUCLEAR REGULATORY COMMISSION

Congress first established the Atomic Energy Commission (AEC) in the Atomic Energy Act of 1946.[10] Congress enabled the development of commercial nuclear power with the Atomic Energy Act of 1954 and assigned regulation of the nascent nuclear power industry to the AEC. Throughout the 1960s and early 1970s, critics charged that the AEC's regulations were not sufficient with regard to radiation protection, reactor safety, plant siting and environmental protection.[11] In 1974, Congress responded to these criticisms by abolishing the AEC and passing the Energy Reorganization Act of 1974 which, among other things, created the Nuclear Regulatory Commission (NRC).[12] The NRC inherited the responsibility of licensing and

---

[5] Global Nexus Initiative, *Advancing Nuclear Innovation: Responding to Climate Change and Strengthening Global Security* (Jun. 2019).

[6] *See* note 4.

[7] Organization for Economic Co-operation and Development (OECD), Nuclear Energy Agency, NEA News, *Load-following with nuclear power plants* (Vol. 29, No. 2).

[8] *See* note 4.

[9] *See* note 5.

[10] Pub. L. No. 79-585 (1946).

[11] Nuclear Regulatory Commission, History (www.nrc.gov/about-nrc/history.html) (accessed Feb. 1, 2020).

[12] Pub. L. No. 93-438 (1974).

regulating the operation of commercial nuclear power plants in the United States from the AEC.[13]

On January 14, 2019, President Donald Trump signed into law S. 512, the Nuclear Energy Innovation and Modernization Act. The law revised the NRC's budget and fee structure and required the NRC to develop new processes for licensing nuclear reactors. Specifically, it amends the Omnibus Budget Reconciliation Act of 1990 to ensure that amounts appropriated for the development of regulations for advanced nuclear reactor technologies are not recovered through fees. For commercial advanced nuclear reactors, the law requires NRC to establish stages within the licensing process; increase the use of risk-informed, performance-based licensing evaluation techniques and guidance; and establish by the end of 2027 a technology-inclusive regulatory framework that encourages greater technological innovation.[14]

III. NUCLEAR ENERGY AND DECARBONIZATION

Global energy demand is predicted to grow by at least 30 percent by 2035. Currently, 81 percent of the world's energy, and two-thirds of the world's electricity, comes from fossil fuels.[15] Notwithstanding the current distribution among these sources and growing electricity demand, the power sector can still cut emissions faster than other sectors of the economy. Along with the use of renewable energy, firm (i.e. reliable electricity sources that can sustain output for long periods) low-carbon resources, like nuclear energy, have the potential to decarbonize the power sector more affordably.[16] Recent reports from the Intergovernmental Panel on Climate Change, the International Energy Agency, and the Pacific Northwest National Laboratory all suggest the world will need 1,600 gigawatts of nuclear capacity, or more, to meet current emissions targets.[17]

IV. ECONOMIC VIABILITY OF INCREASED NUCLEAR DEPLOYMENT

U.S. nuclear power plants face increased financial, operating, and customer demand pressures and challenges stemming from low natural gas prices, increases in renewable energy use, and flat energy demand.[18] Recent nuclear plant retirements in the United States correlate with increased emissions from replacement power sources like natural gas.[19]

---

[13] Nuclear Regulatory Commission, *Fact Sheet on Nuclear Power Plant Licensing Process* (www.nrc.gov/reading-rm/doc-collections/fact-sheets/licensing-process-fs.pdf) (accessed Feb. 1, 2020).

[14] Pub. L. No. 115-439 (2019).

[15] *See* note 4.

[16] Jesse Jenkins, Max Luke, and Samuel Thernstrom, *Getting to Zero: Carbon Emissions in the Electric Power Sector*, Joule (Dec. 19, 2018).

[17] *See* note 4.

[18] *See* note 2.

[19] *See* note 5.

Cost and schedule overruns have stalled recent U.S. efforts to build new nuclear units. Only one project, comprised of two new reactors at Plant Vogtle in Georgia, is currently under construction.[20] In 2017, the V.C. Summer project in South Carolina was canceled due to rising costs and lengthy construction delays.[21]

Advanced reactors have the potential to address the deployment challenges that traditional nuclear power plants face. By using non-water coolants, these reactors eliminate or reduce the need for large-pressurized containment and cooling equipment found in existing nuclear plants. Additionally, by reducing the complexity and size of structures needed on-site, advanced plants can be built faster. Current estimates show advanced reactor capital costs of 33 to 80 percent less than large LWR costs in the United States, and construction times of around two years.[22] However, more research and development is needed to get an accurate picture of the realities of advanced reactor deployment.[23] The advanced reactor technologies discussed above are all at various stages of maturity, with only a few systems projected to be ready for commercialization by 2030.[24]

V. WITNESSES

The following witnesses have been invited to testify:

Maria Korsnick
President and Chief Executive Officer
Nuclear Energy Institute

Armond Cohen
Executive Director
Clean Air Task Force

Joseph Hezir
Principal
Energy Futures Initiative

The Honorable Jeffrey S. Merrifield
Chairman, Advanced Reactor Task Force
U.S. Nuclear Industry Council

John L. Hopkins

---

[20] *See* note 1.

[21] *U.S. Nuclear Comeback Stalls as Two Reactors Are Abandoned,* New York Times (July 31, 2017).

[22] *See* note 4.

[23] MIT Energy Initiative, *The Future of Nuclear Energy in a Carbon-Constrained World: An Interdisciplinary MIT Study* (Sep. 2018).

[24] *Id.*

Chairman and Chief Executive Officer
NuScale Power, LLC

Chris Levesque
President and Chief Executive Officer
TerraPower, LLC