ENERGY & COMMERCE
CHAIR RODGERS

MEMORANDUM April 14, 2023

TO: Members of the Subcommittee on Energy, Climate, and Grid Security

FROM: Committee Majority Staff

RE: Hearing entitled "American Nuclear Energy Expansion: Powering a Clean and Secure Future"

I. INTRODUCTION

On Tuesday, April 18, 2023, at 2:00 p.m. in 2123 Rayburn House Office Building, the Subcommittee on Energy, Climate, and Grid Security will hold a hearing entitled "American Nuclear Energy Expansion: Powering a Clean and Secure Future." The hearing will examine issues associated with expanding nuclear energy for power generation and industrial use and for international competition and security, including issues concerning advanced reactor deployment and licensing, industrial infrastructure and fuel supply chains.

II. WITNESSES

- **Jess C. Gehin, Ph.D.,** Associate Laboratory Director, Nuclear Science and Technology, Idaho National Laboratory
- **Regis Repko,** Senior Vice President, Generation and Transmission Strategy, Duke Energy
- **Jeremy Harrell,** Board of Directors Chair, U.S. Nuclear Industry Council, and Chief Strategy Officer, ClearPath
- **Armond Cohen,** Executive Director, Clean Air Task Force

III. BACKGROUND

Nuclear energy plays an important role in American energy security, reliable generation of power, and in American international relationships and leadership.

In many respects, the nuclear industry today reflects the success of U.S. nuclear policy dating to Congressional determinations following World War II to foster peacetime development of "atomic" energy. As Congress focused in those early years on the development of the national laboratory R&D and production infrastructure for nuclear weapons through the Atomic Energy Act of 1946, it also focused on development of nuclear reactors for power and naval propulsion. In time, and in keeping with President Eisenhower's 1953 Atoms for Peace proposal, Congress fundamentally revised the Atomic Energy Act to remove barriers to the peaceful, civilian application of nuclear technology. The Atomic Energy Act of 1954 established the policy that "the development, use, and control of

atomic energy shall be directed so as to promote world peace, improve the general welfare, increase the standard of living, and strengthen free competition and private enterprise."[1]

The ensuing forty years witnessed tremendous growth of the U.S. nuclear industry, supported by the government's own nuclear industrial infrastructure for fuels and technologies, and then pioneering developments by private industry.[2] At the same time, the United States embarked on expanding international nuclear relationships, through establishment of the International Atomic Energy Agency[3] and through Atomic Energy Act section 123 agreements[4] as well as related nuclear treaties—all serving to establish the United States as a leader on nuclear technology, nuclear safety, and non-proliferation safeguards.

The Atomic Energy Act also assigned regulation and licensing of nuclear energy to the Atomic Energy Commission (AEC), which oversaw development of the nuclear industry into the 1970s; in The Energy Reorganization Act of 1974, Congress abolished the AEC and assigned the regulation and licensing of nuclear energy and nuclear materials to the Nuclear Regulatory Commission (NRC). Remaining functions relating to the development of nuclear technologies were assigned to what is now the Department of Energy (DOE).

Today, the United States maintains the world's largest nuclear power industry. With 93 operating reactors (down from 112 in 1990),[5] the U.S. domestic industry accounts for more than 30% of worldwide nuclear generation, and just under 19% of U.S. electrical output. The current operating fleet of reactors is operated by 21 different power companies at some 54 sites, across 28 different states.[6] This energy output also represents about 55% of the nation's carbon-dioxide free power generation—accounting for most of the clean power production in some of these states.

The U.S. nuclear industry has over 4,500 years of operational experience. Because of the lessons of this experience, the U.S nuclear fleet is operating at the highest levels of performance and safety in its history and has been ranked as the highest performing nuclear industry in the world. Safe operations – leading to longer run times, more efficient operations—enabled the industry to produce record levels of power in 2019 and 2020, even with fewer operating plants.[7] Capacity factors surpass

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[1] Section 3 of the Act states: "It is the purpose of this Act to effectuate the policies set forth above by providing for…a program to encourage widespread participation in the development and utilization of atomic energy for peaceful purposes to the maximum extent consistent with the common defense and security and with health and safety of the public…"

[2] Westinghouse designed the first fully commercial pressurized water reactor (PWR), developed by Argonne National Lab (including at what is now Idaho National Lab), and GE designed a prototype boiling water reactor (BWR), also developed by Argonne, in 1960—designs which account for some 89% of world capacity. See "Outline History of Nuclear Energy," World Nuclear Association.

[3] See IAEA history at https://www.iaea.org/about/overview/history

[4] See "123 Agreements for Peaceful Cooperation," National Nuclear Security Administration.

[5] This number includes Plant Vogle Unit 3 in Georgia, which recently started preliminary operations, and will increase to 94 reactors when Vogtle Unit 4 comes on-line, as expected, in early 2024.

[6] See data and descriptions of U.S. industry from the U.S. Nuclear Regulatory Commission Information Digest, 2022-20233 and *Nuclear Power in the USA*, World Nuclear Association (April 2023).

[7] See "The Nexus Between Safety and Operational Performance in the U.S. Nuclear Industry," Nuclear Energy Institute, March 2020 at https://nei.org/CorporateSite/media/filefolder/resources/reports-and-briefs/NEI-20-04-The-Nexus-Between-Safety-and-Operational-Performance-in-the-US-Nuclear-Industry.pdf

90%, more than any other generating source, which underscores the role nuclear plays in the reliable production of power.

Despite this performance, growth of U.S. nuclear industry, including its role in international nuclear commerce, has experienced a period of stagnation and decline. On the international front, the United States has been largely absent form what is estimated as a $500 billion to $740 billion market this decade, with Russia and China leading on plans to construct upwards of 66 reactors across multiple countries.[8]

In the United States, nuclear capacity has been nearly flat for three decades.[9] Congress enacted incentives for new nuclear power plants in the Energy Policy Act of 2005, including tax credits and DOE loan guarantee authorities. By 2009, NRC had received 18 applications for 28 new reactors—state of the art versions of traditional, so-called lighter-water reactor designs. NRC eventually issued licenses for the construction and operation of 14 new reactors. Only two of those licensed units have been constructed, with the remaining licenses terminated or on indefinite hold by the applicants. High up-front construction costs, low electricity demand growth, and competition in electricity markets from natural gas and renewable energy generation undermined the demand for these new nuclear power plants. Many of these same factors led to the permanent shut down of 12 operating reactors between 2013 and April 2021, with three more scheduled for closure by 2025.[10]

Nevertheless, increasing activity that is focused on next generation nuclear technologies, buoyed by federal energy policies and support, holds promise for a resurgence of American nuclear development and deployment by the end of the decade.

These advanced reactor designs use combinations of new and existing technologies and materials to improve upon the earlier generations of reactors. The current fleet of U.S. nuclear power plants uses "light-water technology" and a once through fuel cycle to generate electricity. Dozens of companies are developing alternative designs, using "small modular reactor" (SMR) designs and in many cases materials other than water as a coolant. They offer potential advances that combine attributes relating to improved cost, safety, security, waste management, and/or versatility.[11] Work on advanced nuclear is global. One recent survey found 150 projects worldwide, 60 of which are based in the United States.[12] What is necessary for successful development and deployment of U.S. technologies domestically and abroad will be a central topic of this hearing.

Congress has enacted a number of laws over the past four years to address economic challenges to the existing fleet and to help development and deployment of new reactor technologies, along with the advanced fuels to support those technologies. Notably, the Nuclear Energy Innovation and

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[8] See "Restoring America's Competitive Nuclear Energy Advantage: A Strategy to assure U.S. national Security," Department of Energy, April 2020.
[9] See "Nuclear Explained: U.S. Nuclear Industry," Energy Information Administration (April 2022).
[10] Three of the closures were because of need for expensive repairs, three were retired under agreements with state utility regulators, six could not compete in regional wholesale electric markets. Many of the shutdowns had substantial time remaining on their operating licenses or were planning 20-year license extensions. See "Advanced Nuclear Reactors: Technology Overview and Current Issues," Congressional Research Service, February 17, 2023 (R5706).
[11] Ibid.
[12] See Third Way, *"2022 Advanced Nuclear Map: Charting a Breakout Year*," January 27, 2022.

Modernization Act, (P.L. 115-439) signed into law in January 2019, reformed NRC's budget and fee processes to increase transparency and reduce unnecessary burdens on operating reactors and directed the NRC to create a new, risk-informed licensing process suitable for advanced reactors.

The Energy Act of 2020 (Division Z of P.L. 116-260) authorized the Advanced Reactor Demonstration Program (ARDP) within DOE to provide cost share and technical support for demonstration projects. The Act authorized establishment of the Advanced Nuclear Fuel Availability program, to develop so-called high assay low-enriched uranium, or HALEU, fuels needed for certain advanced reactors. The Act also established statutory limits on the import of Russian-sourced nuclear fuels, to assure Russia's massive production capacity wouldn't further undermine a struggling domestic U.S. nuclear fuel industry.[13] With Russia's invasion of Ukraine, issues relating to American nuclear fuel security have become more acute.[14]

Finally, provisions in The Infrastructure Investment and Jobs Act (P.L. 117-58) appropriated almost $2.5 billion for the ARDP and $6 billion for a civil nuclear credit program[15] to help preserve operations of existing reactors at risk of closure due to economic conditions in competitive electricity markets. Provisions in the Inflation Reduction Act (P.L. 117-169) provided power production tax credits for existing nuclear reactors.

IV. ISSUES

The following issues may be examined at the hearing:

- What is necessary to assure the domestic infrastructure and workforce for expanding nuclear;
- What do utilities and other industries look for to deploy nuclear technologies;
- What are the regulatory issues to address to assure a robust nuclear industry;
- What is necessary to increase U.S. competition in the international markets.

V. STAFF CONTACTS

If you have any questions regarding this hearing, please contact Peter Spencer, Elise Krekorian, or Mary Martin of the Committee staff at (202) 225-3641.

[13] See footnote 8.
[14] See Letter to Secretary of Energy Jennifer Granholm from Representatives Cathy McMorris Rodgers and Fred Upton, April 27, 2022, linked here.
[15] See DOE description of program, here.