

INQUIRY INTO URANIUM MINING AND NUCLEAR FACILITIES (PROHIBITIONS) REPEAL BILL 2019

Organisation: Nuclear Energy Institute

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NUCLEAR ENERGY INSTITUTE

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Standing Committee on State Development

Parliament of New South Wales

Parliament House

6 Macquarie Street

Sydney, NSW 2000

Australia

Subject: Nuclear Energy Institute's submission to the inquiry on the "Uranium Mining and Nuclear Facilities (Prohibitions) Repeal Bill 2019."

Dear Standing Committee State Development:

On behalf of our more than 300 members, the Nuclear Energy Institute (NEI)¹ is pleased to respond to the inquiry to repeal the Uranium Mining and Nuclear Facilities (Prohibitions) Act of 1986. For the United States, Australia and the world, nuclear energy offers critical benefits for shared environmental and economic development goals. As we transition toward a cleaner electricity grid and seek to decarbonize our wider economies, nuclear energy will be essential. NEI is happy to provide further evidence and testimony.

NEI is the policy organization of the nuclear energy industry in the United States. Our vision is simple: A world powered by clean and reliable energy. NEI's members include entities licensed to operate commercial nuclear power plants in the United States, nuclear plant designers, major architect/engineering firms, fuel cycle facilities, nuclear materials licensees, and other domestic and international organizations and entities involved in the U.S. nuclear energy industry.

Nuclear Power in the United States

Nuclear energy provides 55 percent of the United States' carbon-free electricity and nearly 20 percent of U.S. electricity generation overall.² The United States currently operates the largest nuclear reactor fleet in the world with 97 reactors operating at 58 sites in 29 states. These 97

¹ The Nuclear Energy Institute is the organization responsible for establishing unified industry policy on matters affecting the nuclear energy industry, including the regulatory aspects of generic operational and technical issues.

² U.S. Energy Information Administration publication titled, "Electric Power Monthly."

<https://www.eia.gov/electricity/monthly/>.

nuclear reactors account for over 98,300 megawatts-electric of baseload capacity on the grid, producing over 807 million megawatt-hours (MWh).³ Nuclear plants are the most efficient source of electricity, operating 24/7 at a capacity factor of greater than 92 percent.

NEI has worked continuously with member companies and the U.S. Department of Energy on ways to improve the efficiency and to extend the operating licenses of U.S. nuclear power plants. Improved operations have enabled a 40 percent increase in nuclear electricity generation since the late 1980s, despite more than a dozen fewer reactors in operation today. Each of the U.S. nuclear reactors now in operation was initially licensed by the U.S. Nuclear Regulatory Commission (NRC) to operate for 40 years. Of the 97 reactors in operation, 94 reactors have been granted an initial license renewal, extending their original licenses from 40 years to 60 years.⁴ The U.S. nuclear reactor fleet is demonstrating a longevity rarely seen in energy infrastructure.

During the past decade, the U.S. nuclear industry and the NRC have laid the groundwork for plants to apply for a subsequent license renewal, which has the potential to increase the life of a plant by an additional 20 years to a total of 80 years.⁵ NEI members, including Dominion Energy and Exelon Corporation, have submitted applications for subsequent license renewals for their reactors.

Environmental Benefits

One of the defining attributes of nuclear energy is its ability to produce large amounts of reliable and baseload energy without carbon emissions. Nuclear power, which already provides more than half of the carbon-free power generated in the United States, is essential to any realistic strategy to decarbonize the U.S. electricity sector. Electricity produced by U.S. nuclear reactors avoids the emission of more than 528 million metric tons of carbon dioxide annually.⁶ That exceeds the annual carbon emissions of all 111 million passenger vehicles driven on U.S. roads.⁷ U.S. nuclear reactors also avoid over 286,000 short tons of Nitrogen Oxide (NOx) emissions and over 346,000 short tons of Sulfur Dioxide (SO₂) emissions, further improving air quality and preventing adverse health effects.

³ Ibid. See 1.

⁴ U.S. Nuclear Regulatory Commission. "Status of Initial License Renewal Applications."

<https://www.nrc.gov/reactors/operating/licensing/renewal/applications.html>

⁵ U.S. Nuclear Regulatory Commission. "Subsequent License Renewals."

<https://www.nrc.gov/reactors/operating/licensing/renewal/subsequent-license-renewal.html>

⁶ Emissions avoided are calculated using regional and national fossil fuel emissions rates from the U.S.

Environmental Protection Agency (<https://www.epa.gov/emc/emc-continuous-emission-monitoring-systems>) and 2018 plant generation data from the U.S. Energy Information Administration

(<https://www.eia.gov/nuclear/generation/>).

⁷ Calculated using the "Greenhouse Gas Equivalencies Calculator" from the U.S. Environmental Protection Agency.

<https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator>.

In February 2019, a briefing paper by five respected non-governmental organizations concluded that “a more comprehensive and aggressive strategy is to focus on carbon emissions and allow all proven low-carbon emitting technologies to play a role. Specifically, nuclear energy must be considered alongside solar, wind and hydro as leading sources of low-emission power.”⁸

Economic Benefits

Nuclear plants are economic engines for the communities and states where they are located. In addition to providing reliable electricity to homes and businesses, nuclear plants supply the firm electricity needed to power large manufacturing facilities, data centers and other large power users. According to the Brattle Group, a consulting firm, the U.S. nuclear fleet adds USD \$60 billion to the U.S. gross domestic product.⁹ Nuclear plants also anchor the tax base in local communities and states. The nuclear industry contributes USD \$10 billion in federal and USD \$2.2 billion in state taxes each year. These local tax dollars are used to fund schools, firehouses and police stations.

A single nuclear power plant creates more jobs than any other type of energy generation facility, making the nuclear industry a uniquely powerful engine for job creation. The U.S. nuclear industry directly provides approximately 100,000 high-paying full-time jobs and an additional 375,000 secondary full-time jobs.¹⁰ In the United States, nuclear plant worker salaries are 20 percent higher on average than those of workers at other electricity plants.¹¹ These facilities are long-lived, thereby providing multi-generational employment in the communities where they operate.

Cost of Electricity Generation

The average total generating cost for nuclear energy in the United States in 2018 was USD 3.19 cents per kilowatt-hour (kWh)¹², or AUD 4.63 cents per kWh. According to a report by the Australian Energy Market Commission, the average cost of wholesale electricity across Australia

⁸ “Clean Energy Solutions Must Include Nuclear: A Briefing for Everyone Concerned About Climate Change.” <https://static.clearpath.org/2019/02/ce-solutions-must-include-nuclear-1.pdf>.

⁹ The Brattle Group publication titled, “The Nuclear Industry’s Contribution to the U.S. Economy.” https://brattlefiles.blob.core.windows.net/files/5921_the_nuclear_industry's_contribution_to_the_u.s_economy.pdf.

¹⁰ Ibid. See 10.

¹¹ Oxford Economics publication titled, “Nuclear Power Pays: Assessing the Trends in Electric Power Generation Employment and Wages.” <https://www.oxfordeconomics.com/recent-releases/nuclear-power-pays-assessing-the-trends-in-electric-power-generation-employment-and-wages>.

¹² Nuclear Energy Institute publication titled, “Nuclear Costs in Context.” <https://www.nei.org/resources/reports-briefs/nuclear-costs-in-context>. Data compiled using the Electric Utility Cost Group.

in 2018 was AUD 11.72 cents per kWh¹³ - 250 percent greater than the average for U.S. nuclear plants.

Nuclear power provides affordable, reliable and clean electricity to the residential and commercial customer in the United States and can do the same in Australia.

Another potential benefit for nuclear power plants in Australia is the local production of Uranium fuel. According to the Organisation for Economic Co-operation and Development (OECD), Australia “remains one of the world’s largest producers and exporters of Uranium.”¹⁴ Australia continues to be the country with the largest globally identified source of Uranium. Fuel accounts for approximately 20 percent of the total generating cost of nuclear power.

Industry Innovation

Exciting innovations are occurring in the U.S. nuclear industry. Given the continuing expansion of electrification worldwide and the increasing demand for clean energy, next-generation advanced nuclear reactors, including small modular reactors, will be essential to sustainable power generation worldwide. Their lower capital costs, small power output and flexible operations make them well suited to the needs of small and developing nations. Smaller, micro-reactors can provide power for rural communities and mining operations. Advanced reactor designs can start up quickly and provide resilient power even when the electricity on the grid fluctuates, making them a valuable piece of the energy portfolio. Next-generation designs also have a wider range of applications than power generation, including turning seawater into drinking water. Certain designs will run at high enough temperatures to provide heat for industrial processes, or assist in the production of hydrogen as an alternative to fossil fuels, enabling decarbonization of the transportation and industrial sectors.

Next-Generation Small Modular Reactors

Of particular interest to this inquiry, small modular reactors are advancing from development to commercialization in the United States. The first wave of small modular reactors have scaled down and simplified traditional light-water technology used in the existing fleet of large plant, enabling lower capital costs and shorter construction timeframes through standardized, modular designs.

¹³ Australian Energy Market Commission publication titled, “2018 Residential Electricity Price Trends Review.” <https://www.aemc.gov.au/sites/default/files/2018-12/2018%20Price%20Trends%20-%20Final%20Report%20-%20CLEAN.PDF>.

¹⁴ OECD – Nuclear Energy Agency and International Atomic Energy Agency joint publication titled, “Uranium 2018 Resources, Production, and Demand.” <https://www.oecd-nea.org/ndd/pubs/2018/7413-uranium-2018.pdf>.

The Oregon-based U.S. company NuScale Power is leading the way for small modular reactors through the NRC regulatory process with a design that will be constructed in Idaho by the Utah Associated Municipal Power Systems (UAMPS). The NuScale design features a fully fabricated unit that is capable of generating 60 megawatts-electric at capacity factors above 90 percent. The plant can scale up incrementally to 12 units based on requirements, for a total output of up to 720 megawatts-electric.¹⁵ According to the NRC, NuScale Power is on schedule for a design certification approval in 2020. UAMPS already has begun preparing its application for a combined construction and operating license, with the goal to produce electricity on the grid by 2026. Other American vendors, including GE-Hitachi Nuclear Energy and Holtec International, also have small modular reactor designs and have begun interactions with the NRC and potential domestic and international customers.

These small modular reactor technologies have an added benefit of complementing the current electricity grid infrastructure and the National Electricity Market in Australia.

Advanced Non-Light Water Reactors

Moving down this continuum of nuclear innovation, advanced non-light water reactor designs will allow more diverse applications of nuclear technology. Using a variety of coolants including molten salt, high temperature gas and liquid metal, these designs will be able to achieve higher thermal efficiencies. The high-temperature heat generated by these plants will have applications in water desalination, direct industrial and manufacturing applications and hydrogen production.

Essential to a Low-Carbon Economy

A global consensus is emerging that economy-wide decarbonization must be achieved as fast as possible. As the world looks to reduce emissions beyond electricity generation, the demand for firm, clean nuclear energy will continue to increase. Nuclear energy will be essential to a clean energy economy.

NEI appreciates the opportunity to comment on this inquiry. As Australia considers the role of nuclear energy in its future, we are ready to help. Please feel free to contact me if we can provide additional assistance.

¹⁵ NuScale Power. <https://www.nuscalepower.com/benefits/smallest-reactor>.

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Thank you for your consideration.

Sincerely yours,

Maria Korsnick