

**Statement of Carol L. Berrigan**  
**Blue Ribbon Commission on America's Nuclear Future**  
**Subcommittee on Reactor and Fuel Cycle Technology**  
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Chairmen Domenici and Peterson and distinguished members of this subcommittee, my name is Carol L. Berrigan and I am the senior director for industry infrastructure and supply chain at the Nuclear Energy Institute (NEI). Thank you for the invitation to speak to you today about the availability of the future skilled work force and manufacturing capacity necessary to support the continued operation and expansion of commercial nuclear energy generation in the United States.

NEI is the national policy organization of the nuclear industry.<sup>1</sup> NEI has nearly 360 members in 17 countries. They include companies that operate nuclear power plants, design and engineering firms, fuel suppliers and service companies, companies involved in nuclear medicine and nuclear industrial applications, radionuclide and radiopharmaceutical companies, universities, community colleges and research laboratories, and labor unions. This diverse membership gives NEI an opportunity to provide a broad perspective on the issues before this subcommittee.

The nuclear industry faces several challenges in meeting its future work force demands and reinvigorating the domestic nuclear manufacturing base. Chief among these challenges is the lack of a durable national energy policy that creates an environment in which long-term investment in energy infrastructure is encouraged. Due to the long lead times and level of investment necessary for nuclear project development, adherence to a consistent long-term policy is critical.

Despite this, the commercial nuclear industry has taken aggressive action to create an infrastructure through which the next generation nuclear work force will be trained and has implemented a program to expand the domestic manufacturing base.

Since the interest of this subcommittee is the forecasted capability of the nation's skilled work force and manufacturing capacity necessary to support the continued operation and expansion of commercial nuclear energy generation, I will begin by describing the size of the work force needed to support the current nuclear industry and new nuclear construction.

Current Nuclear Power Plants: Each nuclear reactor in operation today directly employs 400 to 700 people.<sup>2</sup> In addition to direct employment, the nuclear industry relies on numerous vendors and specialty contractors for additional expertise and services. For maintenance and outages, nuclear plants also require skilled labor to compliment full-time utility staff, in some cases over 1,000 additional workers, depending on the scope of the outage work. Based on an extrapolation of data supplied from the Associated Maintenance Contractors, over 30 million man-hours are worked by supplemental craft labor each year at the nation's 104 nuclear reactors. In total, NEI estimates that there are approximately 120,000 workers employed in all sectors of the commercial nuclear industry in the United States.

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<sup>1</sup> NEI is the organization responsible for establishing unified nuclear industry policy on matters affecting the nuclear energy industry, including the regulatory aspects of generic operational and technical issues.

<sup>2</sup> For some single-unit sites, the number of workers may exceed 1,000. In addition to direct employment, each plant creates economic activity that generates roughly an equivalent number of additional jobs within the local community and produces approximately \$430 million annually in expenditures for goods, services and labor, and through subsequent spending because of the presence of the plant and its employees. The average nuclear plants also contributes more than \$20 million annually to state and local tax revenue, benefiting schools, roads, and other state and local infrastructure and provides annual federal tax payments of \$75 million.

NEI's 2009 nuclear work force survey indicated that 38 percent or 21,600 current nuclear utility employees will be eligible to retire within five years (2009 to 2014). In addition, the industry continues to experience non-retirement attrition, which over the same five-year period may require replacement of an additional 10 percent of the nuclear utility work force or 6,000 workers.

New Nuclear Power Plants: The resurgence of nuclear energy will lead to increasing demand for skilled labor at all levels. According to analysis by the National Commission on Energy Policy, the development of a nuclear power plant project will require 14,360 man-years per gigawatt installed. These jobs include skilled crafts such as welders, pipefitters, masons, carpenters, millwrights, sheet metal workers, electricians, ironworkers, heavy equipment operators and insulators, as well as engineers, project managers and construction supervisors.

If nuclear energy generation were to continue to provide 20 percent of the nation's electricity supply, it would require the construction of between 20 and 25 new nuclear units by 2030. If the industry were to construct these units, this would require between 287,200 and 359,000 man-years of labor. Once built, these plants would require 8,000 to 17,500 permanent full-time workers to operate the plants and additional supplemental labor for maintenance and outages.

Nuclear Work Force Development: The commercial nuclear industry has undertaken a systematic program to create and reinforce the infrastructure needed to develop the next generation nuclear workforce. This infrastructure was developed to meet the future staffing needs of the fleet of 104 commercial nuclear reactors currently in operation, but it was designed to be scalable so that it could be expanded to meet the work force demands of new nuclear units as they are constructed.

In addition to ongoing support for nuclear engineering university programs and their related infrastructure, the industry program has centered on the development of the Nuclear Uniform Curriculum Program (NUCP). The NUCP is a systematic approach that utilizes community colleges in key locations to deploy an industry-recognized, standard curriculum structured to meet the industry's demands for new workers in key disciplines. The NUCP has three components:

- quantifying industry needs and the supply of graduates from partner programs
- defining the curriculum
- implementing the appropriate number of programs on a regional basis

Currently there are 43 community colleges throughout the country that are part of the NUCP. They offer courses in radiation protection, operations, electrical, mechanical and instrumentation and control maintenance, and chemistry. The program will expand to offer training for quality control technicians.

In addition to the NUCP, the nuclear industry works closely with the Center for Energy Workforce Development (CEWD) to leverage programs and resources across the utility sector and coordinates activities with North American Young Generation in Nuclear and U.S. Women in Nuclear to support career outreach and educational efforts across the country. These efforts range from direct outreach at career fairs to programs that work with local schools to provide information about nuclear science and technology and career opportunities in the industry.

Supply Chain: In the 30-year period since 1980, the U.S. nuclear supply chain contracted due to lack of new nuclear plant construction in the United States and abroad. Thanks to nuclear energy expansion under way and on the horizon, the United States has a unique opportunity to rejuvenate

the U.S. nuclear manufacturing sector through investment in state-of-the-art factories and processes to supply the high-precision, high-quality components demanded by nuclear technologies.

Today, there are 60 nuclear power plants under construction around the world.<sup>3</sup> In addition, there are 149 plants on order or planned and 344 projects under consideration.<sup>4</sup> This represents a significant opportunity for U.S. based suppliers, and some have begun responding by adding staff, capacity and developing additional manufacturing facilities. Over the past few years, we have seen a significant increase in the number of domestic nuclear suppliers. ASME Section III Nuclear Certificates (commonly called “N-stamps”) held in the U.S. have increased 34 percent since the beginning of 2007—from 221 in January 2007 to 297 in January 2010. Currently, 46 percent of all N-stamps are held in the United States.

Also, in excess of 15,000 new U.S. jobs have been created to date due to new nuclear plant activities. Manufacturing and technical service jobs have been created in Virginia, North and South Carolina, Tennessee, Pennsylvania, Louisiana and Indiana. These jobs include engineering services and the manufacture of components including pumps, valves, piping, tubing, insulation, reactor pressure vessels, pressurizers, heat exchangers and moisture separators, to name a few.

The demand for high-quality commodities, components and services provides an important opportunity for U.S. manufacturers:

- The Nuclear Energy Institute estimates that the world market represents potential orders of over \$400 billion in equipment and services over the next 15 years.
- As a rule of thumb, the Department of Commerce estimates that every \$1 billion of exports by U.S. companies represents 5,000 to 10,000 jobs.

Due to their size and complexity, nuclear plants create a broad range of domestic manufacturing and export opportunities. For example, depending upon the design, a single new nuclear power plant requires approximately:

- 500 to 3,000 nuclear grade valves
- 125 to 250 pumps
- 44 miles of piping
- 300 miles of electric wiring
- 90,000 electrical components.

NEI has gathered information from companies managing three of the five lead projects. Some supply chain and strategic sourcing information is closely held for competitive reasons, but our survey shows that:

- Three of the lead projects will obtain between 60 and 80 percent of components, commodities and services from U.S. firms.
- For three of the five lead plants, more than \$2 billion of equipment and services has already been procured from U.S. companies in 17 states.
- Three of the five design-centered project teams have set procurement and labor goals of between 75 and 90 percent of U.S. content, and are on target to achieve these goals. This represents potential U.S. orders for commodities, components and services of around \$50 billion for the first wave of new U.S. nuclear plants.

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<sup>3</sup> IAEA, Power Reactor Information System, August 2010

<sup>4</sup> World Nuclear Association, 2010

U.S. companies and workers are also benefiting from the expansion of nuclear energy underway worldwide. Our survey shows that American companies have already booked export orders for more than \$2.5 billion in equipment and services, including generators, reactor coolant pumps and instrumentation and control systems. U.S. workers in 25 states—including Illinois, Ohio, Pennsylvania, South Carolina, Virginia and Tennessee—are beginning to reap the benefits of reinvestment in the U.S. nuclear supply chain.

Recommendations: Beyond the development and adherence to a durable, long-term energy policy, there are several areas where government can assist in the expansion of the work force and reinvigoration of the supply chain:

1. To fully help reinvigorate the domestic nuclear manufacturing base, robust administration support for the expansion of nuclear energy domestically is required, as well as a consistent policy to support the export of nuclear products and services.
2. Investment in research for the next generation of nuclear technologies will open further opportunities for American companies to take back technological leadership. As with the current generation of reactors, though, success will require political support, consistent policy and a willingness to address international barriers to trade.
3. The federal government should renew and expand the 48c tax credit made available in the American Recovery and Reinvestment Act. This credit will help industry invest in the development and upgrade of nuclear manufacturing facilities.
4. Continued federal support of nuclear work force programs and tax incentives for worker training are needed. The Integrated University Program at the Department of Energy and the Nuclear Regulatory Commission should be continued. This program is helping to effectively educate technicians and professionals for careers in all sectors of nuclear science and technology. In addition, federal support for Research Reactor Infrastructure and the Advanced Test Reactor National Scientific User Facility at Idaho National Lab should be continued.
5. The federal government should provide a tax credit for the expenses of training workers for nuclear power plants and facilities producing components or fuel for such plants. This credit could serve to accelerate hiring and allow industry to utilize a broader range of work force training solutions including apprenticeship programs, community college-based education programs and specialized technical training not currently available at public educational institutions.

In closing, development of the future nuclear work force and reinvigoration of the domestic manufacturing base have long lead times and require adherence to a consistent long-term policy that supports the expansion of nuclear energy domestically and the export of nuclear products and services. Success in this area represents a tremendous potential for U.S. industry and for the American worker.

I appreciate the opportunity to speak with you today on these important issues and I would be pleased to answer any questions that you may have.