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**Testimony for the Record**

Chairman Baucus, Ranking Member Grassley and members of the Committee, I appreciate this opportunity to express the nuclear industry's views on future jobs under climate legislation.

I am Carol Berrigan, senior director of industry infrastructure at the Nuclear Energy Institute (NEI). NEI is responsible for establishing unified nuclear industry policy on regulatory, financial, technical and legislative issues affecting the nuclear industry. NEI members include all companies licensed to operate commercial nuclear power plants in the United States, nuclear plant designers, major architect/engineering firms, fuel fabrication facilities, materials licensees, and other organizations and individuals involved in the nuclear energy industry.

Let me begin by thanking the members of this committee for your long-standing oversight of the nation's fiscal affairs and for your support of legislation like the production tax credit for new nuclear generation as passed in EAct 2005 and the tax credit afforded under the American Recovery and Reinvestment Act of 2009 for investments in new or expanded capacity to manufacture components for clean energy technologies. Both of these programs are important initial steps toward the financial incentives necessary to accelerate the deployment of nuclear energy generation and rebuild the nation's manufacturing infrastructure.

My testimony today will cover three major areas:

1. the role of nuclear energy under climate legislation
2. the impact of new nuclear generation on the work force and manufacturing base
3. recommendations that are essential to expanding nuclear energy to meet the nation's climate and energy goals

**1. The role of nuclear energy under climate legislation**

Today, the 104 reactors operating in the United States are among our nation's safest and most secure industrial facilities. In addition, they are the nation's lowest cost producer of base-load electricity, averaging just 1.83 cents per kilowatt-hour. These 104 nuclear power plants produce one-fifth of America's electricity.

U.S. utilities are preparing to build advanced-design nuclear power plants to meet our nation's growing electricity demand. Currently, 13 applications for 22 new reactors are under active review by the Nuclear Regulatory Commission. Over \$4 billion has been spent on new nuclear plant development over the last few years, including the ordering of long-lead components, and the industry plans to invest

approximately \$8 billion in the next few years to be in a position to start construction of the first new reactors in 2011-2012.

Nuclear energy holds great potential for meeting our nation's future climate-related goals. Today, nuclear energy represents more than 72 percent of the nation's emission-free generation portfolio, avoiding nearly 700 million metric tons of carbon dioxide per year. To put this in perspective, the emissions avoided are equal to removing 133 million of the approximately 136 million passenger cars from the nation's roads. In addition, U.S. nuclear generation has avoided 2.65 million short tons of sulfur dioxide and 0.91 million short tons of nitrogen oxide compared to the fossil fuels that would have been burned in the absence of nuclear energy.<sup>1</sup>

On a life-cycle basis, all energy generation technologies emit some amount of CO<sub>2</sub> during the manufacture of components (whether it be pressure vessels, wind turbines or photovoltaic cells) and during other activities not directly associated with the production of electricity at the power plant. A number of studies by organizations such as the Organization for Economic Co-operation and Development have concluded that nuclear energy's emissions "footprint," including all of the activities to build and provide fuel for nuclear plants, is comparable to that of renewable generation sources.

As Congress and the administration turn greater attention to climate legislation, mainstream analyses of the climate change issue by independent organizations show that reducing carbon emissions will require a portfolio of technologies and that nuclear energy must be part of the portfolio. Further, they indicate that major expansion of nuclear generating capacity over the next 30 to 50 years is essential.

Analyses of H.R. 2454, the American Clean Energy and Security Act, which passed the House on June 26, by the Environmental Protection Agency (EPA) and the Energy Information Administration (EIA) demonstrate that substantial increases in nuclear generating capacity will be essential to meet the legislation's carbon-reduction goals.

In the EPA analysis, nuclear generation increases by 150 percent, from 782 billion kilowatt-hours (kWh) in 2005 to 2,081 billion kWh in 2050. If all existing U.S. nuclear power plants retire after 60 years of operation, 187 new nuclear plants must be built by 2050.<sup>2</sup> In the EIA's analysis, in the "Basic" scenario, the U.S. would need to build 96 gigawatts of new nuclear generation by 2030 (69 new nuclear plants). This would result in nuclear energy supplying 33 percent of U.S. electricity generation, more than any other source of electric power.<sup>3</sup>

When examining the portfolio of technologies that will need to be deployed in order to meet climate goals, the Electric Power Research Institute's (EPRI) "The Power to Reduce CO<sub>2</sub> Emissions: The Full Portfolio" analysis indicated that there is no single technology that can, by itself, slow and reverse increases in carbon emissions. A portfolio of technologies and approaches will be required.

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<sup>1</sup> Emissions avoided by nuclear power are calculated using regional fossil fuel emission rates from the Environmental Protection Agency and plant generation data from the Energy Information Administration.

<sup>2</sup> Environmental Protection Agency, "Analysis of H.R. 2454, American Clean Energy and Security Act of 2009"

<sup>3</sup> Energy Information Administration, "Energy Market and Economic Impacts of H.R. 2454, the American Clean Energy and Security Act of 2009." The "Basic" scenario represents an environment where key low-emissions technologies – including nuclear, fossil with carbon capture and sequestration and renewables – are developed and deployed on a large scale in a timeframe consistent with the emissions reduction requirements of H.R. 2454 without encountering any major obstacles.

The EPRI analysis starts with the Energy Information Administration's forecast of electric sector carbon emissions in 2030, then assembles the portfolio of technologies that could reduce the electric sector's carbon emissions to 1990 levels by 2030. All the elements in the portfolio represent maximum feasible deployment, so failure to develop and deploy the full portfolio would place unsustainable stress on the other technologies in the portfolio.

EPRI's analysis concludes that reducing U.S. electric sector carbon emissions to the 1990 level would require:

- aggressive efficiency programs to reduce electricity demand growth to less than 1 percent per year
- 135,000 megawatts (MW) of new renewable energy capacity (instead of the 60,000 MW in the EIA's reference case)
- significant improvements in the efficiency of existing coal-fired and gas-fired power plants and widespread deployment of carbon capture and storage beyond 2020
- accelerated deployment of plug-in hybrid electric vehicles and electro-technologies
- 64,000 MW of new nuclear generating capacity, in addition to the 100,000 MW now operating.<sup>4</sup>

In addition to producing carbon-free electricity, expansion of nuclear energy generation will serve other national imperatives. Construction of new nuclear power plants will create tens of thousands of jobs in project development, construction, operations and manufacturing. A robust nuclear construction program will also significantly expand the U.S. manufacturing sector and the domestic nuclear supply chain.

## **2. The impact of new nuclear generation on the work force and manufacturing base**

Thanks to increasing world demand for new nuclear reactors, American companies have an unprecedented opportunity to expand the nuclear manufacturing base in the United States and open new international markets to domestic suppliers. American firms have the potential to expand production and repurpose existing infrastructure to re-emerge as world leaders in the nuclear industry. In the process, nuclear suppliers can contribute substantially to job creation, economic development and reduction of greenhouse gas emissions.

Since the interest of this committee is the impact of climate legislation on the work force, I will begin by describing the size of the work force needed to support the current nuclear industry and new nuclear construction. The nuclear industry faces several challenges in meeting its future work force demands, but with these challenges come significant opportunities for American workers.

Current Nuclear Power Plants: Each nuclear unit in operation today directly employs 400 to 700 people.<sup>5</sup> In addition to direct employment, the nuclear industry relies on numerous vendors and

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<sup>4</sup> Electric Power Research Institute, "The Power to Reduce CO2 Emissions: The Full Portfolio," first release was in August 2007, updated again in December 2008 and again in July 2009.

<sup>5</sup> For some single unit sites, the number of workers may exceed 1000. 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.

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 as many as 1,000 additional workers over a 4 to 8 week period, 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.

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.

Existing nuclear power plants generate substantial economic value in addition to payroll spending. In 2008, nuclear companies procured over \$14 billion in materials, fuel and services from over 22,500 domestic suppliers.<sup>6</sup> Ongoing operation and maintenance of existing nuclear power plants provides substantial economic benefit for American manufacturers.

While only 31 states have nuclear power plants, nuclear procurement takes place in all 50 states, with an average of \$277 million of procurement occurring per state. States with the top procurement include Maryland, with over \$1.9 billion; Pennsylvania, with over \$1.8 billion; and North Carolina, with over \$1.2 billion of procurement. Of particular interest to the members of this committee may be the fact that last year \$555 million was procured from over 1,200 companies in Florida, \$463 million was procured from over 1,600 companies in New York, \$415 million was procured from over 1,400 companies in Massachusetts, \$352 million was procured from over 1,550 companies in Texas and \$259 million was procured from over 1,050 companies in New Jersey.

New Nuclear Power Plants: The resurgence of nuclear energy will lead to increasing demand for skilled labor at all levels. According to a recent analysis by the National Commission on Energy Policy, the development of a nuclear power plant project will require 14,360 man-years per gW installed.<sup>7</sup> 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 the industry were to construct the 22 units that are currently under active Construction and Operating License (COL) review, this would require almost 316,000 man-years of labor. Once built, these 22 plants would require 8,800 to 15,400 permanent full-time workers to operate the plants and additional supplemental labor for maintenance and outages.

Supply Chain: The nuclear supply chain represents a major opportunity for American manufacturers to expand capacity to meet the needs of the growing world nuclear power market. Today, there are 53 nuclear power plants under construction around the world. In addition, there are 137 plants on order or planned in 26 countries and 295 projects under consideration in 36 countries<sup>8</sup>. This represents a

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<sup>6</sup> Procurement numbers are based on a Nuclear Energy Institute survey of member companies. The numbers include all data received by NEI through October 31, 2009. Procurement of nuclear services includes fees paid to regulatory agencies. The referenced number of domestic suppliers includes all organizations from which the industry procured over \$1,000 worth of materials, services or fuel in 2008.

<sup>7</sup> Task Force on America's Future Energy Jobs, National Commission on Energy Policy, 2009, Appendix A: Bechtel Report on Design and Construction. Man-year numbers include salaried and hourly man-years.

<sup>8</sup> "World Nuclear Power Reactors & Uranium Requirements," World Nuclear Association, Sept. 2009

significant opportunity for U.S. based suppliers and they are responding by adding staff and 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 22 percent since the beginning of 2007—from 221 in January 2007 to 269 in May 2009.

Today, U.S. manufacturers of components for new nuclear power plants and fuel cycle facilities are adding to design and engineering staff, expanding their capability to manufacture nuclear-grade components, and building new manufacturing facilities in preparation for new reactor construction in the U.S. and abroad. 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.

### **3. Recommendations that are essential to expanding nuclear energy to meet the nation’s climate and energy goals**

A program to expand reliance on nuclear energy to meet U.S. climate change goals, even if it only approaches the scale indicated by EPA and EIA analyses, will require a sustained partnership between federal and state governments and the private sector, including additional policy support from the federal government.

Financing is the single largest challenge to accelerated deployment of new nuclear power plants. The financing challenge for the industry is structural. New nuclear power plants require large capital investments to be made by relatively small companies. While the financing challenges are different for the regulated integrated utilities than for the merchant generating companies in those states that have restructured, they can be managed.

An effective, long-term financing platform is necessary to ensure deployment of clean energy technologies in the numbers required and to accelerate the flow of private capital to clean technology deployment. The loan guarantee program authorized by the 2005 Energy Policy Act was an important step in the right direction, but the scale of the challenge requires a broader financing platform than the program envisioned by Title XVII.

Additional federal tax stimulus is also an important element that would accelerate capital investment in new nuclear power plants and in the critical manpower and infrastructure necessary to build new nuclear power plants in the numbers required to reduce carbon emissions. Tax incentives could help refill the pipeline of highly trained personnel needed to build, operate and maintain new nuclear power plants and restore America’s ability to manufacture the components and other equipment that go into nuclear power plants in the U.S. and abroad, thereby creating additional jobs.

To provide the level of financial stimulus necessary to accelerate deployment of nuclear energy consistent with the nation’s climate and energy goals, we encourage you to:

- 1) Create a permanent financing platform (the Clean Energy Deployment Administration, or CEDA) to provide loans, loan guarantees and other credit support to clean energy technologies, including new nuclear power plants and new nuclear equipment manufacturing facilities. We encourage you to

support the CEDA legislation approved earlier this year by the Senate Energy Committee that would absorb the Title XVII loan guarantee program into CEDA, not impose limitations on financial support to any particular technology and provide at least \$100 billion in additional loan volume, in addition to the funding already authorized for the Title XVII loan guarantee program.

2) Provide tax stimulus for investment in new nuclear power plants, new nuclear-related manufacturing and work force development and expand the existing production tax credit provided by the 2005 Energy Policy Act.

1. Amend the production tax credit authorized by 2005 Energy Policy Act to:
  - a. remove the 6,000-megawatt national megawatt limitation and make the credit available to all reactors placed in service before January 1, 2025
  - b. allow public power entities to transfer credits allocated to them (by virtue of their ownership position in a nuclear power plant) to tax-paying partners in the project
  - c. index the credit for inflation
2. If companies so choose, in lieu of the production tax credit authorized by the 2005 Energy Policy Act, provide a 30 percent investment tax credit for investment in new nuclear power plants on which construction begins on or before January 1, 2025, or upgrades to increase output from existing nuclear power plants, available on an annual basis during construction as investments are made (qualified progress expenditure credits). Allow credits to be used against the alternative minimum tax. Allow companies to elect a grant in lieu of the credit.
3. Amend the 30 percent investment tax credit (provided in the American Recovery and Reinvestment Act of 2009 for investments in new or expanded capacity to manufacture components for clean energy technologies) to:
  - a. state explicitly that nuclear energy is a qualifying technology
  - b. expand the value of the credit to \$5 billion (from \$2.3 billion)
  - c. extend from 3 years to 7 years the time period allowed between certification of a project by the secretary and when the project must be placed in service
4. Reduce and eventually eliminate tariff and non-tariff barriers to international trade in nuclear plant components while providing expanded investment stimulus to develop U.S. manufacturing capability for nuclear goods and components where such capability does not exist .
5. 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 via public educational institutions.
6. Amend Section 468A of the Internal Revenue Code to allow non-rate-regulated licensees that may be required by the Nuclear Regulatory Commission (NRC), as part of their operating license requirements, to pre-fund decommissioning costs to obtain a current income tax deduction as such contributions are made. (For example, some taxpayers may be required to pre-fund decommissioning costs in one year and the tax deduction for such costs should correspond to that one-year period.)

Mr. Chairman, in conclusion, the role of nuclear energy in achieving the nation's climate goals is clearly established. The expansion of nuclear energy in the U.S. and globally provides a significant opportunity for American workers and industry, increasing high-wage employment and significantly expanding our domestic manufacturing sector. I encourage you and this committee to continue your legacy of leadership on these issues and promote legislation that would provide the necessary financial stimulus to realize these goals.