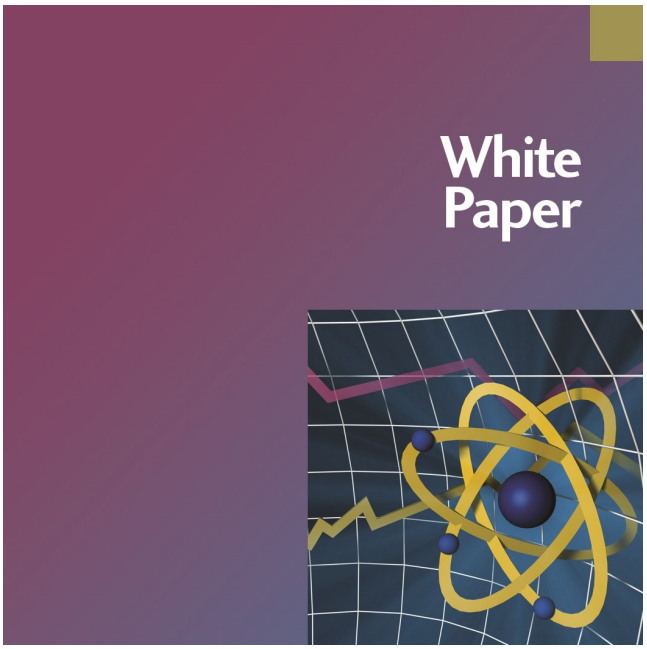

April 2014

Nuclear Energy's Economic Benefits — Current and Future

Executive Summary

The nuclear energy industry plays an important role in job creation and economic growth, providing both near-term and lasting employment and economic benefits. The 100 nuclear reactors in the U.S. generate substantial domestic economic value in electricity sales — $40-$50 billion each year — with over 100,000 workers contributing to production.

Worldwide, over 170 new nuclear plant projects are in the licensing and advanced planning stage, with 72 plants currently under construction. As a result, the years ahead will see a surge in demand for materials, components and services for the global nuclear industry. The Department of Commerce estimates the global market for nuclear products, services and fuel at $500-$740 billion over the next 10 years.

The U.S. Department of Energy projects that U.S. electricity demand will rise 28 percent by 2040 — a conservative estimate of less than one percent each year, below historical levels of growth. That means our nation will need hundreds of new power plants to provide electricity to meet rising demand and replace aging infrastructure. Nuclear energy is the only proven technology that can provide emission-free, affordable baseload electricity.

Nuclear Plant Economic Benefits

Each year, the average 1,000 megawatt nuclear plant generates approximately $470 million in economic output or value. This includes over $35 million in total labor income.[1] These figures include both direct output and

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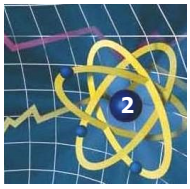
[1] In 2010 dollars unless otherwise noted.



secondary effects. The direct output reflects the plant's annual electricity sales — approximately $453 million. The secondary effects at the local level — approximately $17 million — include indirect and induced spending attributable to the presence of the plant and its employees as plant expenditures filter through the local economy. There are also secondary effects outside the local area, at the state and national level. For a nominal 1,000-megawatt nuclear plant, these secondary effects are $80 million and $393 million, respectively.

Analyses of 23 U.S. nuclear power stations representing 41 reactors show that every dollar spent by the average reactor results in the creation of $1.04 in the local community, $1.18 in the state economy and $1.87 in the U.S. economy.[2]

The average nuclear plant pays about $16 million in state and local taxes annually. These tax dollars benefit schools, roads and other state and local infrastructure. The average nuclear plant also pays federal taxes of $67 million annually.

Workforce Income Impacts

A recent analysis found that nuclear plants create some of the largest economic benefits compared to other electric generating technologies due to their size and the number of workers needed to operate the plants. Operation of a nuclear plant requires 400 to 700 direct permanent jobs. These jobs pay 36 percent more than average salaries in the local area. There are opportunities for new workers in the nuclear business since 39 percent of the nuclear workforce will be eligible to retire by 2016 (about 25,000 employees).

According to one recent analysis, "[n]uclear plants create the largest workforce annual income based on both large capacity and being a labor-intensive technology."[3] The table below compares the number of jobs, average salaries and workforce income among different energy sources.

Technology[3]	Jobs/MWe	Average Size (MWe)	Direct Local Jobs	Average Salary ($/hour)	Workforce Income ($ Million/year)
Nuclear	0.50	1,000	504	$31	$32.49
Coal	0.19	1,000	187	$28	$10.99
Hydro > 500 MW	0.11	1,375	156	$33	$10.79
Hydro Pumped Storage	0.10	890	85	$38	$6.70
Hydro > 20 MW	0.19	450	86	$33	$5.79
Concentrating Solar Power	0.47	100	47	$27	$2.62
Gas Combined Cycle	0.05	630	34	$28	$2.02
Solar Photovoltaic	1.06	10	11	$15	$0.33
Micro Hydro < 20 MW	0.45	10	5	$35	$0.33
Wind	0.05	75	4	$35	$0.29

[2] A discussion of the economic model is found on pages 6 and 7.
[3] Donald Harker and Peter Hans Hirschboeck, "Green Job Realities: Quantifying the Economic Benefits of Generation Alternatives," *Public Utilities Fortnightly*, May 2010.

Manufacturing and Service Impacts in the U.S.

America's 100 nuclear reactors generate substantial domestic economic value in electricity sales — $40-$50 billion each year. From this revenue, nuclear companies procure over $14 billion each year in materials, fuel and services from domestic suppliers.[4] Nuclear procurement takes place in all 50 states (31 states have nuclear power plants). The average procurement per state each year is over $270 million. Materials, fuel and services are procured from over 22,500 different vendors across the country.[5]

The resurgence of nuclear energy will lead to increasing demand for skilled labor at all levels.

U.S. suppliers provide a full range of products and services for the complete lifecycle of nuclear facilities. During the construction phase, U.S. suppliers provide design, engineering, procurement, construction and consulting services for the reactor, the turbine generator and other plant systems. In addition, major components, subcomponents, fuel, commodities and consumables are purchased from U.S.-based manufacturers for safety-related and general commercial applications. These components include turbines, polar cranes, pumps, valves, piping, and instrumentation and control systems, safety-related batteries and reactor control rod drive mechanisms.

During the operational life of the plant, U.S. vendors provide operations, maintenance, repair and inspection services. They also supply replacement components and perform plant modifications and upgrades. Ongoing maintenance of existing nuclear power plants provides substantial economic benefits for American manufacturers. Over 30 million man-hours are worked by supplemental craft labor each year at the nation's 100 reactors, translating to over 14,000 full-time equivalent jobs.[6]

Impact of a 1,000 MW nuclear plant on Local, State and National Economies

Units	Region	Effect	Output	Labor Income	Employment
Multipliers		Direct	1.00	1.00	1.00
	Local	Direct + Indirect/Induced	1.04	1.22	1.66
	State	Direct + Indirect/Induced	1.18	1.49	2.36
	National	Direct + Indirect/Induced	1.87	3.75	8.26
			$ 2010 Millions		
Dollar and job values per gigawatt	Local	Direct	453	36	319
		Direct + Indirect/Induced	471	44	528
	State	Direct	453	61	505
		Direct + Indirect/Induced	533	91	1,192
	National	Direct	453	65[7]	530
		Direct + Indirect/Induced	846	244	4,372

Source of data: IMPLAN model. See detailed description on pages 6-7.

[4] Procurement numbers are based on a Nuclear Energy Institute survey of member companies. Procurement of nuclear services includes fees paid to regulatory agencies.
[5] The number of domestic vendors includes all organizations from which the industry procured over $1,000 worth of materials, services, or fuel in 2008.
[6] Extrapolation of data from Associated Maintenance Contractors, October 2007.
[7] The total direct labor income calculated in the table on page 2 is $32 million, compared to $65 million above. The labor income on page 2 does not include fringe benefits, but the data above does include them.

New Plant Construction

A new nuclear plant represents an investment of $6-8 billion (depending on plant size), including interest during construction. New plant construction creates demand for skilled labor 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.

In anticipation of new nuclear plant construction, U.S. companies have created in excess of 15,000 new U.S. jobs since 2005. Manufacturing and technical service jobs for new plants 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.

Construction of a new nuclear power plant requires up to 3,500 workers at peak construction. Construction will also provide a substantial boost to suppliers of commodities like concrete and steel, and manufacturers of hundreds of plant components. A single new nuclear power plant requires approximately 400,000 cubic yards of concrete, 66,000 tons of steel, 44 miles of piping, 300 miles of electric wiring, and 130,000 electrical components.

American companies have already booked export orders for billions of dollars in equipment and services, including generators, reactor coolant pumps and instrumentation and control systems.

New U.S. Nuclear Plant Procurement of U.S. Equipment and Services

Since 1980, the U.S. nuclear supply chain has contracted because of the lack of new nuclear plant construction in the U.S. and abroad. Thanks to nuclear energy expansion in the U.S. and around the world, the U.S. has a unique opportunity to rejuvenate its nuclear manufacturing sector through investment in state-of-the-art factories and processes to supply the high-precision, high-quality components necessary for nuclear technologies. The demand for these commodities, components and services provides an export opportunity for U.S. manufacturers.

Over the past few years, the U.S. has seen a significant increase in the number of domestic nuclear suppliers. Suppliers of nuclear equipment are qualified and quality controlled through an accreditation known as N-stamp (also known as American Society of Mechanical Engineers' Section III Nuclear Certificates). This means that the supplier is authorized to produce the commercial nuclear-grade components in accordance with the AMSE's Boiler and Pressure Vessel Nuclear Codes and Standards. The number of N-stamps held in the U.S. has increased 70 percent since 2007.

NEI has gathered information from companies managing the lead projects in the U.S. Some supply chain and strategic sourcing information is closely held for competitive reasons, but the survey found that:

- The lead projects will obtain between 60 percent and 80 percent of components, commodities and services from U.S. firms.
- Over $2 billion of equipment and services has already been procured from U.S. companies in 17 states.

Commercial Nuclear Exports = More U.S. Jobs

U.S. companies and workers also benefit from the expansion of nuclear energy underway worldwide. American companies have already booked export orders for billions of dollars 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.

The four Westinghouse AP1000 projects underway in China support over 15,000 U.S. jobs. These jobs include design and engineering, manufacturing, information technology and transportation.

Although the new nuclear projects under construction in the United Arab Emirates are not U.S.-supplied reactors, the Export-Import Bank of the United States approved a $2 billion loan to support U.S. exports of nuclear-related goods and services to that project. The U.A.E. has contracted with multiple U.S. firms to provide program management, regulatory, legal, design, engineering, environmental, oversight, training, licensing and permitting services. Westinghouse Electric Company is the project's largest U.S. supplier, providing reactor coolant pumps, reactor components, controls, engineering services and training. Other U.S. firms are providing additional engineering, construction management, quality surveillance, material management and regulatory services.

According to the Department of Commerce, every $1 billion of exports by U.S. companies represents 5,000 to 10,000 jobs in the United States.

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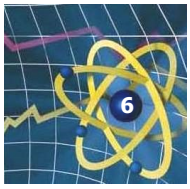

IMPLAN Model Reveals Significant Economic Benefits

Using IMPLAN's input/output model, widely used by U.S. government agencies, NEI has conducted 13 economic benefits studies on 23 nuclear plants (comprising 41 reactors). The data collected for these studies provides a snapshot of the economic impact of an average nuclear power plant, including economic value or output (based on the plant's electricity sales), jobs provided, and labor income. (Labor income is a subset of the total economic value or output.)

Input/output models link various sectors of the economy — agriculture, construction, government, households, manufacturing, services and trade — and trace how spending flows among those various sectors. An input/output model also includes geographic linkages, and shows how spending flows at national, state and county levels.

Output
Input/output models like IMPLAN model the direct values to derive the secondary impacts.

The direct output of $453 million (shown in the table on page 3) is the annual revenue produced by an average 1,000-megawatt nuclear plant. This revenue flows to various purposes — including salaries for those who work at the plant, purchases of good and services, taxes (local, state and federal), and returns to investors.

This distribution of money creates secondary effects at the local, state and national level. These secondary effects can be indirect or induced. Indirect effects reveal how the facility's spending patterns in each region (county, state and national) affect subsequent spending patterns among suppliers. Induced effects reflect how changes in labor income in each region affect the demand for goods and services in those regions, which has a subsequent impact on all sectors producing basic, intermediate, and final goods and services.

The total economic output or value of a nuclear plant is the sum of the direct output and the secondary effects. Direct output is the largest contributor at the local and state level. Secondary effects are a much larger contributor at the national level.

Labor Income
To highlight the economic impact of a nuclear plant's workforce, labor income (a subset of output) is also analyzed for each region. Direct labor income is the salary of the plant's workforce. Direct labor income also creates secondary effects so total labor income is the sum of the direct and secondary effects in each region.

Multipliers
"Multipliers" can be developed for any industry/business sector or geographic area in the model. Multipliers show the ratio of the facility's total economic output or value to its direct economic output or value, and can be measured for each geographical region.

Multipliers for a county are typically smaller than for a larger area, such as the state in which the county is located, because some spending associated with an economic activity migrates from the small area into the larger area. At the local area level, multipliers are larger if the local area tends to produce the types of goods and services that the plant requires.

The total output multiplier reveals how much spending results in a given area from each dollar of direct output. The multiplier for the local area during one year of operation is 1.04 (or $471 million divided by $453 million). This indicates that for every dollar of revenue (output) from the nuclear facility, the local economy produces $1.04. The output multiplier is 1.18 for the state and 1.87 nationally.

Employment

The average direct employment for a nuclear plant is 530. About 60 percent of these jobs (319) are filled by workers who reside in the county. Typically, 95 percent of the direct jobs at the plant (505) reside within the state.

The employment multiplier shows how many jobs are created in a geographic area from each direct job. The model shows that the local economy produces an additional 66 indirect and induced jobs for every 100 direct jobs at the nuclear facility. The employment multiplier for the state is 2.36 and for the nation, 8.26. Thus, for every 100 direct jobs at a nuclear plant, another 726 indirect and induced jobs are created throughout the country.

Economic Modeling Description

Estimates are based on normalized averages from analyses of the economic and employment impact of 23 U.S. nuclear power plants representing 41 units (Braidwood, Byron, Catawba, Clinton, Diablo Canyon, Dresden, Grand Gulf, Hope Creek, Indian Point, LaSalle, Limerick, McGuire, Millstone, Oconee, Oyster Creek, Palo Verde, Peach Bottom, Quad Cities, Salem, Susquehanna, Three Mile Island, Wolf Creek). The figures are calculated per megawatt of installed capacity and reflect a nominal 1,000-megawatt plant size. In practice, new nuclear plants are larger than 1,000 megawatts, so the economic benefits listed in the table on page 3 understate the benefits that new nuclear plants will produce.