Nuclear Energy—Providing Power, Building Economies

Clean energy sources, such as wind, solar, and nuclear, are best known for their environmental benefits—providing electricity while preserving clean air and reducing emissions. However, additional benefits of clean energy are that it provides good-paying jobs and helps grow local economies. Historically, nuclear power plants have provided many benefits to the local communities in which they are located, including providing reliable employment, increasing local tax revenues, and decreasing consumer vulnerability to electricity price volatility. Combined, these benefits create a positive impact from nuclear energy on local and national economies.

Creating Jobs—A Powerhouse of Employees

When accounting for job creation, energy projects create jobs that are divided into three categories:

- Direct—jobs located at the facility (e.g., nuclear plant operators, site staff, business personnel, and construction workers)
- Indirect—jobs that support the facility (e.g., uranium miners and fuel fabricators)
- Induced—jobs created because of the existence of direct and indirect jobs (e.g., health care and service industry jobs).

The number of jobs created depends on an energy project's phases—construction, operation, or decommissioning—and can vary significantly within these phases. Because different studies analyze different metrics, it is difficult to compare results across economic impact studies. This fact sheet presents case studies from multiple countries, describing job creation from various energy projects.

The number of direct jobs created depends on a country's regulatory requirements, domestic industries, and international industries. Several multicountry studies indicate that the number of direct jobs created at a nuclear power plant falls in the range of 0.4–1.0 job per megawatts-electric (MWe) or, to put it in whole numbers, 400–1,000 employees per gigawatts-electric (GWe). These case studies are from countries that have had nuclear power plants operating for several decades and have established mature supply chains to support nuclear energy, including France, South Korea, and the United States. Table 1 shows the estimated jobs and nuclear capacity for these case studies [1, 2, 3]. Figure 1 shows the number of jobs created in the United States based on energy technology. In cases where the indirect and induced jobs were not reported separately, they were combined as is the case for the United States in Table 1.

Table 1. Countrywide Job Creation from Nuclear Programs

Country	Nuclear Capacity (GWe) *(At the time of the study)*	Direct	Indirect	Induced	Total Estimated Jobs
France	63	125,000	114,000	171,000	**410,000**
South Korea	18	29,400	36,700	27,400	**93,500**
United States	98	70,000		430,000	**500,000**

Sources: [1, 2, 3]

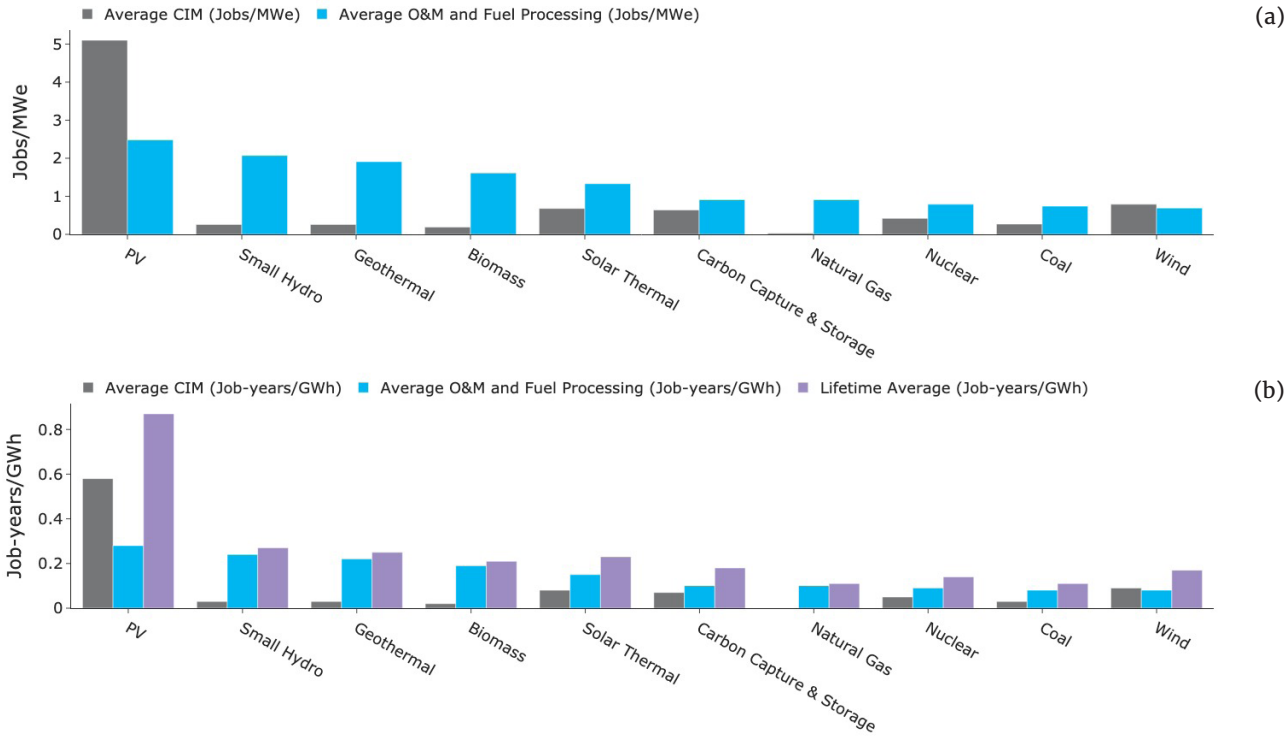

Figure 1. Jobs created in the United States by energy technology and phase based on per MWe (a) and job-years/GWh (b). CIM is construction, installation, and manufacturing; O&M is operations and maintenance. The y-axis expresses the number of jobs in terms of both average MWe (adjusted for capacity factors of the technologies) and job years per GWh (averaged over the lifetime of the project).

In addition to creating jobs, nuclear power plants create good-paying jobs. It is estimated that jobs related to nuclear energy pay, on average, approximately 30% more than other local jobs [3].

For countries seeking to start a nuclear program, the initial years may result in fewer domestic jobs because equipment, technology, and expertise are often imported. However, even countries new to nuclear energy can expect strong positive impacts on their economies through the adoption of nuclear energy. In 2021, the International Atomic Energy Agency (IAEA) analyzed 10 countries to assess the economic impact from nuclear energy in terms of gross domestic product (GDP) and employment, including a base case in which no nuclear energy was adopted. Economic data and reference years from 2007–2020 were used as inputs; projections were provided from 2020–2034 on the impact of nuclear adoption or expansion. Several of these countries were nuclear newcomers. Results indicate the GDP of these countries grew between 0.2% and 3% because of investments in nuclear energy. This resulted in billions of dollars (estimated in U.S. dollars) in each country from both domestic and international sources, with 10%–70% of investments occurring in-country, depending on financing and construction agreements [1].

From a policy maker perspective, whether starting or continuing a nuclear program, significant employment opportunities and investments can be added to a country's economy by adopting nuclear energy and scaling-up the supporting industries.

Providing Energy Stability

In addition to job creation and economic growth, nuclear power plants may help protect consumers from volatile electricity prices [6, 7, 8]. Nuclear energy is not always the lowest cost energy source on a levelized cost of energy (LCOE) basis [9]; however, once power plants are constructed, nuclear energy has very low variable costs. This means that nuclear energy may reduce wholesale electricity price volatility in a way that is not often captured in an LCOE analysis. For example, traditional energy generation sources rely on regular availability of fossil fuels, such as gas and coal, and the variability of renewable generation can result in mismatches between electricity generation and demand. Both dependencies can result in large wholesale price swings.

Additionally, alternative uses of fossil fuels, such as for heating or transport fuels, can cause large swings in electricity pricing. Adding nuclear energy to this mix has been shown to reduce price volatility and cause

system-wide electricity price savings for consumers [6], attributable to long-duration fuel cycles and 24-hour-a-day operation. One study showed a reduction in weighted-average wholesale electricity prices by as much as 10% [6].

Decentralizing Nuclear Power—A Bright Future at the Local Level

Today, nuclear power plants are often GWe-scale megastructures. But a new generation of smaller, MWe-scale power plants could help decentralize the benefits of nuclear energy to a local level. Following the examples of wind and solar, energy jobs from future smaller nuclear power plants may be available in more communities. These jobs are also diverse. Figure 2 shows the percentage of direct, indirect, and induced jobs by type. For nuclear energy, these jobs include engineering, manufacturing, business, health care, and service industries.

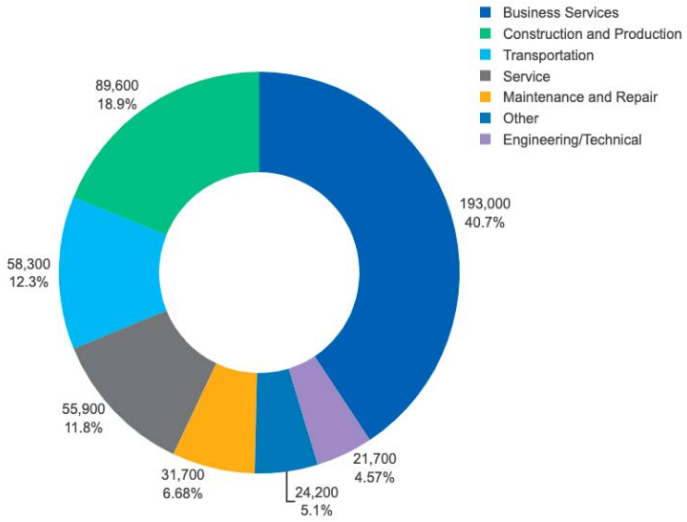

Figure 2. Jobs created, by type, in the United States from nuclear energy [6]

Deploying small modular reactors can also contribute to continued renewable energy growth, which is currently being deployed at breakneck speed, with more than 260 GWe renewable capacity added in 2020 [10]. This growth fuels the jobs in renewable energy sectors. But, as renewable energy increases, its marginal value can decrease because of its variability (i.e., as more solar energy comes online it generates electricity at the same time, reducing the electricity prices paid to solar when it is available). Deployment of flexible nuclear energy can help balance renewables and contribute to their continued growth, increasing overall renewable capacity deployed [11]. Adding nuclear energy to the clean energy mix has the potential to support job growth in all clean energy technologies.

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