NUCLEAR ENERGY INSTITUTE

NUCLEAR COSTS IN CONTEXT

March 2026

In 2024, the average total generating cost for nuclear energy was $33.74 per megawatt-hour (MWh). The 2024 total generating costs were 3.7 percent higher than in 2023 and 37.6 percent below 2012 costs. Total generating costs include capital, fuel, and operating costs – all the costs necessary to produce electricity from a nuclear power plant, but not to own and operate a nuclear power plant. Cost information for the U.S. nuclear fleet is collected by EUCG, with prior years converted to 2024 dollars for accurate comparisons.

TOTAL GENERATING COSTS

The 3.7 percent increase in total generating costs year-over-year is due to a 3.7 percent increase in fuel costs, a 5.2 percent increase in capital expenditure and a 3.2 percent increase in operating costs. The 37.6 percent reduction in total generating costs since 2012 is due to a 41.6 percent decrease in fuel costs, a 48.6 percent decrease in capital expenditures and a 30.9 percent decrease in operating costs. Prior to the 2012 peak, nuclear total generating costs had increased steadily over the previous decade. The 2024 total generating costs are the fourth lowest since EUCG started collecting industry-wide detail data in 2002.

U.S. Nuclear Plant Costs ($/MWh in 2024 dollars)

Year	Fuel	Capital	Operating	Total Generating
2002	7.21	4.94	23.43	35.57
2004	6.67	7.14	23.42	37.23
2007	6.51	7.77	24.22	38.50
2010	8.68	12.03	26.76	47.47
2012	9.67	14.80	29.63	54.10
2015	8.79	10.25	26.82	45.87
2016	8.57	8.59	26.04	43.20
2018	7.78	7.60	24.19	39.57
2020	6.84	6.35	21.72	34.91
2021	6.31	6.26	20.54	33.11
2022	5.69	7.30	19.82	32.81
2023	5.44	7.23	19.85	32.52
2024	5.65	7.61	20.48	33.74
2023-2024 Change	3.7%	5.2%	3.2%	3.7%
2012-2024	-41.6%	-48.6%	-30.9%	-37.6%

Source: EUCG

THE FULL COST OF OWNING & OPERATING A NUCLEAR PLANT

The intent of the cost data, collected by EUCG, is to perform benchmarking comparisons on operating and maintenance and capital costs among nuclear power plant operators. The total generating costs presented in this paper do not represent the full costs of operations, as it does not include market and operational risk management, property taxes, depreciation and interest costs, spent fuel storage costs or returns on investment that would be key factors in decision-making about continued operation of a nuclear plant.

Risk is a significant cost component of operating a nuclear power plant. As baseload power suppliers, nuclear power plants do not respond to market signals in the same way peaking power plants do and may incur losses based on market price volatility that does not affect other generating technologies. The immense amount of power that nuclear plants produce also amplifies the potential losses due to changes in electricity market prices. This type of risk is known as market risk, which is the risk borne by nuclear power plant operators due to volatility in electricity market prices.

Nuclear power plants also face operational risks. Because nuclear power plants are fixed cost assets, meaning their costs do not vary proportionally to their electricity output, any unforeseen loss in generation due to equipment failures or forced outages will increase the plant's cost per MWh dramatically. Additionally, when a plant experiences an unplanned outage, it must also procure additional power for the grid due to contractual obligations, due to market dynamics the cost of replacement electricity is typically higher for nuclear plants than the payments they would have received if operating.

In order for owners to sustain the operation of a nuclear power plant, the cost of the associated risk must be covered. It is vital for the nuclear power industry to be recognized for its positive externalities related to carbon-free electricity generation, but at a level that also accounts for inherent market and operational risks.

Approximately 80 percent of the electricity generated from nuclear power in the U.S. comes from plants with multiple reactors. The economies of scale allow plant operators to spread costs over more generation, resulting in a lower total generating cost. In 2024, the average total generating cost at multiple-unit plants was $31.88 per MWh compared to $41.88 per MWh for single-unit plants. The average total generating cost at single-unit plants decreased by 1.7 percent compared to 2023, while multiple-unit plant costs increased by 5.4 percent. While capital costs decreased for single-unit plants and increased for multiple-unit plants, the operating costs increased across both categories. The average total generating costs for an operator with only one plant was $36.90 per MWh compared to $32.97 per MWh for owners of multiple plants in 2024. Operators with one plant and multiple plants saw increases in across all cost categories, with the exception of fuel costs for operators with one plant.

[1] The data provided are based on averages across the operating fleet. Individual plants may vary notably from the average due to factors such as geographic location, local costs and the timing of refueling outages.

2024 Cost Summary ($/MWh)

Category	Plants / Sites	Fuel	Capital	Operating	Total Generating
All U.S.	55	$5.65	$7.61	$20.48	**$33.74**
Plant Size					
Single-Unit	18	$6.24	$9.62	$26.02	**$41.88**
Multiple-Unit	37	$5.51	$7.15	$19.22	**$31.88**
Operator					
One Plant	10	$5.79	$6.83	$24.28	**$36.90**
Multiple Plants	45	$5.61	$7.79	$19.56	**$32.97**

Source: EUCG

In 2024, the average total generating cost for merchant market plants was $30.11 per MWh compared to $36.51 per MWh for cost of service regulated plants. The average total generating cost increased by increased 4.6 percent and 3.2 percent, respectively, for merchant market plants and cost of service regulated plants compared to 2023. All cost categories increased for both merchant and cost of service plants from 2023 to 2024. The average total generating costs for Boiling Water Reactor (BWR) plants was $33.58 per MWh and Pressurized Water Reactor (PWR) plants was $33.82 per MWh. Both BWRs and PWRs saw increases across all cost categories.

2024 Cost Summary ($/MWh)

Category	Plants / Sites	Fuel	Capital	Operating	Total Generating
All U.S.[3]	55	$5.65	$7.61	$20.48	**$33.74**
Revenue Source					
Merchant Market	23	$5.48	$4.25	$20.38	**$30.11**
Cost of Service Regulation	32	$5.78	$10.17	$20.56	**$36.51**
Type					
BWR	20	$5.45	$6.64	$21.49	**$33.58**
PWR	35	$5.75	$8.12	$19.95	**$33.82**

Source: EUCG

Capital Costs

Industrywide, capital expenditures in 2024 increased to $5.93 billion from $5.57 billion in 2023, compared to the peak of $11.35 billion in 2012 (all in 2024 dollars). Capital investment saw a step-change increase around 2003 followed by another step-change increase in 2009 before peaking in 2012. These trends are the result of a few major investment categories: upgrades related to license extensions of plants, uprates and safety-related investments post-September 11th and post-Fukushima. Since 2012, capital costs have declined 48.6 percent as these programs have been completed.

[3] For the purposes of these categories, Hope Creek Unit 1 and Salem Units 1 & 2 are treated as one plant site due to their proximity.

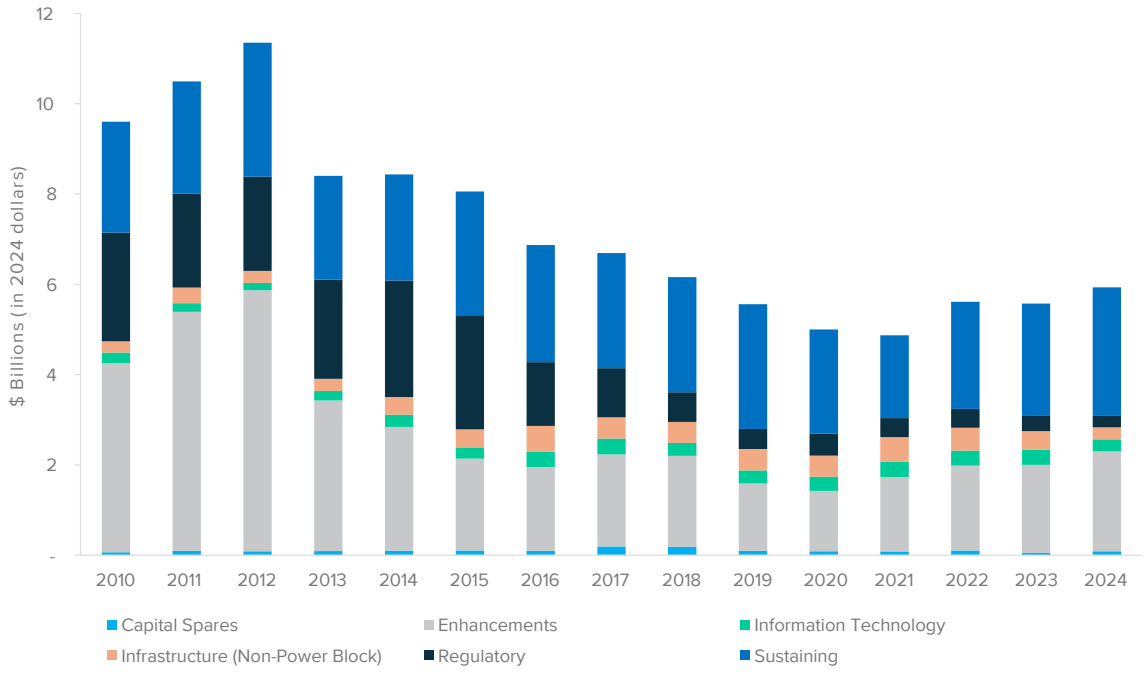
[4] As capital costs are larger, often cyclic investments that are less dependent on the megawatt-hours of production, capital costs are presented below in billions of dollars and adjusted to 2024 dollars.

As companies prepare plants for operation after the first 40-year license and 20-year initial license renewals, a series of vessel head replacements, steam generator replacements and other upgrades have been completed. As a result of these investments, 97 reactors have received their initial license renewal and 20 reactors have received a second license renewal as of December 2025. Ten of these reactors, Duane Arnold, Fort Calhoun, Indian Point Units 2 and 3, Kewaunee, Oyster Creek, Palisades, Pilgrim, Three Mile Island Unit 1, and Vermont Yankee, have since ceased operations prematurely; however, Palisades, Three Mile Island Unit 1 (now Crane Clean Energy Center), and Duane Arnold are pursuing restarting because new commercial opportunities emerged. Five reactors are currently under review for second license renewal, with many more publicly announced intentions for renewal.

Power uprates have been a priority for the industry, with over 8,000 megawatts of electricity capacity approved by the U.S Nuclear Regulatory Commission. Of this, over 7,500 megawatts of capacity are at operating reactors. Capital expenditures on uprates and items necessary for operation beyond 40 years moderated in recent years as most plants completed projects. Investments in uprates peaked at $3.26 billion in 2012 and declined to $91.8 million in 2023, but increased to $194 million in 2024 as utilities renew efforts to expand capacity at existing plants (all numbers in 2024 dollars). Given the incentives afforded by the Inflation Reduction Act, there may be opportunities for investment in additional clean, firm capacity at existing nuclear plants. According to the U.S. Nuclear Regulatory Commission, thirty power uprates are expected by 2030 for an additional 2,143 MWe of capacity added to existing plants.

Capital expenditures decreased notably between 2018 and 2024 due to the completion of other industry initiatives. Capital expenditures to meet regulatory requirements increased from $805 million in 2006 and peaked at $2.58 billion in 2014, before dropping to $255 million in 2024. This increase began with significant investments after September 11th to enhance security, followed by expenditures for post-Fukushima items, which peaked at $1.45 billion in 2015. As the Fukushima-related safety upgrades have been completed, regulatory capital expenditures have reduced below 2006 levels. The increase in capital costs from 2023 to 2024 was largely driven by economy-wide inflation-related cost increases as well as plant upgrade projects as plants prepare for life extensions. The chart below breaks down capital costs since 2010 in billions of 2024 dollars.

Nuclear Industry Capital Expenditures, 2010 to 2024 (in 2024 dollars)



Source: EUCG

Operating Costs

Operating costs increased from $23.43 per MWh in 2002 to $29.63 per MWh in 2012, before falling to $20.48 per MWh in 2024. In 2024, operating costs showed a 3.2 percent increase compared to 2023 and 30.9 percent reduction compared to the peak in 2012. Operating costs include categories such as licensing, security, maintenance and human resources and are presented in dollars per megawatt-hour because they are associated with labor and actions required for the plant to produce electricity.

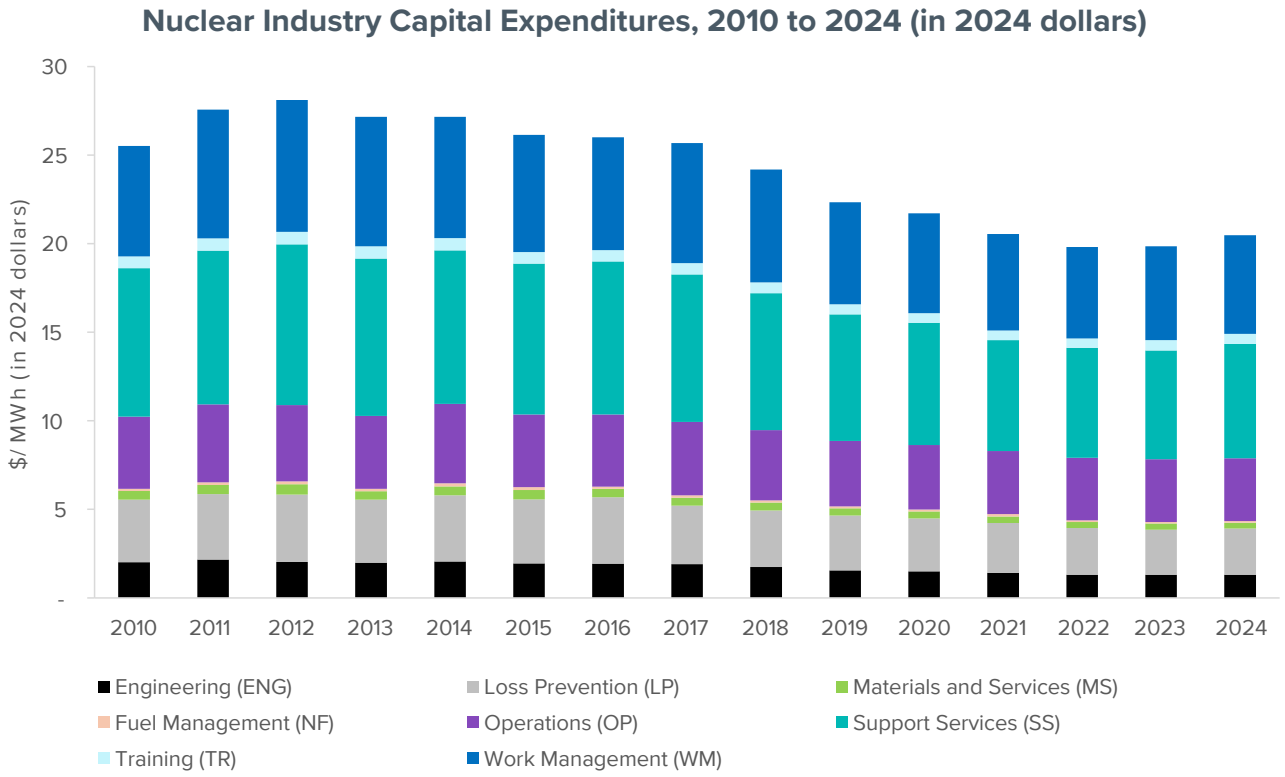
[5] U.S. Nuclear Regulatory Commission: Status of Initial License Renewal Applications and Industry Initiatives. August 2024. https://www.nrc.gov/reactors/operating/licensing/renewal/applications.html

[6] U.S. Nuclear Regulatory Commission: Status of Initial License Renewal Applications and Industry Initiatives. August 2024. https://www.nrc.gov/reactors/operating/licensing/renewal/applications.html

[7] Nuclear Energy Institute: U.S. Nuclear Plant Actual and Expected Uprates by Plant. May 2024. https://www.nei.org/resources/statistics/us-nuclear-plant-actual-and-expected-uprates

[8] U.S. Nuclear Regulatory Commission: Assessing the Impact of the Inflation Reduction Act on Nuclear Plant Power

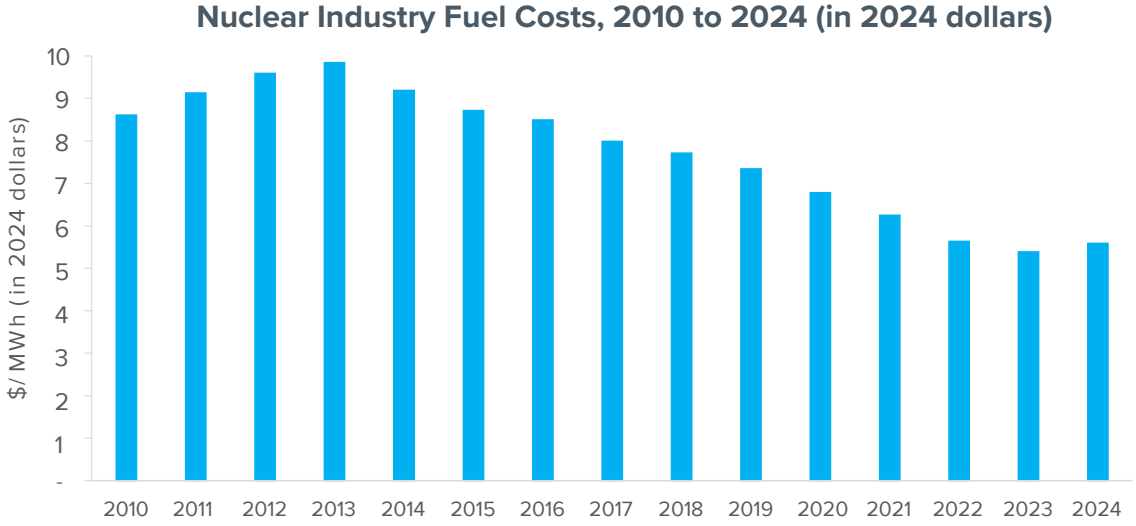
The increase in operating costs between 2002 and 2012 was not driven by any single category, but most operating cost reductions were concentrated between 2017 and 2022. Across the different cost types, industry labor costs totaled to nearly $11.4 billion in 2024, accounting for more than half of operating costs – a share which has remained roughly the same since 2014. The chart below breaks down operations spending since 2010 by cost type in 2024 dollars per megawatt-hour.



Source: EUCG

Fuel

Fuel costs represent approximately 17 percent of the total generating cost. Fuel costs experienced an increase from 2009 to 2013, largely as a result of an escalation in uranium prices, which peaked in 2008. As uranium is purchased far in advance of refueling and resides in the reactor for four to six years, the effect of changes in the commodity price on the reported fuel costs appear several years after. The chart below breaks down fuel expenditures since 2010.



Source: EUCG

QUARTILES

The following tables provide the costs by quartiles for each of the cost categories above. Within each cost category, nuclear power plants are divided into four equal quartiles, with lowest cost plants in Quartile 1 (Q1) and highest in Quartile 4 (Q4). The values shown for each quartile are the costs for the plant at the bottom of that quartile, also known as "end points." For example, if Q1 included 15 plants, the value displayed below under Q1 would be equivalent to the cost of the 15th plant in that category, and any plant with a lower cost would be in the first quartile. The fourth quartile plants are those with costs above the Q3 endpoint. Plants may be in different quartiles for different cost categories depending on their performance with respect to their peers in that specific cost category.

Fuel Costs by Quartile (in 2024 dollars)

($ per MWh)	Q1	Q2	Q3
Fuel Costs	$4.96	$5.75	$6.25

Source: EUCG

Capital Expenditures by Quartile (in 2024 dollars)

($ per MWh)	Q1	Q2	Q3
Capital Expenditures	$4.50	$6.92	$10.37

Source: EUCG

Operating Costs by Quartile (in 2024 dollars)

($ per MWh)	Q1	Q2	Q3
Operating Costs	$16.72	$21.40	$23.53

Source: EUCG

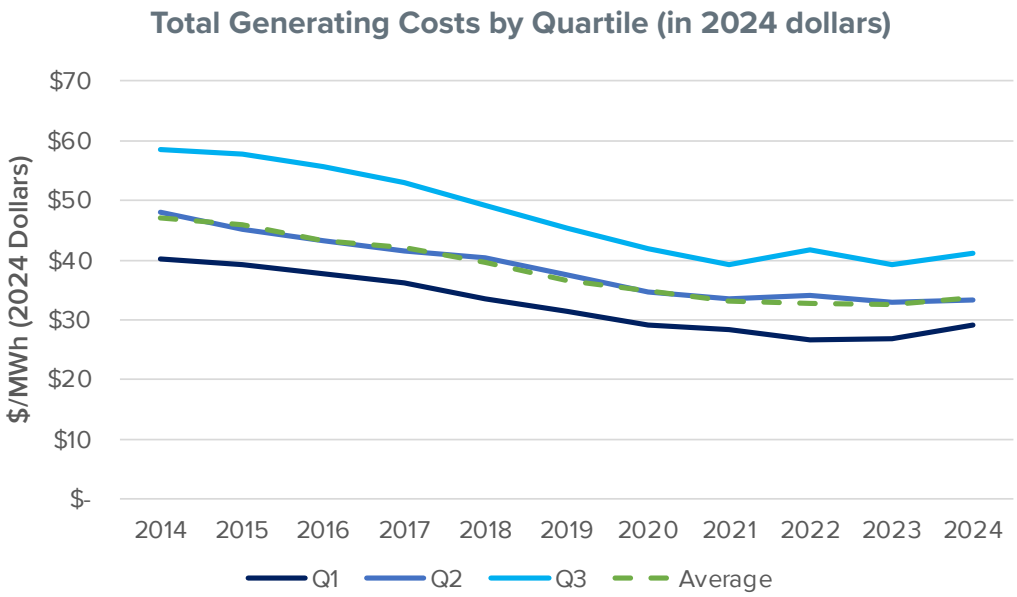
Total Generating Costs by Quartile (in 2024 dollars)

($ per MWh)	Q1	Q2	Q3
Total Generating Costs	$29.13	$33.36	$41.10

Source: EUCG

Since 2014, all quartiles for the total generating costs for plants have steadily decreased due to knowledge-sharing efforts emphasized through the industry's "Delivering the Nuclear Promise" initiative. In 2022, plants in Q2 and Q3 saw increases related to trends discussed in other portions of this paper, but the spread of the quartiles again reduced between 2022 and 2024. The extent of additional possible cost efficiencies for the fleet is unclear.

[9] If plants are unevenly divided by 4, the midpoint between highest value of previous and lowest value of next quartile is used.



THE COST VERSUS VALUE OF NUCLEAR ENERGY

The cost reductions and efficiencies achieved by the industry since 2012 are a sign of the continued pursuit of excellent performance from the U.S. commercial nuclear plants. However, some plants have still been forced to close prematurely despite significant cost reductions experienced across the nuclear fleet. Thirteen reactors in eleven states have ceased operation prematurely, resulting in the loss of 85.1 million megawatt-hours of clean electricity. Most reactors prematurely shut down in the last decade did so at least in part due to market pressures, including the suppression of wholesale power market prices by sustained low natural gas prices and increased penetration of renewable energy, as well as market designs that do not properly value the firm, carbon-free electricity that nuclear plants provide to the grid. Recently, three of these thirteen reactors have announced intention to pursue restarting operations.

Nuclear energy offers value on many fronts to the U.S. energy industry. In the face of the significant challenge presented by climate change, the existing fleet is the largest source of clean electricity in the U.S., and has avoided over 18 billion metric tons of carbon emissions since 1995. The industry-wide capacity factor is 92 percent, meaning nuclear plants provide carbon-free electricity that is reliable and complementary to wind, solar and grid storage. As identified by the U.S. Department of Energy in their recent Liftoff Reports and a recent Rockefeller Foundation analysis, the ability to complement variable sources of generation and respond to electricity load requirements continues to be increasingly valuable as the grid transitions to clean energy technologies while maintaining affordable, reliable electricity service for all.

The commercial nuclear industry also provides significant economic benefits, adding $63.8 billion to the U.S. gross domestic product and paying $9.06 billion in state and local taxes. Nuclear plants are the highest-paying energy generation source by far, providing 73,000 high-quality, long-term jobs across the country at more than twice the national median wage. , The communities that host nuclear plants are supportive of their neighbors due to the jobs and clean air benefits they provide. Additionally, maintaining U.S. presence on the global commercial nuclear stage has been identified as a national security imperative for international nuclear safety and nonproliferation, making it a long-term investment in geopolitical relationships and a strong bipartisan energy solution.

In order to retain the resilient, emissions-free electricity, nuclear power plants must be properly valued by the markets they operate within. Representatives at both the state and federal level are recognizing the full value of nuclear energy to their constituents and to the nation as a whole. With the passage of federal legislation, including the Bipartisan Infrastructure Law of 2021 and the Inflation Reduction Act of 2022, as well as state actions across the United States, nuclear plants are being recognized and compensated for their social and environmental attributes, preserving more than 10,000 direct jobs.

[10] NEI: Annual Greenhouse Gas Emissions Avoided by the U.S. Nuclear Power Plants. May 2024. https://www.nei.org/resources/statistics/emissions-avoided-by-us-nuclear-industry.

[11] NEI: U.S. Nuclear Generating Statistics. May 2024. https://www.nei.org/resources/statistics/us-nuclear-generating-statistics.

[12] Department of Energy: Pathways to Commercial Liftoff. October 2025. https://liftoff.energy.gov/

[13] The Rockefeller Foundation: The Role of Nuclear Energy in Powering Universal Energy Abundance for Emerging Economies. December 2025. https://www.rockefellerfoundation.org/reports/the-role-of-nuclear-energy-in-powering-universal-energy-abundance-for-emerging-economies/

[14] The Brattle Group: The Nuclear Industry's Contribution to the U.S. Economy. July 2015. https://www.brattle.com/news-and-knowledge/news/[13] report-by-brattle-economists-assesses-economic-and-carbon-value-of-nuclear-plants

[15] U.S. Energy & Employment Report. April 2024. https://www.energy.gov/us-energy-employment-jobs-report-useer

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