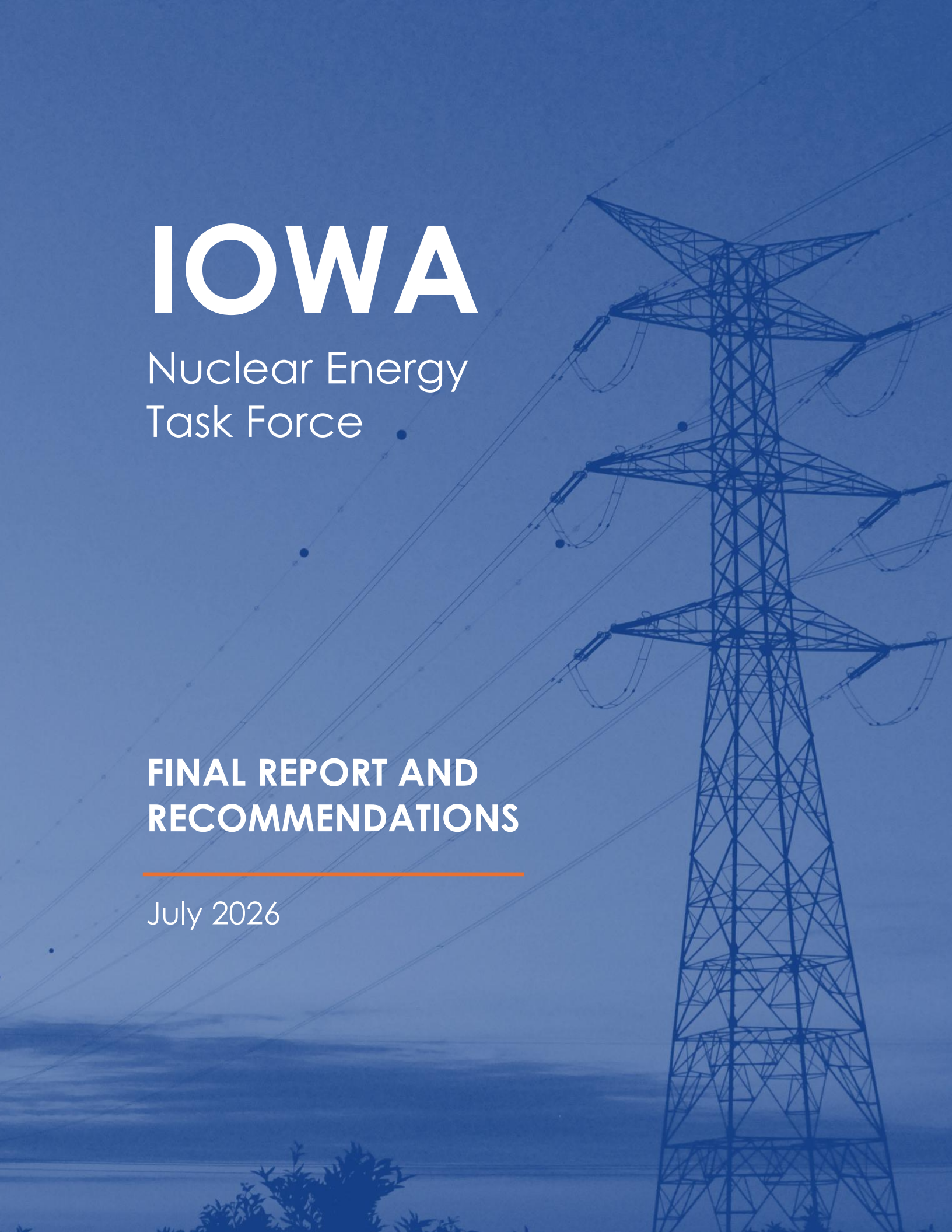




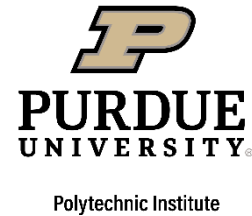
IOWA

Nuclear Energy
Task Force

FINAL REPORT AND RECOMMENDATIONS

July 2026

REPORT PREPARED FOR THE IOWA ECONOMIC DEVELOPMENT AUTHORITY BY:



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Table of Contents

1. Letter from the Chairperson	5
2. Executive Summary	8
Task Force Members.....	10
3. Iowa's Energy Landscape	12
3.1 Iowa Energy Leadership.....	12
3.2 Iowa's Electric Grid Today	12
3.3 Iowa Capacity Demands and Electricity Needs	15
4. Opportunity of Nuclear	20
4.1 Growing Momentum of Nuclear in the US	20
4.1.i. Key Attributes of Nuclear Energy Generators Driving Interest.....	20
4.1.ii Nuclear Energy Technology: Existing and Future Reactor Technologies.....	25
4.1.iii Nuclear Energy Market Signals	30
4.1.iv Existing Policy	37
4.1.v Remaining Challenges.....	45
4.2 Nuclear in Iowa	49
4.2.i Iowa nuclear history and siting readiness	49
4.2.ii Nuclear energy technology integration to Iowa's grid	50
4.2.iii Iowa's existing relevant policy framework	52
4.2.iv Nuclear workforce requirements	53
4.2.v Iowa's nuclear-relevant workforce resources	55
4.2.vi Iowa's nuclear-relevant workforce gaps.....	58
4.3 Iowa Impacts.....	61
4.3.i Nuclear reactors' economic impact during construction and operation	61
4.3.ii Nuclear reactors' local costs and impacts during construction and operations	67
4.3.iii Opportunities and barriers to nuclear supply chain development in Iowa.....	69
4.3.iv Mechanisms to enable ecosystem development.....	75
4.3.vi Waste management and fuel reprocessing best practices	76
5. Recommendations	81
6. Appendices	91
Appendix A: Iowa Executive Order 17.....	92

Appendix B: Task Force Timeline	97
Appendix C: Workforce Development Analysis	99
1. Workforce Demand Assumptions and Methodology	99
2. Education and Training System Alignment	101
3. Training, Certification, and Skills Mapping	104
4. Illustrative Nuclear Workforce Organization and Skills Framework	106
5. Workforce Development Timeline and Phasing	110
Appendix D: Detailed Description of the LCOE Analysis.....	115
Appendix E: Consultant Biographies	119

01

Letter from the Chairperson

Governor Reynolds,

Please accept this final report from the Iowa Nuclear Energy Task Force. This task force was established per Iowa Executive Order 17 and was charged with advising you, the General Assembly, and relevant state agencies on matters relating to the deployment and advancement of nuclear energy technologies and infrastructure in Iowa. The diverse task force you established with representatives from utilities, power production companies, local government, academia, a national laboratory, the Iowa Utilities Commission, and members of the General Assembly (serving in an ex officio capacity) diligently, collaboratively, and professionally addressed each aspect you asked of us. We:

- evaluated the state's role in the growing advanced nuclear energy ecosystem;
- explored opportunities for engaging with the federal government;
- assessed emerging advanced nuclear technologies and how they could fit in Iowa;
- determined if any federal or state regulatory barriers for deployment exist;
- investigated Iowa workforce, training, and educational needs;
- considered how Iowa companies could be a part of the nuclear supply chain;
- identified the Federal Government's responsibilities with respect to nuclear waste management and what Iowa can do with respect to management, storage, and environmental stewardship; and
- evaluated opportunities to utilize nuclear energy to enhance economic growth in Iowa.

Overall, we believe that deploying advanced nuclear reactors could play an important role in providing affordable, reliable, and sustainable energy to meet the growing demand forecasted for Iowa. Iowa has a strong education, trades, and workforce foundation that uniquely position the state to lead a growing nuclear enterprise. Our actionable recommendations are aimed at better positioning Iowa to capitalize on the national growth and advancements in nuclear energy to meet Iowa's goals for energy independence and economic growth. We recognize that the successful deployment of advanced nuclear reactors in Iowa is a complex process involving many stakeholders. Strong and continued state leadership, advocacy, and involvement will be essential for successful deployment.

I am honored to have served as chair of this task force – it was an amazing group and a fantastic experience, one that I will never forget. Having strong roots in Iowa, I'm grateful for the opportunity to help evaluate how nuclear energy can responsibly and effectively benefit Iowans. This truly is an exciting time to explore innovative solutions for Iowa's energy future, and I believe this task force has set the stage for Iowa's future prosperity.

Respectfully,



W. Mark Nutt, PhD

2022

Executive Summary

2. EXECUTIVE SUMMARY

Iowa is well-positioned to be a leader in the growing nuclear industry, with its strong history in new energy technology deployment, its leadership in the nuclear sector with the restart of the Duane Arnold Energy Center, its strong manufacturing base and its strong workforce capability. As the demand for energy grows within Iowa, the Midwest and nationwide, nuclear energy is poised to meet that growth by providing firm, reliable power. Nuclear energy represents a good opportunity for the states that are embracing industry: nuclear energy power plants and the supply chain of nuclear power plants have the potential to create many high-paying, permanent jobs throughout the state and a steady tax revenue stream for the local and state government. Nuclear energy power plants can be economically competitive with other electric power generators when the utilities and developers are able to leverage the full package of federal fiscal incentives, take into account the local economic benefits that the plant will provide, and share the risk among project stakeholders in a way that is appropriate for each stakeholders' abilities.

This task force recommends nine policies that help Iowa to demonstrate its readiness to embrace the nuclear power industry, prepare the state for the opportunities that arise in this space and ensure that the Iowa communities are thoroughly educated and supported as they decide how they might play a role in this industry. The task force recommends that these recommendations are led and tracked by a new state function, outlined in the first recommendation, to ensure that Iowa's efforts are coordinated, continuous, comprehensive and sustained.

Recommendations

1. Create a single point of contact within the state to facilitate nuclear energy development activities.
2. Complete a statewide nuclear feasibility study that screens areas for new nuclear development including technical, commercial, regulatory, and community acceptance criteria.
3. Explore incentives to help Iowa be a leader in the nuclear energy supply chain sector. Prioritize incentivizing existing Iowa manufacturers to grow or enter the nuclear energy industry, while also attracting new nuclear-industry companies, and building broader supportive workforce capabilities
4. Explore, identify, and pursue incentives and policy changes at the state level that drive nuclear reactor investments.
5. After the completion of the Statewide Nuclear Feasibility Study (recommendation #2), create an Iowa nuclear-ready program that provides guidance and support for communities interested in exploring the opportunities and requirements to deploy nuclear energy, determining if it might be a fit for the community, and taking action to demonstrate their interest and readiness. The Iowa workforce development department shall expand Iowa's workforce development pathways to strengthen its alignment with nuclear energy.
6. Expand Iowa's workforce development pathways to strengthen alignment with nuclear energy.

7. Coordinate with the federal government decision-makers to encourage clarification of existing incentives, expansion of the existing incentives, and the addition of new incentives or programs.
8. Consider the state's role in the management of spent nuclear fuel (SNF) (e.g. waste)
9. Position Iowa, Iowan entities and Iowan projects to pursue opportunities for federal funding.

Iowa Nuclear Energy Task Force

The Iowa Nuclear Energy Task Force was convened to advise on advancing nuclear energy in Iowa to strengthen the state's energy portfolio, reliability and long-term growth. On January 5, 2026, Gov. Kim Reynolds **signed Executive Order 17** establishing the group, whose members represent utilities, power generation companies, local government, academia, the Iowa Utilities Commission and the General Assembly. The task force met seven times over the course of 5 months to study the nuclear energy sector, opportunities and gaps and to devise the recommendations included in this final report.

Task Force Members

- Dr. Mark Nutt (chair) – Pacific Northwest National Laboratory (PNNL)
- Andy Roberts – Iowa State Building & Construction Trades; Plumbers & Steamfitters Local Union 33
- Brandy Zumbach Meisheid – Linn County Board of Supervisors
- Dr. Jim McCalley – Iowa State University
- Lane Witten – NextEra Energy
- Matt Resor – IBEW Local 405
- May Farlinger – Alliant Energy
- Mike Fehr – MidAmerican Energy
- Sarah Martz – Iowa Utilities Commission

Ex Officio

- Rep. David Young, Iowa House of Representatives
- Rep. Hans Wilz – Iowa House of Representatives
- Sen. Izaah Knox – Iowa Senate
- Sen. Mike Bousset – Iowa Senate
- Rep. Sean Bagniewski – Iowa House of Representatives

03

Iowa's Energy Landscape

3. IOWA'S ENERGY LANDSCAPE

3.1 Iowa Energy Leadership

Governor Reynolds issued Executive Order 17 on January 5, 2026, establishing the Iowa Nuclear Energy Task Force, outlining its duties, and requesting that recommendations be made via this report (See Appendix A). This task force convened seven times to learn about the market, trends, opportunities, and hurdles related to nuclear energy, and to discuss next steps for Iowa to become a leader in the nuclear energy space.

Iowa has a history of leading in the development of new energy technologies. In 1983, Iowa was the first state in the nation to adopt a renewable portfolio standard. That standard required the two investor-owned utilities in the state, MidAmerican Energy and Alliant Energy, to build a total of 105 MW of renewable generation. The utilities have thus far exceeded this requirement, furthering Iowa's progress towards energy independence.^{1,2} As of the end of 2025, the entire state of Iowa had 13.4 GW of utility-scale wind projects and nearly 700 MW of utility-scale solar projects throughout the state. This scale of deployment sets Iowa apart from other states; in 2025, 61% of all electricity generated in the state came from wind and solar plants, more than any other state that year.³ In total, Iowa has \$22 billion of wind power investments, with annual lease payments to Iowa landowners estimated at \$68 million per year.⁴ This has resulted in significant tax revenue; wind generators pay about \$57 million in local and state taxes annually.⁵

3.2 Iowa's Electric Grid Today

Utilities

Iowa's electricity is primarily served by two investor-owned utilities (IOUs) in the state: MidAmerican Energy and Alliant Energy. Together, they serve 73% of all customers and 76% of all load in Iowa.⁶ The remaining load is served by 135 municipal utilities (10% of load) and the 45 rural electric cooperatives (14% of load).⁷ As Iowa is a vertically integrated state, utilities are responsible for supplying the generation capacity to meet the needs of their load. They achieve this balance by building and owning plants or contracting for capacity with independent power plants. Iowa's vertically integrated structure still allows Independent Power Producers (IPP) participation through PPAs, joint ventures, and rate-based mechanisms. The Iowa Utilities Commission (IUC) oversees the in-state utilities to ensure they are providing reliable power prudently.

Independent Systems Operators

Regionally, the electric grid is operated by Independent System Operators (ISOs)¹, which operate the transmission system and facilitate the wholesale electricity market in their regions. Most of Iowa's utilities are served by the Midcontinent ISO (MISO), which spans 15 states throughout the Midwest and South of the U.S. and Manitoba, Canada. Parts of northwestern and north central Iowa are in another ISO, the Southwest Power Pool (SPP). SPP's territory

¹ Note: In this report, the Iowa Nuclear Energy Task Force includes Regional Transmission Organizations (RTOs) within the term ISOs for clarity and brevity.

extends throughout 17 states.⁸ Northwest Iowa Power Cooperative is served by SPP,⁹ which in turn serves its members, including 6 rural electric cooperatives and a cooperative of 6 municipal electric cooperatives.¹⁰ The Federal Energy Regulatory Commission (FERC) oversees those markets to ensure they are providing reliable power at just and reasonable rates.

Demand

The demand for electricity has been rising in Iowa over the past decade. The total energy sold to retail customers in Iowa climbed by 24% from 2015 to 2025, a CAGR of 2.2%.¹¹ Nationwide, the growth of retail energy sales of electricity has been much lower, with a compound annual

growth rate (CAGR) of 0.8% over the same period. Iowa's growth was driven largely by industrial load growth (See Figure 1), with industrial load growing at a 3.5% CAGR over that period, and residential and commercial loads growing at a 1.0% CAGR.¹¹

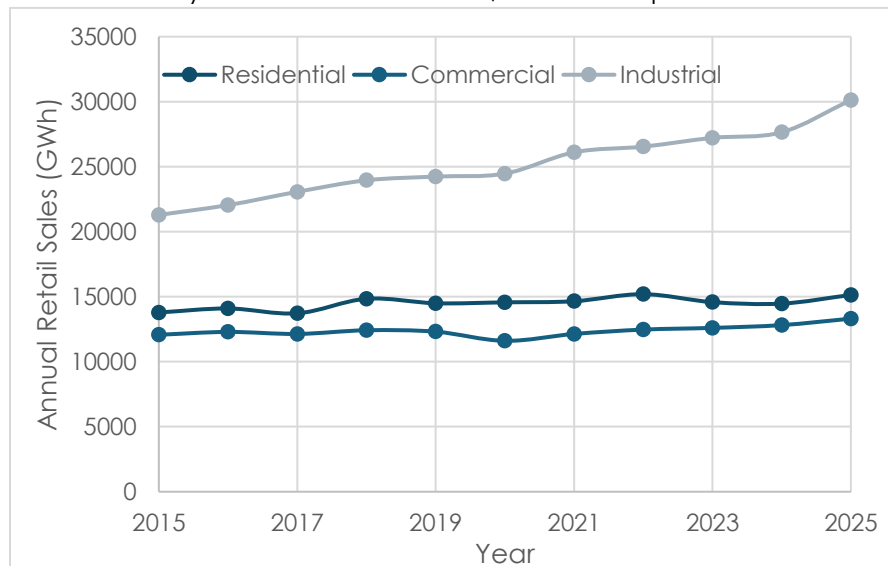


Figure 1: Electricity Sales Growth in Iowa over the Past Decade, by End-Use

As of 2025, 51% of all retail energy sales were to industrial customers, 23% of all sales were to commercial customers, and 26% of the sales were to residential customers. Nationwide, residential loads averaged 37% of total load in 2025, indicating that Iowa has a much larger share of industrial and commercial loads than other states.¹¹

Iowa's major industrial consumers include agricultural loads, manufacturing, data centers and ethanol production. Iowa's largest manufacturing activities include: machinery; food and beverages; chemicals; computers and electronics; plastics; and wood products.¹² The growth in the industrial sector over the past 5 years is linked to new manufacturing loads and data centers. Alliant Energy, for example, notes that 49% of the non-data center load growth for new projects announced in their territory between 2022 and 2025 was from the manufacturing sector; and has also announced multiple data center projects in Iowa contributing to load growth. Data centers have been contributing to MidAmerican Energy's load growth in the past decade as well.¹³ About 10% of the industrial load could be tied to ethanol production, however that has not been a significant factor in the growth over the past 5-6 years.

Generation

Iowa's electric energy generation mix has changed significantly over the past two decades due to the large-scale build-out of renewables in the state, particularly wind power plants. In 2025, non-dispatchable renewables (wind and solar) made up 61% of Iowa's electric energy

generation mix, whereas 10 years before, in 2013, only 37% of the electricity generated in Iowa came from non-dispatchable renewables (wind).¹⁴ Overall, electric energy generation in Iowa has grown by 37% over the past decades, while electricity consumption has grown by only about 20%, meaning that, at least on an energy basis, Iowa has been able to increase its exports over the past decade.

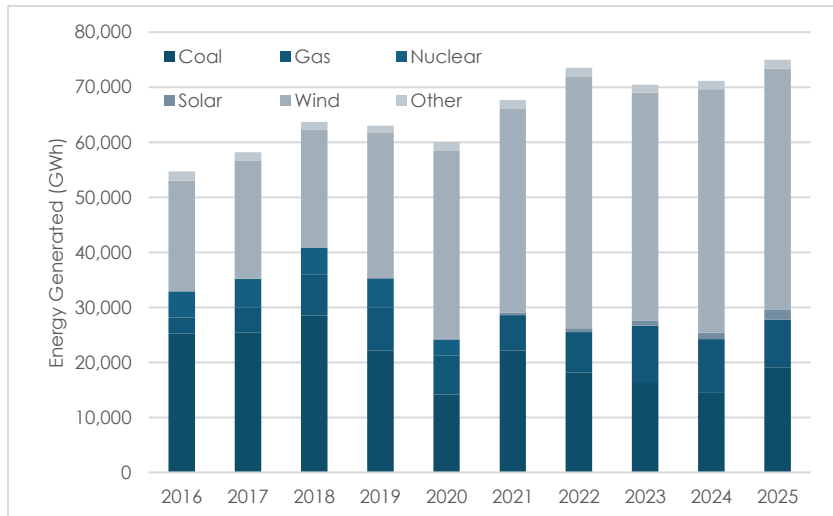


Figure 2: Electricity Generation by Fuel Type in Iowa

Iowa's Electricity Prices

Iowa's retail electricity prices have consistently been below the US average, falling even further in recent years (See Figure 3). In 2025, for example, Iowa had an average retail rate of 9.76 cents per kWh, compared with 13.63 cents per kWh nationwide.¹⁵

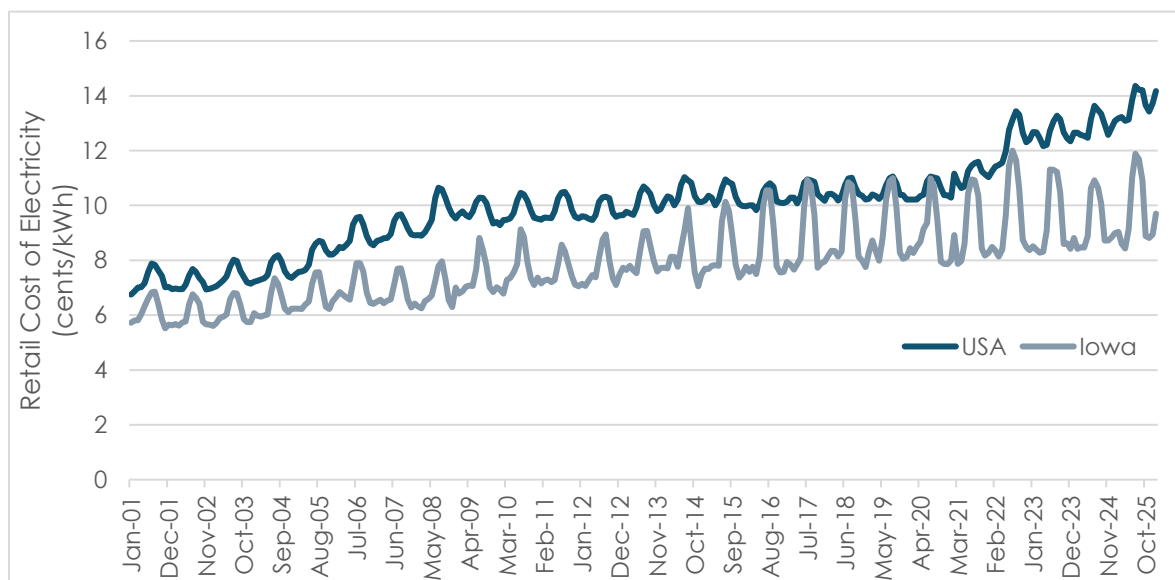


Figure 3: Retail Cost of Electricity in The US and Iowa

Key takeaways

As a vertically integrated state, Iowa's 182 utilities supply electricity by building their own generation or contracting for capacity. Industry represents the largest share of electricity consumption, while wind now accounts for the largest share of in-state generation. Coal and natural gas remain the next largest generation resources, and Iowa currently has no nuclear generation. Overall, electricity rates in Iowa tend to be below the national average.

3.3 Iowa Capacity Demands and Electricity Needs

Demand Signals

The largest driver of interest in nuclear power (and other generation resources) is the strong demand signal coming from the electric power sector. After decades of relatively constant demand, load growth is expected throughout the U.S., with the Energy Information Administration (EIA) predicting 2.2% load growth in 2025 and 2026. Furthermore, MISO, which serves the majority of Iowa's load, predicts annual peak demand growth of 2.0% per year through 2035 (1.1%-3.0% range). All in, this will result in a MISO-wide load growth of about 23% over the coming decade (2025-2035). This peak demand forecast has grown significantly since December 2024, when the ISO predicted 1.6% peak demand load growth through 2044 (1.1%-2.0% range). This is also a significant change over recent historical load peak demand growth; In the 2015-2025

timeframe, the ISO experienced little or no peak demand growth.¹⁶ MISO cites data centers in the Des Moines area and ethanol refineries as key areas of load growth expected in Zone 3, which includes most of Iowa (except the parts served by SPP) and parts of Minnesota.

MISO's load zone 3 is predicted to have 23 to 69 TWh of energy load growth over the 2026-2046 time frame, putting it at about average for the MISO region, but still above load zone 3's historical growth rate (See Figure 4).¹⁶ This forecasted demand growth is driven by a variety of factors, including the continued electrification of residential lifestyles, the onshoring of heavy manufacturing, critical mineral processing, and the establishment of new data centers.¹⁷ Data centers are particularly fast-growing across the MISO footprint, with MISO estimating a 17.9-18.2% CAGR of electric energy demand growth from 2026-2046.¹⁶ As shown in Figure 5, MISO's electric energy load growth expectations are driven primarily by growth in data center load with the ISO forecasting 1880348 TWh of data center load growth over the coming two decades.

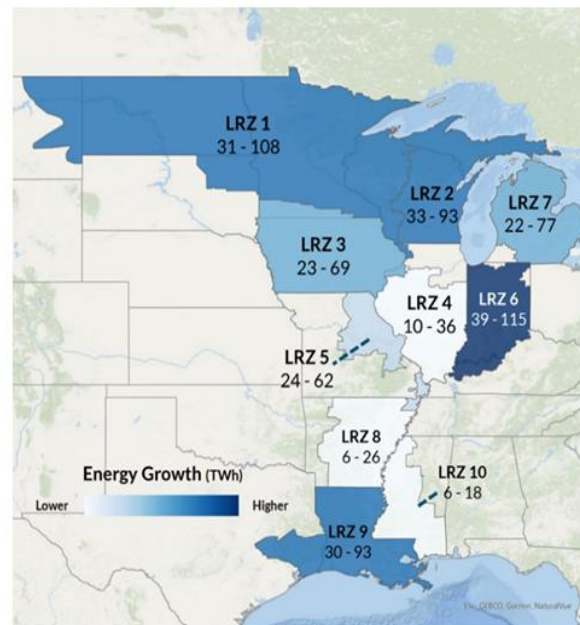


Figure 4: MISO 2026-2046 Forecast Incremental Load Growth by MISO Local Resource Zones (LRZs): Low-High Ranges

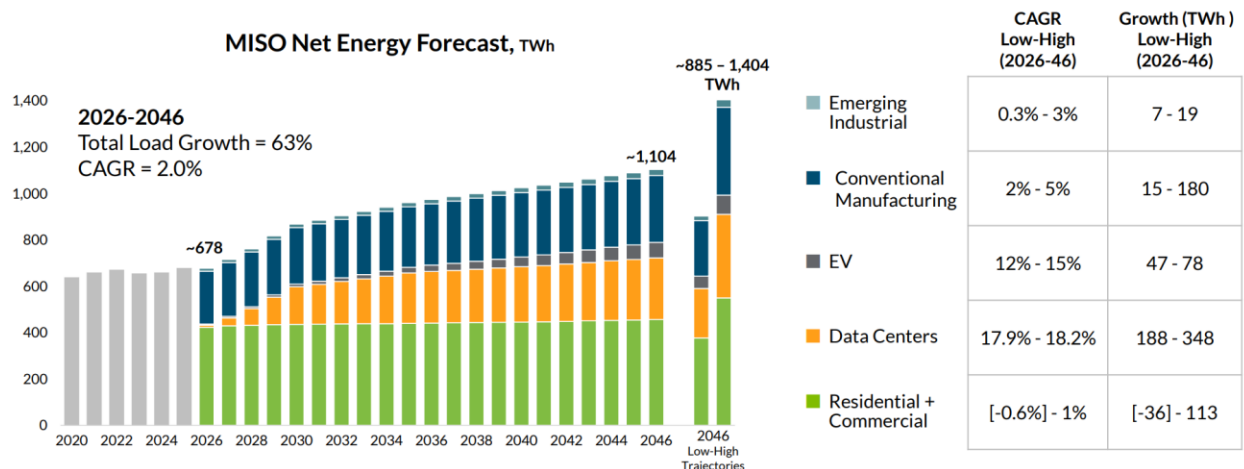


Figure 5 MISO Current Trajectory Incremental Load Growth Forecasts by Segment (TWh)¹⁸

MISO is working with stakeholders, particularly the load-serving entities it serves, to update their load forecasting models, and has piloted this methodology in 2025. The results of that pilot survey and other updates to the load forecasting methodology are included in the 2026 long-term load forecast.¹⁹

Iowa's two large investor-owned utilities are experiencing this change firsthand. Alliant Energy reported having an energy services agreement signed with 4 data centers during 2025 and Jan-March 2026 for a total of 3 GW of new load.²⁰ Note that only three of the four data centers mentioned are in Iowa, with the other in Wisconsin. Demand from these data center projects is expected to ramp up in the next decade. In addition, as of Q1 2026, Alliant Energy was in negotiations with other data center projects, which could add another 2-4 GW of load.²⁰ MidAmerican Energy had load growth of 8.8% in 2025, attributed primarily to data center load, and reports an expected average CAGR of 4.2% from 2021 through 2027.²¹

Generation Mix is Changing

On the supply side, both nationwide and within MISO and Iowa, power capacity additions are hitting record highs; however, they are largely dominated by solar and wind resource additions (see Figure 6²²). Existing power plants, primarily coal plants, are retiring as these new plants come online, offsetting the effects of the new additions.

MISO is observing similar trends in the generation resources available to that market. In 2023-2025, MISO had a net addition of 13,585 MW of resource nameplate capacity, with 22,068 MW of new

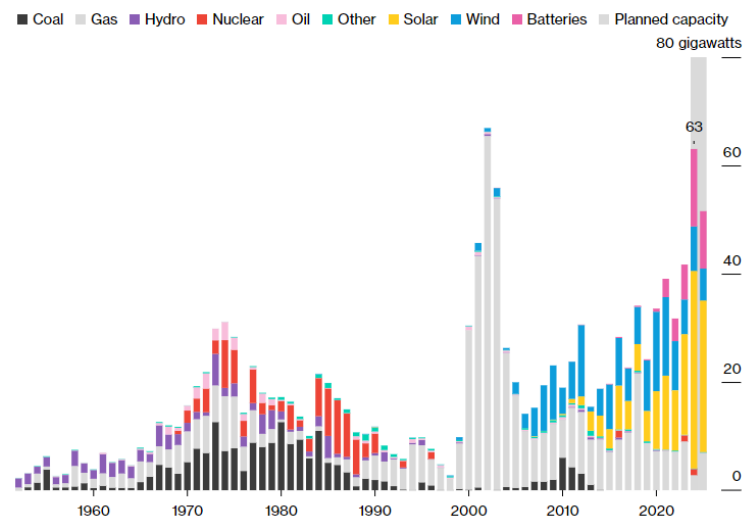


Figure 6: US Capacity Additions since 1950

generation coming online and only 8,482 MW retired. The 22,068 MW of new capacity includes 16,053 MW of solar, 3,093 MW of wind, 2,163 MW of natural gas, and 714 MW of energy storage. The retirements consist of coal (4,897 MW) and natural gas plants (3,091 MW).²³ Iowa, likewise, has added 1,289 MW of new nameplate capacity, including 849 MW of wind and 429 MW of solar, and retired only 325 MW, most of which is coal (307 MW).²³

This trend is expected to continue over time. As seen in Figure 7, by 2043, MISO expects that 87% of its energy needs will be met by solar and wind resources.²⁴

Capacity Market Changes

Capacity requirements ensure the grid has enough reliable resources online to meet peak

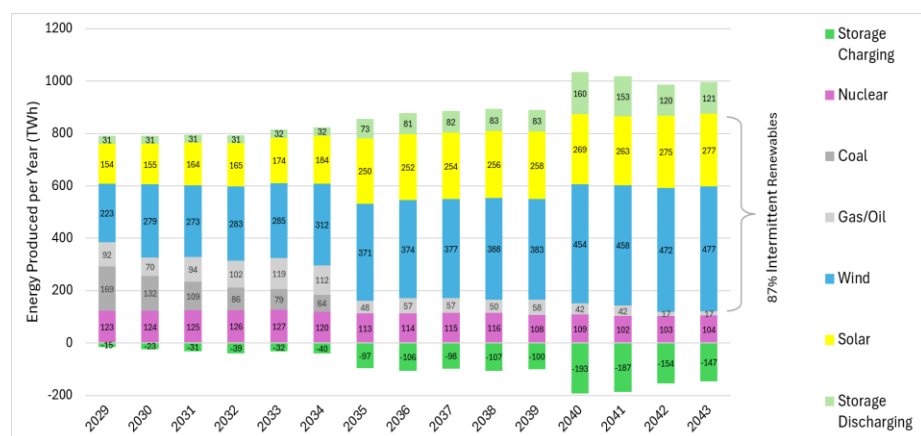


Figure 7: Energy Generation Mix Forecast, MISO

demand. While in the past, capacity prices in Iowa have been low, two recent changes in the MISO market are tightening the supply of capacity, increasing the price of capacity exchanged in their annual resource auction, and driving up demand for new capacity.

1. Change to Capacity Accreditation Methods

In October 2024, FERC approved a change to how capacity is accredited in MISO ([ER24-1638](#)). The new accreditation methodology accounts for the intermittent nature of many grid resources and adopts a more holistic approach to modeling them.²⁵ The new rule will greatly reduce the amount that intermittent renewables can count toward the capacity requirements. Figure 8 illustrates what MISO expects to happen, on average, to the capacity accreditation of wind, solar, and dispatchable resources when the rule goes into effect in 2028-29 and beyond. As before, each specific solar plant and wind plant will have slightly different accreditation depending upon their performance throughout the year, but the rule will lower the total capacity accreditation that can be granted to wind and solar overall once it takes effect. As more wind and solar come online, the rule will likely further reduce the accreditation of those resources.

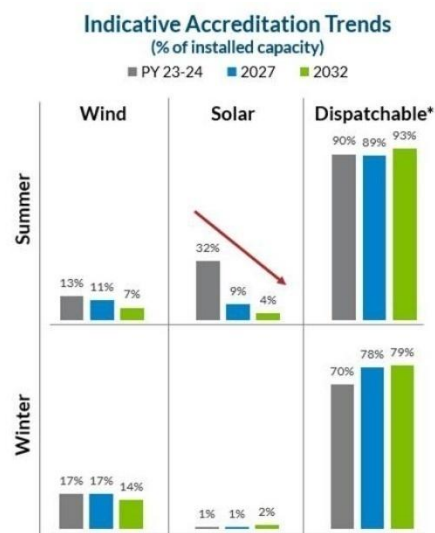


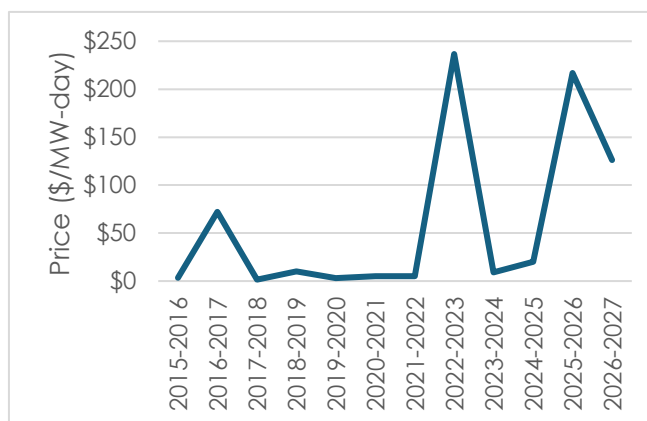
Figure 8: MISO Accreditation Changes

For example, a 100 MW solar array would have previously been counted as a ~32 MW capacity asset during the summer of 2023 (though it varied from location to location), but under the new accreditation methodology, that same 100 MW plant is projected to be counted as a ~4 MW capacity asset during the summer of 2032. The Direct Loss of Load (DLOL) methodology change will take effect in the 2028/2029 resource auction. If a utility owned the solar farm and was using that capacity to cover the needs of their customers, they will now have to find new resources to cover their load's capacity requirements. If the solar farm were privately owned, the owner could no longer sell the same amount of capacity that they could previously sell to utility customers, private off-takers or in the planning resource auction (depending on how they sell their capacity).

2. Capacity Market Auction Demand Curve Changed from Vertical to Sloped

In June 2024, a new rule took effect that is expected to increase capacity prices in this region in the coming years.²⁶ The rule will change the pricing methodology for the capacity auction to better align the auction's clearing price with the true value of capacity to the market, using a sloped demand curve, also known as the reliability-based demand curve (RBDC). This change in pricing allows the market to clear slightly above the required capacity level (at higher prices) or slightly below it (at lower prices). This makes the demand curve more elastic and less susceptible to wild swings from one year to the next. This change will help MISO to maintain adequate electricity supply and grid reliability year after year.

The new demand curve rule has resulted in higher prices in the last two auction years, as the auction has cleared above the traditional clearing demand in all four seasons in both years. In the 2026 auction, the 4 markets cleared 3.5-5.7% higher than the initial target capacity.^{27,28} This, the FERC filing reasons, will incentivize new generators to come online or existing generators to stay online, which will make MISO's grid more reliable.



Key takeaways

Figure 9: Average Annual Capacity Prices in MISO Zone 3

In the coming years, electricity demand in Iowa is expected to grow, driven by developments such as data centers and expanded industrial activity. At the same time, a greater share of generation will come from non-dispatchable renewable resources like wind, while changes in MISO capacity accreditation may reduce the capacity value of renewables. Together, these trends create a demand signal for firm, reliable capacity in Iowa and throughout the MISO footprint.

04

Opportunity of Nuclear

4. OPPORTUNITY OF NUCLEAR

4.1 Growing Momentum of Nuclear in the US

The need for new electric power capacity matches well with the attributes of nuclear energy as an efficient and reliable resource. There is growing momentum at a national scale towards nuclear energy, and this national interest is driving policy shifts and project announcements across the country.

4.1.i. Key Attributes of Nuclear Energy Generators Driving Interest

Nuclear power plants are reliable, firm resources.

Nuclear power plants, like the fossil fuel fleet, are considered dispatchable resources; their availability to produce power as well as their power production level can be scheduled. Unlike wind and solar, which, without storage, produce power only when their respective renewable resources are available, nuclear power plants can produce power at all times, except during plant downtime for maintenance, refueling, or repair. Because nuclear power plants can be scheduled to provide power when needed, utilities and the Independent System Operator (ISO) can count almost the entire nameplate capacity of the plant towards their peak capacity needs.

Because nuclear power plants are typically run as a “baseload” resource, meaning when they operate, they are producing power almost always at their nameplate capacity, their capacity factor², is a good proxy for their overall availability. Over the past decade (2015-2024), the overall capacity factor of the existing US nuclear fleet ranged from 90.8% to 93.4%.²⁹ Most of the downtime is due to scheduled outages, during which plants typically refuel and perform regular maintenance tasks. Repairs and upgrades also take place during scheduled outages, when possible, to minimize the plant's downtime.

Planned outages typically occur during the “shoulder months” of April, May, September, and October, when energy needs are lower. Figure 10 shows the total outage rate of the nuclear fleet from 2021-2025, with most outages occurring in shoulder months.

² Capacity Factor: Energy produced divided by the total energy they would have produced if they had run at peak power.

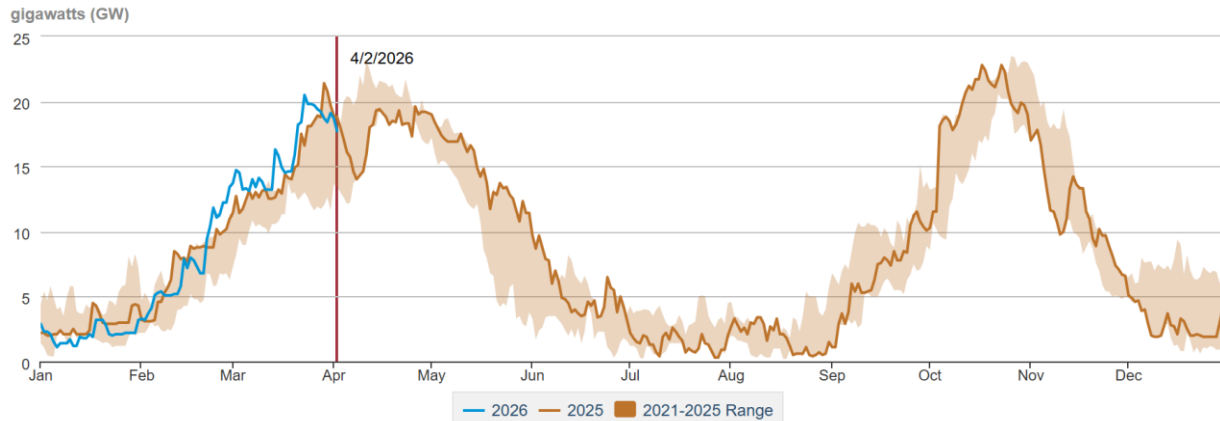


Figure 10. Outages of Nuclear Power Plants by day of the year³⁰

Some outages are forced or unplanned. There were 35 forced outages in 2022,³¹ accounting for about 2% of the total lost capacity throughout the year.³² As seen in Figure 11, the forced outages, as defined by NERC, are lower for nuclear power plants than for other fuel types in recent years.

New reactor designs tend to promise lower overall outage rates due to quicker scheduled maintenance and longer refueling cycles. The Westinghouse AP1000, for example, promises 93% availability due in part to a long, 18-month refueling cycle and a shortened refueling operation timeline. Small Modular Reactor (SMR) vendors likewise expect their outages to be shorter than those of large Light Water Reactor (LWRs) in the existing fleet, though there is no operational data yet to support those claims.

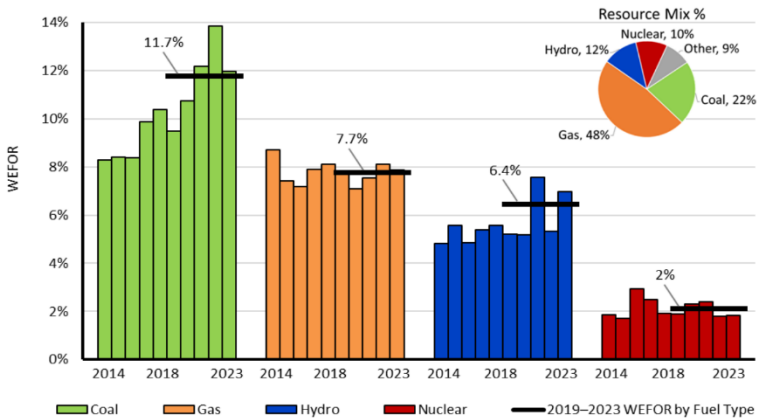


Figure 11: Forced Outage Rate in the USA 2014-2023 by fuel type

Nuclear power plants have a demonstrated history of safe operations

Nuclear power plant operations, fuel storage, and management of waste are overseen by the Nuclear Regulatory Commission (NRC). The NRC issues regulations that cover all aspects of the nuclear fuel cycle including operations, operator certifications, radiation safety, storage of spent nuclear fuel including certification of the storage casks as well as manufacturing and qualification of the fuel.³³ The NRC provides oversight including having two resident inspectors at each nuclear power plant.

Existing nuclear power plants rely primarily on “active” safety features to ensure safe operation. Examples of active safety features include systems or components that rely on external power, mechanical interventions, or reliance on human input in the event of a malfunction.³⁴ The

advanced reactor designs, particularly the non-LWR designs, are designed to be inherently safe, generally through “passive” safety systems (also known as “walk-away safe”). Passive safety systems do not rely on active components or external power sources to perform their safety functions. Instead, they use natural forces such as gravity or convection to maintain safety without human intervention.³⁵ Nearly all advanced reactor designs, both LWR and non-LWR, are designed to be “passively” safe. A fundamental principle of NRC regulations for all reactor designs is the “defense in depth” principle, which asserts that there should be “multiple, independent, redundant layers to compensate for potential human and mechanical failures”.³⁶

Nuclear energy is widely considered one of the safest ways to produce electricity, in terms of lowest total deaths per MWh of electricity produced. Comparative analyses show that nuclear power has among the lowest overall public health impacts and workplace safety impacts of any major energy source, particularly when compared with fossil fuel-based generation.³⁷ In the United States, this low risk is reinforced by stringent NRC oversight, including multiple layers of engineered safety systems, continuous monitoring, and comprehensive emergency preparedness requirements.

Over the past decade, the U.S. commercial nuclear power fleet has consistently operated at a high level of safety and performance. The NRC tracks various safety performance indicators using its Reactor Oversight Process (ROP) and a color-coded rating issued to each reactor each quarter. The performance indicators (PIs) are made public and for the last 40 quarterly evaluations, more than 95% of all reactors had all “green” PIs³⁸, which is defined as: “indicates performance within an expected performance level where the associated cornerstone objectives are met.”³⁹ In 2026 for the 97 reactors evaluated against 17 performance indicators over 4 quarters (a total of 6596 evaluations), all findings were green except for one “yellow” (“indicates related cornerstone objectives are being met, but with a minimal reduction in the safety margin.”) and one “white” (“represents performance outside an expected range of nominal utility performance but related cornerstone objectives are still being met.”) finding.⁴⁰

Two industry-led organizations, the World Association of Nuclear Operators (WANO) and the Institute of Nuclear Power Operations (INPO), offer additional credentialling and support to member organizations in identifying, addressing, and minimizing risk. INPO sets standards for safety and risk assessment at levels stricter than the NRC, recognizing that “in nuclear energy production, safety is non-negotiable and public trust is paramount.”⁴¹ Additionally, INPO centers member organizations around five core values: trusting relationships, impeccable integrity, influential people, unwavering standards, and continuous learning.⁴²

In summary, the NRC ensures the safe operation of commercial nuclear power plants through a comprehensive regulatory framework of licensing, continuous onsite oversight, a positive safety culture policy, and strict performance evaluations that are publicly available. Additionally, the NRC has the authority to levy financial fines or even mandate the shutdown of a facility if it is considered unsafe to operate.^{43,44}

Nuclear power plants have a relatively high local economic impact As discussed in a later chapter, nuclear energy is characterized by a larger positive local economic impact than other energy sources. During construction, there are significant on-site work activities that, even for the “factory-made” SMRs, require significant materials and manpower to be sourced at or brought to the construction site. According to Bechtel, the commissioning of Vogtle Units 3 & 4 employed 9,000+ craft professionals onsite at peak construction.⁴⁵ Nuclear power plants provide more jobs during operations than other generators, as seen in Figure 12.⁴⁶

Generation type	Permanent jobs on site, jobs/GW		Industry wage median, \$/hour	Benefits concentrated in local community?
Nuclear	237	~500	\$56	✓
Coal	107		\$49	✓
Natural gas	30		\$49	✓
Wind	80		\$37	✗
Solar	36		\$34	✗

Note 237 jobs is an estimate for SMRs; ~500 represents the current operating fleet of large reactors; coal and natural gas are both the value of “Fossil Fuel Electric Power Generation,” when they were measured separately in the 2020 USEER Wage Report, they were within ~5% of each other; hydropower onsite jobs per GW not available, but industry median wage was \$51/hour

Figure 12: Nuclear Provides high Paying jobs and the most jobs on site per GW

Likewise, salaries and maintenance are the major expenses in nuclear power plant operations, whereas in fossil fuel generators, the largest operational expense is fuel.⁴⁷ The breakdown of operational costs, maintenance costs, and fuel costs in various generators. For Iowa, which doesn't produce any fossil fuels used in power production (coal, natural gas)⁴⁸, the fuel expenditures associated with the fossil plants go to out-of-state entities while operations and maintenance expenditures tend to be to in-state entities like employees of the plant or local contractors.

Nuclear power plants are efficient

Nuclear power plants have a lower carbon footprint and physical land footprint compared to most electricity generation technologies (nuclear is comparable to that of wind when accounting for direct land displacement).⁴⁹ Nuclear is among the lowest greenhouse gas-emitting technologies. The lifecycle greenhouse gas emissions, which include the emissions upstream of the energy production, such as the construction of the power plant or the mining of the fuel, for various fuels were studied by the National Laboratory of the Rockies (formerly the National Renewable Energy Laboratory) and, as shown in Figure 13, nuclear energy has very low carbon emissions according to most studies, putting it below solar energy and on par with wind energy.⁵⁰ While natural gas is not shown in the figure, its lifecycle carbon emissions are about 602 gCO₂/kWh (with a range of 386-818 gCO₂/kWh), which is about half of coal's emissions but well above those of other technologies.⁵¹

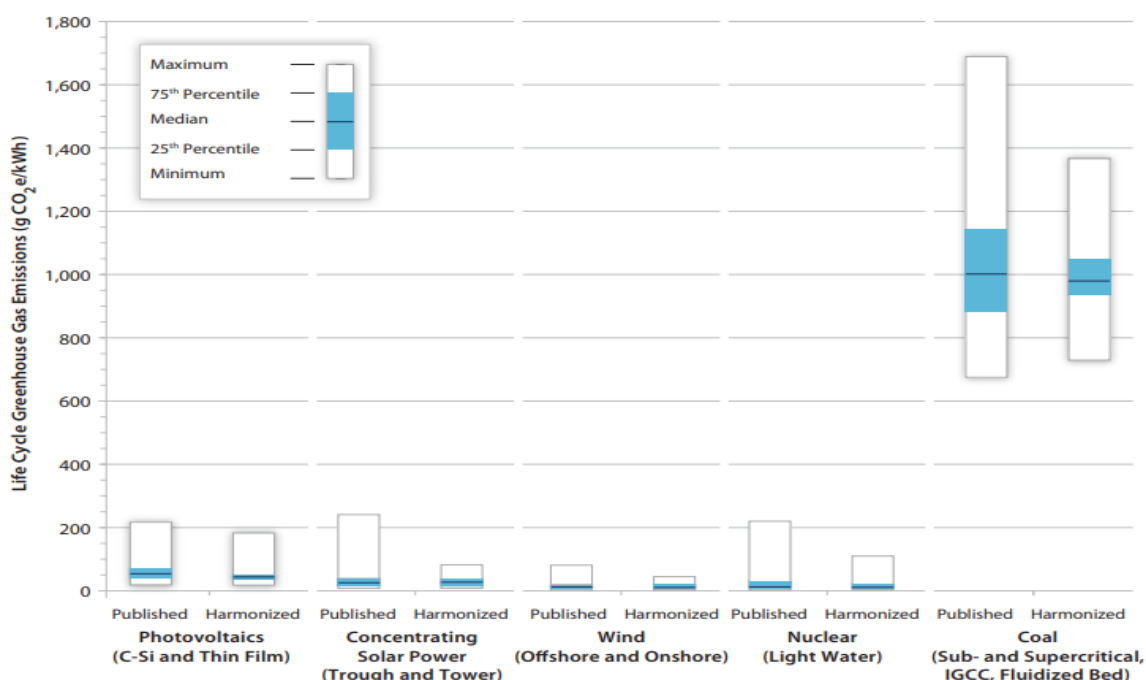


Figure 13: Lifecycle Greenhouse Gas Emissions of Various Energy Generation Technologies

Due to their low carbon emissions, energy from nuclear power plants is valued at a premium in the market because of demand from power-consuming companies seeking to reduce their carbon footprint. Traditionally, carbon-free power has been traded using Renewable Energy Certificates (RECs), which allow renewable energy generators (like wind and solar power plants) to mint a certificate for each MWh of production and sell it to energy consumers who want to offset the carbon associated with the MWh they consume over a long timeframe. RECs are generated and used in two ways: compliance markets (for states with active portfolio standards) and voluntary markets. Iowa sold 5.8 million MWh of RECs in the voluntary market in 2024, making it the 12th-largest seller of RECs in the nation.⁵² More RECs may be sold into compliance markets for states that have them and allow out-of-state generation to count toward their compliance totals, but those are not tracked by the federal government. RECs are

part of a larger category of certificates called Energy Attribute Certificates (EACs)⁵³, which have recently been expanding and now include certificates with more detailed information about the generation, allowing buyers to:

- Focus their purchases on the “emissions-free” attribute, which includes nuclear, as opposed to the “renewable” attribute, which does not. Examples of EAC's that nuclear qualifies for are Zero Emissions Certificates (ZECs) or Alternative Energy Certificates (AECs)
- Tie their use to the generation hour (using time-stamped certificates)
- Tie their use to the general location of their consumption (using) regional certificates
- Determine the marginal fuel that was offset by the new generation in that region at that particular time, which will force renewables to see diminished values when displacing other renewables.
 - Because nuclear energy produces around-the-clock power and MISO still has a relatively high percentage of its generation from coal plants, these additional attributes may create greater value for nuclear energy produced in Iowa beyond the traditional value of RECs.

Nuclear energy also has relatively low lifecycle land-use requirements compared to other energy technologies. Figure 144 shows the relative land use for various technologies, in square meters per TWh of energy produced annually.⁵⁴ Land use for power plants can be measured in various ways; the values shown in Figure 6 represent the square meters associated with the plant's construction footprint and

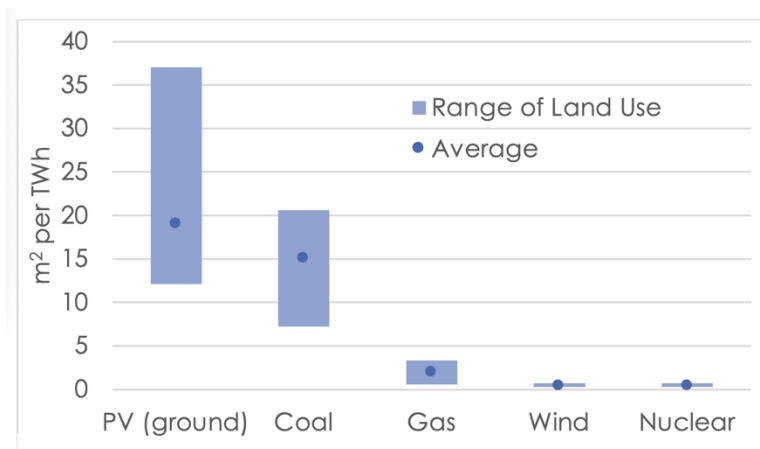


Figure 14: Average Land Use by Generation Type

the fuel's mining footprint.⁵⁵ For nuclear power, that would mean the footprint of the reactor, the generators, the associated buildings, and the mines from which uranium is extracted, but not the additional land behind the fenceline. For wind power, that would be the footprint of the turbines, and any associated support structures or power electronics, but not the land in between the turbines. By this measure, nuclear and wind power are the most efficient users of land of the various technologies in use in Iowa.

4.1.ii Nuclear Energy Technology: Existing and Future Reactor Technologies

Existing fleet of nuclear power reactors

There are currently 94 nuclear reactors in operation at 54 sites across the U.S. All operating reactors in the U.S. today are Light Water Reactors (LWRs), meaning that they use light water (normal water with normal isotope distributions) as the primary coolant and to moderate the

nuclear reaction. Among the operating LWRs, 31 are boiling water reactors (BWR), such as the recommissioning Duane Arnold Energy Center in Linn County, Iowa, and 63 are pressurized water reactors (PWRs).⁵⁶ In 2024 and 2025, nuclear reactors represented 18% of the U.S. energy generation mix.⁵⁷

The majority of the existing U.S. nuclear capacity was constructed between 1969 and 1990 (91 GW out of 97 GW total).⁵⁸ The first reactors to be built in over 30 years were the two reactors built at Plant Vogtle, in Waynesboro, Georgia: Vogtle 3 & 4. Vogtle 3 reached criticality on July 31, 2023, and Vogtle 4 reached criticality on April 29, 2024. Vogtle 3 & 4 use a Gen III+ AP-1000 PWR design from Westinghouse, which includes integrated passive safety features and enhanced steam turbine design features for more efficient energy production. All other operating reactors are Generation II technology.

Reactor technologies under development and under construction

Modern reactors are classified by their electric power output capability as reflected by their nameplate rating: Microreactors are rated between 1 MW and 20 MW each; Small Modular Reactors (SMRs) are rated between 20 MW and 300 MW each; and large reactors are rated between 300 MW and 1000+ MW in size. All reactors being developed today in each of these sizes can be considered “Advanced reactors”. Advanced reactors are either Gen III+ LWRs or Gen IV reactors. Gen IV reactors do not use light water to moderate or cool their reactors, but rather use various coolants, including molten salt, liquid metal, or gas, and various moderators, such as graphite, or in the case of “fast reactors,” no moderator at all. Additionally, Gen IV reactors use fuel forms different than the uranium dioxide fuel used in LWRs. Currently, several new reactor designs are at various stages of development in the market.⁵⁹ Note that the advanced reactor landscape is rapidly changing, with some designs being discontinued with others entering the pilot phase each year. This list reflects current status but may change in the future.

1. **Gen III+ Advanced Light Water Reactors:** There are four major technology vendors in this class of advanced reactors. All Gen III+ reactors will use Low Assay Enriched Uranium (LEU) as fuel, which is the same fuel used by all existing reactors today, with enrichment on the order of 3-5% Uranium-235:
 - a. **GE Hitachi:** GE Hitachi has an SMR-scale reactor, the BWRX-300, that is a BWR with 300 MW of electrical output. This reactor design was selected for use in projects in Tennessee (TVA's Clinch River Project) and South Carolina (Duke Energy's Belew's Creek). The TVA project is fairly mature, receiving an early site permit for SMR reactor deployment in 2019, submitting its construction permit (referencing the GE-Hitachi design) in 2025, and receiving a \$400 million cost-share award from the DOE in November of 2025, although the BWRX-300 has not yet received a Design Certification from NRC. Four BWRX-300 reactors are also currently under construction at a project in Canada (OPG's Darlington Project), which is expected to be online by 2029.⁶⁰
 - b. **Holtec:** Holtec has an SMR-scale design, the SMR 300, a PWR with 300 MW of power output. Holtec is deploying its first two SMR units at its existing nuclear power plant site in Palisades, Michigan. The project was awarded \$400 million in cost-share funding from the DOE in November of 2025.

- c. **NuScale:** NuScale has an SMR-scale reactor design, the VOYGR, a PWR with 77+ MW of electrical output, offering scalability with 4, 6, and 12-module configuration options. While their project slated for Idaho (UAMPS) was canceled in 2023, in 2025 NuScale announced plans to deploy 6 GW of reactors with TVA and its dedicated developer ENTRA1, though the exact site(s) were not named. NuScale's design has been pre-certified by the NRC Design Certification, which greatly simplifies project-specific license applications.⁶¹
 - d. **Rolls-Royce:** Rolls-Royce's SMR, a PWR with 470 MWe output, making it too large to count as an SMR by some definitions. After winning the bid in Jun 2025⁶², Rolls-Royce signed a contract with Great British Energy in April 2026 to deliver the UK's first three small modular reactors, which together will deliver 1.2 GW of energy.⁶³ Rolls-Royce also has a contract to deliver 3 GW of reactors to the Czech Republic. It does not yet have a Design Certification in the U.S.
- Westinghouse:** Westinghouse has a GW-scale reactor, the AP1000 PWR, with 1.1 GW of electrical output. They also have a design for a related SMR-scale reactor, the AP300, a PWR with 300 MW of electrical output. Westinghouse deployed their GW-scale reactor, the AP1000, at Plant Vogtle in Georgia. Westinghouse's owner, Brookfield, announced their intention to study the deployment of two more AP1000s by restarting a project at a VC Summer site⁶⁴ that was canceled in 2017.⁶⁵ Further, in October 2025, the Trump administration announced the availability of \$80 billion in Japanese funds to deploy AP1000s in the US.⁶⁶ Westinghouse has four AP1000 reactors in operation in China with additional planned, as well as projects in various stages of development in Ukraine, Bulgaria and Poland.⁶⁷ The AP1000 design has been certified by the NRC under 10 CFR 52, which simplifies project-specific licensing applications.
2. **Gen IV Advanced Reactors:** Gen IV reactors are more technically diverse, with designs using different coolants, moderators, and fuels. The six types of Gen IV reactors identified by the World Nuclear Association are: the gas-cooled fast reactor (GFR), the lead-cooled fast reactor (LFR), the molten salt reactor (MSR), the sodium-cooled fast reactor (SFR), the supercritical-water-cooled reactor (SCWR), and the very high-temperature reactor (VHTR). Advanced reactors typically use Highly Enriched Low-Assay Uranium (HALEU) fuel; fuel that is enriched to 5-20% Uranium-235. Some of the reactors will use tri-structural isotropic (TRISO) particle fuel, a fuel form that contains the fuel inside of a spherical ceramic and graphite particle layered in a way to allow the nuclear reaction to take place inside the sphere and to be safely contained within the sphere. The Nuclear Energy Agency's SMR Dashboard, which tracked designs up until February 2025, analyzed 74 SMR designs (note: the NEA's definition of SMRs includes microreactors as well).⁶⁸ Of those 74 designs, only 23 are water-cooled. Although there are numerous Gen IV reactor designs being developed globally, the key technologies with projects moving forward in the U.S. are listed below.
 - a. **Kairos Power:** Kairos Power is developing an advanced reactor known as the KP-FHR, a fluoride salt-cooled high-temperature reactor with an electrical output expected to be in the 140 MW range for its commercial design. The KP-FHR uses TRISO particle fuel containing HALEU, molten fluoride salt as the coolant, and graphite as the moderator. Kairos is currently constructing two of its Hermes

demonstration reactors in Tennessee, both of which have received construction permits from the NRC, making them the first Gen IV reactors to receive a construction permit (as a demonstration reactor). The Hermes project is intended to validate the technology, supply chain, and construction approach ahead of commercial deployment, and has received support from the DOE. Kairos has a Master Plant development agreement with Google to deliver 500 MW of KP-FHR nuclear power to them, though the site location is not yet public.⁶⁹

- b. **Oklo:** Oklo is developing an advanced microreactor known as the Aurora, with an electrical output of approximately 15 MW. The Aurora design is a fast reactor that uses metallic HALEU fuel, liquid metal coolant (sodium), and does not require a moderator due to its fast neutron spectrum. In 2025, Oklo broke ground on its first Aurora units in Idaho.⁷⁰ Oklo also has a strategic partnership with Meta to pursue project development in Ohio.⁷¹ Although its combined license application was originally rejected by NRC in 2022, Oklo has subsequently engaged with the NRC on its design in pre-application discussions, and will likely resubmit its application for review. In parallel, Oklo is pursuing development under the DOE Reactor Pilot program.
- c. **TerraPower:** TerraPower is developing a Gen IV reactor called Natrium, a sodium-cooled fast reactor (SFR) using HALEU fuel with approximately 345 MW of electrical output, coupled with a molten salt energy storage system that can boost the electrical output to about 500 MW. The reactor uses liquid sodium as the coolant and does not require a traditional moderator because of its fast-neutron spectrum. The Natrium concept is unique in how it will load follow by using a molten-salt system to store excess heat for up to 5.5 hours of peaking capacity. TerraPower is deploying its first Natrium plant in Kemmerer, Wyoming, near a site of a retiring coal facility, in partnership with PacifiCorp. In March 2026, the project received its construction permit from the NRC⁷², the first Gen IV construction permit granted for a commercial reactor. The project is eligible for up to \$2 billion in cost-share funding from the U.S. DOE's Advanced Reactor Demonstration Program (ADRP). TerraPower also has an agreement with Meta to deliver 2-8 units in the 2032-2035 timeframe.⁷³
- d. **X-energy:** X-energy is developing a Gen IV SMR-scale reactor called the Xe-100, with approximately 80 MW of electrical output per unit, planned to be deployed in four-pack configurations for a total of about 320 MW. The Xe-100 is a high-temperature gas-cooled reactor (HTGR) that uses helium as the high-temperature gas coolant and graphite as its moderator. The Xe-100 will use TRISO particle fuel containing HALEU. X-energy has partnered with Dow Chemical to deploy its first Xe-100 units at a chemical plant in Texas, where it will be used to produce power and process heat. Like TerraPower, the project is receiving significant support from the DOE's ARDP. X-Energy is eligible for up to \$1.2 billion in funding through that program. X-Energy has also announced a project with Amazon and Energy Northwest in Richland, Washington. That project will be 320 MW with the option to grow to 960 MW. Amazon has planned to deploy 5 GW of energy from X-Energy units overall.⁷⁴ In April 2026, X-Energy announced a collaboration with Kentucky

Utilities and Louisville Gas and Electric to explore deploying Xe-100's in the Commonwealth of Kentucky.⁷⁵

- e. **Microreactors:** Besides Oklo, mentioned above, there are several microreactor designs under development. All but the last two in this list are part of the U.S. DOE's Reactor Pilot Program, which also includes two designs by Oklo.⁷⁶ The Reactor Pilot program has a goal of having multiple reactors achieve criticality by July 4, 2026.
 - i. Aalo Atomics: A ~10 MW_e sodium-cooled reactor using a particular type of LEU, UzRH.
 - ii. Antares Nuclear: A sodium-heat-pipe-cooled reactor using HALEU/TRISO fuel. Antares Nuclear's demonstration reactor achieved criticality on June 4, 2026.⁷⁷
 - iii. Deep Fission: A small, borehole-deployed ~15 MW_e PWR using LEU. (technically, not Gen IV)
 - iv. Last Energy: A small, ~20 MW_e PWR using LEU. (technically, not Gen IV)
 - v. Natura: A molten salt reactor (fluoride salts) using HALEU fuel.
 - vi. Radiant Industries: A HTGR using helium coolant and HALEU/TRISO fuel.
 - vii. Valar Atomics: A HTGR using helium coolant and HALEU/TRISO fuel.
 - viii. Terrestrial Energy: A molten salt reactor (fluoride salts) using LEU.
 - ix. Westinghouse (eVinci): A ~5 MW_e sodium heat-pipe-cooled reactor using HALEU/TRISO fuel.
 - x. BWX Technologies (BWXT): A ~1–5 MW_e mobile HTGR using helium coolant and HALEU/TRISO fuel.
- 3. **Fusion:** All existing nuclear reactors and the aforementioned advanced reactors use nuclear fission reactions as a source of energy; that is, they use energy from the breaking of nuclear bonds in heavy atoms, usually Uranium. In fusion reactions, two light atoms fuse into a single atom; during the fusion reaction, mass is converted to energy. This is the reaction that powers the Sun. Most fusion research is focused on the fusion of deuterium and tritium, which are hydrogen isotopes with one and two neutrons, respectively.⁷⁸ Recent advances in fusion technology have spurred private-sector investment, public-sector support, and pilot project announcements. Fusion recently reached a notable technical achievement: in December of 2020, researchers at the National Ignition Facility (NIF), in California, recorded a laser-powered fusion reaction that exceeded the "Scientific breakeven" point, sometimes referred to as "Q>1". That is, it produced more energy than it consumed in the reaction.⁷⁹ U.S. Energy Secretary at the time, Jennifer Granholm stated: "Simply put, this is one of the most impressive scientific feats of the 21st century."⁸⁰ Fusion has yet to demonstrate a milestone indicating a more practical readiness called "engineering breakeven", where the energy it takes to power the entire laser system is exceeded by the useful energy created by the fusion reaction. The experiment in which the scientific breakeven point was exceeded, for example, used 300 MJ of energy to power the lasers that produced 2 MJ of beam energy. Multiple companies are working now to develop fusion reactors that will produce power for the electric grid. Once the engineering breakeven point is achieved in a sustained reaction, the reactor companies will work to tackle other engineering challenges to build robust, reliable, cost-effective, and long-lasting fusion reactors that can breed their own tritium.

Two companies are noted for their advanced stage of pilot project deployment and funding:

- a. **Commonwealth Fusion Systems (CFS):** CFS uses a different technology called magnetic confinement fusion, which holds the plasma in a tokamak machine instead of lasers like the NIF project used.⁸¹ CFS is currently building a demonstration tokamak, SPARC, in Devens, VA, which it expects to achieve scientific net energy gain by 2027.⁸² The company has also begun construction of the first fusion reactor power plant in Chesterfield, VA, called ARC, which CFS expects to begin commercial delivery of 400 MW of power by the early 2030's.⁸³ CFS has raised \$3.8 billion in publicly disclosed transactions through 2025.⁸⁴
- b. **Helion:** Helion also uses a unique reactor design and has a plan to use a Helium Isotope along with deuterium as the fuel, instead of tritium and deuterium.⁸¹ Helion's prototype reactor, the Polaris, demonstrated fusion in February 2026, making it the first private company to do so.⁸⁵ In July of 2025, the company started construction on its first commercial power plant, the Orion Fusion plant in Malaga, WA, which will deliver 50 MW by 2028.⁸⁶ Helion has raised a total of \$1 billion through 2025. As of their last fundraise in January 2025, the company's total valuation was \$5.4 billion.⁸⁷

4.1.iii Nuclear Energy Market Signals

Nuclear power has attracted significant interest over the past three years, largely driven by the aforementioned growing demand for clean, firm power and the ongoing retirement of power plants reaching the end of their useful lives. The indicators of market traction include announced projects, restart announcements, equity investments in reactor startups, and nuclear PPAs that are negotiated at a significant premium over typical renewable PPAs.

New project announcements are increasing

The number of advanced nuclear power projects has expanded over the last five years, and now, according to the Nuclear Energy Institute, an industry advocacy group, there are a total of 87 advanced nuclear power projects across North America, including one completed project (Vogtle), 7 projects under construction, and 14 planned projects⁸⁸, as shown in Figure 15. The key projects were detailed in section 4.a.ii. The progress these projects are making is critical to the continued growth of the nuclear industry and acceptance of nuclear as a commercially viable energy technology choice.

Two reactors came online, and three restart projects are underway

The first reactors to be built in over 30 years were at Plant Vogtle, in Waynesboro, Georgia. Vogtle 3 reached criticality on July 31, 2023, and Vogtle 4 reached criticality on April 29, 2024. Vogtle 3 is a Gen III+ AP-1000 design from

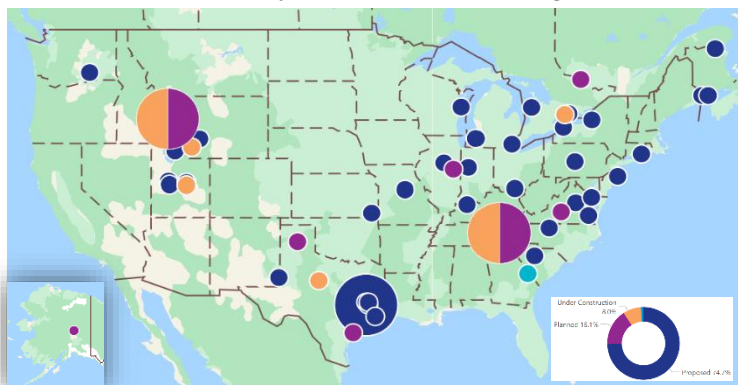


Figure 15: Advanced Nuclear Projects in the US, as of April 3, 2026

Westinghouse, which includes integrated passive safety features and enhanced steam turbine design features for more efficient energy production. While the final schedule exceeded the initial planned schedule by more than 7 years, and costs were significantly higher than the original estimation, the completion of these units has nevertheless led to increased confidence in the United States' ability to complete nuclear mega-projects. Besides being the first-of-a-kind build of the AP-1000 design, the Vogtle project was impacted by the bankruptcy of Westinghouse during the construction, the COVID-19 pandemic (and its ensuing supply chain disruptions), and the lack of recent reactor deployments in the U.S. prior to its construction.⁸⁹

Since the completion of the Vogtle project, three nuclear restart initiatives have been announced in the U.S., underscoring the growing demand for nuclear power:

- 1) **Holtec Palisades Restart:** In mid-2023, Holtec International began the process of restarting the 800 MW Palisades Reactor (which ceased operation in 2022).⁹⁰ The project is planned to come back online in 2026.⁹¹ This is slated to be the first restart in the U.S.⁹² The restart is tied to a Power Purchase Agreement (PPA) with Wolverine Power and Hoosier Energy.⁹³
- 2) **Constellation Crane Clean Energy Center:** In September 2024, Constellation announced the restart of Unit 1³ at the former Three Mile Island (TMI) site, under the new name Crane Energy Center.⁹⁴ The 835 MW reactor is set to restart as early as 2027.⁹⁵ This restart is tied to a PPA with Microsoft.⁹⁶
- 3) **NextEra Duane Arnold Energy Center Restart:** In January 2025, NextEra Energy Resources submitted regulatory filings to the NRC outlining a regulatory pathway to recommission the 615MW Duane Arnold Energy Center (DAEC) in Linn County, Iowa (which ceased operation in 2020).⁹⁷ In October 2025, NextEra Energy Resources announced PPAs with Central Iowa Power Cooperative (CIPCO) and Google Energy LLC. DAEC is Iowa's only nuclear power plant and is anticipated to enter commercial operations no later than the first quarter of 2029.⁹⁸

Venture Capital and Private Equity (PE) Investments in Nuclear Startups are up

In recent years, investments in nuclear technology startups have increased dramatically. In the North American market, after five or more years with minimal private equity and venture capital investments in nuclear technology startups, the years of 2022, 2024, and 2025 (through June) saw upwards of \$2 billion⁹⁹ of private equity and venture capital investments according to Bloomberg New Energy Finance data (See *Figure 16*).¹⁰⁰ Note these investments are in reactor technology companies, and not project development and construction costs and should be treated only as an indicator of market interest in nuclear technology generally, but not of project investment activities.

³ Note: Unit 1 was unaffected by the 1979 reactor accident (Unit 2 experienced the minor meltdown) and was retired only for fiscal reasons.

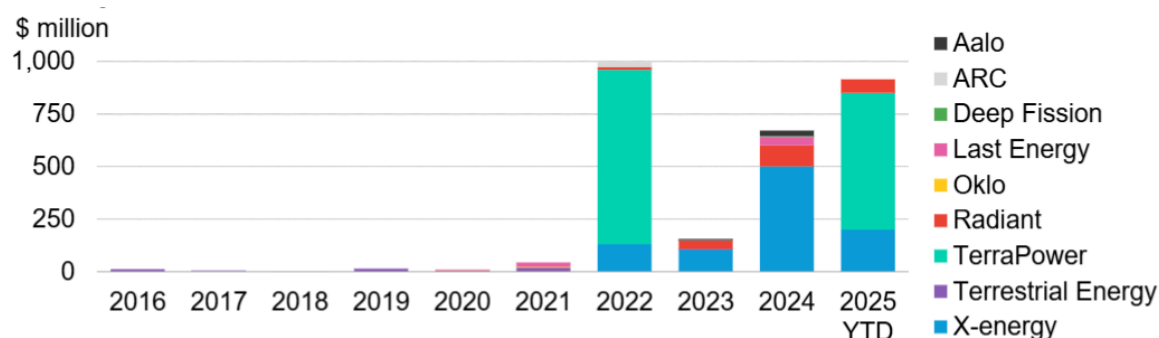


Figure 16: Private Equity and Venture Capital Investment in Nuclear Technology Startups.

Nuclear Power PPAs have been negotiated at a premium price

Besides equity investments, companies deploying large data centers have been active in signing Power Purchase Agreements (PPAs) for nuclear power from existing plants and PPAs that are financially enabling the restart of recently closed nuclear reactors. For the three projects shown in Table 1, the PPA values have been estimated by the consulting firm, Jeffries. These prices are a significant premium over power prices from solar or wind PPAs, which typically cost \$30-\$40/MWh, and demonstrate the premium that off-takers are willing to pay for nuclear power. Note that nuclear PPAs should not be directly compared with energy-only renewable PPAs without considering capacity value.

Table 1: Nuclear Restart and Relicensing PPA's with estimated Prices

Seller	Buyer	Amount	Price (est.)	Power Plant
Constellation	Meta	1,092 MW	\$70/MWh ¹⁰¹	Clinton (re-license)
Talen	AWS	1,620 MW	\$88/MWh ¹⁰²	Susquehanna (re-license)
Constellation	Microsoft	835 MW	\$110-\$115 ¹⁰³	Crane (restart)

These deals were the first PPAs to make a significant contribution to the U.S. corporate PPA volumes, which have historically been dominated by solar and wind, as shown in Figure 17.¹⁰⁴ Also included in the nuclear PPA totals shown in Figure 17, there are PPA's for which a price estimate was not readily available including two fusion energy PPA's and the two additional restart PPA's mentioned above (Palisades and DAEC). The two fusions PPA's include a 2023 PPA between Microsoft and Helion for power in Malaga WA¹⁰⁵ and a 2025 PPA between Google and CFS. for power in Deven, VA.¹⁰⁶

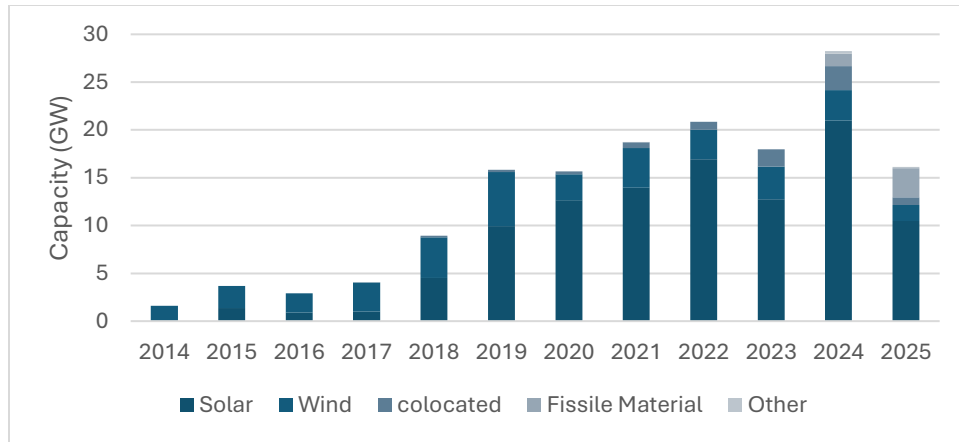


Figure 17: Annual U.S. Corporate PPA Volumes by Technology, Bloomberg New Energy Finance

Nuclear Power costs are expected to decline

The Department of Energy's (DOE) Office of Energy Dominance Financing (EDF), formerly the Loan Program Office (LPO) published expectations around the cost of new nuclear. The cost metric used is the Overnight Capital Cost (OCC), a simplistic metric unique to the power industry that evaluates the cost to build the power plant as if it were built immediately, without any cost of capital or debt interest. EDF expects the OCC of the next two-unit AP1000 to be \$8,300/kW in 2024 dollars.¹⁰⁸ EDF stated that the true cost of a First of a Kind (FOAK) build for the two AP1000s constructed at Vogtle should have been \$2,900/kW higher, or \$11,200/kW in 2024 dollars, due to the inefficiencies associated with building a first-of-a-kind reactor. In reality, Vogtle's OCC was \$15,000/kW in 2024 dollars for a two-unit AP1000.¹⁰⁸ The additional \$3,800/kW in costs was attributed by the EDF report to "Vogtle-specific inefficiencies," and the report details best practices to avoid cost overruns of this nature for future FOAK builds.

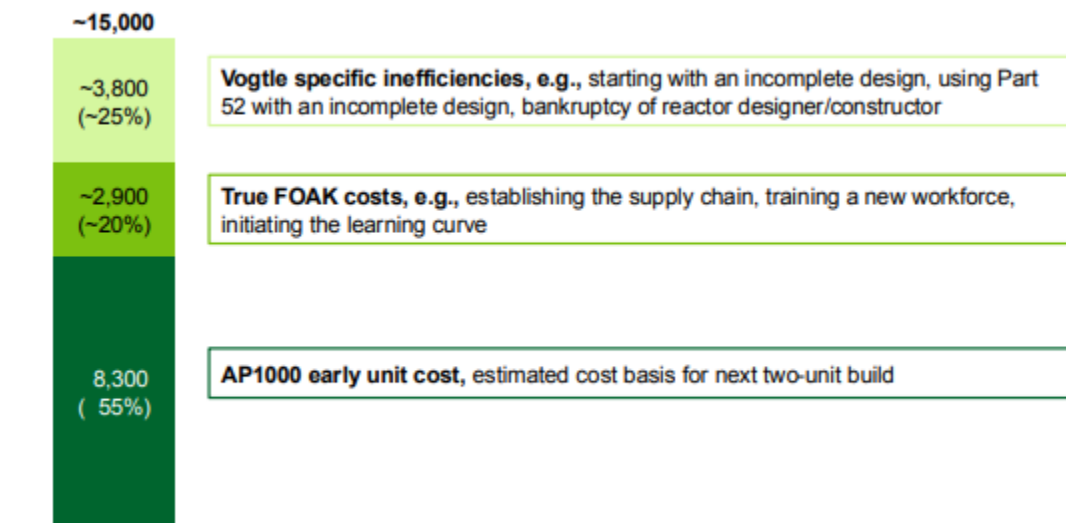


Figure 18: Breakdown of the cost of building Vogtle 3&4 in 2024\$

These cost estimates are on par with the cost of building a new reactor in France, and well above other global costs observed in countries building new reactors today, as seen in Figure 19.¹⁰⁷

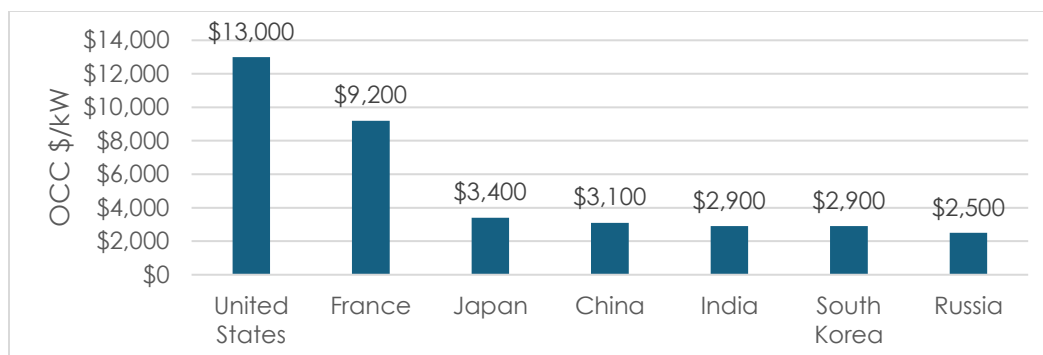


Figure 19: Historical Global Costs of Nuclear Reactors, 2000-2024

The EDF report further estimates that the OCC will continue to decline as additional plants of the same design are built, following the learning rate, or “learning curve”. According to the report, the ongoing design standardization, workforce experience building, and supply chain build-up can reduce the nth-of-a-kind (NOAK) cost, as shown in Figure 20.¹⁰⁸

Each nuclear reactor built in the U.S. was historically a custom design. Additionally, regulatory requirements changed after the Three Mile Island accident, so U.S. experience does not demonstrate the effect of the “learning curve”.¹⁰⁹

The EDF estimated the impact of the learning curve in their study, as

seen in the price difference between the FOAK and the NOAK in Figure 20. That effect has been observed in the real world in Korea, as seen in Figure 21.¹⁰⁹ There, the country coalesced around a standard design and, as a result, saw a drastic reduction in construction costs over time.

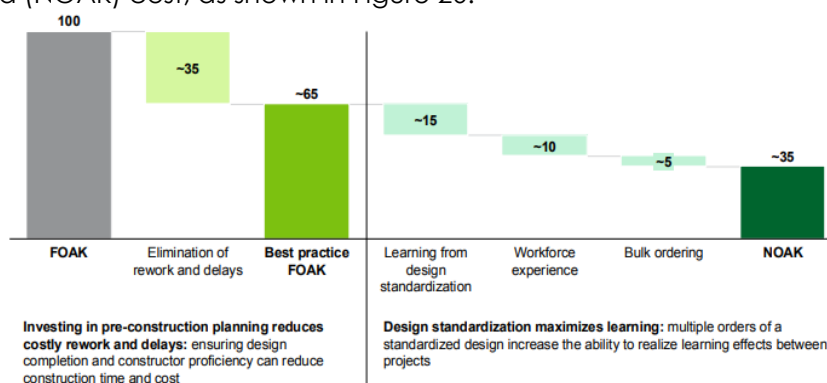


Figure 20: Predicted Relative Cost of Advanced Reactors for First of a Kind, and Nth of a Kind (%)

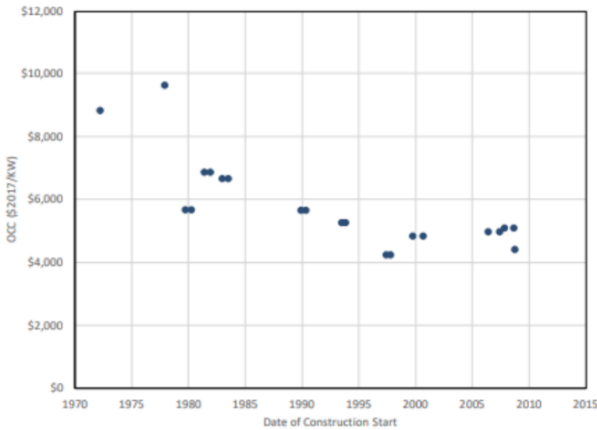


Figure 21: Construction Costs in Korea over time, using a standard design

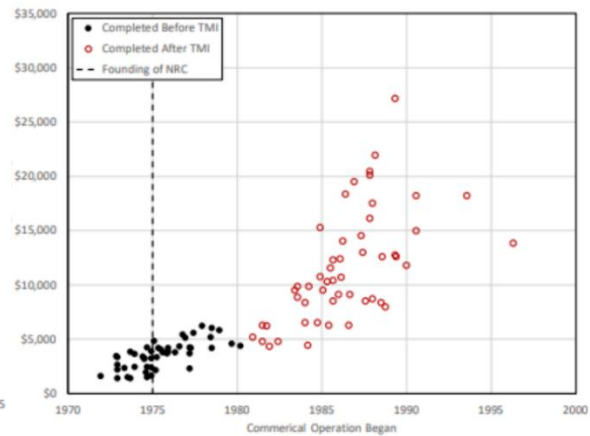


Figure 22: Historical Cost of U.S. Reactor Overnight Capital Costs Before and After TMI

While the United States had a high cost of construction from 2000 to 2024 (e.g. the construction of Vogtle 3 & 4), historic nuclear construction costs in the U.S. were significantly lower before the Three Mile Island incident, as seen in Figure 22¹⁰⁹. The earliest reactors were below \$5,000/kW, with costs ballooning to \$10,000-\$28,000/kW by 1989.

Of the many reactor vendors, most do not publish or announce all-in cost estimates. Considering that only 12% of the project costs are the reactor and the related nuclear steam system, the reactor vendors would need input from the engineering procurement and construction (EPC) firm, and data on the site specifics, to make a good, all-in OCC estimate.¹¹⁰ One exception is Rolls-Royce, which has publicly stated that their 470 MW reactor will have an OCC of approximately \$3 billion all-in¹¹¹. This figure, which normalizes to \$6,200/kW, is well below the FOAK cost expectations published by the EDF in 2024 but aligns perfectly with the EDF's FOAK estimates published in 2023.¹¹²

As the below analysis shows, a project cost of \$6,200/kW or \$8,300/kW OCC can create a competitive business case for nuclear power, providing returns acceptable to the investment community and a competitive all-in price for firm, reliable power. The EDF's "best practices" FOAK estimated cost of \$11,200/kW, on the other hand, would make the business case difficult, and is shown in the below analysis as the "high" cost case. Projects with costs of \$10,000/kW or more will likely need additional subsidies (besides the two subsidies included in the below analysis) to make the projects price competitive in the market.

Nuclear power costs, when subsidized, are competitive with other generators

The Levelized Cost of Energy (LCOE) is a method for incorporating capital costs, amortized over the project's lifetime, and operating costs, and normalizing those costs by the amount of energy the project produces. The shortfall of the LCOE method is that it doesn't account for the value of a technology's planning capacity or of a technology's ability to provide balancing services (i.e. regulation and ramping) needed by the grid. Furthermore, the LCOE doesn't account for project risk and thus newer unproven designs, such as the nuclear reactors, will likely have to have a lower LCOE to be competitive with proven designs on the market today such as natural gas plants of solar + storage.

The LCOE calculation shown in Table 2 assumes a range of possible OCCs and assumes the project is eligible for at least the minimum of the two federal subsidies described below: The Investment Tax Credit (ITC) and a loan from the Energy Dominance Fund (EDF). See section 4.a.iv.b for further explanation of these two federal policies that can have a large impact on the cost of new nuclear power plants and thereby, the power they produce. Additional assumptions are outlined in Appendix D.

Table 2: LCOE calculation for new Nuclear

	Nominal FOAK per EDF '23	Next AP- 1000 per EDF '24	"Best Practices" FOAK per EDF '24	OCC of Vogtle in \$2024
OCC rate (\$/kW)	\$6,200	\$8,300	\$11,200	\$15,000
Cap Ex Rate (\$/kW)	\$8,110	\$10,857	\$14,650	\$19,621
Capacity Factor	92%	92%	92%	92%
Investment Tax Credit	30-50%	30-50%	30-50%	30-50%
Equity %	20%	20%	20%	20%
Equity IRR	14%	15%	15%	16%
Lifetime	40	40	40	40
Debt Interest Rate	5.0%	5.0%	5.0%	5.0%
Variable O&M Rate (\$/MWh)	\$5.15	\$5.15	\$5.15	\$5.15
Fixed O&M (\$/MW-yr)	\$136	\$136	\$136	\$136
Fuel cost (\$/MWh)	\$8.88	\$8.88	\$8.88	\$8.88
LCOE at 30% ITC	\$62	\$89	\$75	\$99
LCOE at 40% ITC	\$58	\$83	\$70	\$93
LCOE at 50% ITC	\$55	\$78	\$65	\$87

To compare these figures to other energy technologies, the nuclear LCOE was overlaid on the Lazard LCOE+ analysis results from 2025¹¹³ in Figure 23, modified to account for the changes made in the One Big Beautiful Bill Act (enacted in July 2025) where most technologies become unsubsidized by 2027, except battery energy storage which will continue to be eligible for the ITC through 2033. Lazard's analysis does include nuclear (not shown), but it uses a higher OCC (based on Vogtle), excludes the effect of the ITC subsidy, uses higher debt interest rates, and assumes a higher equity stake (40%) compared to the above analysis (which assumes obtaining a loan from EDF is feasible). These assumptions resulted in a significantly higher range for nuclear energy LCOE in Lazard, compared to the LCOE shown in Figure 22.

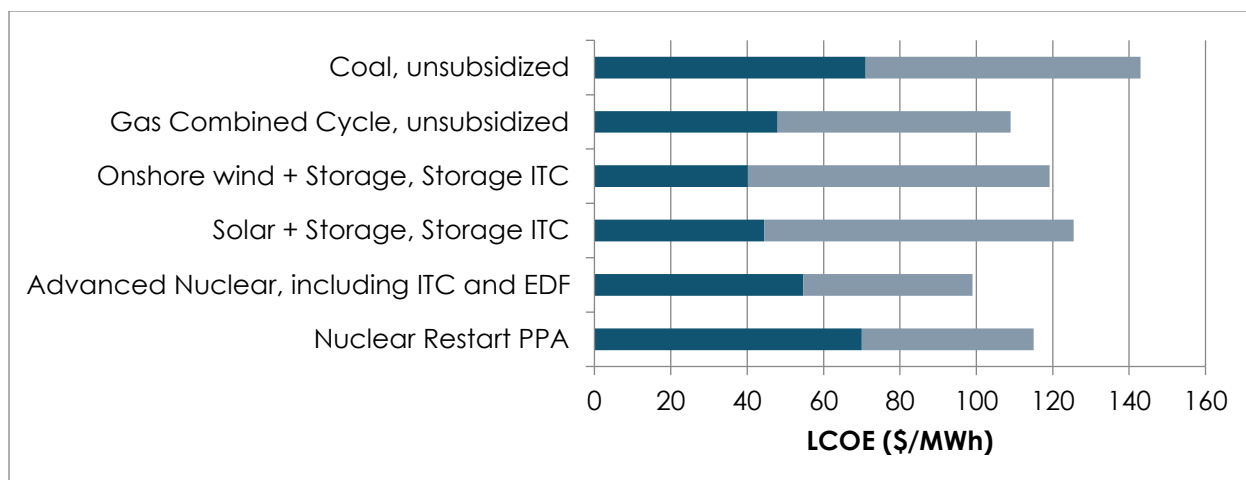


Figure 23: Nuclear Energy LCOE per above analysis, overlaid with Lazard's 2025 LCOE with post-OBBA subsidies

As seen in Figure 23, the lower end of the nuclear LCOE cost range is comparable to that of the higher end of new gas combined-cycle plants (the more efficient gas power plant type). Given the recent increase in the cost of construction of new combined cycle gas, natural gas LCOE values may be above the high end of the range in the coming years. Lazard's analysis used \$1,600/kW as its "high" scenario and yet a report by GridLab found that actual capital costs are rising to \$2,000/kW as of September 2025.¹¹⁴ Similarly, a report by Wood McKenzie in April 2026 found that the prices of the turbines themselves (not the all-in CapEx) have surged by 195% since 2019 to \$600/kW.¹¹⁵ With a higher risk of cost overruns, it seems that the prices on the higher end of the range, e.g. an ITC of 30% and an OCC of \$11,000, are far from being commercially competitive with gas.

4.1.iv Existing Policy

4.1.iv.1a Federal support of new nuclear through executive orders

Federal government policies can help support the deployment of new nuclear reactors. In May 2025, the Trump administration issued four executive orders aimed at jumpstarting a U.S. "nuclear renaissance."¹¹⁶

- **E.O. 14299: Deploying Advanced Nuclear Reactor Technologies for National Security:** Directs the rapid deployment of advanced reactors at Department of War (DOW) and DOE sites to support critical national security infrastructure.
- **E.O. 14300: Ordering the Reform of the Nuclear Regulatory Commission:** Mandates structural and operational reforms at the NRC to reduce regulatory delays and streamline regulatory oversight. The NRC is an independent federal commission led by 5 Commissioners appointed by the President and confirmed by the U.S. Senate. Commissioners are appointed for a 5-year term. Oversight of the NRC is provided by the U.S. Congress, including several House and Senate Committees.¹¹⁷
- **E.O. 14301: Reforming Nuclear Reactor Testing at the Department of Energy:** Expands DOE's role in testing advanced reactor designs, eases regulations for test reactors, and ensures access to critical nuclear fuel like HALEU.

- **E.O. 14302: Reinvigorating the Nuclear Industrial Base:** Aims to rebuild the broader nuclear industrial base through domestic uranium production, supply chain support, plant restarts, workforce training, and fuel recycling.

The overall target announced by the administration set in E.O. 14300, to quadruple the nation's nuclear capacity by 2050 to 400 GW, was an increase over the Biden administration's goal to triple nuclear capacity by 2050.

4.1.iv.1b Federal Incentives and Loan Guarantees for new nuclear

Investment Tax Credit: The primary lever used by the federal government to incentivize the construction of new nuclear is the Investment Tax Credit (ITC), specified by 26 U.S. Code § 48E. The ITC is worth 30-50% of the total project costs and is typically released upon the start of commercial operation (COD), but at times can be made available to projects during construction. The effect of this tax credit is significant and has the potential to greatly impact the LCOE, as shown in the above analysis. To qualify for the base 30% ITC, the project must have started construction by 2033 and must meet a variety of other requirements laid out in the Inflation Reduction Act (2022) and the One Big Beautiful Bill Act (2025), including the hiring of union labor and limited involvement of foreign entities of concern. To increase the tax credit to 40% or 50%, the project must qualify for one

or both of the ITC adders: 1) The project can earn a 10% adder if the project uses at least 55% domestic content. 2) The project can earn a 10% adder if the project is built in a DOE-designated "Energy Community".¹¹⁸ Most nuclear projects are expected to meet the domestic content adder because more than 55% of the work is expected to be done in the USA or on-site. There are some Energy Communities in Iowa (see Figure 24).¹¹⁹ Projects that begin construction in 2034 will be eligible for an ITC of 75% of the full value, and projects that begin construction in 2035 will be eligible for 50% of the original ITC value.¹²⁰ The ITC was originally a tax credit that applied to solar and wind projects and later battery energy storage projects. Therefore, the IRS has extensive guidance on how specifically the terms in the ITC apply to those technologies, including descriptions of the definition of "construction start", tables delineating the safe harbors for domestic content adders and foreign entity of concern suppliers, and the definition of "continuous construction".¹²¹

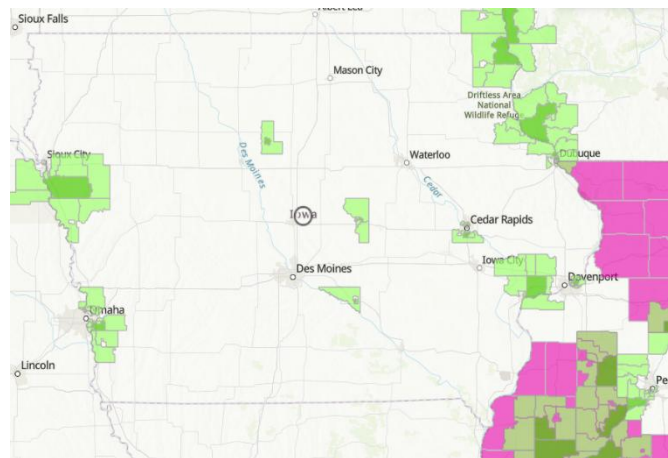


Figure 24: Energy Communities in Iowa

Most nuclear projects are expected to meet the domestic content adder because more than 55% of the work is expected to be done in the USA or on-site. There are some Energy Communities in Iowa (see Figure 24).¹¹⁹ Projects that begin construction in 2034 will be eligible for an ITC of 75% of the full value, and projects that begin construction in 2035 will be eligible for 50% of the original ITC value.¹²⁰ The ITC was originally a tax credit that applied to solar and wind projects and later battery energy storage projects. Therefore, the IRS has extensive guidance on how specifically the terms in the ITC apply to those technologies, including descriptions of the definition of "construction start", tables delineating the safe harbors for domestic content adders and foreign entity of concern suppliers, and the definition of "continuous construction".¹²¹

According to the Nuclear Energy Institute, the rules do not yet account for the specific nature of nuclear power plant development timelines and equipment supply chains, nor do they include safe harbor tables for nuclear components.¹²² The recommended guidance, that takes into account the long lead times, complex supply chains, first of a kind risks and extended construction schedules associated with advanced and large scale nuclear projects includes:

- nuclear-specific implementation guidance on key eligibility and compliance requirements,
- nuclear-specific “beginning of construction” rules,
- a 12-year continuity safe harbor for nuclear facilities, rather than applying the shorter continuity periods developed for less capital intensive technologies,
- nuclear-specific domestic content safe harbor tables, comparable to the safe harbor tables provided for wind, solar, and storage,
- clear nuclear-specific guidance on foreign entity of concern and prohibited foreign entity restrictions, including safe harbor tables and
- calculation methodologies that can be applied to nuclear fuel, major equipment, engineered components, and long-cycle procurement items.

Without this guidance, the industry members' group contends, the ITC may remain difficult to finance in practice, limiting its effectiveness as a tool to support new nuclear deployment and potentially limiting U.S. nuclear growth.

EDF Loan Guarantees: Another important incentive the federal government has in place to drive investment in new nuclear is the loan guarantee program run by the EDF. The EDF has \$250 billion in lending authority to fund new energy projects that use technologies that are not ready for commercial lending, and nuclear energy projects are eligible to receive all \$250 billion in loans. According to Energy Secretary Chris Wright, “By far the biggest use of those dollars will be for nuclear power plants — to get those first plants built.”¹²³

According to the Acting Chief Investment Officer at the EDF, “EDF can provide loans with tenors up to 30 years and finance up to 80% of eligible project costs. Interest rates are roughly as low as the matched maturity US Treasury plus 37.5 basis points.”¹²⁴ Both the interest rate and the debt-to-equity ratio are much better terms than a new technology, such as a new reactor design, could obtain commercially, and by lowering the interest rate and raising the debt-to-equity ratio, projects with EDF loans will be able to significantly lower the total cost of the power delivered. The EDF has had a role in many recent nuclear projects. The office issued a \$1.5 billion loan to Holtec to restart the Palisades nuclear power plant in Michigan. The office lent \$1 billion to Constellation for the restart of the Crane Clean Energy Center.¹²⁵ EDF, then known as the LPO, also provided an \$11.5 B loan to the Vogtle 3 & 4 Reactor project (a move that saved the project), helped the first two reactors come online in the US in over 35 years, and saved Georgia ratepayers over \$3 B in interest costs. In February 2026, EDF announced a \$25.6B loan to Southern Company, which included various technologies, including uprates (increasing the capacity rating of an existing plant through capital improvements) and licensing renewals for nuclear power plants in Alabama and Georgia.

Other programs for Nuclear-Energy Related Innovation:

The federal government has other programs that provide awards for new nuclear technologies; the key programs include:

1. As previously discussed, DOE's ARDP awarded funding in 2020 to two advanced reactor designs to demonstrate their first-of-a-kind reactor: 1) The X-energy XE-100 reactor being built in Seadrift, Texas; 2) The TerraPower sodium Reactor being built in Kemmerer, Wyoming, both of which are receiving 50% federal cost share.¹²⁶ Holtec, Kairos, and

others are in the risk-reduction part of the ARDP and are receiving smaller awards and a smaller (20%) federal cost-share to design and develop their reactors.¹²⁷

2. In July 2025, the DOE launched the Reactor Pilot Program, which provides an expedited pathway for advanced reactor developers to build demonstration reactors under DOE authorization, with a goal of achieving criticality for at least three advanced reactor concepts by July 2026.¹²⁸ In 2026, DOE also launched its Fuel Pilot Line program for companies to deploy facilities to manufacture fuel for the demonstration reactors.¹²⁹
3. The DOE's Gen III+ Light Water Reactor SMR program announced \$800 million in funding in late 2025 to support the deployment of two first-of-a-kind reactors: 1) Two Holtec SMR-300's being deployed by Holtec to Palisades Power Plant in Michigan 2) One GE Hitachi BWRX-300 being deployed by TVA to its Clinch River Site.¹³⁰
4. The U.S. Department of Energy announced \$2.7 billion in funding in January 2026 to expand domestic uranium enrichment capacity and support development of fuels needed for advanced reactors, including HALEU. The awards support four projects aimed at rebuilding the U.S. nuclear fuel supply chain and reducing reliance on foreign suppliers.¹³¹
5. The U.S. government entered a strategic partnership with Japanese investors and Westinghouse in October 2025 to support construction of at least \$80 billion of new nuclear reactors in the United States, primarily using the Westinghouse AP1000 design. The initiative is intended to accelerate large-scale nuclear deployment and strengthen the domestic nuclear supply chain.¹³²
6. Nuclear Energy University Program: In 2009, the US DOE created the Nuclear Energy University program to consolidate its university support.¹³³ The program provides funding to US colleges and universities for nuclear energy research, equipment upgrades, and educational support. Since 2009, the program has granted \$1.07 billion in awards to 139 universities and colleges.¹³⁴
7. In March of 2026, the US and Japan announced a deal for up to \$40 billion in Japanese investment for nuclear SMR projects in Tennessee and Alabama.¹³⁵ The initiative is part of a \$550 billion agreement finalized between the US and Japan in 2025, which lowered US tariffs on Japan in exchange for Japanese investment in the US industrial sector.¹³⁵

4.1.iv.2 Federal Regulatory Policies and jurisdictional bounds

NRC Jurisdiction

The Nuclear Regulatory Commission (NRC) is the competent authority in the U.S. for regulations that ensure commercial nuclear power plants are designed and operated in a safe manner, and the fuel and waste are handled and managed safely.

The NRC derives its primary authority from the Atomic Energy Act of 1954, which established the framework for the civilian use of nuclear materials, and the Energy Reorganization Act of 1974, which created the NRC as an independent agency to separate regulatory oversight from the promotional and developmental activities now housed in the Department of Energy. Under this legal mandate, the NRC holds exclusive jurisdiction over the licensing, inspection, and safe operation of commercial nuclear power plants, research reactors, and the management of nuclear fuel and waste. Its core mission is to provide reasonable assurance of adequate

protection for public health and safety, promote the common defense and security, and protect the environment. This authority is further refined through recent legislation like the ADVANCE Act of 2024, which directs the commission to streamline licensing processes and modernize its regulatory framework to support the deployment of advanced reactor technologies.^{59, 136}

Reactor Licensing

Nuclear reactor licensing can take one of three pathways defined in Title 10 (Energy) of the Code of Federal Regulations: Part 50, Part 52, and Part 53.

- Part 50 is a two-step process where the NRC first reviews and approves the site's construction permit and then reviews and approves the site's operating license.
- Part 52 is also referred to as a combined construction and operating license application (COLA). In a COLA, both licenses are sought in parallel.
- Part 53 final rule was issued in March 2026 and provides a risk-informed, technology-inclusive, and performance-based approach to reactor licensing, appropriate for advanced reactors. Part 53 retains all of the license options available under Parts 50 and 52.

The traditional, two-step licensing pathway is described in Title 10 CFR Part 50 ("Part 50"). In Part 50, the NRC first reviews and approves the site's construction permit and then reviews and approves the site's operating license. The construction license requires the project to have a selected preliminary design and conduct a thorough environmental study, including a detailed analysis of the geology, meteorology, and hydrology at the site, among other factors. All currently operating nuclear power plants, except Vogtle 3 and 4, were licensed under the two-step process described in Part 50.¹³⁷ In recent years, five projects have started the Part 50 process. Four nuclear reactors have received construction permits from the NRC, including: Kairos' Hermes 1 Reactor¹³⁸ and Kairos' Hermes 2 Reactor¹³⁹ at an Oak Ridge, TN site, Abilene Christian University's Natura reactor in Abilene, TX¹⁴⁰ and TerraPower's Sodium reactor in Kemmerer, WY.¹⁴¹ Two reactors have been submitted in proposed construction permits: X-Energy's Xe-100 reactor in Seadrift, TX,¹⁴² and the University of Illinois' KRONOS MMR in Urbana, IL.¹⁴³ In the Part 50 process, the operating license application typically begins once the reactor is under construction and is finalized when all the tests have been completed for the reactor to enter commercial operations. None of the 6 projects listed above have applied for their operating license.

Part 52 provides flexibility in licensing options. A combined license (COLA) authorizes construction and conditional operation of a nuclear power plant. A COLA must contain essentially the same information required in an application for an operating license issued under 10 CFR Part 50 and may incorporate by reference a standard design certification, an early site permit (ESP), both or neither. Additionally, a nuclear reactor manufacturer can get a design certification without a site, and a developer/owner may obtain an early site permit without a reactor design. The NRC can certify a reactor design through the rulemaking process, independent of a specific site. The issues that are resolved in a design certification rulemaking are subject to a more restrictive change process than issues that are resolved through the issuance of a license. An applicant can also apply for an ESP for approval of one or more sites separate from an application for a construction permit or combined license. ESPs address site

safety issues, environmental protection issues, and plans for coping with emergencies, independent of the review of a specific nuclear plant design. The two Westinghouse AP-1000 reactors built in Georgia followed the Part 52 licensing path to completion, although they required nearly 200 license amendments during construction as issues and design changes arose¹⁴⁴. These many changes have led other FOAK projects to pursue Part 50 instead, allowing them to begin construction and obtain the operating license thereafter. NuScale's SMR has received a design certification through this process. Several sites nationwide, including TVA's Clinch River site, have received an ESP.

It is possible for sites to get an ESP under Part 52 and then return to Part 50. When evaluating the construction permit application, the NRC will consider the information and approvals in the ESP, which will simplify obtaining the construction permit. Likewise, a technology with a design certification can also apply for a construction permit in Part 50. Again, the NRC will not repeat the work already done under the design certification and will instead focus on site-specific licensing issues.

Recent efforts for NRC regulatory reform

In 2024, Congress passed the ADVANCE Act, which aimed to modernize the NRC. The act included many aspects, but notable changes that directly impact the licensing of new reactors include: reducing licensing fees by reducing the hourly rate for license reviews, creating shorter and more predictable licensing timelines, and implementing new guidance and licensing pathways to address new technology types.¹⁴⁵

In January of 2025, the NRC updated its mission statement from being purely focused on its role in ensuring civilian nuclear activities are safe and secure to a new mission statement:

*"The NRC protects public health and safety and advances the nation's common defense and security by enabling the safe and secure use and deployment of civilian nuclear energy technologies and radioactive materials through efficient and reliable licensing, oversight, and regulation for the benefit of society and the environment."*¹⁴⁶

The new mission statement notably directs the NRC to "enable" the use of nuclear energy technologies and notes that the licensing processes should be efficient. Still, the requirement that the NRC protect public health and safety persists.

On May 23rd, 2026, in Executive Order 14300, the NRC was directed to accelerate the timelines for all new reactor licensing processes (construction and operational licenses) to a maximum of 18 months. The only exception to this deadline is if the applicant fails to respond in a way that is "reasonably diligent".¹⁴⁷ The executive order further instructed the NRC to modernize nuclear regulation and realign its culture to consider the benefits of nuclear energy and not "unnecessarily limit" nuclear energy use.

The results of these efforts have had a measurable impact on the licensing process in recent months. Kairos Hermes 1 reactor, a demonstration reactor, received its construction license in 24 months, while the Hermes 2 reactor, a significantly larger reactor with many similar design elements, was completed in only 16 months.¹⁴⁸ Using the new efficient processes, the NRC was allowed to reuse some parts of the Hermes 1 application analysis and approval process in their review of Hermes 2 and only consider the changes. The Kemmerer, WY power plant, a

TerraPower Sodium reactor, received its construction permit in 24 months (from submission of the original application through construction permit approval), despite being the first commercial non-light-water reactor ever permitted.¹⁴⁹

Other executive orders have also affected nuclear power regulations. For example, an executive order issued in January 2025, “Unleashing American Energy,” mandates that agencies review, rescind, or sunset regulations that constrain energy development. Most notably, the administration ordered the government to rescind National Environmental Policy Act (NEPA) regulations and replace them with streamlined agency-level procedures. Nuclear projects receiving federal assistance, including the ITC or an EDF loan, have to comply with NEPA regulations, so streamlining those regulations will impact most new nuclear projects.

4.1.iv.3 State-level nuclear-related policies across the U.S.

There are more than 250 nuclear-supportive state “actions”, including state legislation, resolutions, and other executive branch actions that have been documented by the Nuclear Energy Institute over the past 10 years.¹⁵⁰ Policies include grants that stimulate development activities, expanding existing programs to include nuclear, and designating particular working groups, offices, or coalitions to maintain dialogue within the state. Many states have a multi-pronged approach to nuclear development policies. The National Association of State Energy Officials (NASEO) classified the state approaches into four categories:

- “Deployment-focused”: Active pursuit of new projects
- “Exploratory”: Setting up task forces, working groups, dockets, and community engagement processes
- “Supply chain-focused”: Focus on manufacturing and fuel processing opportunities
- “Constrained”: Some states completely limit nuclear power (moratoria) or have policies in place to limit its development.¹⁵¹

Texas

Texas is an example of a “deployment-focused” state and has taken several actions to encourage in-state new nuclear development. Texas began in 2023 by setting up a Texas Advanced Nuclear Reactor Energy Working Group, which issued a report detailing its recommendations in 2024.¹⁵² Texas created the Texas Advanced Nuclear Development Fund (House Bill 13, 2023), a \$350 million fund that assists companies’ nuclear energy development efforts in the state throughout the project’s life cycle. The fund has the potential to grow to up to \$2 billion in funding over time, which can cover up to 60% of a project’s costs with state-backed loans.^{153,154} The state created an office, the Texas Advanced Nuclear Energy Office (TANEO), to coordinate new nuclear projects with state agencies and to administer the TANEO fund. To prepare its workforce, the state created the Advanced Nuclear Energy Workforce Development Program (S1535). Additionally, Texas has three notable project announcements in the state that may be tied to these policies: The Fermi America Matador site with a planned deployment of four AP1000’s, the DOW chemical plant X-Energy reactor project (though that site was selected in May 2023, before many of these announcements were finalized) and the Texas A&M RELLIS site in Byrum, TX which is slated to host a Last Energy Microreactor Demonstration pilot.¹⁵⁵

Kentucky

Kentucky, a commonwealth with no existing nuclear power plants, has moved from a “constrained” state in 2016 through its “exploratory” phase and is now a “deployment-focused” state with multiple programs in place. Starting in 2017, Kentucky legislators repealed the state moratorium on new nuclear power plants. Throughout 2022, Kentucky engaged DOE’s NE GAIN program to host a series of webinars and educational events for key state stakeholders. In March of 2023, Kentucky established a Nuclear Energy Development Workgroup to guide strategy in the commonwealth. The group found there were no insurmountable barriers to the development of nuclear energy in the state and made policy recommendations for moving forward.¹⁵⁶ In April of 2024, the passage of SB198 created the Kentucky Nuclear Energy Development Authority (KNEDA) to foster the nuclear energy ecosystem. The 2024 budget, House Bill 1, included \$20 million in initial funding for KNEDA to administer for siting studies, supply-chain planning, and workforce development projects.¹⁵⁷ In 2025, Senate Bill 179 created the Kentucky Nuclear Energy Development Grant Program with grant amounts up to \$2 million.¹⁵⁸ KNEDA made the first \$8 million in awards under that grant program in March of 2026.¹⁵⁹ In 2025, KNEDA began to offer a designation process for “nuclear-ready” communities. To get this designation, communities (defined as counties) had to hold at least two public education meetings, identify suitable development sites, and have some form of formal demonstration of local support, such as a resolution or a ballot initiative. In 2026, the General Assembly passed Senate Bill 57, which creates the Nuclear Reactor Site Readiness Pilot Program, housed under KNEDA, with a \$25 million budget to cover up to one-third of NRC license application costs.

Nebraska

Nebraska has several approaches to incentivizing nuclear power in the state. In 2021, with Legislative Bill 84, renewable energy was redefined to include nuclear energy. This made nuclear projects eligible for the state’s renewable energy business tax incentive. In 2022, Nebraska established the Nuclear Plant Siting Feasibility Study Program, administered through its Department of Economic Development. The program was funded with \$1 million and “federal grant funds [from the American Recovery and Reinvestment Act] to a political subdivision to conduct a feasibility study to assess (1) siting options for new advanced nuclear reactors throughout Nebraska (2) existing electric generation facilities based on key compatibility assets for advanced nuclear reactors.”¹⁶⁰ The siting study was completed in 2023.^{161,162} In 2023, the legislature passed Legislative Resolution 178, which commissioned a statewide interim study on the feasibility of constructing and operating SMRs in the state. Also in 2023, Legislative Bills 568 and 565 established a 12-member Working Group appointed by the Governor to study workforce training needs related to nuclear energy and hydrogen production.¹⁶³ While not a state policy, four public electric utilities (three based in Nebraska and one in Oklahoma) formed a consortium in 2025 to explore the feasibility of deploying 1-2 GW of new nuclear within Nebraska.¹⁶⁴

Other notable policies to incentivize development activities

Many states have begun their nuclear development policies by designing early development grant programs because they directly address the biggest barrier to new reactors: high upfront risk before a project is financeable. For example, the Tennessee Nuclear Energy Fund (FY 2023–

2026 budgets) provides roughly \$70 million in grant funding (initially \$50M, later expanded) to support site preparation, workforce development, and supply chain development, enabling projects to overcome early-stage hurdles that private capital is reluctant to fund.¹⁶⁵ In addition, the state awarded \$50 million in grant funding directly to TVA's Clinch River project. Wyoming leveraged a more general energy project fund, the Wyoming Energy Matching Fund, to award \$100 million to BWXT to site a \$500 million nuclear fuel facility in the state.¹⁶⁶ These policies are meant to attract investors in nuclear energy, both by incentivizing their activity in the state and by including a stake that assures the state's own buy-in. Developers are attracted to early development funding opportunities because the early phase is typically the riskiest in the development timeline and therefore most difficult to finance.

Other notable state siting policies and approaches

A few states have conducted comprehensive statewide siting studies for new nuclear power plants. Wisconsin's Act 125 (2025) initiated a statewide siting study.¹⁶⁷ In Virginia, House Bill 2473 (2024) funded a feasibility study for seven candidate sites in Virginia's Lenowisco region.¹⁶⁸ While not a state policy, precisely, in Arizona, a consortium of three major utilities began working together on a three-year siting study in 2026.¹⁶⁹

Indiana's approach to nuclear power plant siting is more general, and the law (House Bill 425, 2024) applies to all new power plants. The law establishes "Energy Production Zones", which are sites that have existing operating power plants (not including wind and solar). It allows local authorities within these Energy Production Zones to temporarily (up to one year) block siting, construction, or deployment of additional energy generation facilities.¹⁷⁰ This certainty of a maximum one-year delay from local zoning and permitting restrictions reduces risk to nuclear energy development projects. New York also has a unique siting policy for its state-run utility, NYPA, which was directed by the governor to build a nuclear power plant in the state. Instead of approaching sites to gauge their interest in hosting a nuclear power plant, NYPA issued an RFI asking host communities to volunteer to host the new nuclear power plant. This novel approach generated enthusiasm among private developers as well, who felt that the RFI responses de-risked community acceptance in the responding counties in NY.¹⁷¹

4.1.v Remaining Challenges

4.1.v.1 Nuclear reactor project cost risk and financing

While there is great momentum around industry today, it has not reached a level of maturity where project formation and financing are standardized. Rather, each project must be considered independently, risk must be shared and allocated appropriately among the participating parties, and government support must also be leveraged individually. The big banks, such as Citi, JPMorgan, Goldman Sachs, Bank of America, and Morgan Stanley, have all publicly stated that they cannot invest in new nuclear projects under the current financial regulatory environment given the risk profile of these investments.¹⁷² The key reasons are:

1. **Cost overruns:** Only two advanced reactors have been built in the U.S., the Vogtle 3 and 4 units, and they were completed with about 2.5 times their original budget and 10 years over schedule.¹⁷³ The V.C. Summer Expansion project in South Carolina,¹⁷⁴ a similar project with two AP1000 units planned, was canceled after \$9 billion had been spent, due to cost overruns. This is consistent with the broader US experience in building nuclear

power plants, where 90% of all plants have been over budget. The average cost overrun has been 102%.¹⁷⁵

2. **Misestimated costs:** Another advanced nuclear project, the Carbon Free Power Project in Utah, was canceled when the projected cost of the project grew significantly, in turn increasing the projected price of the energy. The project failed to subscribe the originally committed buyers to the new price and was therefore cancelled.
3. **Few advanced projects underway:** Of the advanced reactor projects underway, only four have received a construction license from the NRC. That includes the TerraPower Project in Wyoming, two Kairos test reactor projects, both of which will be built in Oak Ridge, Tennessee, and one Natura 1 MW_T molten salt research reactor to be built at Abilene Christian University.¹⁷⁶ Of those, only one is a commercial reactor (TerraPower), and of the remaining three reactors, only one will produce electricity at all (Kairos Hermes 2).
4. **Long construction timelines, complex construction:** Nuclear power plants typically expect a 4 to 6 year construction timeline, far exceeding the two-year timeline expected for a typical gas plant and the 1-2 year construction timeline for solar and battery energy storage projects. Further, the construction is complex compared to the highly modular and repeatable solar and battery installations. All of these factors can introduce additional risk of schedule and cost overruns.

Reasons for Cost Overruns

The costs are largely driven by work that is not nuclear in nature. From EPRI:

*"...the direct cost of the nuclear island was found to be less than 20% of all direct costs (i.e., 80% of on-site labor, on-site materials, and off-site manufacturing are for components in the balance of plant). Therefore, the perception that only the NSSS [nuclear steam supply system] reactor hardware cost that must come down to make nuclear competitive is not correct; significant savings should also be pursued in the balance of plant."*¹⁷⁷

The risks associated with building a new nuclear reactor, particularly the supply, licensing, and construction of the reactor, do contribute significantly to the schedule risk, which in turn affects the cost risk. Still, that points projects down the path of managing schedule risks above all else in order to contain both direct costs and construction financing costs. Also from EPRI:

*"The most significant cost reduction strategies found were those that were able to reduce construction duration, in addition to the savings in labor and to a lesser extent, the savings in materials. These savings are further amplified when accounting for reduced interest costs."*¹⁷⁷

After the construction of Vogtle, which was completed far above the original cost estimates, the EDF summarized the lessons learned¹⁰⁸ to avoid such events happening in the future:

- Complete Design
- Constructability Review
- Detailed Schedule Planning
- Clear and Consistent QA/QC standards

- Ongoing risk assessments
- Invest in intensive workforce training

The EDF notes that because the design was incomplete, perhaps only 5% complete when the original cost estimates were made, the changing cost was in part attributed to cost underestimation and not just cost overruns. Note that the COVID-19 pandemic and ensuing supply chain disruption contributed to cost overruns for the Vogtle project.¹⁰⁸

Mitigating Financial Risk by Sharing Risk

One important way to control risk is when project owners strategically share risk with suppliers and EPC firms. For a project developer, they can place all the risk on the EPC firm or technology development firm if those counterparties are creditworthy and willing to accept fixed-price contracts. However, the size of these companies relative to a new nuclear project often means they cannot provide a fixed-price contract, or, if they did, a failure to meet it would result in potential company bankruptcy. During the Vogtle project construction, the prime contractor went bankrupt and thus, the fixed-price contract that they began with did not protect the owners from the cost overruns. Price mechanics (including incentives to build the project at or below the target cost and penalties associated with cost overruns and schedule delays) are ways to share the risk with the EPC firms and technology providers without asking them to shoulder the entirety of the cost overrun risk.

There are other ways to share risk as well:

- 1) **Multiple Owners:** In early projects, risk sharing is often accomplished by having others take on a minority equity stake. This was the case with Vogtle, where multiple utilities came together as co-owners to build the project.¹⁷⁸ This was also a strategy used by the UAMPS project. UAMPS used a special-purpose vehicle (SPV) called the Carbon Free Power Project in Utah, backed by several utilities across 6 states.¹⁷⁹ As mentioned above, the UAMPS project was ultimately abandoned when cost estimates rose, and it failed to meet its power subscription limits.
- 2) **Share non-recurring development costs:** Cross-project collaboration can reduce risk by having multiple projects co-invest in the cost of non-recurring engineering, such as design finalization. One instance in which costs were shared across projects is the consortium among TVA, OPG, and Synthos Power. Each project had planned to buy a GE-Hitachi BWRX-300, and each contributed to the cost of finalizing the design and preparing its documentation for regulatory filings.¹⁸⁰
- 3) **Leverage percentage-based incentives and programs:** Projects that leverage the federal government's incentives that are based upon percentages of total actual costs are sharing some of the risk with the federal government. For example, if a project qualifies for a 50% ITC and experiences a cost overrun, half of the overrun costs will be payable by the ITC and are not a risk to the equity financiers.
- 4) **"Buyers Club":** In early projects, there may also be cross-project collaboration to share the costs and risks associated with building the first-of-a-kind project. The Nuclear Scaling Initiative (NSI), a nuclear-focused nonprofit coalition, has proposed creating "buyers clubs" among new nuclear project development teams to share FOAK costs and risks across projects.¹⁸¹ This model has not yet been executed, but has been suggested by

NASEO, which has a working group called “First Movers”, as a way the states may work together to minimize costs.¹⁸²

- 5) **Cost overrun insurance:** Finally, many in the community, particularly the NSI, advocate for the creation of a cost stabilization facility, also at times referred to as cost overrun insurance.¹⁸¹ This would likely need to be funded by the federal government, though advocates such as NSI propose that the private sector may be able to create such an insurance instrument if they can diversify sufficiently among projects and technology types. Notably, there are no private players publicly considering a cost stabilization facility at this time. Likewise, the government has stated that the incentives in the ITC and the EDF should be sufficient to derisk new nuclear projects. As such, the federal government is not considering creating cost overrun insurance at this time.¹⁸³

Avoid or Mitigate Financial Risk Where Possible

The key financial risks of building the new nuclear reactor (including design, constructability, licensing, supply chain, and workforce issues) can be managed by applying lessons learned from Vogtle and by creating an environment that incentivizes integrated project teaming. A large portion of risk can be controlled by minimizing project development risks associated with other decisions throughout the project lifetime. Some possible decision points that can minimize risk include:

- 1) **Site Selection:** Early advanced nuclear projects can reduce the risk of site-specific licensing issues by picking sites that do not require any special NRC exceptions for the guidelines given in the CFR including the seismic, population and geological guidelines. Sites can minimize the risk of cost overruns by identifying well-understood geological conditions optimal for construction. Sites can minimize the risk of community pushback by seeking locations where the local population and authorities with jurisdiction, including state, county, and local governments, are supportive of new nuclear and value the benefits the technology can bring. Brownfield sites with former or existing infrastructure may be more receptive to nuclear energy development. In 2022, the DOE published a report exploring the possibility of coal-to-nuclear transitions.¹⁸⁴ In 2024, the DOE published an Information Guide on coal-to-nuclear transitions.¹⁸⁵ Using sites with existing geological data or NRC approvals can also reduce the risks associated with early development efforts, such as sites with existing nuclear power plants
- 2) **EPC Selection and Integrated Project Teaming:** Projects can select an experienced, capable, and reputable EPC firm that has teamed early in the nuclear development process with subcontractors and other trades that are capable and familiar with the designs and complexity of nuclear construction. This will minimize the risk of cost overruns through proper material procurement, adequate staff availability throughout the project, and familiarity with the specific designs/nuances of each nuclear technology.
- 3) **Leverage Existing Nuclear Supply Chain:** Projects, or the technology vendors that are chosen by projects, can leverage existing nuclear supply chain and experienced nuclear workforce where feasible to ensure continuity between the existing fleet and the lessons learned by those manufacturers and the new fleet.
- 4) **Technology Due Diligence:** When working with a nuclear technology company with little or no project history, the project team can conduct in-depth technical due diligence of the company.

- 5) **Deploying an SMR instead of a GW scale reactor:** Because the total price of the SMR is lower than that of a traditional reactor, cost overruns are likely to have a smaller total value and therefore a lower inherent risk profile. Also, the smaller size and modularity of the SMR designs promise to move more of the work from the site to the factory, providing greater continuity in procurement activities, lower field labor requirements, and improved schedule performance. Figure 25¹⁰⁸ below, from the EDF, illustrates this effect. According to EDF's analysis, SMRs will be more expensive on a per-kW basis, but their smaller overall size and cost help investors limit their total risk exposure. Because there are not yet many advanced reactors completed, it still remains to be seen whether the costs of SMRs will be higher or lower on a per-kW basis as these projects have not yet been proven with real project price data. It may be that the ability to move work to the factory and to control the schedule more tightly due to the design's modularity may ultimately lead to lower costs for SMRs on both a total and a normalized basis.

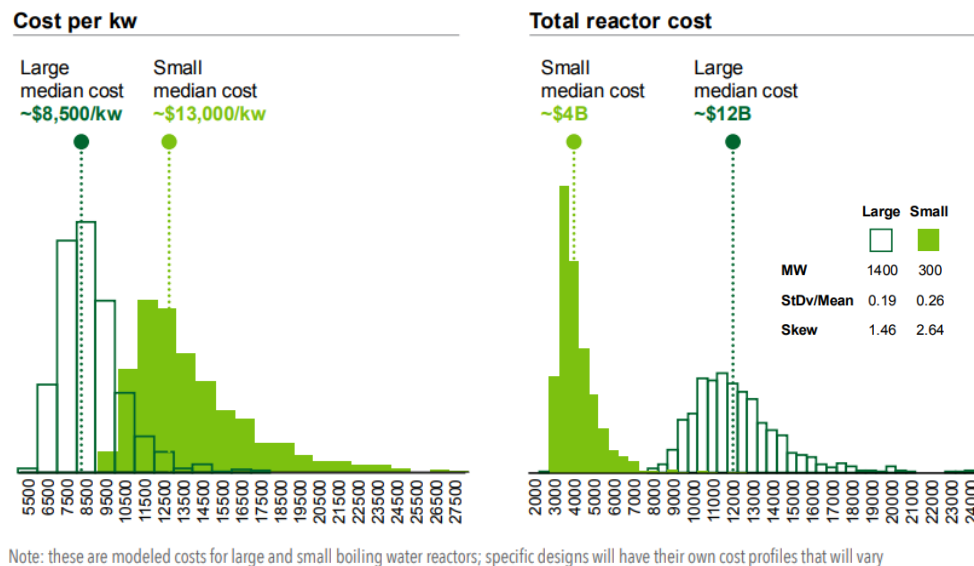


Figure 25: Probability Distribution of Projected Project Costs for Large and Small BWRs

4.2 Nuclear in Iowa

4.2.i Iowa nuclear history and siting readiness

Iowa Nuclear History

Iowa's role in nuclear energy began during the Manhattan Project, when Ames Laboratory at Iowa State University developed the Ames Process, a method for producing high-purity uranium metal that was critical to early reactor fuel and wartime efforts.¹⁸⁶ The state's only commercial nuclear plant, Duane Arnold Energy Center in Linn County, began operation in 1975 and operated a 615 MW GE BWR (Type 4). The plant was a major regional employer, supporting about 500 jobs regularly and roughly 1,000 during refueling and operations, before it was shut down in 2020 after a derecho damaged it three months before it was scheduled to cease

operations for economic reasons.¹⁸⁷ Citing the need for reliable, baseload power to support cloud and AI infrastructure, NextEra, the plant owner, announced in 2025 that the plant would restart, with a planned 2028 online date.¹⁸⁸ Iowa State University had a leading nuclear engineering program through 1997, when it was discontinued. The university continued a minor program through 2019, when that, too, was ended. Iowa State University also had a research and training reactor, the UTR-10, that was decommissioned in 2000.¹⁸⁹

Despite having only one in-state reactor, Iowa has long been influenced by nearby plants in the Midwest. The Quad Cities Nuclear Power Plant in Illinois, located just across the Mississippi River from Iowa, is jointly owned by Constellation and MidAmerican Energy and employs Iowa residents. The Cooper Nuclear Station is approximately 27 miles from the Iowa border, as well.

4.2.ii Nuclear energy technology integration to Iowa's grid

Iowa, due to the abundance of wind power plants, produces abundant energy; more energy than the state consumes. In 2025, for example, Iowa generated 74 TWh of energy at utility-scale power plants, yet retail sales and utility-scale self-generation were only 59 TWh. Still, Iowa's grid does have two key constraints on the horizon: Need for accredited capacity and need for load-following capability.

- 1) **Need for accredited capacity and nuclear's expected accreditation:** With the recent changes to the accreditation methodology, a 100 MW nameplate capacity wind farm will go from being accredited at about 13 MW in the summer of 2023-2024 to about 7 MW by 2032. Given the high concentration of wind resources in Iowa, this could have an impact across the state. Nuclear power is a very reliable resource. With an uptime in the low 90% range (see Section 4.a.i), MISO's initial nuclear accreditation calculations yielded accreditation of 92% in the summer, 94% in the fall, 85% in the winter, and 81% in the spring. With an average of 88%, this makes it the resource with the third-highest accreditation overall: hydropower has an average of 95%, and gas combined cycle has an average of 89%.¹⁹⁰ Further, if multiple SMRs are deployed at a single site, the outages can be staggered such that the entire capacity of the plant is not offline at a single time. In addition, some advanced reactor designs, such as X-energy's Xe-100 reactor, are designed for on-line refueling, also potentially increasing the plant's capacity factor.

- 2) **Need for load following, and nuclear's capabilities thereto:** Due to the nature of wind resources and the utilities' heavy investment in wind, the Iowa grid requires other power generators to be load-following. Ultimately, the power demand, net the renewables producing at any given moment, called the "net load", must be met by a utility's dispatchable power generators. The more renewables there are the more the net load curve can dip to lower values or even negative numbers, forcing even baseload resources to turn down. Nuclear resources are not typically used for load following, primarily for economic reasons. The capital expenses for nuclear power plants are very high and uncertain, estimated

at \$6,400/kW and higher for First-Of-A-Kind units. Capital costs are fixed, so repayment of capital cost loans must continue regardless of how much energy the plant produces. Likewise, most operating expenses are fixed costs, including operators' salaries and regularly scheduled maintenance activities. Nuclear reactors do not typically save much cost when they reduce their output: 90% of an NPP's costs

are fixed costs, and even the fuel costs are not reduced by much when the power output is reduced. For example, reducing the power by 50% would only allow the plant to save 4-5% of their fuel costs.¹⁹¹ In France, nuclear power accounts for 75% of total generation, and its existing light-water reactor fleet does load-follow to some degree, as shown in Figure 26.¹⁹² In 2001, the European Utilities Requirements (EUR) added a standard for new nuclear capacity that included load-following capabilities. In the EUR standard, new nuclear must be capable of continuous operation between 50% and 100% of its nameplate power, and it must have a ramp rate of at least 3% per minute up and down.¹⁹² In 2011, EPRI issued guidelines for new nuclear in the U.S. that align with the European requirements.¹⁹² The one exception to this is TerraPower's Sodium reactor, which can store energy in the molten-salt coolant loop. By raising the temperature of the salt, the plant can increase its output from 345MW, its baseload capability, to 500 MW for up to 5.5 hrs.¹⁹³ The modern reactors listed below also advertise load-following among their attributes, but do not store energy as the Sodium reactor does; they can only turn down their power output to avoid overgeneration on the grid, with little or no cost savings (nuclear power plants can be paired with an energy storage system if load following were important at that location):

- a. Westinghouse's AP-1000 is capable of a ramp rate of 5% per minute up or down and a minimum power of 15% of full power.¹⁹⁴

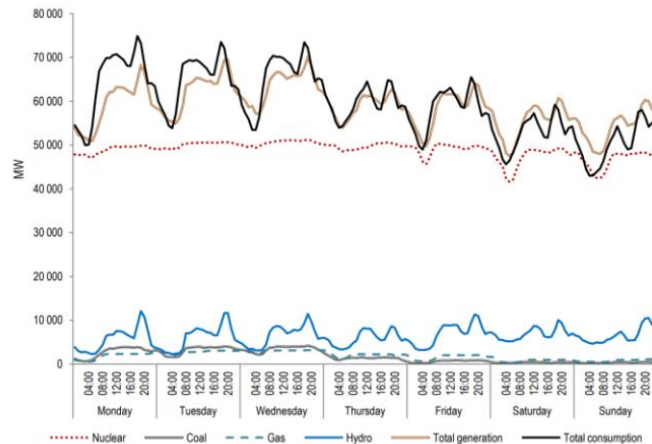


Figure 26: Load Following by Generation Types in France, 2010

- b. NuScale SMR reactor has a ramp rate of 10% per minute up and down when using a turbine bypass valve but it can thermally ramp its reactor's thermal output at a rate of 40% per hour.¹⁹⁵
- c. GE Vernova Hitachi's BWRX-300 can ramp up or down at 0.5% per minute down to 50% of its nameplate capacity.
- d. X-Energy's XE-100 can ramp down or up by 3% per minute down to 40% of its nameplate capacity. There are no fuel savings when reducing the power output.

4.2.iii Iowa's existing relevant policy framework

As described in Section 3, the state of Iowa has a history of leading new energy technology development. Iowa's geographic and topographic characteristics (generally flat and windy) allowed the state to expand wind energy production facilitated by the early adoption of the 1983 Renewable Portfolio Standard (RPS).¹⁹⁶ The RPS required Iowa utilities to build 105 MW of renewable generation, far exceeded by current in-state wind and solar generation totaling 14 GW (as of 2024).¹⁹⁷

In 2010, the Iowa legislature considered a bill that required certain rate-regulated public utilities to prepare for the possible construction of low-carbon-emitting nuclear generation facilities. The Iowa House included this language in House File 2399, which also permitted all rate-regulated public utilities to make significant alterations to existing generation facilities. The nuclear-related language was later repealed, reflecting public and political hesitation to expand nuclear energy generation facilities in the US at this time.¹⁹⁸

Iowa also recognized nuclear as an asset in the energy portfolio in 2016 with the creation of a state-wide Energy Plan including 15 objectives and 45 strategies to encourage growth in all of Iowa's energy sectors. The 15 objectives support the following 4 pillars: Economic Development and Energy Careers, Energy Efficiency and Conservation, Iowa's Energy Resources, and Transportation and Infrastructure. While nuclear energy is noted in the Plan, *"the working group decided that although nuclear power provides benefits as part of the existing portfolio, federal regulatory and cost constraints keep nuclear power from playing a greater role in the near term"*.¹⁹⁹ A 2018 progress report did not mention nuclear energy, further illustrating the state of nuclear development in Iowa at the time.²⁰⁰

As the national conversation around energy demand gained momentum, Iowa continued to consider legislation related to nuclear development. In 2024, the Iowa legislature considered House File 2554, which would have allowed utilities to use their rate base to support the development of energy infrastructure (including nuclear facilities), but the bill ultimately did not pass.²⁰¹

While House File 2554 failed, the Iowa legislature passed House File 2279 in 2024, which expanded the definition of "alternative energy production facilities" to include nuclear and energy storage, thereby allowing these technologies to qualify under the RPS.²⁰² The addition of nuclear energy to the definition of "alternative energy production facilities" allows utilities to support early site development activities for nuclear power plants through advanced ratemaking, under Iowa Code 476.53.²⁰³

In the past two years, public opinion²⁰⁴ and the federal policy landscape for the nuclear energy sector have continued to change. In 2025, President Donald Trump released four Executive Orders related to the nuclear industry, as explained in section 4.a.iv.1 a.²⁰⁵ Recognizing the opportunities that this policy shift created for Iowa, Governor Kim Reynolds released Executive Order 17 in 2025, establishing the Iowa Nuclear Energy Task Force, commissioning this report, and signaling Iowa's interest in the nuclear sector.²⁰⁶

In 2026, the Iowa legislature passed House File 2757 to incentivize the restart or deployment of new nuclear power plants. The legislation grants sales and use tax exemptions for constructing, operating, repairing, relicensing, or restarting nuclear energy generation facilities in Iowa. The fiscal analysis estimates that the measure will cost the state about \$41 million in lost revenues from 2027-2029.²⁰⁷ Additionally, nuclear facilities are required to contribute \$2,200 per MW to a new fund, the Nuclear Energy Workforce Fund (the Fund) while receiving the tax exemptions (with a cap of 4 years).²⁰⁸ The tax exemptions apply retroactively to qualifying purchases made on or after January 1, 2025, and are effective as of July 1, 2026.

The Fund will be distributed by the State Board of Regents to the Regents Universities to maintain programs and equipment for nuclear workforce development. For a 300 MW SMR, that would amount to \$660k per year, for the 615 MW Duane Arnold Energy Center that will be about \$1.4 million per year and for a large GW scale reactor like the AP-1000, that would be about \$2-\$2.2 million per year for 4 years.

4.2.iv Nuclear workforce requirements

Iowa's future participation in nuclear energy, particularly in advanced reactors such as small modular reactors (SMRs) and microreactors, is likely to depend on the development of a highly skilled, multidisciplinary workforce. The scale and specialization required extend beyond traditional energy sector roles and demand early, coordinated investment.

A central need is to develop a nuclear-qualified technical workforce capable of supporting plant design, construction, operation, and maintenance. This includes nuclear, mechanical, electrical, civil, and other types of engineers, reactor operators, radiation protection specialists, instrumentation and controls technicians, welders certified for nuclear-grade fabrication, and quality assurance professionals. Because nuclear facilities operate under strict regulatory frameworks, workforce training would need to align with Nuclear Regulatory Commission (NRC) standards and industry certification pathways (see Appendix C.3 for a full overview of regulatory training and certification frameworks).^{209, 210}

In addition to plant-specific roles, Iowa may require a broader supporting ecosystem for the workforce. This includes professionals in project management, cybersecurity, environmental compliance, emergency preparedness, and supply chain logistics ^{211, 212, 213}. As nuclear projects are capital-intensive and highly regulated, expertise in licensing, permitting, and regulatory affairs is likely to be important at both the state and utility levels.

One potential driver of workforce demand is the anticipated convergence of nuclear energy with industrial decarbonization ^{214, 215, 216}. Iowa's agricultural and biofuels sectors may increasingly require clean process heat and hydrogen production, creating demand for workers who can operate integrated energy systems. This expands workforce needs into "hybrid" skill

areas that combine nuclear engineering with chemical processing, agricultural systems, and advanced manufacturing. These cross-disciplinary requirements are reflected in workforce scaling assumptions (see Appendix C.1, Scaling Methodology).

Workforce scale is another defining need. Even a single advanced reactor deployment can require thousands of workers during construction and several hundred permanent positions during operation (see Table 1) 212· 217. If Iowa pursues multiple deployments or nuclear-enabled industrial applications, workforce demand could increase substantially. This underscores the potential value of establishing training pipelines years in advance of deployment (see Appendix C.5 for phased workforce development timeline).

The approximate workforce composition for operating nuclear power plants, including SMR-scale and large-scale facilities, can be summarized by job category and education level as shown in Table 1.

Workforce Category	Typical Roles	Typical Education Requirement	Estimated Workforce (SMR)	Estimated Workforce (1000MW)
Engineering & Technical (Bachelor's or higher)	Nuclear engineers, mechanical engineers, electrical engineers, safety analysts	Bachelor's degree (often specialized)	31	185
Operations (Operators & Supervisors)	Reactor operators, control room operators, shift supervisors	Associate or bachelor's degree + licensing	38	88
Technical / Skilled Technicians	Instrumentation & controls technicians, radiation protection techs, maintenance techs	Associate degree or technical certification	49	92
Skilled Trades (Construction + Maintenance)	Welders, electricians, pipefitters, mechanics	Industry certification / apprenticeship / HS diploma	24	145
Support & Professional Staff	Project management, cybersecurity, regulatory affairs, HR, supply chain	Bachelor's degree (varies by role)	49	90

Table 1. Estimated nuclear workforce composition⁴ by role and education level for SMR, based on industry workforce data and projections 212· 217· 213· 218.

The SMR workforce composition is consistent with planning-level benchmarks. The 1000MW workforce is derived from a public benchmark of a 600-person team^{219, 220} (see Appendix C, Table 1.1 for methodology and assumptions).

Typical nuclear power plants employ approximately 500–800 workers during operation, (see Table 1). In contrast, the construction phases require significantly larger labor requirements²¹², with 1,200–4,500 workers at peak construction for a single reactor.^{221 222} Workforce demand also spans a broad range of roles, from engineers and operators to skilled trades and support professionals 212· 213.

Retention and attraction of talent represent an additional challenge. Nuclear professionals are in high demand nationally^{223, 224}, and states with established nuclear industries have a

⁴ Estimated workforce is based on the use of a single SMR, having multiple SMRs either concentrated or spread out can vary the workforce estimates.

competitive advantage. Iowa may be positioned to attract and retain nuclear professionals by offering competitive wages, career stability, and clear pathways for advancement. This may require coordination across education, policy, and industry stakeholders.

Finally, workforce readiness can include public and institutional familiarity with nuclear energy ^{225, 226, 227}. Decision-makers, regulators, educators, and local communities may benefit from a foundational understanding of modern nuclear technologies to support deployment. Workforce development, therefore, extends beyond technical roles to include public education, outreach, and stakeholder engagement.

4.2.v Iowa's nuclear-relevant workforce resources

Iowa possesses several foundational strengths that can facilitate the development of a nuclear workforce, including experience operating the Duane Arnold Energy Center.

The state's education system provides a strong base. Institutions such as Iowa State University and the University of Iowa offer programs in engineering, materials science, and energy systems that are directly applicable to nuclear technologies ^{228, 229, 230}. These institutions already offer relevant programs in engineering and energy systems; they provide a foundation that could support the development of certificate programs to support nuclear-related technologies, if needed. Community colleges across the state have demonstrated success in delivering technical training programs aligned with industry needs ²³¹, particularly in manufacturing, electrical systems, and industrial maintenance. They could contribute to programs supporting this expansion, and they could be expanded to include nuclear-focused curricula and certifications (see Appendix B for a structured assessment of education-to-workforce alignment).

Iowa's workforce benefits from high school attainment, which provides a strong foundation for entry-level and technical roles (see Figure 27) ^{232, 233}. However, lower levels of advanced educational attainment (Figure 28) may constrain the availability of specialized nuclear professionals, particularly for engineering and regulatory roles ^{232, 234}.

Iowa's high school graduation rates have beaten the national average for a decade, giving the state a solid foundational workforce (see Figure 27) ^{232, 233}. However, this strength is offset by lower levels of advanced educational attainment, as only 32.1% of Iowa's adult population holds a bachelor's degree or higher compared to about 38% nationally, which may constrain the availability of specialized nuclear professionals (see Figure 28) ^{232, 234}.

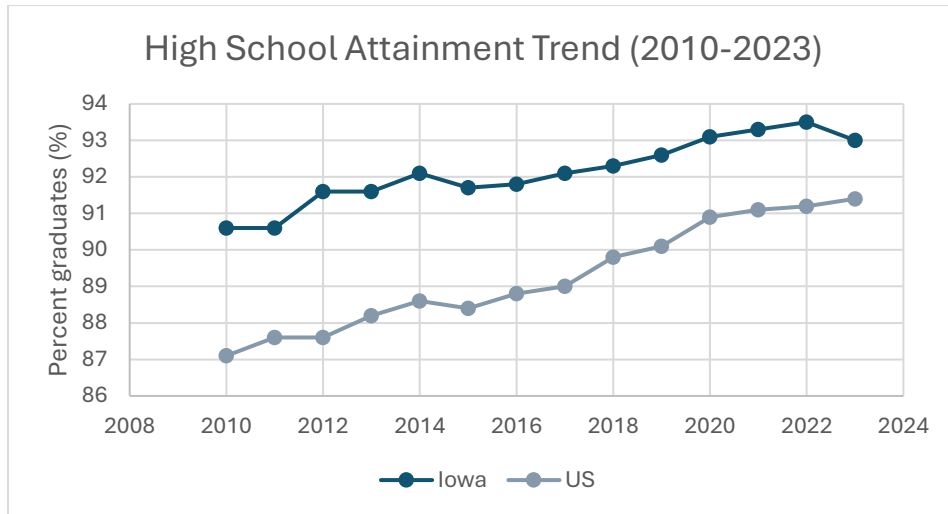


Figure 27: High School Attainment Levels in Iowa Compared to the U.S. (2010-2023).^{232, 233}

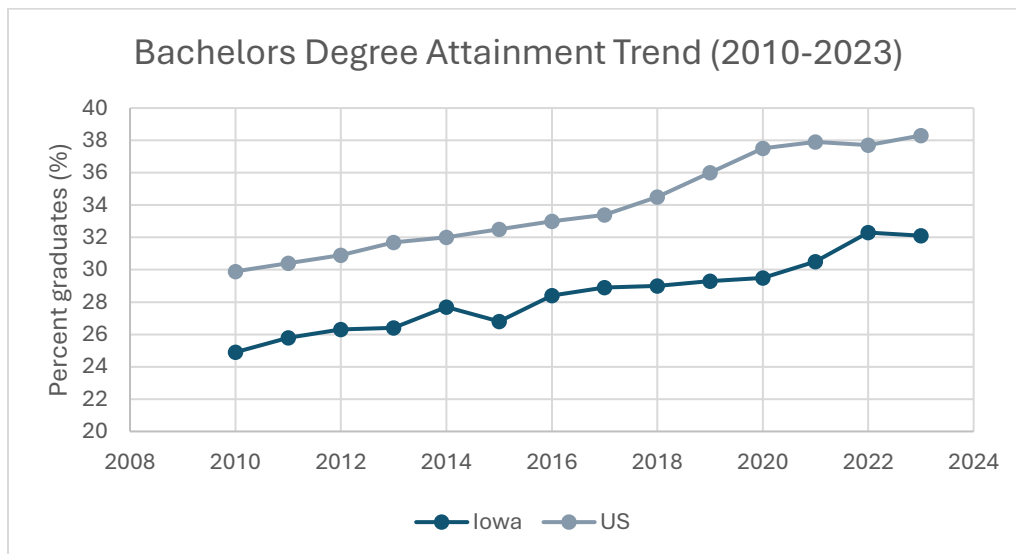


Figure 28: Bachelor's degree attainment trends in Iowa compared to the U.S. (2010–2023).^{235, 234}

Iowa's workforce is characterized by a strong manufacturing and skilled trades base, which is directly relevant to nuclear construction and operations. The state has experience in precision manufacturing, fabrication, and large-scale infrastructure projects.^{236, 237} These capabilities can transition into nuclear supply chain roles with targeted upskilling and certification programs. Projected growth trends across key skilled trades in Iowa and neighboring states, as seen in Figure 29 highlight the expanding regional workforce. This growth is leading in the areas of industrial machinery and electrical occupations, both of which are critical for the construction and maintenance of nuclear facilities.

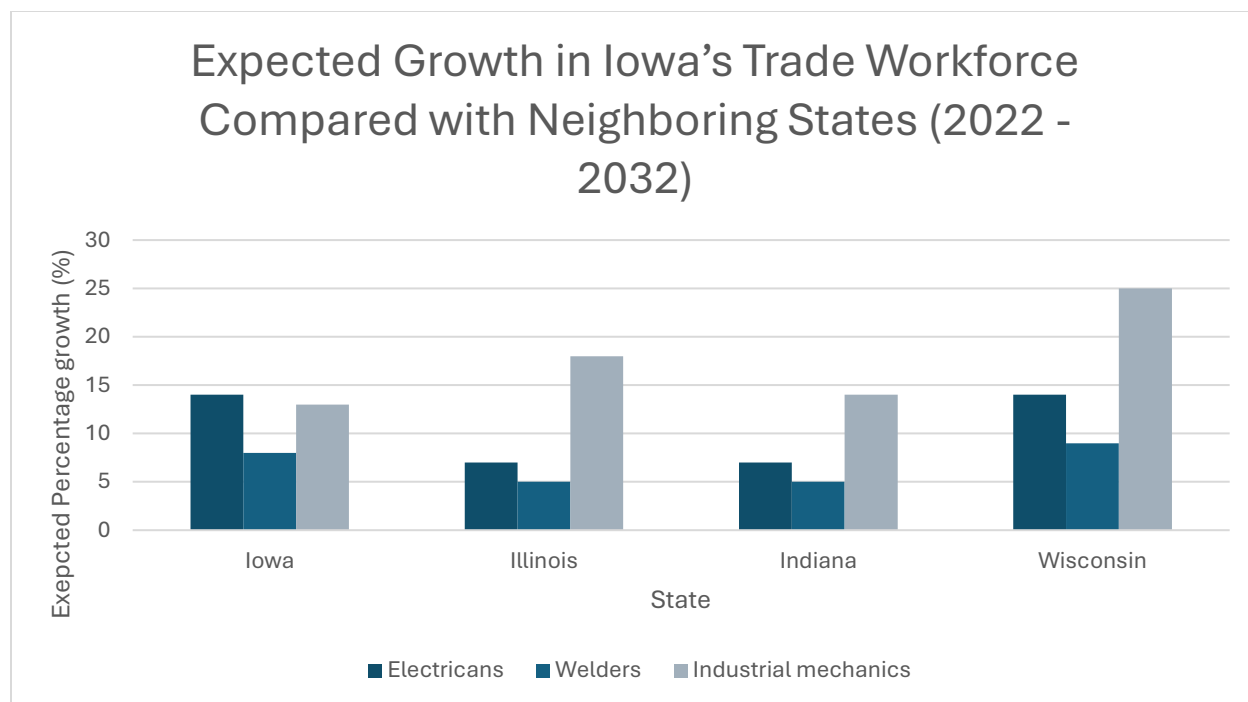


Figure 29: Expected Growth in Iowa's Trade workforce Compared with neighboring States (Pipefitter data was not available for all the states) (2022–2032). ^{238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249}

In addition to technical upskilling, cross-disciplinary familiarity between engineers, operators, and skilled trades is often associated with improved workforce effectiveness. For example, familiarity with responsibilities, constraints, and practices of skilled trades may support improved communication, planning, and operational coordination. Similarly, greater exposure among skilled trades personnel to nuclear system design, operational priorities, and safety considerations may enhance their ability to support complex nuclear systems ²¹³. Such cross-functional awareness is generally associated with more cohesive work environments, stronger safety culture, and the high level of coordination characteristic in nuclear operations (see Appendix C Table 3.1, Skills-to-Credentials Crosswalk).

The state's leadership in renewable energy has also built experience in energy workforce development, including training programs for wind technicians, grid operators, and energy project managers ²⁵⁰. This experience may provide a model for scaling and adapting training programs to fit nuclear applications. Workers currently employed in the renewable and fossil energy sectors may be retrained or cross-trained to support nuclear deployment and operation.

Iowa benefits from an established network of industry partnerships and economic development organizations that can support workforce initiatives. Collaboration between utilities, manufacturers, educational institutions, and state agencies provides a framework for coordinated workforce planning. These partnerships can play an important role in aligning training programs with industry demand ²⁵¹.

The agricultural and industrial economy also creates opportunities for sector-specific workforce integration. Workers in biofuels, food processing, and chemical production already possess relevant operational experience that can be adapted to nuclear-integrated systems, particularly in process control and safety management.

While these assets provide a strong foundation, they are not yet organized or scaled to meet the specific requirements of nuclear energy deployment.

4.2.vi Iowa's nuclear-relevant workforce gaps

Despite its strengths, Iowa faces several gaps that may limit its ability to support nuclear workforce needs (see Figure 30) 235- 232.

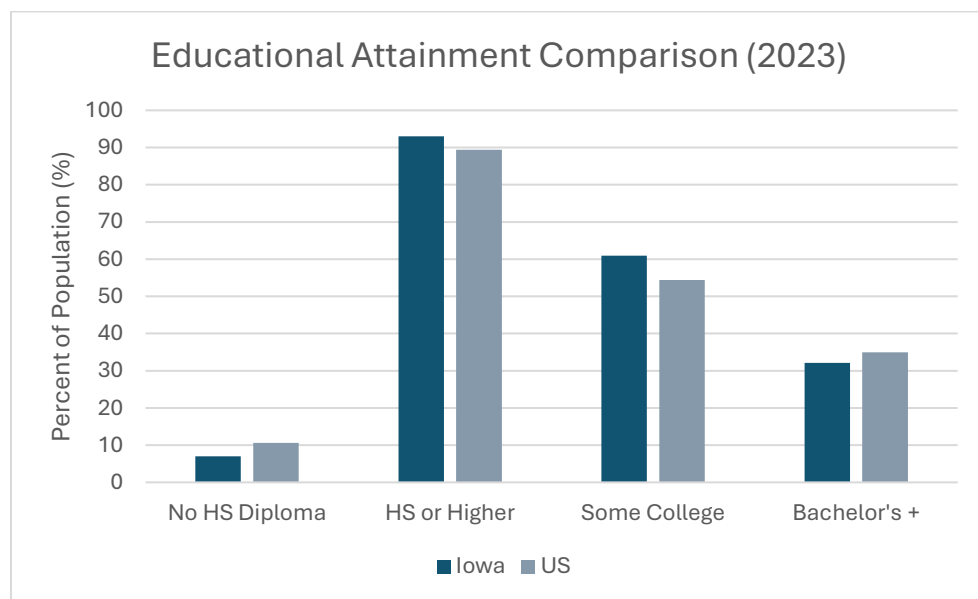


Figure 30: Comparison of educational attainment in Iowa and the U.S. (2023). 235- 233

The most immediate gap is the absence of nuclear-specific education and training programs. While Iowa has a strong baseline workforce, lower rates of advanced degree attainment may limit the supply the highly specialized professionals needed for nuclear engineering and regulatory roles (see Figure 31). **Error! Bookmark not defined.**232 This gap is not limited to advanced-degree occupations. Construction and skilled trades generally do not require specialized facilities, but they do require nuclear-specific certifications, safety training, and familiarity with nuclear standards. A significant share of the workforce also has some postsecondary experience without completing a degree. This indicates a pool of partially trained workers with existing skills though they are not fully credentialed for nuclear applications (see Appendix C Section 2, Identified Gaps).

Iowa does not currently offer dedicated nuclear engineering degree programs, SMR specific reactor operator training pipelines, or radiation protection certification pathways tailored to new reactor technologies. Nuclear facilities routinely draw talent from a national pool of nuclear engineering graduates, and the industry relies on a broad range of disciplines, many of which

are already strongly represented within Iowa's universities. While some specialized roles rely on external hiring and industry-provided training, existing academic programs in Iowa provide a foundation that can support entry into the nuclear sector. As a result, workforce development in this area reflects a combination of in-state educational pathways and recruitment from out of state rather than relying on a strict reliance on dedicated nuclear-specific programs.

There is also a practical opportunity to begin building this workforce during a facility's construction phase, when no radioactive materials are present on site. This approach is standard practice in the nuclear industry, with workforce training, simulator use, and operational preparation commonly beginning prior to commissioning. The International Atomic Energy Agency (IAEA) notes that the use of simulators for the training and qualification of nuclear power plant operating personnel has become standard practice worldwide.²⁵²

While plant-specific training facilities, simulators, and operational training programs are typically provided by the reactor vendor or plant operator during deployment, placing them outside the direct scope of state responsibilities. However, this period provides for early access to hands-on training, familiarizes the workforce with plant systems, and builds operational discipline in a lower-risk environment. For example, vendor-supported training programs such as those observed at facilities like NextEra's Hiawatha training center, utilize a full-scope simulator that replicates the control room and train licensed operators prior to plant restart.²⁵³ Using construction and pre-operational phases for structured training can accelerate workforce readiness and support a smoother transition into full operations (see Appendix C Section 3, Operator Licensing Pathway and Vendor-Supported Training).

A related gap is the limited availability of hands-on training infrastructure, although recent initiatives, such as NextEra Energy's Hiawatha training facility, demonstrate emerging efforts to address this need.²⁵⁴ Nuclear workforce development requires access to specialized facilities, simulators, and laboratories²⁵². Partnerships with national laboratories, other states, or federal programs may be necessary to provide experiential learning opportunities until in-state capabilities are developed. These manufacturer-supported training systems are designed to reflect the exact equipment and control environments used at the facility and can play an important role in preparing operators and supporting staff. Leveraging these resources, in combination with broader workforce development efforts, may help bridge the current infrastructure gap and ensure alignment between training and real-world plant operations.

Iowa possesses a well-established foundation for radiation training, primarily concentrated at the University of Iowa across three distinct academic and operational areas. This curriculum includes mandated laboratory safety training covering exposure control, contamination prevention, and regulatory compliance^{255, 256, 257}, alongside medical and clinical instruction in radiation biology, physics, and imaging safety^{258, 259}. Additionally, the university offers a specialized Radiochemistry Graduate Certificate providing hands-on experience with nuclear instrumentation, concepts, and data analysis²⁵⁷. These core programs are reinforced by a university-wide system offering over 100 specialized safety courses and hazard-specific frameworks tailored to research roles²⁵⁶⁻²⁵⁷. Complementing these efforts, the ISU College of Engineering has recently studied this issue and indicated a willingness to support an undergraduate minor, an undergraduate certificate, and a graduate certificate, all in nuclear engineering. However, these educational assets currently operate within isolated academic silos. Because coursework remains distributed

across separate medical and scientific tracks rather than being integrated into a broadly accessible pathway, Iowa's existing framework lacks a scalable workforce pipeline capable of supporting the broader commercial nuclear industry.

Another key gap is the absence of a coordinated statewide workforce strategy for nuclear energy. While individual institutions and organizations have relevant capabilities, there is no unified plan aligning education, training, and industry demand as illustrated in see Figure 31212. 213. The development of a statewide strategy could help define workforce targets, identify priority roles, and coordinate investments across sectors (see Appendix C Section 5, Phase 1: Early Planning).

There is currently limited Iowa-specific survey data on student awareness of nuclear careers. However, broader energy workforce studies in the state rely on stakeholder surveys and highlight the importance of career awareness across energy sectors. National survey research indicates that students are often unfamiliar with nuclear career pathways, suggesting that similar awareness gaps may exist in Iowa, particularly given the absence of in-state nuclear programs and limited exposure to the field ^{260, 261}. Addressing this may involve proactive outreach, increased visibility of career pathways, and the integration of nuclear topics into existing STEM education programs. Early engagement at the K–12 level may be especially important, as it helps build foundational awareness and interest in energy careers before students make decisions about postsecondary education and training. Incorporating age-appropriate curriculum, classroom resources, and teacher support can help normalize nuclear energy within Iowa's broader energy landscape ²²⁶.

In addition, the development of local or regional information centers can play a valuable role in supporting both workforce development and public understanding. These centers can provide accessible, transparent information about nuclear energy, SMR technologies, and plant operations, operating in coordination with a centralized state function that provides oversight, consistency, and strategic direction ^{225, 226}. By partnering with schools, community organizations, and local institutions, these efforts can help educate the public, build trust, and encourage students to pursue careers in nuclear energy and related industries.

Supply chain workforce readiness is another unmet need. While Iowa has a strong advanced manufacturing base, including firms with capabilities in welding, precision machining, and metal fabrication, most operate under general industrial standards rather than nuclear-specific quality systems. Iowa-based manufacturers such as Owen Metals Group and Co-Line Manufacturing demonstrate expertise in complex structural fabrication and advanced metalworking processes, and some firms also support energy-sector components, including nuclear-adjacent applications such as precision fasteners and high-performance materials for critical infrastructure ^{262, 263, 264}. However, nuclear supply chains require significantly more stringent quality assurance standards, including certifications such as ASME Section III and NQA-1, which govern traceability, inspection, and qualified welding procedures (see Appendix C Section 3, Supply Chain Certifications). National supply chain analyses identify fabrication, welding, and workforce qualification as major bottlenecks limiting nuclear deployment capacity due to the limited number of certified suppliers capable of meeting these requirements. ²⁶⁵. While Iowa has identifiable “adjacent” suppliers with relevant technical capabilities, state-level assessments

recognize the need to further develop specialized manufacturing capacity and workforce training to meet nuclear-grade standards and fully participate in the nuclear supply chain. 226

Finally, Iowa can address competition for talent. The broader relationships between workforce development, institutions, and industry needs are illustrated in Figure 31226- 213 which provides a conceptual view of Iowa's nuclear workforce ecosystem. This ecosystem framework aligns with the functional workforce structure and organizational model described in Appendix C Section 4. States with active nuclear industries and established training programs are already developing workforce pipelines. Without early action, Iowa may face challenges being at a disadvantage in attracting both workers and employers. Strategic incentives, partnerships, and early program development may help support competitiveness to remain competitive. 212- 213

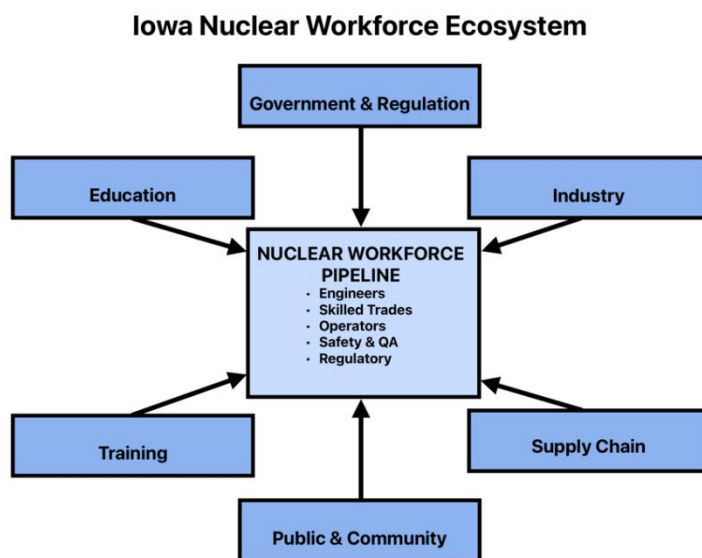


Figure 31: Conceptual model of Iowa's nuclear workforce ecosystem and institutional relationships.

4.3 Iowa Impacts

4.3.i Nuclear reactors' economic impact during construction and operation

Construction Phase

As part of the Construction Permit application, the TerraPower project in Kemmerer, Wyoming and the X-Energy Project in Seadrift, Texas completed economic impact analyses as part of their Environmental Impact Study (EIS). While these represent only two of the many aforementioned reactors currently available on the market, these two projects are furthest along the development timeline; therefore, the design and engineering are more complete, which makes the economic impact assessments more complete. In 2008, the Vogtle project also submitted its estimate of its expected economic impact to the NRC as part of its Early Site permit, which is included for comparison.

To estimate the economic impact in the three-county region surrounding their plant's proposed location just south of Kemmerer, Wyoming, from the construction of the first Sodium Reactor, a

300 MW (345 MW peak) sodium-cooled reactor, TerraPower estimated the number of construction workers needed at each phase of the development.¹⁵⁵ Given the region's small construction workforce and low unemployment (5%), the analysis assumed that 95% of the construction workforce would be in-migrant workers. During construction, the plant will begin hiring operations staff, and those workers are shown arriving in the area at the same time. Those were assumed to be 100% in-migrant⁵ to the region. See the direct employment anticipated by the construction project in Figure 32. In total, this amounts to 5,010 job-years of direct labor.

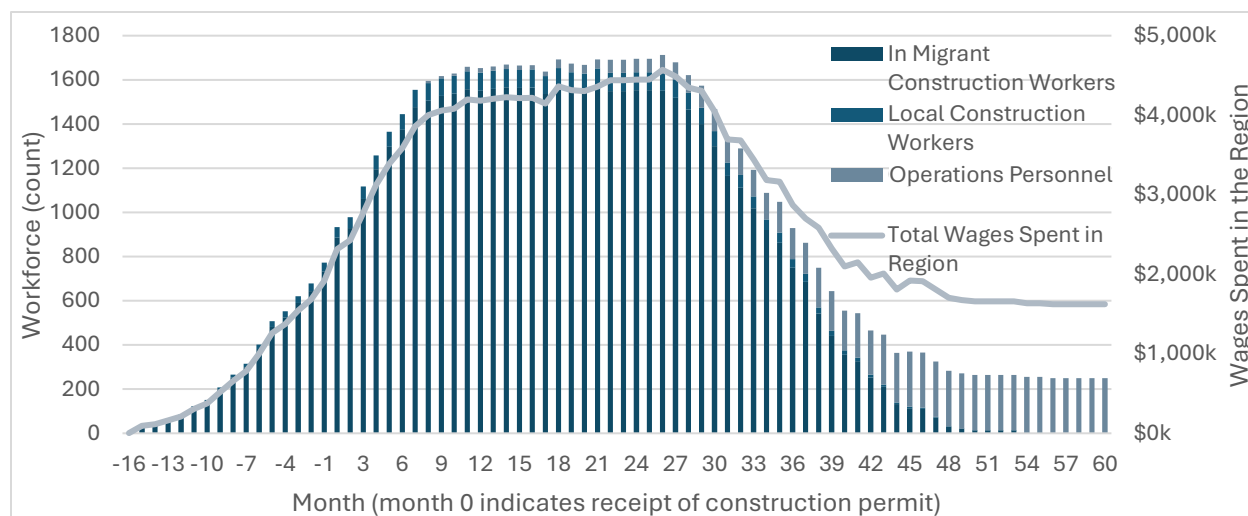
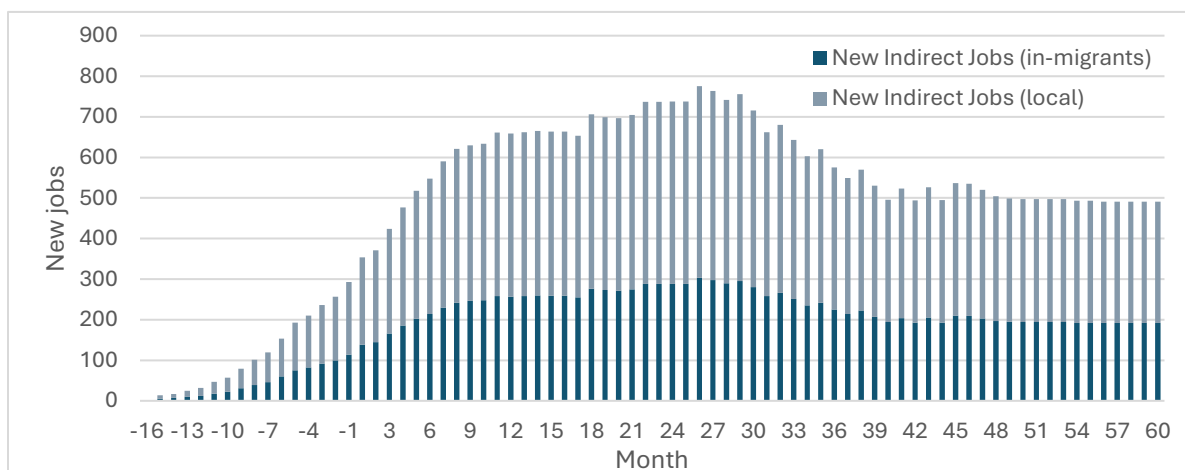


Figure 32: Workforce Expectations for Construction Period for TerraPower Project in Kemmerer, WY

TerraPower's analysis further estimated that the facility will pay property taxes, starting in 2023 at \$4,000 per year and growing steadily to \$12 million per year by the final year of construction, 2029. This is projected to represent 31% of all property tax revenue collected by Lincoln County. Wyoming does not levy an income tax, and so the largest source of revenue for the state is the sales and use tax. In 2021, Wyoming earned \$493 million through its sales and use tax, 29.2% of

Figure 33: New Indirect Jobs Created for Construction Period for TerraPower Project in Kemmerer, WY



⁵ The TerraPower EIS defines in-migrant workers as workers who migrate from outside the economic region of interest to the region during the construction period.

the general fund revenue for that year. A total of 69% of the sales and use tax collected is kept by the state, and the remainder is returned to the county of origin (from there it may be further distributed to the municipalities). The analysis expects that the construction activities from 2025 through 2029 will generate about \$12 million in additional sales and use taxes for the state, with the peak of \$4.2 million reached in 2027.

The X-Energy project in Seadrift, Texas, also conducted an economic impact study for their proposed project site as part of their construction permit application to the NRC. The project is comprised of four (4) 80 MW high-temperature gas reactors. That analysis considered the counties within a 50-mile radius of the site, which also resulted in a 3-county region. The X-Energy construction worker timeline, as seen in Figure 34, was shorter, limited to 44 months, and the peak employment through month 44 was 1473.²⁶⁶

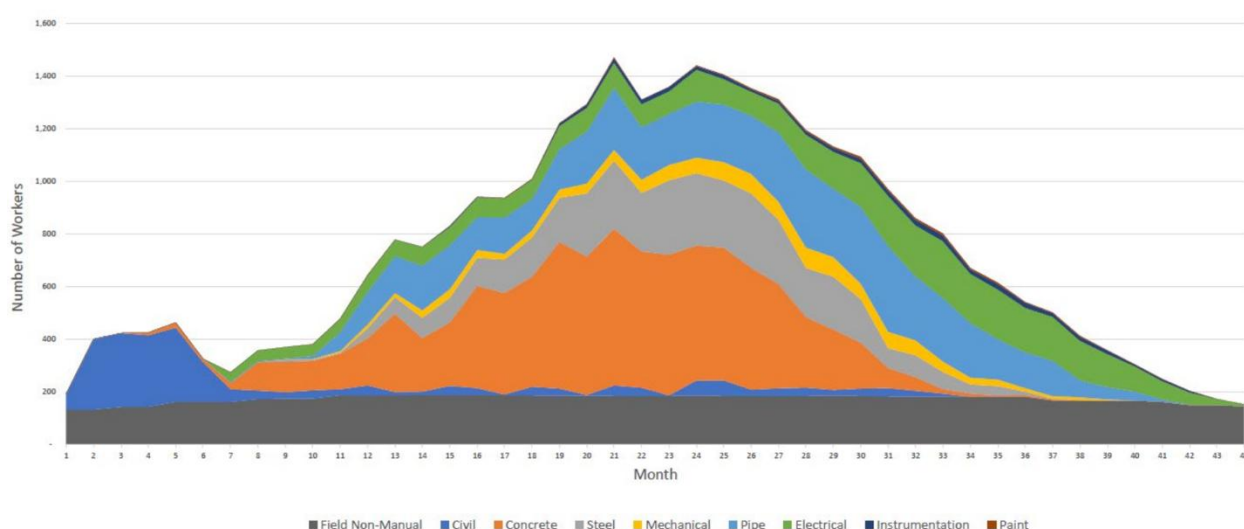


Figure 34: Workforce expectations during construction for Four (4) XE-100 80 MW units to Seadrift Texas

In the case of the Seadrift project, the analysis assumed that 90% of the construction workers would come from outside the three counties and 10% within. The analysis also used the BEA RIMS II model. Using those multipliers for that project in those counties yielded a total economic added value of \$1.6 billion. It will create \$150 million of earnings per year over the 44-month construction period.

Texas has no personal income tax, and while it has a franchise tax applied to firms' margins, the franchise tax will not apply during the construction period as the project will not yet have revenue. The analysis noted that sales and use taxes would increase as a result of construction activities (and the project's purchases) and purchases by the new workers. However, they determined that the impact would be small and did not estimate that revenue specifically. The property had a former tax rate of \$5,278/yr, but they have negotiated a 10-year tax abatement once construction begins. In lieu of taxes, the project will pay \$2 million per year for the first two years of construction, for a total of \$4 million. The county currently earns \$22.5 million per year, so \$4 million over 10 years, the analysis concludes, is a small increase for that county.

Vogtle's economic impact analysis from its 2008 environmental impact filing to the NRC for the construction of Vogtle 3 & 4, two AP-1000's, assumed an 84 month construction period and a total of 22,000 job-years (direct labor) created over the course of the construction of the two 1.1 GW units.²⁶⁷ A recent analysis published by Westinghouse estimates an even higher figure, 40,000 direct job-years created in the state that deploys a two-unit AP-1000²⁶⁸, though that has not been submitted to the NRC in a license application yet.

In the case of Iowa, the economic benefits of building a new reactor would align with the workforce and local construction activities, much as in Wyoming and Texas, along with the indirect economic impacts associated with that workforce and construction activity. Iowa would also stand to benefit from the income taxes that would be registered in the state. The total expected direct wages paid from the TerraPower construction project over the 76 months was \$409 million, which at a 3.8% tax rate would earn the state \$15 million in revenues, an average to \$2.45 million per year over 6.3 years. This doesn't include the effect of the new indirect jobs because their wages were not estimated in the study but given the fact that there were 489 indirect jobs on average throughout the 6.3 years, it could have a significant effect on the total revenues to the state. The X-energy project, on the other hand, had slightly lower employment figures, a shorter construction duration, and estimated the total earnings for project personnel (direct) to be \$150 million over the 44 months. That would result in \$5.7 million in revenues for the state over the 44 months or \$1.5 million per year. As Iowa recently passed a sales tax exemption for new nuclear projects to incentivize new entrants, the sales tax won't be a revenue source to the state.

Operational Phase

The Idaho National Laboratory (INL) published a guidebook in 2024 that evaluated 300 possible scenarios for coal-to-nuclear transitions to estimate the ongoing economic impact of the new nuclear power plant on the regional economy during the operational phase.²⁶⁹ They estimated a range of nuclear generator sizes and a range of community sizes to get a matrix of economic impacts across various scenarios. The study used economic data from 30 counties across the U.S. where coal power plants are currently operating and used the input-output model in IMPLAN to calculate the economic impacts of operating a nuclear power plant in each county. The study showed the average economic impact for each reactor size and each community size across all 300 scenarios. For a 300 MW SMR, the INL report estimates that 100 direct jobs and 352 total jobs would be created. It further estimates that the community's total economic output would increase by \$212 million per year. Overall, a nuclear plant typically creates twice as many local jobs as a similarly sized coal plant, and its employees earn 18% more, on average, than coal plant workers.¹⁵⁰ A nuclear power plant's revenue is also assumed to be about 78% higher than a coal plant because nuclear plants have a higher capacity factor. In total, the economic output of a 300-900 MW nuclear power plant was typically twice that of a coal plant of the same size in communities with more than 90,000 people.

The expected economic impacts for a 300 MW, 500 MW and 900 MW nuclear power plants in a community of 200,000 people or more are shown in Table a. The exception would be if the Nuclear Power Plant were located near the state border and employees could easily commute across the border to report to work.

Table a. Nuclear Power Plant Operations Annual Economic Impact for Communities of 200,000+ ¹⁵⁰

		Employment (jobs)	Labor Income (\$ Millions)	Value Added (\$ Millions)	Total Output (\$ Millions)
300 MW plant	Direct Effect	100	\$16.1	\$53.5	\$136.7
	Indirect Effect	161	\$15.3	\$30.9	\$60.0
	Induced	91	\$5.1	\$9.2	\$15.8
	Total	352	\$36.5	\$93.7	\$212.5
500 MW Plant	Direct Effect	140	\$22.6	\$84.9	\$227.8
	Indirect Effect	269	\$25.5	\$51.6	\$100.0
	Induced	139	\$7.9	\$14.1	\$24.2
	Total	548	\$55.9	\$150.6	\$352.0
900 MW Plant	Direct Effect	260	\$41.9	\$154.1	\$410.1
	Indirect Effect	484	\$45.9	\$92.8	\$180.0
	Induced	254	\$14.4	\$25.8	\$44.2
	Total	998	\$102.2	\$272.7	\$634.3

One key input to the economic impact analysis is the assumptions about the direct and indirect jobs that would be created at a new nuclear power plant. The numbers used in the INL study were based on estimates from NuScale and TerraPower, primarily, each of which has estimated their technology's expected direct operational employee count. Other measures of direct employment requirements, based on historical data for nuclear power plants are higher, as shown in Table d. Note that SMR reactor vendors expect that SMRs will need fewer employees per MW than traditional reactors.

Table b: Estimates for Direct Employment Requirements of SMRs (Highlighted Report Econ Outputs Above)

Source	Description	MWe (net)	Direct Jobs	Jobs/G W
DOE Liffort Report ²⁷⁰	Existing Fleet (GW-scale included)	Various		500
	SMR estimate	Various		237
INL 2024 ²⁶⁹	SMR estimate	300	100	333
	SMR estimate	500	140	280
Univ. Idaho, 2019 Economic Impact ²⁷¹	12-pack of NuScale's US600	685	360	526
NuScale, 2021 Whitepaper ¹⁹⁵	12-pack of NuScale's Voygr Product	884	270	305
TerraPower, 2022 Press release ²⁷²	1 - 345 MW Sodium Reactor	345	250	725
Depart. Of Energy, AP-1000 ²⁷³	Additional Jobs for Vogtle 3&4	2200	800	364
IEA Historical Data, Small Reactors (2001) ²⁷⁴	A 1-unit plant with a 2-loop LWR	535	359	671
	A 1-unit plant with a 2-loop LWR	517	204	395
	A 2-unit plant with 2X 2-loop LWR	1048	479	457

	A 2-unit plant with 2X 2-loop LWR	1186	567	478
IEA Expected Employment (2001) ²⁷⁴	AP-600 (not built)	625	282	451

As with the economic impacts during construction, the operators' income tax would be an ongoing revenue source for the state, since those individuals would use state resources as full-time residents of Iowa. The direct, indirect, and induced wage growth expected for a 300 MW plant, for example, of \$36.5 million would result in an annual income tax revenue increase of \$1.4 million.

An operating nuclear power plant will also create revenue once it is operational through the Utility Replacement Tax, a tax that replaces traditional property taxes for certain power plants in the state of Iowa. The local county will receive a portion of the revenues from the Utility Replacement Tax. For a nuclear power plant in operation, the Utility Replacement Tax is 0.06 cents/kWh of generated electricity.²⁷⁵ For a hypothetical 300 MW SMR, that would result in ~\$1.5 million/yr, for the DAEC 615 MW plant, that would result in ~\$3 million/yr and for a large gigawatt scale reactor, that would result in \$4.8-\$5.3 million/yr. This revenue may not all reach the county where the nuclear power plant resides due to the local revenue being capped according to the local levy rate and a maximum valuation of \$44.4 million.

The local county may also receive tax revenue from the delivery and consumption of the power according to Iowa Code section 437A.4(1), although that depends on whether the power generated by the new plant is consumed in the same county.

The state of Iowa will also earn revenue from an operating power plant from the statewide property tax, which is assessed at \$0.03 per \$1000 of assessed value. This amount is meant to offset the costs to the state of administering the Utility Replacement Taxes.

Recommissioning Project

The restart of the 615 MW Duane Arnold Energy Center in Linn County, Iowa, offers valuable insight into the expected operational impact of nuclear power in the state. The following table shows the expected impacts in Linn County and Iowa over the 25-year operating life of the power plant.²⁷⁶

Table c: Economic Impacts of Duane Arnold Energy Center during 25-yr Operations

Impact Type	Linn County			Iowa		
	Jobs	Wages	Total Output	Jobs	Wages	Total Output
On-Site Direct	433	\$87 mm	\$158 mm	433	\$87 mm	\$160 mm
Supply Chain	214	\$18 mm	\$91 mm	254	\$21 mm	\$99 mm
Induced	399	\$23 mm	\$71 mm	494	\$28 mm	\$87 mm
Total	1,046	\$128 mm	\$320 mm	1,181	\$135 mm	\$346 mm

The analysis for the Duane Arnold Energy Center calculates the Utility Replacement Tax revenue, assuming a rate of \$0.0006/kWh applies.²⁷⁷ As with any operational plant, this tax replaces

property taxes for certain energy generation assets in the state. Assuming the plant produces 5 TWh annually (a 93% capacity factor), the analysis estimates that the tax will produce \$3 million in revenue per year. While collected by the state, the funds are redistributed to Linn County, according to the tax allocation principals. Because the local tax allocation is capped according to the local levy rate and a max valuation of \$44.4 million, Linn County estimates it will be eligible to receive about \$800k, and the remaining \$2.2 million will be distributed to the state.²⁷⁸ Once the county receives its URT allocation, the taxes are paid to the same tax jurisdictions as general property tax including: 1) Cedar Rapids Area School District 2) Linn County 3) Fayette Township 4) Kirkwood Community College 5) Local Fire District.

The county also receives an allocation from the state for electricity delivered and consumed in the county.²⁷⁵ For a future nuclear power plant, that tax may or may not benefit the same county where the plant is located.

As with a new nuclear reactor, the state will receive revenue via the statewide property tax, a tax of \$0.03 per \$1000 of property valuation.²⁷⁵ The purpose of that tax is to offset the costs of administering the Utility Replacement Tax. For a hypothetical SMR, valued at \$2 billion, for example, the statewide property tax would result in \$60k in annual revenues for the state.²⁷⁵ Once that asset depreciated to 20% of its original value, the revenue would be \$12k per year.

4.3.ii Nuclear reactors' local costs and impacts during construction and operations

There are local costs associated with supporting the construction and operation of a nuclear power plant. Linn County used an analysis of past costs and a Host Community Agreement negotiated with the power plant owner, NextEra Energy Duane Arnold, LLC, to recapture the costs associated with being a host community. **Error! Bookmark not defined.** The Host Community Agreement was consistent with national best practices and based upon the recommendations of the U.S. Blue Ribbon Commission on America's Nuclear Future. For example, the county has to support the roads and other community infrastructure used by the plant's workers and by construction vehicles coming to and from the plant.

The NRC filings for the construction permit for TerraPower's site in Kemmerer, Wyoming, and X-Energy's site in Seadrift, Texas, analyzed a variety of other local impacts that are due to nuclear power plants:

- 1) **Water Consumption:** The existing fleet of nuclear power plants typically rely upon water to cool the plant. Some of that water may evaporate as part of the process and some water may return to the water source at a higher temperature. Duane Arnold Energy Center, for example, takes in 40,000-60,000 gallons per minute (gpm) from the Cedar River and 4 on-site wells. Most of the water is used for cooling, and most of that water is returned to the Cedar River after cooling.²⁷⁹ Most reactors could be designed for closed-loop systems that use air to cool the water only, though that is more expensive. The X-Energy project under construction in Seadrift, Texas, will use an air-cooled system, but it will also produce process-steam for the chemical plant it serves, which will consume water. That system will intake 4,843 gpm, and consume 2,831 gpm of that,

returning the rest.²⁸⁰ The TerraPower Sodium system will use 3,689 gpm, and consume 2,902 gpm, returning the rest.²⁸¹

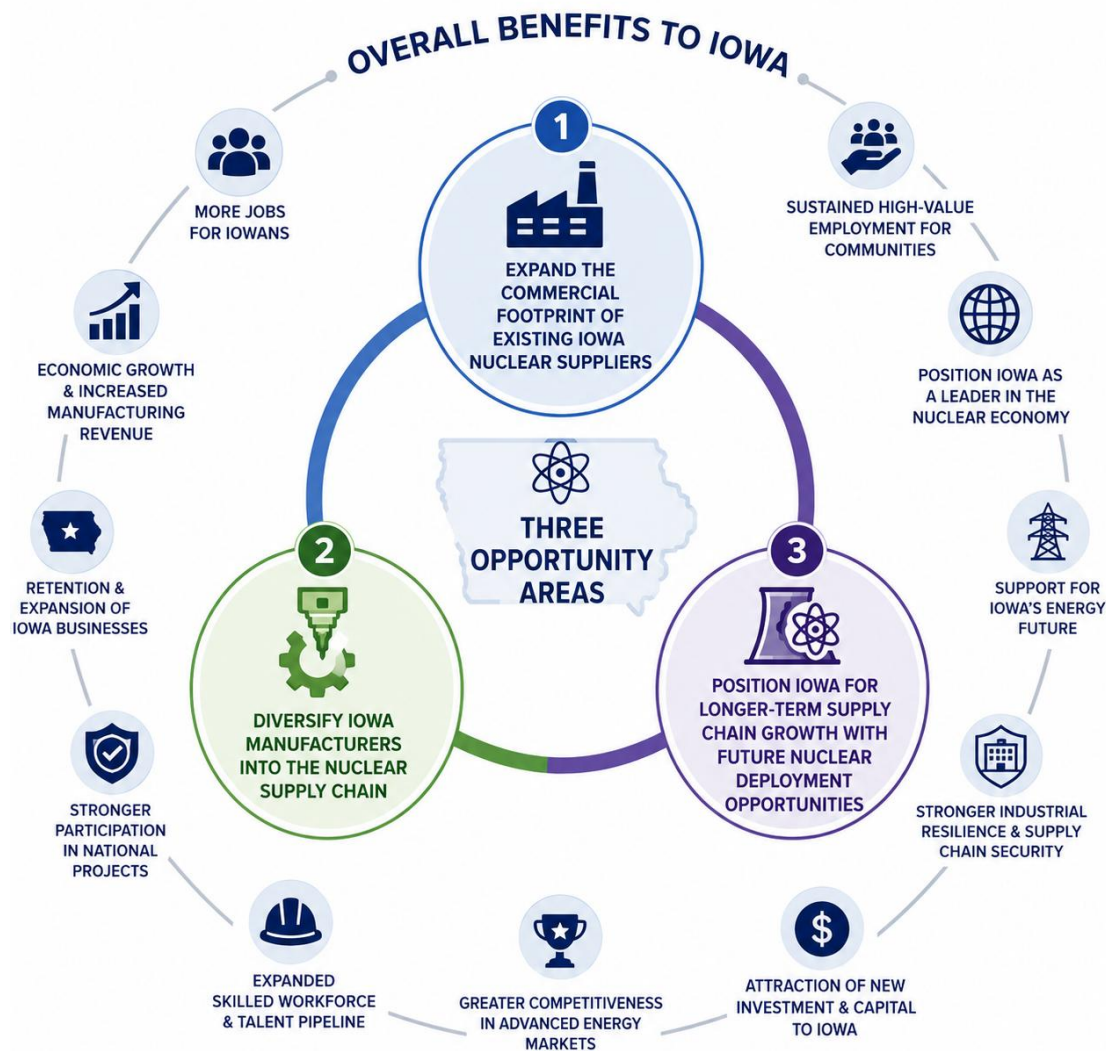
- 2) Land: Although land use is relatively small for a nuclear power plant compared to other generation technology types, local jurisdictions still need to consider the zoning restrictions, as nuclear power plants do still have a footprint. It is also necessary to delineate between the footprint of the facility itself and the exclusion zone required for safety and emergency planning.
 - a. **Land Use:** The Duane Arnold Energy Center sits on about 500 acres. To accommodate the relicensing plant, Linn County created a custom zoning district for Nuclear Energy and Waste Storage Use and established a new district exclusively for this use at the plant's location. This allowed the county to require certain information from the owner, including a major site plan, an economic development plan, and a Host Community Agreement, which allocates costs to the plant owner. Comparatively, the X-Energy site is expected to impact 100-200 acres of the existing chemical plant's site, and the TerraPower site will be 290 acres of their 334-acre property.^{155,272}
 - b. **Emergency Planning Zone:** Beyond the footprint of the facility itself, nuclear power plants are required to site emergency planning zones to mitigate potential effects on surrounding areas in the event of a safety hazard at the site.²⁸² Emergency planning zone size and shape varies according to plant specifications, geography of the site, and adjacent land use.²⁸²
 - c. **Physical Protection Areas²⁸³:** Additionally, the NRC requires physical protection areas with increasing levels of security to protect facility equipment and personnel:
 - i. Exclusion Area: NRC licensee has authority to determine which activities and property are present (lowest level of security) and may add fences or guard posts, though they are not required.
 - ii. Protected Area: An area within the Exclusion Area that is encompassed by physical barriers (such as a chain link fence)
 - iii. Vital Area: An area within the Protected Area with additional barriers and alarms to protect vital equipment.
 - iv. Material Access Area (MAA): Similar security level to Vital Areas, the MAA controls access to forms of nuclear material and prevents theft or diversion. No one is allowed in the MAA alone, and additional detection systems are used when the area is unoccupied.
- 3) Other impacts: Each of the detailed studies and analyses for the proposed projects further outlines other impacts as required by the NRC environmental impact study. Other impacts of the construction and operation of a nuclear power plant include stress on local housing resources and local schools, noise during construction, road use by heavy trucks and workers during construction and operations, visual impacts, and air quality impacts during construction, as well as cumulative impacts from current and projected nearby facilities.

4.3.iii Opportunities and barriers to nuclear supply chain development in Iowa

Iowa retains a modest but credible foundation from which to continue and expand participation in the nuclear energy supply chain. Existing nuclear suppliers (both legacy suppliers to Duane Arnold Energy Center and to operating units outside Iowa), a strong non-nuclear industrial manufacturing base, and transferable workforce capabilities position the state to participate in portions of the growing U.S. nuclear market over time. At the same time, significant barriers to entry, increasing interstate competition, and uncertainty around deployment timing suggest that Iowa's nuclear supply chain development strategy will benefit from public and private sector coordination.

Based on Solestiss-led Iowa stakeholder discussions, industry benchmarking, and assessment of national nuclear supply chain trends, three opportunity areas stand out as worthy of further exploration by the State of Iowa:

1. Ensuring current Iowa-based nuclear suppliers are positioned to compete for new nuclear build projects;
2. Diversifying Iowa non-nuclear manufacturers (e.g. defense, general component manufacturing) into portions of the nuclear supply chain; and
3. Positioning Iowa for longer-term supply chain growth associated with future nuclear deployment opportunities.



Opportunity Area 1: Expand the Commercial Footprint of Existing Iowa Nuclear Suppliers

The most immediate and direct near-term nuclear supply chain growth opportunity is expansion of existing Iowa-based companies already serving portions of the nuclear industry. Stakeholder discussions and desktop review identified three Iowa companies with demonstrated nuclear experience: Paxton & Vierling Steel, Emerson – Fisher Valves, and Corrosion Control Services. These companies support nuclear-related applications ranging from structural fabrication and industrial components to valves, instrumentation, and specialty corrosion-resistant products.

Importantly, some Iowa suppliers have participated in recent or ongoing North American nuclear projects, including Vogtle Units 3 and 4. Their existing technical capabilities, customer familiarity, and experience operating within a nuclear regulatory environment position them more favorably than entirely new market entrants to pursue additional nuclear opportunities.

Nationally, near-term, incremental nuclear deployment demand will rely significantly on expansion of existing qualified suppliers. While this limits the opportunity for prospective new suppliers in Iowa, it should also create opportunities for Iowa companies already participating in

nuclear markets. The nuclear industry is preparing for potential growth driven by increasing electricity demand, energy security priorities, industrial decarbonization efforts, and growing interest in advanced nuclear technologies. At the same time, many industry participants describe portions of the domestic nuclear supply chain as capacity constrained, particularly among suppliers operating under nuclear quality assurance programs such as NQA-1 and ASME nuclear standards.

A consistent theme across stakeholder discussions and industry benchmarking was the importance of long-term demand visibility, or “order book,” in supplier investment decisions. Nuclear suppliers are often hesitant to invest in workforce expansion, equipment upgrades, certification activities, or additional manufacturing capacity without confidence that future project demand will materialize at sufficient scale.

At the same time, several stakeholders noted that portions of the domestic nuclear supply chain are currently operating in relatively low-volume environments due to limited recent deployment activity. This may create a near-term opportunity for states to help position suppliers for future growth before significant demand acceleration occurs.

While Iowa cannot directly control the pace of national nuclear deployment, the State may support supplier readiness, workforce development, and capability expansion in ways that better position established in-state companies to compete if and when nuclear order volumes increase.

However, stakeholder discussions also identified several barriers that may limit supplier expansion, including:

- Capital investment requirements for facility or equipment upgrades
- Workforce recruitment and specialized training needs
- Costs associated with nuclear quality compliance and certification
- Limited visibility into long-term procurement demand and project timing

Stakeholder discussions also highlighted the absence of a centralized entity responsible for coordinating nuclear-related supplier engagement, capability mapping, workforce alignment, and long-term ecosystem strategy within the state. As Iowa continues evaluating potential nuclear opportunities, a dedicated coordination function or statewide nuclear development entity would support more structured supplier outreach, market education, and long-term strategic planning activities.

These types of supplier engagement and coordination efforts represent a relatively low-cost near-term opportunity for the state to improve visibility into Iowa’s existing capabilities and better position suppliers for future market opportunities.

If nuclear new build and associated supply chain demand materialize, the timeline for investment and investment risks should be manageable such that existing Iowa nuclear suppliers do not require significant state incentives to compete. However, improving supplier visibility into emerging project opportunities, strengthening participation in national nuclear industry forums, and supporting broader ecosystem coordination activities through a potential statewide nuclear coordination function would maximize the suppliers’ prospects.

Opportunity Area 2: Diversify Iowa Manufacturers into the Nuclear Supply Chain

Beyond companies already serving nuclear markets, Iowa's broader industrial base presents longer-term opportunities for selected manufacturers to diversify into portions of the nuclear supply chain. Discussions with Iowa Association for Business and Industry (ABI) and regional economic development stakeholders highlighted strengths in advanced manufacturing, component manufacturing, precision machining, industrial systems, and regulated manufacturing environments. Iowa manufacturers are experienced in supporting large OEM supply chains with rigorous quality requirements, particularly in sectors tied to agriculture and other industrial equipment, aerospace, and defense.

National nuclear deployment efforts are expected to increase demand for manufacturing capacity, specialized services, fabrication, machining, inspection, instrumentation, electrical equipment, and skilled labor. At the same time, national supply chain assessments continue to identify constraints across portions of the domestic nuclear manufacturing base, particularly among nuclear-qualified suppliers and specialized industrial trades.

NUCLEAR SUPPLY CHAIN CONSTRAINTS

Key factors limiting the ability of suppliers to scale, compete, and meet future nuclear demand.

 LIMITED MANUFACTURING CAPACITY	 WORKFORCE & TALENT GAPS	 QUALITY, CERTIFICATION & COMPLIANCE	 SUPPLY CHAIN & LOGISTICS RISKS	 CAPITAL & FINANCING CONSTRAINTS	 DEMAND VISIBILITY & MARKET UNCERTAINTY
Many critical components have limited domestic manufacturing capacity and long lead times. • Concentrated supplier base with few alternatives • Equipment and material bottlenecks • Long lead times for forgings, castings, and specialized components	A skilled workforce with nuclear experience is limited and not keeping pace with demand. • Aging workforce and knowledge transfer risks • Shortage of specialized welders, machinists, engineers, and inspectors • Limited pipeline of new talent and training capacity	Stringent nuclear quality and regulatory requirements create time and cost challenges for suppliers. • Complex and lengthy certification processes (e.g., ASME, NQA-1) • High cost of quality systems and audits • Limited supplier familiarity with nuclear requirements	Global and domestic supply chain disruptions create uncertainty and increase costs. • Reliance on global sources for raw materials • Transportation constraints for oversized/heavy components • Geopolitical and trade policy uncertainties	Suppliers face difficulties accessing capital to invest in capacity and technology upgrades. • High upfront costs for equipment and facilities • Limited access to financing, especially for small and mid-sized suppliers • Uncertain demand signals increase investment risk	Unpredictable and long-term demand makes it difficult for suppliers to plan and invest. • Long project timelines and shifting schedules • Limited visibility into future project pipeline • Competition from other industries for capacity and talent

WHAT IT WILL TAKE TO OVERCOME THESE CONSTRAINTS

 Clear demand signals and long-term project visibility	 Targeted funding and risk-sharing to support supplier investments	 Workforce development and training partnerships to build the pipeline	 Streamlined certification and support for quality system adoption	 Stronger collaboration across industry, government, and supply chain partners	 Policy stability and trade strategies that support domestic capability
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These dynamics create opportunities for certain Iowa manufacturers to participate in selected areas of the nuclear supply chain over time. Several plausible opportunities exist in areas aligned with Iowa's existing industrial strengths, including:

- Precision machining and fabrication
- Structural and balance-of-plant components
- Industrial construction support

- Electrical and mechanical systems
- Instrumentation and industrial services
- Inspection, testing, and specialty manufacturing support

At the same time, stakeholder discussions and industry benchmarking suggest that nuclear market entry remains difficult, costly, and highly specialized. Significant barriers include:

- Qualification and certification requirements
- Implementation of nuclear-grade quality assurance programs
- Long customer qualification and procurement cycles
- High upfront investment costs
- Uncertainty regarding long-term demand visibility

Several peer states have established targeted funding programs intended to reduce supplier investment risk and support nuclear manufacturing readiness, workforce development, and ecosystem growth. These programs are generally focused on enabling new market entrants, supporting qualification activities, and encouraging suppliers to invest ahead of large-scale deployment demand.

State Benchmarking: Nuclear Supply Chain Funding

States are making targeted investments to strengthen nuclear supply chains, reduce risk for suppliers, and position their economies for future nuclear growth.

	 TENNESSEE	 TEXAS	 WYOMING	 KENTUCKY
 SUPPLY CHAIN FUNDING	\$70M  SUPPLY CHAIN-FOCUSED FUNDING	\$70M  SUPPLY CHAIN-FOCUSED FUNDING	\$155M+  SUPPLY CHAIN-FOCUSED FUNDING	\$8M–\$10M INITIAL AWARDS  PLUS PROPOSED UP TO \$25M/PROJECT SITING SUPPORT
 SUPPLY CHAIN INITIATIVE(S)	Nuclear Energy Supply Chain Investment Fund Supporting supplier expansion, manufacturing readiness, workforce development, and nuclear-related business attraction.	Project Development & Supply Chain Reimbursement Program Part of the broader Advanced Nuclear Development Fund.	Energy Matching Funds Program Supporting infrastructure, commercialization, demonstration projects, and energy supply chain development through matching grants.	Nuclear Energy Development Grant Program; Proposed Site Readiness Pilot Program Supporting supply chain planning, workforce development, and siting readiness initiatives.
 PRIMARY FOCUS	 Grow a long-term nuclear manufacturing ecosystem and build supplier capacity.	 Reduce supplier investment risk through cost-sharing for manufacturing capacity, licensing, FEED studies, and fuel cycle activities.	 Leverage state funding to attract private and federal investment into supply chain and infrastructure projects.	 Build early-stage ecosystem readiness and reduce siting and licensing risk for future projects.
 STRATEGIC SIGNAL FOR IOWA	Targeted funding can de-risk supplier investment and catalyze a competitive nuclear supply chain ecosystem.	Cost-sharing programs encourage suppliers to invest early and build capacity ahead of large-scale demand.	Matching funds amplify impact by leveraging outside capital and driving innovation and supply chain development.	Early investments in readiness and siting support position states for future nuclear deployment and supply chain opportunities.

Source: Public state agency websites, press releases, program documentation

Based on stakeholder input and broader nuclear industry perspective, not all areas of the nuclear supply chain are equally realistic or accessible for Iowa manufacturers. Until global demand significantly expands, highly specialized segments such as ultra-large forgings and major nuclear steam supply system components will remain dominated by a limited number of global suppliers with substantial scale and technical advantages.

Given the barriers associated with nuclear market entry, stakeholder discussions and peer-state benchmarking suggest that targeted supplier transition support, workforce alignment, and market coordination activities warrant further evaluation if Iowa seeks to expand participation beyond its existing nuclear supplier base. Broader engagement with Iowa manufacturers could help clarify industry interest, transferable capabilities, workforce gaps, and potential commercial pathways into nuclear markets.

Opportunity Area 3: Position Iowa for Longer-Term Supply Chain Growth Associated with Future Nuclear Deployment Opportunities

Based on the interdependence of local supply chain and nuclear power generation – evident both in Iowa with Duane Arnold Energy Center as well as in other states with an installed nuclear power base – future nuclear generation deployment within Iowa may be the largest and most durable potential nuclear supply chain stimulant.

Historically, nuclear facilities have often contributed to broader regional industrial ecosystems extending beyond plant operations alone. Nuclear projects can support demand for construction labor, maintenance services, engineering support, manufacturing activity, workforce training programs, and regional supplier networks over extended time periods.

The planned restart of Duane Arnold Energy Center illustrates the continued economic relevance of nuclear generation within Iowa and is already contributing to labor mobilization, construction activity, and renewed regional economic interest.

At the same time, stakeholder interviews confirm that the Duane Arnold Energy Center restart itself is unlikely to create substantial new nuclear manufacturing activity within Iowa in the near term. NextEra Energy is leveraging an established national nuclear supply chain and existing qualified vendors to support restart activities. Local participation will primarily derive from labor, construction support, maintenance services, and general industrial activities rather than large-scale nuclear-grade manufacturing.

As a result, aggressive Duane Arnold Energy Center-specific supply chain localization policies are inadvisable at this time. Stakeholder discussions suggested that attempts to impose rigid localization requirements could potentially increase project costs or execution complexity without necessarily generating durable long-term supply chain development outcomes.

Instead, Duane Arnold Energy Center may represent a useful foundation from which Iowa can continue evaluating broader nuclear ecosystem development opportunities over time. Additional nuclear deployment activity within the state could strengthen:

- Regional workforce development pipelines
- Supplier and service company interest
- Coordination between industry and educational institutions
- Economic development engagement around nuclear opportunities
- Long-term visibility into market demand

The absence of a centralized entity responsible for coordinating nuclear-related economic development, supplier engagement, workforce planning, and long-term ecosystem strategy within the state would constrain Iowa's ability to compete with other nuclear supply chain

aspirant states. As Iowa continues evaluating potential nuclear opportunities, a dedicated coordination function or statewide nuclear development entity could help support more aligned planning, stakeholder engagement, and strategic positioning activities as well as send a signal to prospective buyers and suppliers of Iowa's commitment.

4.3.iv Mechanisms to enable ecosystem development

Based on stakeholder discussions, industry benchmarking, and initial supply chain assessment activities conducted as part of this effort, several areas warrant further consideration as Iowa continues evaluating potential nuclear ecosystem development opportunities.

Targeted Supplier Support Mechanisms

Several peer states have established funding programs intended to support supplier expansion, workforce development, manufacturing readiness, and nuclear ecosystem growth. Iowa should evaluate targeted support mechanisms such as grants, loan guarantees, tax incentives, or cost-share programs intended to help reduce investment risk for current or prospective nuclear suppliers.

Stakeholder discussions suggested that any future support mechanisms would be most effective if aligned with:

- Existing industrial strengths
- Demonstrated market demand
- Supplier readiness and commercial viability
- Known national supply chain gaps

Statewide Nuclear Coordination and Ecosystem Development

Stakeholder discussions repeatedly highlighted the absence of a centralized entity responsible for coordinating nuclear-related economic development, workforce planning, supplier engagement, and long-term strategic positioning activities within the state.

As Iowa continues evaluating nuclear opportunities, the state should establish a dedicated nuclear coordination function or broader statewide nuclear development initiative to support:

- Supplier capability mapping
- Industry and utility engagement
- Workforce and educational alignment
- Economic development coordination
- Long-term strategic planning

Several peer states have established centralized nuclear development initiatives intended to support similar ecosystem development activities.

Workforce and Local Participation Considerations

Stakeholders consistently identified workforce readiness as one of the most important long-term considerations associated with future nuclear opportunities. Additional coordination between industry, educational institutions, labor organizations, and economic development stakeholders would help Iowa better understand potential workforce development needs and pathways.

If Iowa pursues additional nuclear deployment opportunities in the future, stakeholders also suggested encouraging Iowa-based suppliers and workforce organizations' participation where commercially competitive and aligned with project requirements.

4.3.vi Waste management and fuel reprocessing best practices

What is Used Nuclear Fuel, and How is it Currently Managed?

Nuclear power plants generate electricity using uranium-based fuel in their reactor cores. In the current U.S. light water reactor fleet, “nuclear fuel” refers to ceramic uranium-containing pellets about the size of a jellybean that are stacked inside of long metal tubes called cladding. The tubes are affixed into an array called an assembly, and the assembly remains intact throughout its use in the reactor. After nuclear fuel is no longer able to effectively produce energy, the assemblies are removed from the reactor core, and the fuel is referred to as spent nuclear fuel (SNF) or used nuclear fuel (UNF).²⁸⁴ Even after removal, SNF remains highly radioactive and produces significant amounts of heat for thousands of years, so it must be carefully handled with shielding, cooling, and safety and security controls. In the U.S., UNF management occurs in stages, using proven handling methods and governed by stringent regulatory oversight.²⁸⁵ First, after UNF is removed from the reactor core, it is moved through underwater channels into a spent fuel pool, which is a deep concrete basin filled with more than 20 feet of water to maintain radiation shielding and to facilitate cooling.²⁸⁶ UNF typically remains in spent fuel pools for approximately 5–10 years. During this period, the radioactive decay heat decreases, which helps prepare the UNF for removal from the pool and transfer to its next stage – dry cask storage.²⁸⁷ Dry cask storage systems come in various formats – including both horizontal and vertical designs – but all typically include a grid-like basket that holds the UNF assemblies inside of multi-layer metal and concrete overpacks (see Figure 35). Dry cask storage systems are designed to maintain shielding and safe containment of the UNF for decades, at minimum (see Section 4). Dry storage is commonly implemented at reactor sites, including at sites that have shut down the reactors but still store UNF in independent spent fuel storage installations.

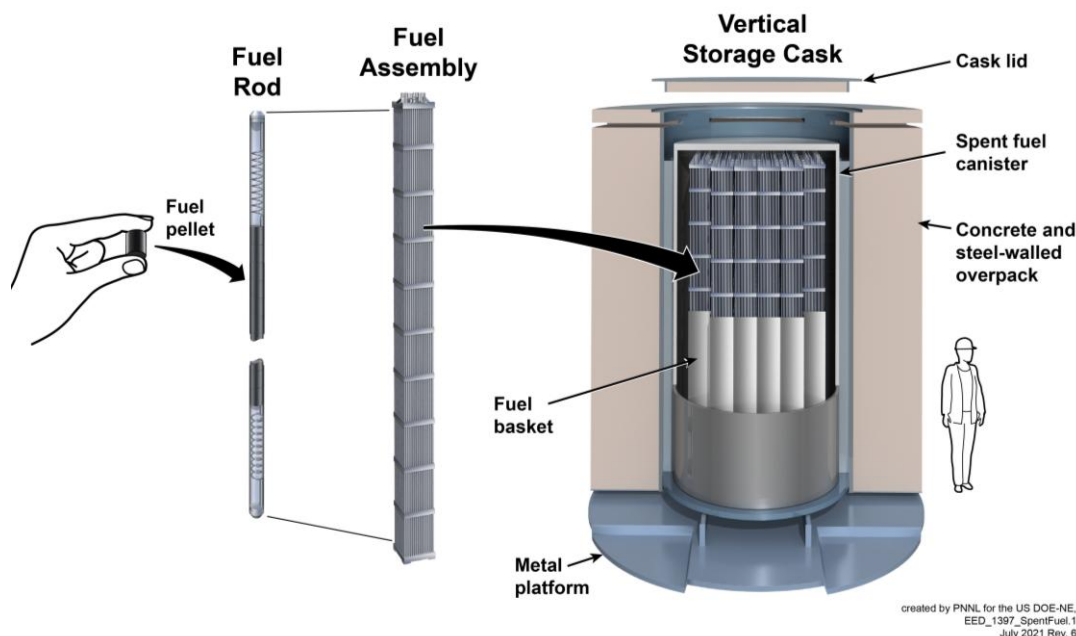


Figure 35. Schematic showing nuclear fuel pellets in an assembly and used nuclear fuel assemblies stored in an example vertical dry cask storage system.

Regulation and Oversight (Federal and State Roles)

The U.S. Nuclear Regulatory Commission (NRC) is the competent regulatory authority in the United States for commercial nuclear power generation and UNF management. UNF management facilities undergo rigorous NRC licensing processes, and dry cask storage systems must be certified by the NRC.²⁸⁸ Facilities are also subject to NRC inspection and monitoring, reinforcing compliance with regulatory standards throughout their operation. In addition to the federal licensing framework,²⁸⁹ states often influence site-based planning, environmental processes, and emergency preparedness at nuclear facilities. For example, states may have a role in utility regulation; permits for land use, water use, or waste management; environmental oversight; emergency planning; agreement state programs, or in state-specific negotiated agreements (such as financial agreements).

Safety, Security, and Environmental Protection through Regulation

Safety and security are paramount in nuclear facility licensing, with requirements spanning engineering, operational, and environmental controls. While some aspects of nuclear facilities are evaluated in a design-specific certification (i.e., by separately certifying the engineering design of nuclear power plants and dry cask storage systems), many licensing aspects center on location-specific (or site-specific) characteristics that take into account the physical environment in which the facility will operate. Safety and security topics addressed in the NRC's licensing requirements include engineering design (structural and thermal loads), criticality safety, radiation protection, evaluation of natural hazards, accident resilience, operating procedures and controls, physical protection, cyber security, and emergency management plans.^{290,291} Furthermore, occupational safety standards are applied to protect workers and the public.

In addition to the safety and security regulatory requirements, environmental reviews evaluate the potential impacts of nuclear facilities, including UNF storage facilities, on the surrounding environment. Once loaded with UNF, dry storage casks are stationary and sit on large concrete pads, and the storage casks are passive containers that produce no effluents. Thus, most environmental impacts tend to occur at the construction phase rather than during operations. Nonetheless, impacts for the entire facility lifecycle are typically assessed in National Environmental Policy Act (NEPA) evaluations, and include topical areas such as land use, groundwater and surface water, air quality, ecology (terrestrial and aquatic), geology and soils, waste management, noise, visual and scenic impacts, socioeconomic effects, and cumulative impacts.²⁹² NEPA evaluations often have a nexus to compliance with other laws, such as the National Historical Preservation Act, Endangered Species Act, and Clean Water Act requirements, as well as federal requirements for government-to-government Tribal consultation. In addition, states often overlay their own environmental requirements, such as permitting for stormwater, waste management, underground storage tanks, or environmental monitoring.

There have been no accidents at dry cask storage facilities that have resulted in radiological release,²⁹³ which can be attributed to the robust regulatory framework, a safety-conscious

nuclear culture among nuclear operators, and NRC inspection and monitoring programs that last the lifetime of the facilities.

Long-Term Disposition of Spent Nuclear Fuel

Ultimately, dry cask storage solutions are intended to be temporary, with license terms for independent spent fuel storage installations issued for 40-year terms initially and eligible for sequential 20-year license renewals. UNF storage is subject to aging management and re-licensing programs of the NRC,²⁹⁴ and NRC has assessed the long-term impacts of continuing to store UNF²⁹⁵ and determined that current practices are safe. For nuclear facilities, operators must provide financial assurance for decommissioning costs through NRC-approved methods, and NRC carefully monitors the viability of decommissioning funds.²⁹⁶

Under the Nuclear Waste Policy Act of 1982, as amended (NWPA),²⁹⁷ the U.S. Department of Energy (DOE) has responsibility for long-term disposition of UNF from commercial nuclear reactors. To formalize this agreement to take ownership, transport, and dispose UNF, DOE enters into contracts - called the "Standard Contract"²⁹⁸ - with nuclear power plant operators. The NWPA also established a federal fund, called the Nuclear Waste Fund, which is financed by a fee on nuclear-generated electricity (paid for by entities that generate UNF) and which would fund activities necessary for permanent UNF disposal. The NWPA required DOE to begin removing UNF from reactor sites by January 31, 1998. Because that deadline was missed, nuclear utilities have sued DOE to recover the costs they have incurred for continuing to store the UNF. These costs are paid out of the U.S. Treasury's Judgment Fund, a permanent account that is used to cover damage claims against the U.S. government.²⁹⁹

Geologic repositories are recognized globally as a viable – but politically challenging – ultimate solution for UNF.³⁰⁰ Although DOE filed a license application with the NRC in 1998 for a permanent UNF geologic repository at Yucca Mountain, DOE subsequently filed a legal motion in 2010 to withdraw the license application,³⁰¹ and funding for the DOE Yucca Mountain repository program was subsequently terminated. Nonetheless, the Nuclear Waste Fund remains, and it is managed by the Nuclear Waste Fund Oversight program. This program ensures the proper oversight of the Nuclear Waste Fund and the administration of the Standard Contract for Disposal of UNF and high-level radioactive waste.³⁰² Recent DOE programs for UNF management have focused on collaboration-based siting and potential facilities to consolidate UNF,³⁰³ and current efforts focus on Nuclear Lifecycle Innovation Campuses,³⁰⁴ which are envisioned to include elements of UNF disposition.

Reprocessing refers to the series of chemical, thermal, or electrochemical processes to separate uranium and plutonium (and potentially other components) out of SNF rather than disposing SNF outright, thus creating a "closed" fuel cycle. While reprocessing can reduce the volume of SNF bound for disposal, it still produces high-level waste products and liquid hazardous waste streams that must be carefully managed.³⁰⁵ France operates a State-sponsored commercial SNF reprocessing facility called La Hague, which handles a significant throughput of SNF. It is the largest reprocessing facility in the world.³⁰⁶ Russia operates a small reprocessing facility with lower throughput at its Mayak production facility. The United Kingdom previously reprocessed SNF at its Sellafield facilities; these were closed in 2022. Japan has been constructing the Rokkasho reprocessing facility since 1993, but it has not yet been able to commence operations.

The U.S. reprocessed SNF during World War II as part of the nuclear weapons program, but it was subsequently ended (and statutorily prohibited, for a time) due to concerns about security and proliferation; i.e., potential for weapons-usable plutonium to be diverted to hostile countries. Because of proliferation concerns, economics, and complex policy, there are currently no commercial reprocessing facilities in the United States, and the three that were built and piloted in the 1960's-1970's were quickly shuttered. In the 2000's-2010's, a few nuclear industry companies expressed interest in commercial SNF reprocessing in the U.S. and engaged with the NRC to explore licensing such a facility. The NRC initiated rulemaking activity on the topic, but this work was suspended in the late 2010's- early 2020's due to waning interest from industry.³⁰⁷ However, as of the mid-2020's, interest in commercial reprocessing is once again rising, attributable to rising energy demand, Federal funding for exploratory programs, concerns about domestic energy independence, and the potential for advanced reactors with fuel reprocessing designed into their lifecycles. A few companies have recently engaged in pre-application discussions with NRC to explore the potential for future reprocessing facility licensing.

Transportation of Used Nuclear Fuel

When UNF is eventually moved from current storage locations around the country to a disposition site, UNF will be transported safely and securely in NRC-certified containers and according to well-established regulatory procedures.³⁰⁸ DOE has designed a railcar certified by the Association of American Railroads specifically for safe transportation of UNF, which would be accompanied by a specially designed rail escort vehicle carrying security personnel.³⁰⁹ A DOE document analyzing the historical worldwide record of UNF transportation reports that of the thousands of completed shipments, there have been few transportation accidents reported, and none have had significant radiological consequences.³¹⁰ SNF transportation in the U.S. is commonly carried out by the U.S. Naval Nuclear Propulsion Program, which has conducted more than 900 shipments of SNF since 1957, primarily by rail.³¹¹ This strong safety record reflects the combination of certified packaging, specialized engineered transport equipment, and regulatory requirements intended to reduce risk during shipment.

Emerging Reactor Designs: Why Future UNF Practices May Change

New reactor types, often called “advanced reactors” or “next-generation reactors,” may use fuels that differ from today's U.S. reactor fleet. As a result, new fuels may require different management practices and modifications to UNF management regulations.³¹² Conditioning and treatment of certain types of UNF will likely be required or desired for several designs. Ongoing collaboration with new reactor vendors is recommended to understand “back-end” fuel cycle impacts. In other words, while current UNF practices are mature and regulated, future technology deployments could change storage, handling, transportation, and regulatory needs.³¹³

05

Recommendations

5. RECOMMENDATIONS

Below are the Task Force's ten recommendations for the Governor and General Assembly to advance nuclear energy in Iowa:

Recommendation 1: Create a single point of contact within the state to facilitate nuclear energy development activities.

- a. Challenge
 - i. Program and Policy Execution: The recommendations in this report and recommendations that come from further investigation and state policy development should be housed and coordinated under a single function. Without a centralized point of contact, state-wide efforts may not achieve efficient and coherent execution.
 - ii. Potential Developer and Utility Engagement: Without a clear starting place and coordinated response from state government, potential nuclear power plant owners may experience higher transaction costs and delays in the development process.
 - iii. Community Engagement: Uncertainty or inconsistent messaging can reduce community trust and slow project development (siting, permitting, etc.).
- b. Recommendation
 - i. Consider the models used in Texas, Kentucky and Virginia, each of which created a central function to coordinate new nuclear activity and administer nuclear related programs. Be mindful of the differences in those states, including but not limited to the different electricity market models which may impact the state coordination needs.
 - ii. Create a state function that acts as a single point of contact and will:
 - 1. Lead engagement with nuclear industry stakeholders to encourage consideration of Iowa and understand how Iowa can help meet their needs
 - 2. Engage with Iowa communities, the Iowa nuclear industry sector, and the Iowa nuclear industry adjacent sector
 - 3. Navigate and own relationships between state-level programs, agencies, and regulatory authorities to promote nuclear industry development and improve permitting efficiency
 - 4. Administer any activities recommended by this or future reports, as applicable
 - 5. Advise the state on regulatory frameworks that increase regulatory certainty for developers and utilities when they are planning investments
 - 6. Continually benchmark Iowa's nuclear policies and actions against those of other states
 - 7. Create community education materials, leveraging existing energy education initiatives. Offer educational resources for communities and the public on nuclear safety and impacts

8. Designate an interim contact to ensure state-wide support continues as efforts to establish an official function are ongoing
9. Coordinate with the federal government to position Iowa to pursue opportunities for federal funding
10. Explore cross-state collaboration to increase regional competitiveness, such as joining or creating cross-state initiatives
11. If determined to be necessary by the state function, the function shall create a temporary Governor-appointed advisory council to advise the state function and track the progress being made towards the state's nuclear policy goals. Advisory council members should be a diverse representation of nuclear industry stakeholders in the state including, as feasible, representatives from the legislature, the state departments, industry, academia, utilities and labor.

c. Rationale

- i. Under this point of contact, recommendations from this report will have continued coordination, centralized ownership, and progress tracking to ensure their effectiveness.
- ii. Iowa will benefit from a function that centralizes nuclear coordination, improving responsiveness to utilities and developers and making the state more attractive for new nuclear industry opportunities.
- iii. An Iowa state function will ensure clearer communication between state agencies and more consistent long-term policy execution, promoting stability to the nuclear industry in the state and allowing the state to evolve strategies and plans over time as the industry matures.

Recommendation 2: Complete a statewide nuclear feasibility study that screens areas for new nuclear development including technical, commercial, regulatory, and community acceptance criteria.

a. Challenge

- i. Communities need preliminary feasibility information before investing substantial time and resources into nuclear readiness efforts, and do not have the capacity or funding to obtain this information. Without a statewide feasibility study, potential host communities may not be aware of the opportunity for nuclear energy development in their area.

b. Recommendation

- i. The Iowa Economic Development Authority should design and execute a statewide feasibility study that considers:
 1. Feasibility and ease of obtaining an NRC license at that location, including population density, seismic risks, flood risks, geological concerns, and meteorological concerns
 2. Availability of infrastructure to support the power plant, including high voltage transmission lines, highways, railways, and water

availability and other relevant factors for deploying a nuclear reactor

3. Availability of workforce, and possibility of supporting a workforce (both long-term and short-term workers)
 4. Community history with nuclear energy or other large power plants
- ii. Engage with all possible future developers or utilities throughout the process to ensure the study is useful and meaningful but doesn't unnecessarily duplicate their own efforts.
 - iii. Socialize the feasibility study with communities and the public to inform future nuclear initiatives.
 - iv. Consider nuclear feasibility studies completed by other states including Indiana, Nebraska, and Michigan.

c. Rationale

- i. This feasibility study can inform the remaining recommendations and how each is executed most effectively.
- ii. If communities are interested in new nuclear, a feasibility study could help them understand which attributes their communities have that make them more or less desirable to nuclear energy on both a state and national scale. Communities may then make changes, where possible, to bolster their ability to address broader industry needs.
- iii. A single state-wide feasibility screening study will be an efficient way to give project developers and utilities a head start in Iowa and minimize duplicated efforts.
- iv. Nuclear developers and utilities may be more inclined to consider communities that already have preliminary feasibility data available when searching for project sites.

Recommendation 3: Explore incentives to help Iowa be a leader in the nuclear energy supply chain sector. Prioritize incentivizing existing Iowa manufacturers to grow or enter the nuclear energy industry, while also attracting new nuclear-industry companies, and building broader supportive workforce capabilities.

a. Challenge:

- i. Existing Iowa companies may not be able to invest in a pivot to nuclear energy before there is robust industry-wide demand.
- ii. The state is competing with other states to attract new nuclear suppliers that will be required for the planned country-wide buildout to 400 GW of new nuclear by 2050.

b. Recommendation:

- i. The Iowa Economic Development Authority should explore state-wide nuclear industry incentives to support:
 1. Attaining nuclear-specific certifications, such as ASME NQA-1
 2. Nuclear industry matchmaking and education
 3. Incentives to locate new nuclear industry facilities in the state

- 4. Workforce development programming that prepares the workforce for the nuclear pivot or staffing of new companies leveraging the support of HF 2757
 - ii. Determine the economic and tax impact of each incentive.
 - iii. Advise the Iowa legislature on specific recommended incentives.
- c. Rationale
 - i. The country has a target to reach 400 GW of nuclear by 2050, from the 100 GW we have today. This will be a massive expansion of the nuclear industry and could represent a significant opportunity for Iowa if manufacturers are aware of it and able to capitalize on it. Early movers will be well-positioned to gain a larger market share in the industry and can grow as the industry scales over the coming 20 years.

Recommendation 4: Explore, identify, and pursue incentives and policy changes at the state level that drive nuclear reactor investments.

- a. Challenge
 - i. Utilities, independent power producers, developers, and the Iowa Utilities Commission may not be able to invest in (or approve the investment of) new nuclear reactors without some form of Iowa-specific incentive given the historical financial risk associated with building new nuclear power plants, at the industry's current maturity level.
 - ii. Federal fiscal policies alleviate some, but not all, of the financial risk associated with building new nuclear.
 - iii. Utilities, independent power producers, developers, and the Iowa Utilities Commission may be especially hesitant to invest in (or approve the investment of) the earliest phases of the project due to high upfront costs, lengthy development and construction timelines, and the risk of acting when newer reactor technologies have yet to prove their ability to meet schedule and cost targets.
 - iv. Economic impacts are not emphasized as a priority in ratemaking decisions.
- b. Recommendation
 - i. Consider the benefits associated with stimulating nuclear reactor development and being a leader in the nuclear energy industry.
 - ii. Consider possible incentives to support early-stage site development, workforce development, investment capital costs, and nuclear energy power plant development efforts.
 - iii. Encourage private and institutional investment in nuclear reactor technologies.
 - iv. Determine the impact of proposed incentives on decision-makers and the impact of the success of those incentives on the state.
 - v. Create appropriate incentives that align with benefits and serve projects with the most potential for impact and success.
- c. Rationale

- i. Other states have nuclear reactor investment incentives and/or grants as outlined in the state policy benchmarking section of the report, including Texas, Kentucky, and Tennessee. Providing additional alleviation at the state level could be compelling for developers and utilities as they assess opportunities throughout the nation.

Recommendation 5: After the completion of the Statewide Nuclear Feasibility Study (recommendation #2), create an Iowa nuclear-ready program that provides guidance and support for communities interested in exploring the opportunities and requirements to deploy nuclear energy, determining if it might be a fit for the community, and taking action to demonstrate their interest and readiness.

- a. Challenge
 - i. Developers and utilities seek local regulatory certainty before they invest in nuclear energy project development.
 - ii. Communities should be part of the development process sooner and engage with the industry according to a standardized process that leverages expertise and programming developed at the state level.
- b. Recommendation
 - i. Create a staged nuclear-ready program that allows multiple “opt in” points. Allow communities to opt in to the program: first, to learn more about nuclear; and second, if the community decides nuclear is a good fit, to meet the requirements to become a nuclear-ready community.
 - ii. Define requirements to certify as a nuclear-ready community, including, at least:
 - 1. Education requirements for the community and community leaders
 - 2. Zoning or ordinance requirements
 - iii. Use the results of the above state-wide feasibility assessment to ensure that this program is investing only in communities with technical nuclear development potential.
 - iv. Model after and/or coordinate with the existing “Iowa certified site program” to share resources, leverage learnings, and incorporate certification requirements that overlap.
 - v. As part of the nuclear ready communities program, educate community leaders and members of the public on the safety, costs and benefits of new nuclear.
 - 1. Develop materials characterizing the safety of nuclear technology, benefits and waste management.
 - 2. Leverage existing education, technical assistance and community engagement functions such as the DOE Office of Nuclear Energy’s GAIN program.
 - 3. Provide funding or tools to quantify local government impacts (staffing, infrastructure, emergency services).

- 4. Create various education tools aimed at the diverse stakeholders that represent and influence the various communities.
 - vi. Develop a community benefit agreement framework to give guidance to communities about how they might offset local costs.
- c. Rationale
 - i. This program will increase a community's ability to support informed decision-making about whether they want nuclear and, if so, how to ready their community to be accepting of nuclear development opportunities
 - ii. This program will attract nuclear project developers and utilities and streamline permitting by establishing community support early.
 - iii. By creating and executing a standardized process developed at the state level, this program will promote fact-based, efficient and clear communication between project stakeholders.

Recommendation 6: Expand Iowa's workforce development pathways to strengthen alignment with nuclear energy.

- a. Opportunity⁶
 - i. Iowa has a strong workforce capability.
 - ii. Iowa has a strong public university system and willing partners in the creation of nuclear workforce development programs.
 - iii. Much of the nuclear supply chain is workforce, or workforce-intensive companies.
 - iv. As a leader in the nuclear industry, Iowa may have the opportunity to export its nuclear workforce for other builds.
 - v. Nuclear energy careers offer an opportunity for veterans.
 - vi. Challenge: A nuclear industry in Iowa requires not only training those entering the workforce, but also extending training and retraining those already in the workforce.
- b. Recommendation
 - i. Grow and promote skilled trades' nuclear workforce development activities.
 - ii. Partner with Regents institutions to create bachelor, master, and doctoral degrees, minors, or certificates that support the growing nuclear energy industry.
 - iii. Partner with community colleges to create nuclear energy certificates, degrees, or programs and encourage the use of Workforce Pell Grant programs to increase opportunities.

⁶ Note: Iowa's workforce capabilities are one of its strongest assets in preparing for nuclear energy development. Therefore, the description of this Recommendation lists opportunities to be leveraged rather than challenges to overcome.

- iv. Introduce K–12 awareness and early exposure programs to ensure that students are aware of nuclear energy generally and the career opportunities in the space.
- v. Continually work with the state's Office of Apprenticeships to ensure that the existing apprenticeship funding is sufficient for the buildout of a nuclear-ready workforce as needed for upcoming nuclear projects, as the projects solidify.
- c. Rationale
 - i. Iowa's workforce potential is one of its strongest assets to support nuclear energy development in the state. Leveraging and expanding Iowa's workforce pathways will enable Iowans to enter the nuclear energy labor pool and benefit from nuclear energy development activities in the state.

Recommendation 7: Coordinate with the federal government decision-makers to encourage clarification of existing incentives, expansion of the existing incentives, and the addition of new incentives or programs.

- a. Challenge
 - i. The states do not have capacity to take the financial risk of early adopters.
 - ii. The benefits of early adoption extend to the whole country, and so states lack the incentives to be early movers.
 - iii. Iowa is one of many states that would like to participate in the nuclear buildout that is planned.
 - iv. Iowa, like other states, would like to communicate their needs to the federal government to ensure the buildout share risk between states, federal government, and private entities appropriately.
- b. Recommendation
 - i. Create a function that partners with other like-minded states or entities to represent state interests to the federal government. Create policy positions and communicate those positions to federal government representatives and stakeholders such that the federal government can understand the on-the-ground needs to meet the ambitious 400 GW nuclear energy target set in Executive Order 14302.
 - ii. Clarification of Existing Programs: To make the ITC viable for new nuclear, this function should encourage the Treasury and the IRS to issue nuclear-specific implementation guidance on key eligibility and compliance requirements that reflect the unique issues of nuclear power plant development and incorporates the suggestions of Utilities and Independent Power producers that are interested in building new nuclear power plants in the state.
 - iii. Expand Existing Incentives: This function should encourage the federal government to expand existing incentives such as the ITC and the loans that are available through the Energy Dominance Financing Office (EDF)

to ensure there is fair and equitable access to these important incentives, including:

1. Duration: Expand them to last longer so fast-follower projects can benefit from the incentives
 2. Geography: Expand the ITC geographically to include other energy communities that are relevant to Iowa
 3. Technology: Ensure EDF loans are applicable to all credible nuclear reactor technologies
 4. Workforce: Expand access of workforce development funding to include programs and grants that can help Iowa, such as funding to start new nuclear engineering programs
 5. Expand federal incentives in any other way that would allow for greater participation from Iowa stakeholders and/or projects
- iv. Add new programs: This function should encourage the federal government to pursue the addition of new programs, including grant funding, that will benefit the potential projects and stakeholders in Iowa to encourage investments in the state.
- c. Rationale
- i. Coordinating and communicating with federal decision makers will ensure continued federal support for nationwide nuclear industry development.
 - ii. Having a clear understanding of current and potential federal incentives will ensure that Iowa is poised to take full advantage of available federal support.

Recommendation 8: Consider the state's role in the management of spent nuclear fuel (SNF) (e.g. waste)

- a. Challenge
- i. Long term storage of SNF is not the responsibility of the state, but rather the federal government.
 - ii. The DOE has not yet established a long-term solution to SNF and so today SNF is stored in safe interim storage solutions at the nuclear power plant site where it was generated.
 - iii. Local governments want to ensure that the SNF generated by a power plant in their jurisdiction is eventually transferred to a long-term waste management solution by the federal government.
 - iv. Any taxes or fees the state implements around SNF management would be counter to the desire to attract new nuclear.
- b. Recommendation
- i. Engage with the federal government to support the implementation of solutions for managing SNF.
 - ii. Partner with other states through existing organizations, such as the Nuclear Waste Strategy Coalition or the Midwest Councils of Government committee to continue to advocate for the removal of SNF from their current interim storage solutions.

- iii. Reinforce with the local governments that the ultimate disposition of SNF and high-level waste remains a federal responsibility.
 - iv. Communicate with local governments and members of the public that temporary on-site storage solutions are safe and durable.
- c. Rationale
 - i. Clear and consistent communication with the federal government on SNF management will ensure that the federal government makes progress toward the long term disposition of SNF.
 - ii. Clear and consistent communication with the Iowa public will mitigate safety concerns and foster trust from community members.

Recommendation 9: Position Iowa, Iowan entities and Iowan projects to pursue opportunities for federal funding

- a. Opportunity:
 - i. The federal government has offered and may continue to offer awards to help stimulate the nuclear industry including awards for the development of new reactor sites, awards to grow or develop a strong nuclear-ready workforce, awards to complete early development and feasibility studies, etc.
 - ii. An Iowa entity or project responsible for applying to such opportunities or creating consortium or partnerships with others in order to apply for such opportunities could ensure Iowa's competitiveness in applying to and receiving awards.
- b. Recommendation
 - i. Outreach to in-state and out-of-state nuclear industry stakeholders to engage and find opportunities for collaboration and partnership in the nuclear industry space.
 - ii. Monitor, facilitate, and support federal funding award opportunities as they arise.
 - iii. Provide state advocacy support to entities applying for federal funding opportunities in an effort to grow Iowa's nuclear energy sector. Apply for opportunities as a state or consortium of entities (as appropriate) to grow Iowa's nuclear energy sector.
 - iv. Provide support for other Iowa-based projects that compete for federal funding in the nuclear energy space, where appropriate.
- c. Rationale
 - i. The federal government has offered and may continue to offer awards to help stimulate the nuclear industry, including awards for the development of new reactor sites, awards to grow or develop a strong nuclear-ready workforce, awards to complete early development and feasibility studies, etc. These awards reduce cost burdens for the state, communities, utilities and developers.

Further Research or Suggested Activities (in collaboration with other ongoing initiatives):

Recommendation 10: Consider modifying the Utility Replacement tax to increase incentives to local governments

- a. Challenge
 - i. Utility replacement taxes are difficult to understand.
 - ii. The utility replacement taxes are meant to replace property taxes, which are local taxes, but the replacement tax may not be allocated locally according to the current rules.
 - iii. For very large generators, like nuclear power plants, the local taxes are capped, and the remaining taxes will be reallocated to other counties or the state.
 - iv. This lowers the incentive for local communities to adopt nuclear, particularly when considering the burden that nuclear can place on the local community (emergency management, perceived storage risk, etc.)
- b. Recommendation
 - i. Understand the rationale for local tax allocation cap.
 - ii. Work within the framework of the existing Utility Replacement Tax Task Force to recommend changes to the tax structure.
 - iii. Clarify allocation principles to ensure economic impact studies can correctly estimate local tax benefits.
- c. Rationale
 - i. Modifying the utility replacement tax can strengthen incentives for local communities to adopt nuclear, further facilitating siting and permitting.
 - ii. Given the capacity and expertise of its members and its mandate to review the Utility Replacement Tax, the newly created Iowa Utility Replacement Tax Task Force is a natural fit to review and recommend changes to the existing framework.

06

Appendices

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Appendix A: Iowa Executive Order 17



State of Iowa

Executive Department

IN THE NAME AND BY THE AUTHORITY OF THE STATE OF IOWA

EXECUTIVE ORDER NUMBER SEVENTEEN

WHEREAS, the State of Iowa is committed to advancing reliable and sustainable energy solutions that contribute to energy independence and drive economic growth; and

WHEREAS, nuclear energy represents a critical component of Iowa's energy future, providing dependable baseload power while complementing our existing energy sources such as wind, solar, and natural gas; and

WHEREAS, Iowa has the opportunity to leverage its strengths in manufacturing and energy innovation to become a national leader in the development and deployment of nuclear technologies, thus ensuring long-term energy security; and

WHEREAS, the creation of Iowa Nuclear Energy Task Force will provide a platform to strategies and policies that ensure the safe, efficient, and responsible deployment of nuclear energy, positioning Iowa as a leader in this sector.

NOW, THEREFORE, I, KIMBERLY K. REYNOLDS, Governor of the State of Iowa, by virtue of the power and authority vested in me by the Constitution and statutes of the State of Iowa do hereby **ORDER** and **DIRECT** the following:

Purpose and Duties

- I. Establishment of the Iowa Nuclear Energy Task Force ("Task Force") which shall advise the Governor, the General Assembly, and relevant state agencies on matters relating to the development and advancement of nuclear energy technologies and infrastructure in Iowa.
- II. The duties of the Task Force shall include, but are not limited to, advising the Governor on:
 - a. Evaluating the state's role in deploying and using advanced nuclear reactors;
 - b. Exploring opportunities to engage with the federal government to support nuclear energy development and ensure Iowa's policies and initiatives align with national regulatory frameworks;
 - c. Assessing emerging technologies, such as small modular reactors (SMRs), fusion energy, and other next-generation nuclear innovations for their suitability in Iowa's energy sector;
 - d. Identifying any federal or state regulatory barriers to the deployment of nuclear reactors;
 - e. Engaging with industry leaders, academic institutions, and other key stakeholders to ensure that Iowa develops a highly skilled workforce capable of supporting the growing nuclear energy sector; and fostering partnerships between education

- institutions and the nuclear energy sector to promote technical training, career development, and apprenticeships;
- f. Engaging with manufacturers and other nuclear energy stakeholders to identify barriers to entry and the partnerships and investments needed to cultivate a nuclear supply chain in Iowa;
 - g. Recommending best practices for safe nuclear waste management, storage, and environmental stewardship to protect Iowa's natural resources; and
 - h. Evaluating opportunities to enhance economic growth in Iowa by utilizing nuclear energy.
- III. The Task Force shall submit a report to the Governor and General Assembly within 180 days from issuance of this Executive Order, detailing its findings and making recommendations to advance nuclear energy in Iowa.

Organization and Operation Membership

- I. **Members.** The Task Force shall consist of at least 11 members appointed by the Governor. Members will include representatives of utilities, power production companies, local government, academia, the Iowa Utilities Commission, and representatives of the General Assembly. Representatives of the General Assembly shall serve in an ex officio capacity. The Chair of the Task Force shall be designated by the Governor from among the appointed members.
- II. **Subcommittees.** The Task Force may form subcommittees as necessary to focus on specific issues, such as regulatory barriers, workforce development, and environmental and safety considerations.
- III. **Meetings.** The Task Force shall hold public meetings as scheduled by the chair of the Task Force.
- IV. **Service as members.** Each appointed member of the Task Force shall serve at the pleasure of the Governor and without compensation.
- V. **Staffing and Support.** Staffing and administrative assistance for the Task Force shall be provided by the Iowa Economic Development Authority, and by other agencies, persons, or organizations from time to time as deemed necessary or appropriate by the Task Force or the Office of the Governor.

Implementation and Interpretation

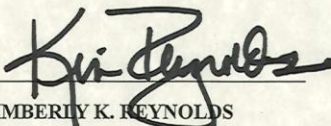
- I. All departments, agencies, boards, commissions, or other political subdivisions of any state and local governments shall cooperate fully with the Task Force. The Task Force may seek the expertise and services of individuals and entities outside of its membership for research, advice, and other needs, as necessary or appropriate to accomplish its mission.
- II. All work of the Task Force shall be done in a manner consistent with laws and regulations of the State of Iowa, and of the laws and regulations of the United States of America.
- III. This Executive Order shall be interpreted in accordance with all applicable laws and regulations and shall not supersede any laws or regulations in place as of its effective

date. If any provision of this Executive Order is found to be invalid, unenforceable, or otherwise contrary to applicable law, then the remaining provisions of this Executive Order, as applied to any person or circumstance, shall continue in full force and effect and shall not be affected by any finding of invalidity or unenforceability.

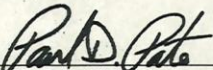
- IV. This Executive Order does not create any right or benefit, substantive or procedural, enforceable at law or in equity, by any party against the State of Iowa, its departments, agencies, or political subdivisions, or its officers, employees, agents, or any other persons.
- V. This Executive Order shall apply prospectively only as of its effective date.



IN TESTIMONY WHEREOF, I HAVE
HEREUNTO SUBSCRIBED MY NAME AND
CAUSED THE GREAT SEAL OF THE STATE
OF IOWA TO BE AFFIXED AT DES MOINES,
IOWA THIS FIFTH DAY OF JANUARY IN THE
YEAR OF OUR LORD TWO THOUSAND
TWENTY-SIX.


KIMBERLY K. REYNOLDS
GOVERNOR

ATTEST:


PAUL D. PATE
SECRETARY OF STATE



Appendix B: Task Force Timeline

Appendix B: Task Force Timeline

Task Force Meeting	Topic	Date
Meeting 1	Nuclear Energy Overview	February 23, 2026
Meeting 2	Federal & State Policy	March 24, 2026
Meeting 3	Economic Impact, Waste Management	April 6, 2026
Meeting 4	Local Considerations, Workforce Development, Supply Chain	April 20, 2026
Meeting 5	Strategy Session	May 18, 2026
Meeting 6	Strategy Session (cont'd)	May 29, 2026
Meeting 7	Final Report Review	June 16, 2026

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Appendix C: Workforce Development Analysis

Appendix C: Workforce Development Analysis

1. Workforce Demand Assumptions and Methodology

This section breaks down the core assumptions and methods we used to forecast the jobs needed for nuclear energy deployment in Iowa. Focusing closely on advanced technologies like Small Modular Reactors (SMRs), our goal is to give planners a clear, reliable baseline for workforce strategy.

Analytical Framework and Key Assumptions

To build these workforce projections, we leaned on a mix of standard industry practices and typical deployment timelines.

Deployment Scenario

The baseline planning scenario assumes deployment of a single SMR facility. Workforce demand is expected to scale with additional reactor units, co-located facilities, or integration with industrial applications such as hydrogen production or process heat systems.

Facility Lifecycle Phases

Workforce demand is evaluated across two primary lifecycle phases:

- Construction Phase: Characterized by peak labor demand, particularly for skilled trades and project-based roles
- Operations Phase: Represents steady-state staffing requirements for ongoing plant operations, maintenance, and support functions

Regulatory Framework

Workforce qualification requirements are assumed to align with established nuclear regulatory standards, including:

- U.S. Nuclear Regulatory Commission (NRC) Regulatory Guide 1.8 (Personnel Qualification and Training) ²⁰⁹
- Title 10, Code of Federal Regulations (10 CFR §50.120) ²¹⁰, governing training and qualification of nuclear power plant personnel

Workforce Estimation Approach

Workforce estimates were developed using a comparative benchmarking methodology, synthesizing multiple data sources and industry references. Key inputs include:

- Published industry workforce data for nuclear facilities ^{212 217}
- SMR-specific workforce studies and deployment analyses ²¹³
- National energy workforce reports ²⁵⁰
- Nuclear Energy Institute (NEI) publications

Workforce demand is organized into the following functional categories:

- Engineering and technical staff

- Operations personnel (including licensed operators)
- Skilled technicians (e.g., instrumentation and controls, radiation protection)
- Skilled trades (e.g., welding, electrical, mechanical)
- Support and professional roles (e.g., regulatory, cybersecurity, human resources)

Workforce Composition Reference

Table 1.1 provides a planning-level reference for the workforce composition associated with a single SMR-scale facility across all phases of development (construction, operation, and maintenance).

Table 1.1 Representative Workforce Composition for SMR Deployment

Workforce Category	Typical Roles	Typical Education Requirement	Estimated Workforce Size
Engineering & Technical	Engineers, safety analysts	Bachelor's degree or higher	~31
Operations	Reactor operators, supervisors	Associate or bachelor's degree plus licensing	~38
Technical / Skilled Technicians	Instrumentation & controls, radiation protection, maintenance	Associate degree or technical certification	~49
Skilled Trades	Welders, electricians, pipefitters	Apprenticeship or industry certification	~24
Support & Professional	Cybersecurity, regulatory, HR, project management	Bachelor's degree (varies by role)	~49

Workforce estimates are based on industry workforce data and projections from Nuclear Energy Institute and national workforce studies

These values represent generalized benchmarks derived from industry data and are intended for planning purposes only.

Scaling Considerations

Workforce demand is influenced by several factors that affect both magnitude and composition:

- Number and configuration of deployed reactor units
- Site siting approach (co-located versus distributed facilities)
- Integration with industrial energy systems or co-generation applications

Key scaling characteristics include:

- Construction workforce demand scales non-linearly, reflecting efficiencies in multi-unit or shared-site development
- Operations workforce demand increases more linearly, with incremental staffing required for each additional unit

- Hybrid or integrated systems increase demand for cross-disciplinary skills, particularly at the interface of nuclear, industrial, and chemical processes

Workforce demand may increase in integrated energy systems, including hydrogen production and industrial applications ^{214 215 216}.

Limitations

The estimates presented in this appendix are subject to several limitations:

- Workforce values are planning-level approximations and do not represent detailed staffing plans
- Vendor-specific reactor designs and deployment models may significantly alter workforce requirements
- State-specific labor market conditions, including workforce availability and migration, are not explicitly modeled

As such, these estimates are intended to support strategic planning and should be refined as project-specific details become available.

2. Education and Training System Alignment

This section provides a detailed look at Iowa's education and training programs to see how well they prepare workers for jobs in the nuclear energy sector. The assessment highlights what Iowa already does well, where programs partially match industry needs, and where the state can make specific improvements to build a skilled nuclear workforce.

Overview

Iowa's education system provides a strong technical foundation for workforce development; however, additional specialization is required to meet nuclear-specific requirements.

University Programs

Iowa's higher education institutions provide a strong academic foundation for technical and engineering-based workforce development relevant to nuclear energy.

Iowa State University

Key program areas include:

- Engineering disciplines, including mechanical, electrical, and materials engineering ²²⁸
- Graduate-level nuclear physics programs ²³⁰
- Potential capacity to develop certificate programs focused on nuclear engineering and related fields

University of Iowa

Relevant program areas include:

- Engineering and energy-related degree programs ²²⁹
- Radiation safety and radiologic science training ^{255 258}
- Graduate-level instruction in radiochemistry ³¹⁴

These programs provide foundational technical knowledge and specialized training directly applicable to nuclear safety, radiation protection, and analytical disciplines.

Community Colleges and Technical Training

Iowa's community colleges excel at hands-on career training. Their programs line up well with many vital roles in the nuclear workforce.

- Key Programs: Mechatronics, industrial maintenance, electrical systems, power tech, and certified welding.
 - Job Readiness: Graduates are well-prepared for immediate roles in construction, upkeep, and technical operations.
 - Proven Success: These colleges have a strong track record of preparing workers for industrial jobs.
 - Next Steps: With small updates, like adding classes on nuclear safety culture, regulatory rules, and strict quality control, these programs can easily adapt to nuclear industry standards.

These programs are well-aligned with workforce needs in construction, maintenance, and technical operations. Community colleges demonstrate strong workforce training outcomes aligned with industry needs ²³¹. With targeted enhancements, particularly in nuclear safety culture, regulatory compliance, and quality assurance, these pathways can be adapted to support nuclear-specific workforce requirements.

Existing Radiation and Safety Training

Iowa maintains a strong foundation in radiation and safety-related education through existing academic and applied training programs. Current capabilities include:

- Radiation safety and protection programs **Error! Bookmark not defined.**
- Laboratory safety and regulatory compliance training ²⁵⁷
- Medical and clinical radiation education ²⁵⁶

These programs provide a critical baseline for nuclear workforce development, particularly in areas related to health physics, environmental safety, and regulatory compliance.

Education-to-Occupation Alignment

The alignment between Iowa's education system and nuclear workforce requirements reflects varying degrees of readiness across disciplines:

- High Alignment: Industrial maintenance, skilled trades, apprenticeships, and general power generation training.
- Medium Alignment: General engineering degrees, standard quality assurance, and basic safety programs.
- Low Alignment: Nuclear-specific technical training, federal regulation studies, and plant operations.

Overall, existing programs provide a solid technical foundation, but additional specialization is required to meet nuclear-specific workforce demands. Educational attainment trends, including

lower bachelor's degree attainment relative to national averages, influence workforce readiness. 233 234 235 232

Figure 2.1 below illustrates the relative alignment between education pathways and workforce needs.

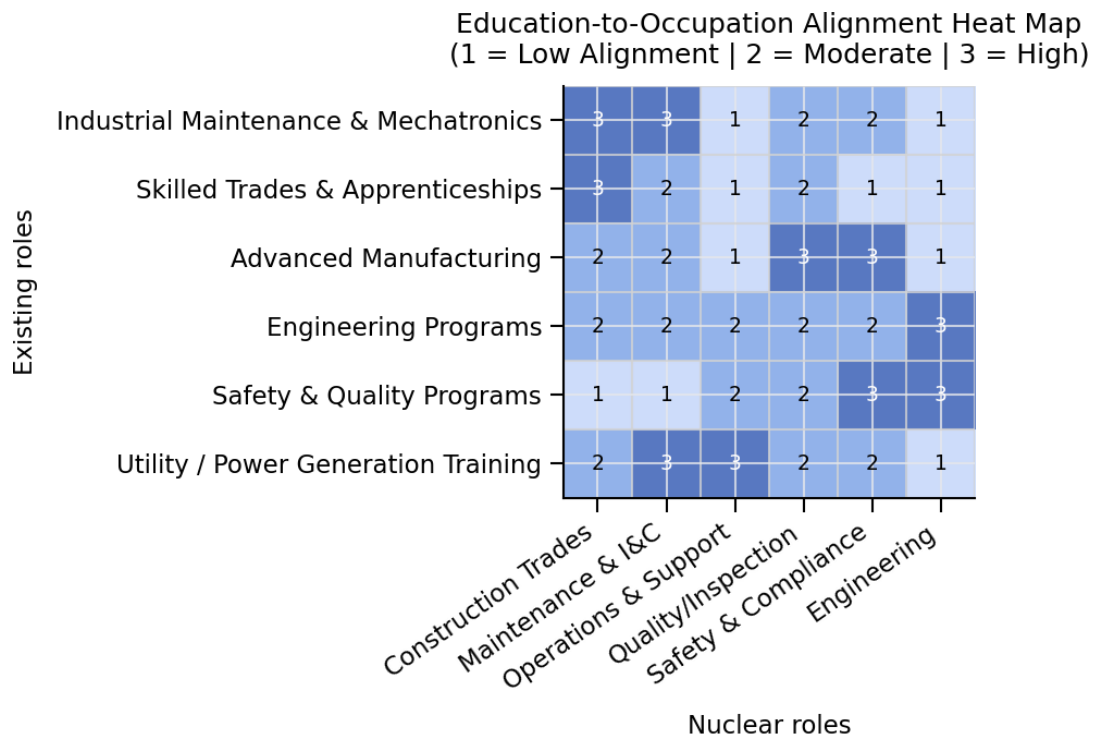


Figure 2.1 Education-to-Occupation Alignment Heat Map

Alignment Framework

Table 2.1 summarizes the relationship between major education pathways, their existing strengths, and areas requiring targeted enhancement.

Table 2.1 Education-to-Occupation Alignment Framework

Education / Training Program	Key Strengths	Enhancement Needs
Industrial Maintenance	Strong technical foundation for operations roles	Nuclear quality assurance, systems integration
Skilled Trades	Highly aligned for construction and maintenance	Nuclear-grade standards, documentation compliance
Engineering Programs	Strong analytical and technical base	Nuclear design concepts, licensing and regulatory exposure
Safety and Quality Programs	Established compliance frameworks	Nuclear-specific regulatory requirements and risk analysis
Utility and Power Training	Direct alignment with plant operations	Nuclear-specific operational training and certification

Identified Gaps

- Absence of dedicated nuclear engineering degree programs
- Limited in-state pathways for reactor operator training and licensing preparation
- Fragmentation across education and training systems, limiting scalability

Opportunities for Development

- Development of stackable credentials aligned with nuclear competencies
- Cross-institutional collaboration to create integrated training pathways
- Integration of nuclear-specific modules into existing engineering, technical, and workforce programs

3. Training, Certification, and Skills Mapping

This section outlines how Iowa can build and certify the skilled workforce needed to support a nuclear energy future. It details the rules we must follow, the paths workers take to learn their roles, and how we can upgrade the excellent skills Iowans already have to meet strict nuclear standards.

Regulatory and Certification Framework

Nuclear workforce development is governed by established regulatory standards that ensure personnel are properly trained, qualified, and capable of operating within a highly regulated environment. These include:

- U.S. Nuclear Regulatory Commission (NRC) Regulatory Guide 1.8 (Personnel Qualification and Training)
- Title 10, Code of Federal Regulations (10 CFR §50.120) governing the training and qualification of nuclear power plant personnel

These frameworks require:

- Structured, performance-based training programs
- Formal qualification and certification processes
- Periodic requalification and continuing training

Together, these requirements define the foundation for workforce readiness in nuclear operations.

Operator Licensing Pathway

The licensing of reactor operators represents one of the most structured and regulated workforce pathways in the nuclear industry. A typical pathway includes:

1. Completion of relevant formal education (technical or engineering)
2. Participation in a utility- or vendor-provided training program
3. Extensive simulator-based training replicating plant systems and operations
4. Successful completion of an NRC-administered licensing examination

Simulator-based training is a standard practice across the industry and is essential for preparing operators to safely manage complex plant systems under normal and abnormal conditions ²⁵².

Skilled Trades and Technician Pathways

Skilled trades and technical personnel form a critical component of the nuclear workforce. While many underlying skills exist within Iowa's current workforce, additional certifications and training are required to meet nuclear-specific standards. These may include:

- Nuclear-grade welding qualifications and procedure compliance
- Instrumentation and controls certification aligned with nuclear systems
- Radiation protection and health physics training
- Procedural compliance and safety culture training

These pathways often build on existing credentials, supplemented by targeted training to meet regulatory and safety requirements.

Supply Chain Certifications

Participation in the nuclear supply chain requires adherence to stringent quality assurance and engineering standards. Key certifications include:

- ASME Section III: Governs the design and fabrication of nuclear components
- NQA-1: Establishes quality assurance requirements for nuclear facilities and suppliers

National supply chain analyses identify certification and workforce qualification as key constraints ²⁵².

These standards ensure:

- Full traceability of materials and components
- Rigorous inspection and documentation processes
- Compliance with nuclear-grade manufacturing and construction requirements

Skills-to-Credentials Crosswalk

Table 3.1 illustrates how existing workforce skills in Iowa align with nuclear-relevant credentials and identifies additional training required for nuclear application ^{262 263 264}.

This crosswalk demonstrates that many foundational skills already exist within Iowa's workforce, with nuclear readiness achieved through targeted enhancements in regulation, quality, and operational context.

Table 3.1 Skills-to-Credentials Crosswalk

Skill Area	Existing Workforce	Current Credentials	Nuclear-Specific Additions
Electrical	Electricians	Journeyman, NCCER	Nuclear safety culture, procedural compliance

Welding	Pipefitters, welders	AWS certifications	Nuclear-quality assurance and code compliance
Mechanical	Maintenance technicians	Industrial certifications	Configuration control, work package execution
Instrumentation & Controls	Automation technicians	Control systems certifications	Nuclear systems standards and testing
Operations	Power generation operators	NERC or process credentials	Reactor operations fundamentals
Engineering	Engineers (mechanical, electrical)	ABET-accredited degrees	Nuclear design basis and system integration
Safety and Quality	QA/QC, EHS professionals	OSHA, ISO certifications	Nuclear QA standards and regulatory compliance
Radiation Protection	Health physics professionals	Radiation safety training	Nuclear radiation protection protocols

Vendor-Supported Training

Reactor vendors and plant operators play a central role in workforce training by providing facility-specific programs tailored to the systems and technologies deployed at each site. These programs typically include:

- Plant-specific technical and operational training
- Full-scope simulators replicating control room environments
- Pre-operational training conducted during the construction phase

Examples of vendor-supported training include facilities such as the Hiawatha training ²⁵⁴. Training programs generally begin prior to plant commissioning, allowing personnel to gain practical experience in a controlled, non-operational environment. This approach supports a smoother transition into licensed operations and enhances overall workforce readiness.

4. Illustrative Nuclear Workforce Organization and Skills Framework

This section provides an illustrative framework of workforce roles and functional groupings that may support nuclear energy deployment in Iowa. It is intended as a conceptual reference to support workforce planning, education alignment, and early-stage stakeholder discussions.

The organizational model reflects a realistic staffing structure for smaller nuclear facilities, including advanced reactors such as small modular reactors (SMRs). It does not establish staffing requirements, prescribe organizational design, or commit to a specific reactor technology, ownership model, or deployment scenario.

Instead, this framework is designed to:

- Support early workforce planning and readiness assessments

- Inform alignment between education, training, and industry needs
- Identify opportunities for skill transfer and targeted workforce development

Framework Basis

The illustrative workforce model is derived from a composite of:

- Operational structures observed in similarly sized fossil generation facilities (e.g., combined-cycle, coal, and peaking plants)
- Workforce configurations used in smaller nuclear plants and advanced reactor concepts

This hybrid approach reflects practical, scalable workforce arrangements suitable for early-stage deployment scenarios, where facility design, scale, and ownership structures may still be evolving. The organizational structure reflects workforce categories commonly identified in nuclear workforce studies.

Organizational Approach

Consistent with workforce planning methodologies used in comparable state-level analyses, roles are grouped by functional area rather than rigid organizational hierarchy. This approach:

- Avoids premature assumptions about staffing levels or plant size
- Aligns with Iowa's existing labor, education, and apprenticeship systems
- Facilitates identification of transferable skills across industries

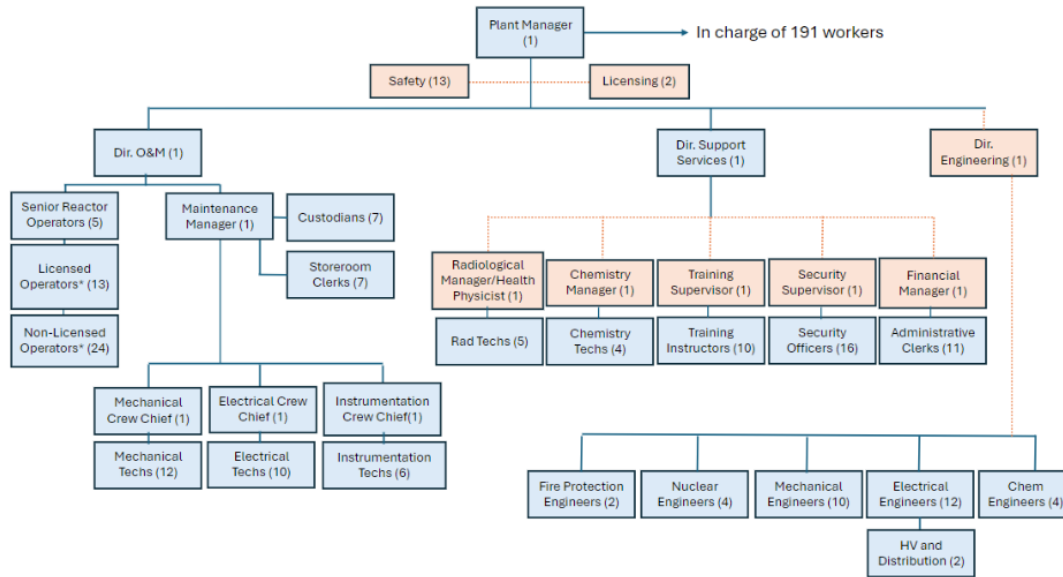
It also reflects real-world practice in which roles—particularly in smaller or emerging facilities—may be cross-functional and evolve across project phases.

Illustrative Workforce Functional Areas

The framework organizes workforce roles into several core functional areas commonly observed across nuclear and energy facilities:²¹⁸

- Plant leadership and administration
- Operations and control room staffing
- Engineering and technical support
- Maintenance and skilled trades
- Safety, regulatory, and quality assurance
- Radiation protection and chemistry
- Security and emergency preparedness
- Training and workforce development
- Administrative and support services

Figure 4.1 Illustrative Workforce Organizational Model



*All operators are trained first responders

Table 4.1 Illustrative Workforce Organizational Model Roles and Descriptions

Nuclear Workforce Organizational Model Roles		
Role	Overview	Qualifications
Plant Manager	Leads all plant operations; corporate liaison; accountable for performance, compliance, safety, continuous improvement.	B deg. (engineering/business or similar); progressive leadership experience; proven operations, team management.
Licensing	Manages reg. compliance (NRC, INPO, IAEA); handles audits, reporting, standards, licensing.	B deg. (engineering/science/legal); NPP licensing experience preferred; strong regulatory knowledge.
Safety	Ensures compliance (NRC, INPO, OSHA); leads safety programs, hazard analysis, safety culture.	As deg. (B deg. preferred); experience with NRC regulations; strong safety, compliance expertise.
Director of Operations & Maintenance	Oversees plant operations and maintenance; ensures safe, reliable performance and scheduling.	Engineering deg.; 5+ years nuclear experience; strong leadership and systems knowledge.
Director of Support Services	Leads finance, radiological, chemistry, and support functions; aligns services with plant goals.	B deg. (relevant field); 5+ years industry experience; leadership, coordination skills.

Director of Engineering	Oversees engineering activities; supports system performance, root cause analysis (RCA), compliance	Engineering deg.; 5+ years nuclear experience; 2+ years leadership; PE preferred.
Maintenance Manager	Directs maintenance programs, crews, outages, and inventory; ensures safe, efficient operations.	Technical As. deg.; maintenance leadership experience; knowledge of scheduling and safety.
Radiation Mgr./Health Physicist	Manages radiological safety, materials handling, monitoring programs.	B deg. (technical field); 7–10 years' experience preferred; strong NRC knowledge.
Chemistry Manager	Oversees chemical operations, treatment programs, compliance	Chemistry-related deg.; 5–10 years' exp.; supervisory exp. preferred.
Training Supervisor	Develops, manages training progs, compliance with NRC/INPO standards.	As. deg. (B deg. preferred); 2+ years training experience.
Security Supervisor	Leads physical/cybersecurity programs, compliance, audits, personnel training.	B deg.; 5–10 years security exp; strong regulatory knowledge.
Financial Manager	Oversees budgeting, reporting, procurement, financial controls.	B. deg. (finance/business); analytical and management skills.
Senior Reactor Operator (SRO)	Directs plant operations from the control room; ensures safe, compliant performance.	Engineering deg.; RO license; operations exp.; regulatory knowledge.
Mechanical Crew Chief	Leads mechanical maintenance, system performance.	Mechanical engineering deg.; maintenance and leadership exp.
Electrical Crew Chief	Oversees electrical system maint., diagnostics, compliance	Electrical deg.; supervisory exp.; license/certification.
I&C Crew Chief	Manages instrumentation & control systems, calibration, reliability	Technical deg.; I&C exp.; strong troubleshooting skills.
Licensed Operator (LO)	Operates plant systems under SRO direction. ensures safe performance	Technical deg. or equivalent; plant experience
Non-Licensed Operator (NLO)	Conducts field monitoring, inspections, supports operations.	B deg.(technical) or equivalent; training program completion.
Fire Protection Engineer	Manages fire safety systems, hazard analysis, compliance.	Fire protection engineering deg.; relevant certifications preferred.
Nuclear Engineer	Supports reactor operations, fuel management, and analysis.	Nuclear or related engineering deg.; strong analytical skills.
Mechanical Engineer	Designs and supports mechanical systems and improvements.	Mechanical engineering deg; design and analysis skills.
Electrical Engineer	Designs, analyzes, and maintains electrical systems.	Electrical engineering deg.; power systems knowledge.
Chemical Engineer	Optimizes plant chemical processes and compliance.	Chemical engineering deg.; process analysis skills.
HV & Dist. Specialist	Maintains, analyzes high-voltage systems & distribution networks.	2–5 years high voltage experience; knowledge of applicable standards.

Mechanical Technician	Performs maintenance, repairs, inspections of mechanical systems	Technical As deg.; 0–2 years' experience.
Electrical Technician	Supports electrical maintenance, troubleshooting, repairs.	As deg.; electrical systems knowledge.
Instrumentation Technician	Maintains and calibrates control & instrumentation systems.	Technical As deg.; PLC experience preferred.
Radiation Protection Tech	Monitors radiation, ensures safety compliance, responds to incidents.	As deg.; radiological experience preferred.
Chemistry Technician	Conducts sampling, testing, chemical monitoring.	As deg.; laboratory experience preferred.
Training Instructor	Delivers training programs & simulations for plant staff.	B deg.; training or instructional experience.
Security Officer	Enforces plant security, monitors systems, responds to threats.	Security clearance requirements; relevant experience preferred.
Administrative Clerk	Provides administrative & financial support, documentation, coordination	2–5 years' experience; strong organizational skills.
Storeroom Clerk	Manages inventory, materials tracking, distribution.	HSD; inventory experience preferred.
Custodian	Maintains cleanliness & safe working environment.	HSD; industrial cleaning knowledge preferred.

Key	
B deg.	Bachelor's Degree
M deg.	Master's Degree
As deg.	Associate's degree
NPP	Nuclear Power Plant
HSD	High School Diploma

5. Workforce Development Timeline and Phasing

This appendix outlines a phased roadmap for developing a nuclear workforce pipeline in Iowa. The framework is intended to guide strategic planning by aligning workforce development activities with the anticipated lifecycle of nuclear energy deployment.

Workforce Development Phases

Workforce development for nuclear energy must be sequenced over time to align with project milestones, regulatory requirements, and training lead times. The following phases represent a generalized progression from early planning through full plant operations.

Phase 1: Early Planning

This phase focuses on establishing the foundational elements required to support long-term workforce development. Key activities include:

- Developing a coordinated, statewide workforce strategy
- Defining education and training pathways aligned with nuclear workforce needs

- Initiating public awareness and outreach efforts to build early interest in nuclear energy careers

Phase 2: Pre-Construction

During the pre-construction phase, workforce development efforts transition from planning to implementation. Key activities include:

- Launching targeted certificate and training programs
- Establishing partnerships among industry, education institutions, and government stakeholders
- Initiating workforce recruitment and pipeline development

Phase 3: Construction

The construction phase is characterized by peak workforce demand and the expansion of hands-on training opportunities. Key activities include:

- Meeting high demand for skilled trades and construction-related roles
- Initiating operator and technician training programs
- Utilizing training facilities, simulators, and vendor-supported programs to prepare the operational workforce

Phase 4: Operations

This phase represents the transition to steady-state workforce needs for plant operation and maintenance. Key activities include:

- Transitioning personnel into operational roles
- Completing licensing, certification, and qualification requirements
- Establishing a stable, long-term workforce to support plant operations

Phase Relationship Overview

This phased framework illustrates how workforce needs evolve over time, from early planning through full operations. It emphasizes the importance of sequencing investments in education, training, and recruitment to align with project timelines.

Figure 5.1 Workforce Development Phases and Pathways

	Construction Phase	Operations Phase
Skilled Trades	 Critical	 Moderate
Engineering	 Critical	 Critical
Construction Mgmt	 Critical	 Supporting
Radiation Protection	 Moderate	 Critical
Nuclear Operations Tech	 Supporting	 Critical
STEM Technicians	 High	 High
Safety & Regulatory	 High	 Critical
Environmental Science	 High	 Moderate
Business/Admin	 Moderate	 High

 Critical
  High
  Moderate
  Supporting

Workforce development does not occur uniformly across all roles; instead, different workforce segments ramp up at different stages. Skilled trades are most critical during construction, while licensed operators and technical staff require earlier training due to longer qualification timelines.

Key Timing Considerations

Several timing considerations influence the effectiveness of workforce development efforts:

- Workforce pipelines must be established years in advance of plant operations to account for training and certification requirements
- Operator training and licensing pathways require extended lead times, particularly for simulator-based training and regulatory approval
- The construction phase provides an opportunity for early, hands-on training in a non-radiological environment, enabling workforce development prior to plant commissioning

Risks of Delay

Delays in initiating workforce development activities can have significant impacts on project success. High demand for nuclear professionals nationally may increase competition for labor ²²³ ²²⁴. Key risks include:

- Increased reliance on out-of-state or imported labor
- Higher project costs due to workforce shortages and competition
- Reduced competitiveness in attracting nuclear investment and associated economic benefits

Implementation Dependencies

Successful implementation of this workforce development framework depends on several enabling factors:

- Effective coordination among state agencies, industry partners, and educational institutions
- Availability of training infrastructure, including facilities and simulation tools
- Early commitment and engagement from project developers and reactor vendors



Appendix D: Detailed Description of the LCOE Analysis

Appendix D: Detailed Description of the LCOE Analysis

A levelized cost of energy (LCOE) is a limited tool that does not fully value the reliability or capacity value of an asset like a nuclear power plant. Each utility or owner would realistically need to evaluate the full stream of costs and benefits to determine if the nuclear power plant investment makes sense for their situation. At a high level, however it is useful to understand the rough comparison between various technology types. In this analysis we compare the cost of solar + storage, wind + storage where in the storage system has half the capacity of the renewable asset and a 4-hour duration. These renewable + storage systems are not directly comparable to nuclear because they cannot deliver the nameplate capacity 24/7, but the storage does have the effect of somewhat “firming” the resource and giving it capacity value. It is also compared with a new combined cycle gas plant of the same nameplate capacity which is a fairer comparison because a combined cycle gas plant can run 24/7, it does produce carbon however, which for some buyers will make the power generated less valuable.

The LCOE analysis was based upon an annual industry report, Lazard's LCOE Plus, last published in June of 2025. Many of the assumptions are taken from that last analysis, with the below changes made to represent the changes in the One Big Beautiful Bill Act (OBBBA) that take effect by late 2026. These include:

- The Lazard analysis shows a subsidized and an unsubsidized version of the analysis. This analysis assumes that the BESS part of the solar + storage and wind+ storage is eligible for a 30-50% ITC and that the solar and wind are not eligible at all, to align with the changes to ITC (48E) eligibility made as part of OBBBA. Nuclear is assumed to be eligible for a 30-50% ITC to align with the rules in OBBBA. Both energy storage and nuclear must start construction by 2033 to be eligible for the 30-50% ITC, which was assumed to be the case in this analysis. Adding the 30-50% ITC for storage only lowered the LCOE of the hybrid systems (solar + storage and wind + storage) by 8-11% compared to the LCOE of the unsubsidized hybrid systems.
- Nuclear is shown to have 80% debt and 20% equity with a debt interest rate of 5%, as would be feasible under the lending authority of the Energy Dominance Financing office, which is prioritizing nuclear loans. Gas combined cycle, Solar + Storage and Wind + storage use the default assumptions in the Lazard analysis, which is 60% debt to 40% equity and 8% interest rate. While this does align with the Lazard 2025 analysis, this may be overly conservative as solar, wind, storage and gas are all fairly mature technologies and may be able to find 70-75% debt providers in the market.

Three additional changes were made to the nuclear LCOE analysis, to represent the unique attributes of nuclear energy shown here:

- The cost of nuclear used a range of assumptions outlined in the “liftoff to commercialization” reports published by the EDF, as opposed to the historical cap ex cost of Vogtle, as used by the Lazard Analysis. This sensitivity analysis will allow us to observe that some nuclear Cap Ex prices allow it to be economically competitive, while estimates on the higher end are not competitive when analyzed on an LCOE basis to other technologies

- The ITC monetization cost was excluded from the Lazard analysis as they assumed that the owner has sufficient tax liability to take advantage of that tax credit. For such a large project such as a nuclear power plant, it may be more difficult for the owner to take advantage of the tax credit and so they would have to transfer that credit and take a hit of about 10%.
- Lazard assumes that all equity stakeholders are willing to receive a 12% return. For a nuclear power plant, that number was increased up to 14-16% as shown, which is more realistic for a newer technology type with inherent financial risk.

Despite a change in OBBBA, the depreciation schedule used in the Lazard 2025 analysis was not changed for the values shown in this report. Solar + storage, wind + storage, and nuclear use a 5-year MACRS in the Lazard analysis and gas uses a 7-year MACRS. OBBBA may allow certain entities (IPP's) to take a 1-year 100% bonus depreciation instead, but utilities may not be able to take advantage of this. Also IPP's with a limited tax liability may not be able to take advantage of the 100% bonus depreciation either. Therefore, this analysis continues to use the 5-year MACRS with a 40.2% combined tax rate, as Lazard's 2025 analysis did.

In Table d, the costs of owning a nuclear power plant are converted into the Levelized Cost of Energy (LCOE) assuming a 30-year loan term and a 60-year project life. Because of the long construction time of a nuclear power plant, the simple assumption used in Lazard's analysis for solar and wind that the equity was all spent one year prior to the commercial online date is unrealistic. For Nuclear, to compress the 5-year construction and testing timeline into a single lump sum payment, made 12 months before the COD as ratio of 30.8% CapEx to OCC was used.

The red cells represent the assumptions unique to this analysis. The orange cells represent the inputs that were reused from Lazard's 2025 LCOE+, "high" case,³¹⁵ which were drawn from data from existing, operating Nuclear Power Plants.

Table d: Levelized Cost of Energy for New Nuclear using a range of OCC and ITC

	Low	Medium (per App. A)	Medium (Per EDF)	High
Capacity Factor	92%	92%	92%	92%
OCC rate (\$/kW)	\$6,200	\$7,000	\$8,300	\$11,000
Cap Ex Rate (\$/kW)	\$8,110	\$9,156	\$10,857	\$14,388
Investment Tax Credit	30-50%	30-50%	30-50%	30-50%
ITC monetization cost	10%	10%	10%	10%
Equity %	20%	20%	20%	20%
Equity Return (nominal)	14%	15%	15%	16%
Project Lifetime	30	30	30	30
Debt Interest Rate	5.0%	5.0%	5.0%	5.0%
Variable O&M Rate (\$/MWh)	\$5.15	\$5.15	\$5.15	\$5.15

Fixed O&M (\$/kW-yr)	\$136	\$136	\$136	\$136
Fuel cost (\$/MWh)	\$8.88	\$8.88	\$8.88	\$8.88
LCOE at 30% ITC	\$62	\$89	\$75	\$99
LCOE at 40% ITC	\$58	\$83	\$70	\$93
LCOE at 50% ITC	\$55	\$78	\$65	\$87

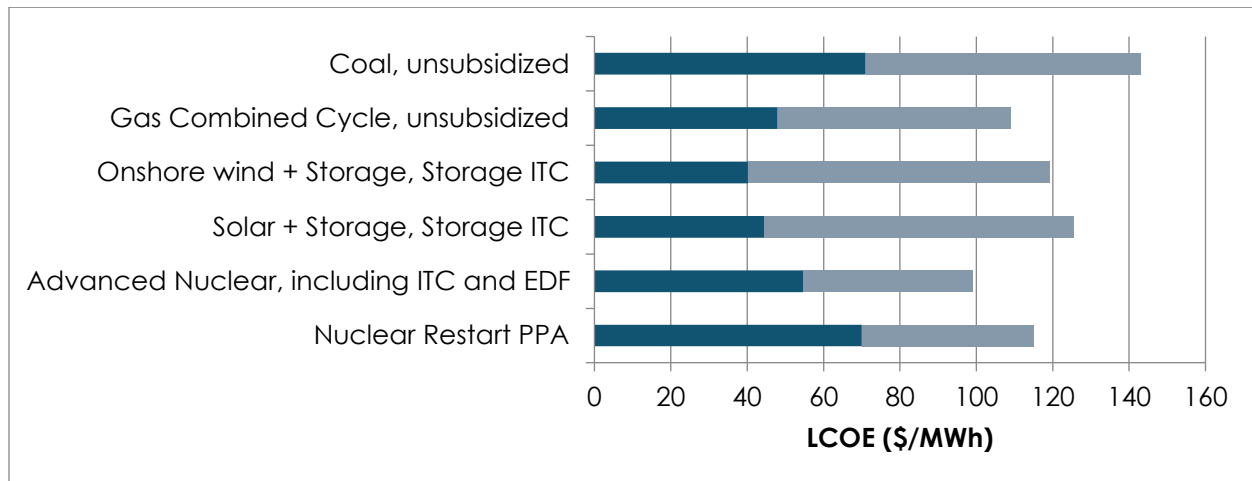


Figure 36: Comparison of the LCOE for various technologies

A large, stylized letter 'E' graphic composed of horizontal bars of varying shades of blue, positioned on the left side of the page.

Appendix E: Consultant Biographies

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Energy Systems Network:



Energy Systems Network (ESN), launched in Indianapolis in 2009, is an Indiana 501(c)(6) non-profit that builds an energy ecosystem that integrates all aspects of the energy landscape: energy generation, distribution, the built environment, and transportation. ESN leverages their network of global thought leaders to develop and deploy integrated, industry-led projects that advance innovative technologies and business models. ESN has worked for 15 years to incubate and launch more than \$1.5 billion in joint ventures, multi-company partnerships, and start-ups across the energy and mobility industries, including alternative fuel transportation, smart grid, transmission and distribution, energy generation, and energy efficiency markets.

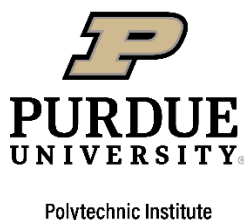
By drawing on a rich diversity of established and emerging companies and institutions globally, ESN leverages each organization's strengths to collectively make up a world-class energy technology cluster with expertise that spans the "energy ecosystem." This ecosystem includes transportation, generation, transmission and built environment – four areas which ESN strives to address with its projects. Each project ESN organizes is a systems-level project that touches multiple aspects of this ecosystem. Learn more at <https://energysystemsnetwork.com/what-we-do/>

Pacific Northwest National Laboratory:



At Pacific Northwest National Laboratory, experts use decades of multi-disciplinary expertise to accelerate the domestic deployment of advanced reactors and innovative nuclear technology, sustain and extend the lives of the existing commercial nuclear reactor fleet, develop new technologies for the safe, secure, and economic recycling of irradiated nuclear fuel, and enable the safe storage, transportation, and disposal of spent nuclear fuel, to ensure that nuclear energy is a part of the 21st century energy generation portfolio. Learn more at <https://www.pnnl.gov/nuclear-energy>

Purdue University:



Purdue University is a leading public research university with internationally recognized strengths in engineering and technology. The university has excelled in tailoring its programs to ensure students are prepared to enter the workforce from day one. Purdue also plays a significant role in advancing nuclear workforce development through its robust nuclear engineering programs and its partnerships with industry and government to prepare students for critical energy

sectors. Through its land-grant mission and strong industry partnerships, Purdue advances innovation, applied research, and education aligned to evolving workforce and economic needs. Learn more at <https://www.purdue.edu/>

Solestiss:



Solestiss is a women-owned, markets, strategy, and technical consultancy specializing in nuclear energy planning and deployment. The team of experts in strategic planning, product development, licensing and regulatory affairs, and project execution experts is uniquely positioned at the intersection of stakeholder planning, project owner execution, and supplier engagement. We have directly supported nuclear operating utilities, reactor developers, component and service suppliers, investors, and state and federal agencies in advancing the deployment of AP1000 reactors and next-generation SMRs. Our team includes former C-suite executives from leading nuclear companies, senior regulators, product engineers, project managers, and consultants who have a track record of helping planners navigate the economic, technological, and regulatory uncertainties of nuclear power both domestically and globally. Learn more at www.solestiss.com

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