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NUCLEAR SERIES PART 6

WYOMING'S NUCLEAR SUPPLY CHAIN OPPORTUNITIES AND CHALLENGES: GENERATED ELECTRICITY

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About the School of Energy Resources (SER)

SER collaborates with stakeholders at the state, national and international levels to advance energy technologies and policies to grow and support Wyoming's robust energy sector. SER's mission is to promote energy-driven economic development for the state, and it leads the University of Wyoming's talent and resources for interdisciplinary research and outreach, fulfilling Wyoming's promise to be a global leader in a thriving and sustainable energy future.

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Abbreviations

AEO	Annual Energy Outlook
CAISO	California Independent System Operator
CERPA	Center for Energy Regulation and Policy Analysis
DOE	Department of Energy
EDAM	Extended Day-Ahead Market
EPA	Environmental Protection Agency
FR	Fast reactor
FERC	Federal Energy Regulatory Commission's
ISOs	Independent system operators
LCOE	Levelized cost of electricity
LWR	Light weight reactor
LNG	Liquid natural gas
MW	Megawatt
MWh	Megawatt hour
MWe	Megawatt of electricity
NPV	Net present value
NERC	North American Electric Reliability Corporation
NRC	Nuclear Regulatory Commission
PSC	Public Service Commission
RTOs	Regional transmission organizations
RCs	Reliability coordinators
SMR	Small modular reactor
SPP	Southwest Power Pool
VSL	Value of statistical life
WYDOT	Wyoming Department of Transportation
WECC	Western Energy Coordinating Council
WEIS	Western Energy Imbalance Service
WMPA	Wyoming Municipal Power Agency

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EXECUTIVE SUMMARY

This report quantifies the economic outcomes of fostering a nuclear electricity generation sector in Wyoming. The unique challenges and opportunities of attracting the industry to Wyoming are identified. Additionally, an event study is performed that estimates economic outcomes under a range of future nuclear power development paths.

The analysis concludes that there is potential to construct additional nuclear reactors in Wyoming, but that growth is limited by the low cost of alternative affordable energy resources in the State.

This report is one in a series evaluating the feasibility of developing an integrated nuclear sector in Wyoming. From the mine mouth to spent fuel processing, each step in the nuclear supply chain has unique economic challenges. To compare the opportunities for Wyoming across the nuclear supply chain, a qualitative scoring system of advantages and obstacles is applied *(Gebben & Peck, 2023)*. The summary of these scoring criteria for nuclear produced electricity is provided in Table 1.

Table 1:
Significant Economic Factors Related to Wyoming Nuclear Produced Electricity

	Level	Summary
Economic	**Major Obstacle**	Natural gas is a cheaper baseload energy source in Wyoming
Existing Industries	**Moderate Advantage**	Retired coal power plants can be converted to nuclear
Tax Structure	**Major Advantage**	Targeted tax benefits in Wyoming
Location	**Minor Advantage**	Locations without licensing obstacles
State Legal	**Minor Obstacle**	Redundant permitting required
Federal Legal	**Minor Obstacle**	Major but variable costs associated with NRC licensing
Technology	**Moderate Obstacle**	Advanced reactors require additional technological improvements.

Table 2 shows the projected economic benefits of nuclear electricity production in Wyoming under various forecasts of nuclear plant installation by 2050. The numeric results are derived from an input-output economic model assuming a reference design of reactors.

Table 2: Wyoming: Total Benefits and Costs of Nuclear Produced Electricity

Nuclear Growth Scenario	Low	Middle	High
Number of Reactors Added	**1**	**2**	**5.5**
Peak Construction Jobs	2,500	5,000	13,750
Long Term Jobs	673	1,346	3,702
NPV of State Taxes (Mill USD)[1]	297	404	778

The associated benefits to Wyoming are linked to nuclear reactor deployment rates in the U.S generally. Economic forecasts show an uptick of U.S. capacity additions of around 10-12 GW , but with a potential for capacity stagnation in the lower bound (CITI Group, 2024; Crooks, 2024; EIA, 2023a; IAEA, 2022, 2024). These outcomes are sensitive to factors such as the rate of nuclear technology innovation, the costs of alternative energy sources, and macro-economic trends. Under a low deployment scenario TerraPower Natrium project still provides an avenue to develop a nuclear industry in the State. The upper bound estimate of nuclear energy growth assumes that innovation will lead to continued cost reductions of reactors. Under an aggressive nuclear reactor expansion scenario Wyoming can acquire 1.9 GW of nuclear capacity, approximately five and half Natrium sized power plants.

The tax and job impacts in Table 2 are calculated using available data and an input-output economic model tailored to Wyoming. The final model applies the IMPLAN software suite, an industry standard for input-output analysis that is grounded on region-specific economic data. The result is an estimate of economic impacts that correspond to the spending patterns required to develop a benchmark nuclear power plant when accounting for the linkages between Wyoming sectors. This model generalizes a Wyoming nuclear project, by using state rather than county specific linkages, and applying tax and spending assumptions that are not tied to specific development plans. The economic outcomes from a single reactor are scaled to match the Wyoming nuclear capacity demand under each growth scenario. In the high growth scenario 5.5 benchmark reactors would be required to fulfill final demand in 2050. While reactors must be built as whole units, the half reactor equivalent capacity can be fulfilled by micro reactors which are smaller than the modeled benchmark.

Under this high growth path, Wyoming is situated to develop innovative methods of nuclear reactor use. For example, the BANR microreactor is being tested at Wyoming trona mines (Wolfson, 2023). The data center Promethius Hyperscale, in Evanston Wyoming, has acquired a non-binding purchase agreement for nuclear produced electricity (Kimball, 2024b; Oklo Inc., 2024a). Finally, the Natrium TerraPower project, in Kemmerer Wyoming was the first industrial sized project to utilize transmission infrastructure previously used for a coal powerplant (Hansen et al., 2022).

While future growth paths are inherently uncertain, Wyoming is well situated to expand nuclear reactor capacity, if economic conditions foster general growth in the sector.

[1] Values are discounted at a 6% discount rate and are the average net returns when the deployment schedule of reactors is uncertain between 2030 and 2050. See Section 5 for details.

INTRODUCTION

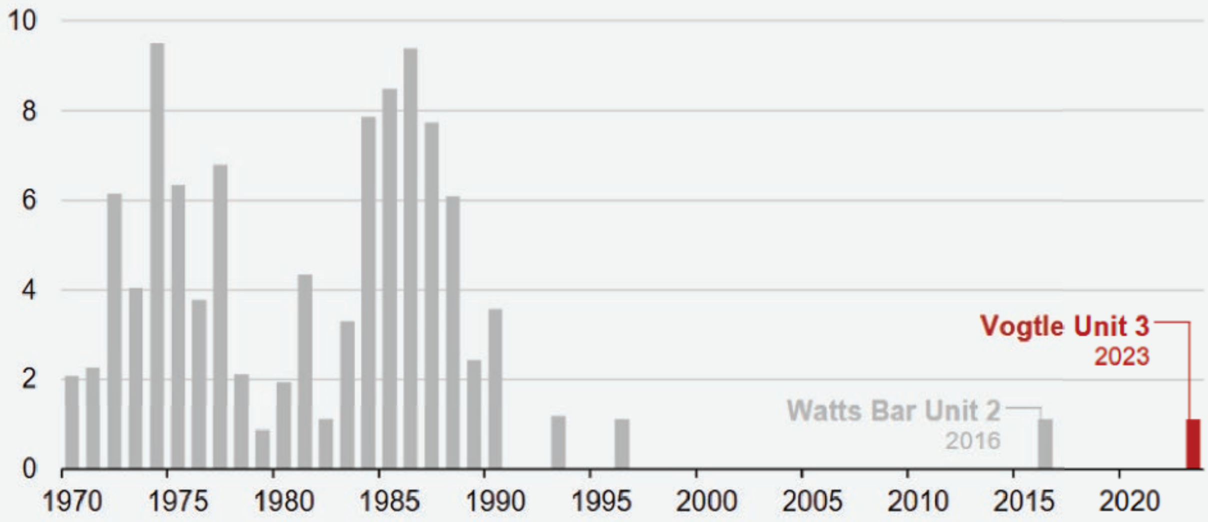
The University of Wyoming, School of Energy Resources Center for Energy Regulation and Policy Analysis (CERPA) completed a series of interdisciplinary economic analyses evaluating the opportunities and challenges for Wyoming economic development in the nuclear sector. The series successively evaluates the economic conditions of each segment of the nuclear supply chain, from uranium mining, all the way to spent fuel storage. This report is the sixth and final in the series and it focuses on nuclear generated electricity. These economic analyses were produced to provide policy makers, stakeholders, and the general public with objective evaluations of new investment opportunities within the State.

This white paper begins by providing an overview of U.S. nuclear electricity trends, and the Wyoming electricity sector. The paper identifies advantages and challenges for producing electricity with nuclear technology in Wyoming. Then, an economic impact analysis is created for the nuclear electricity generation sector. Changes in employment, tax revenue, and non-monetary considerations are provided under different economic scenarios.

BACKGROUND

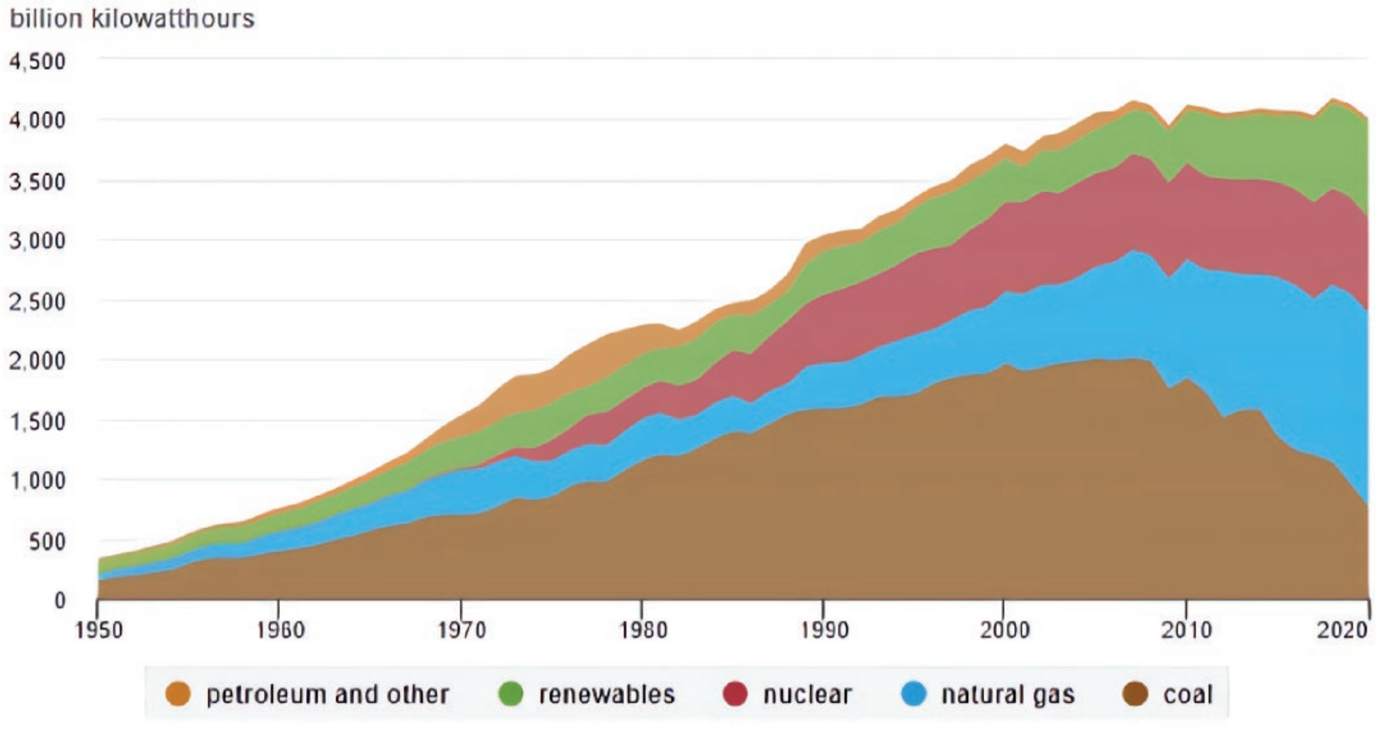
While interest in nuclear power generation has been reignited in recent years, the technology has existed for decades. The first commercial nuclear power plant in the U.S., the Shippingport Atomic Power Station, began operation in 1958 after just four years of construction (*ASME, 2024*). High energy costs due to rising oil prices initially created significant interest and investment in nuclear power generation in the 1970s, but public concern after the Three-Mile Island accident in 1979 grew and came to a head in the wake of the Chernobyl disaster in 1986 (*Char & Csik, 1987*). As can be seen in Figure 1, additional nuclear capacity coming online in the U.S. dropped to zero shortly thereafter.

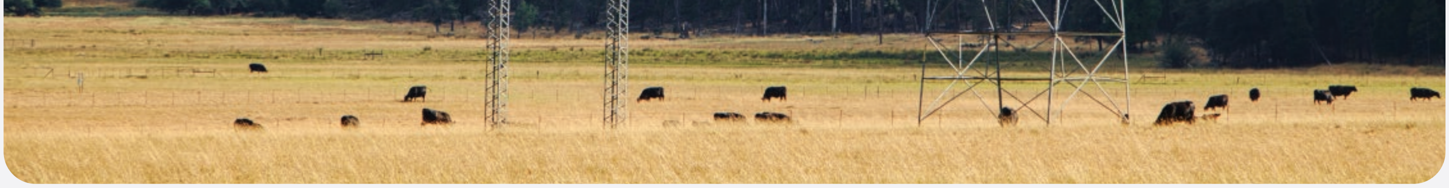
Figure 1:
Gigawatts of U.S. Nuclear Power Capacity Additions by Year of Initial Operation (Fasching et al., 2023)



Despite public sentiment and lack of much additional capacity coming online over recent years, nuclear power still makes up a substantial portion of the electricity generation in the U.S. As shown in Figure 2, about 20% of electricity generation in the U.S. comes from nuclear power sources. This is roughly on par with renewables at 17% and coal at 23%. Notably, while coal has declined from its 2008 peak, natural gas has largely taken its place. Research has attributed this to low natural gas prices relative to other energy sources, the versatile nature of natural gas-fired power plants to operate as a baseload, intermediate, or peaking load, and the increasing penetration of renewables which are subject to intermittency (*Morey & Jell, 2024*). While nuclear power plants are inexpensive to operate after construction, the upfront costs can be a major deterrent. When construction costs are spread out over the lifetime of the power plant, nuclear generators can cost more than twice as much as natural gas-fired power plants per unit of electricity, which is discussed in greater detail in Section 4.1.

Figure 2:
U.S. Electricity Generation by Major Energy Source (EIA, 2024e)

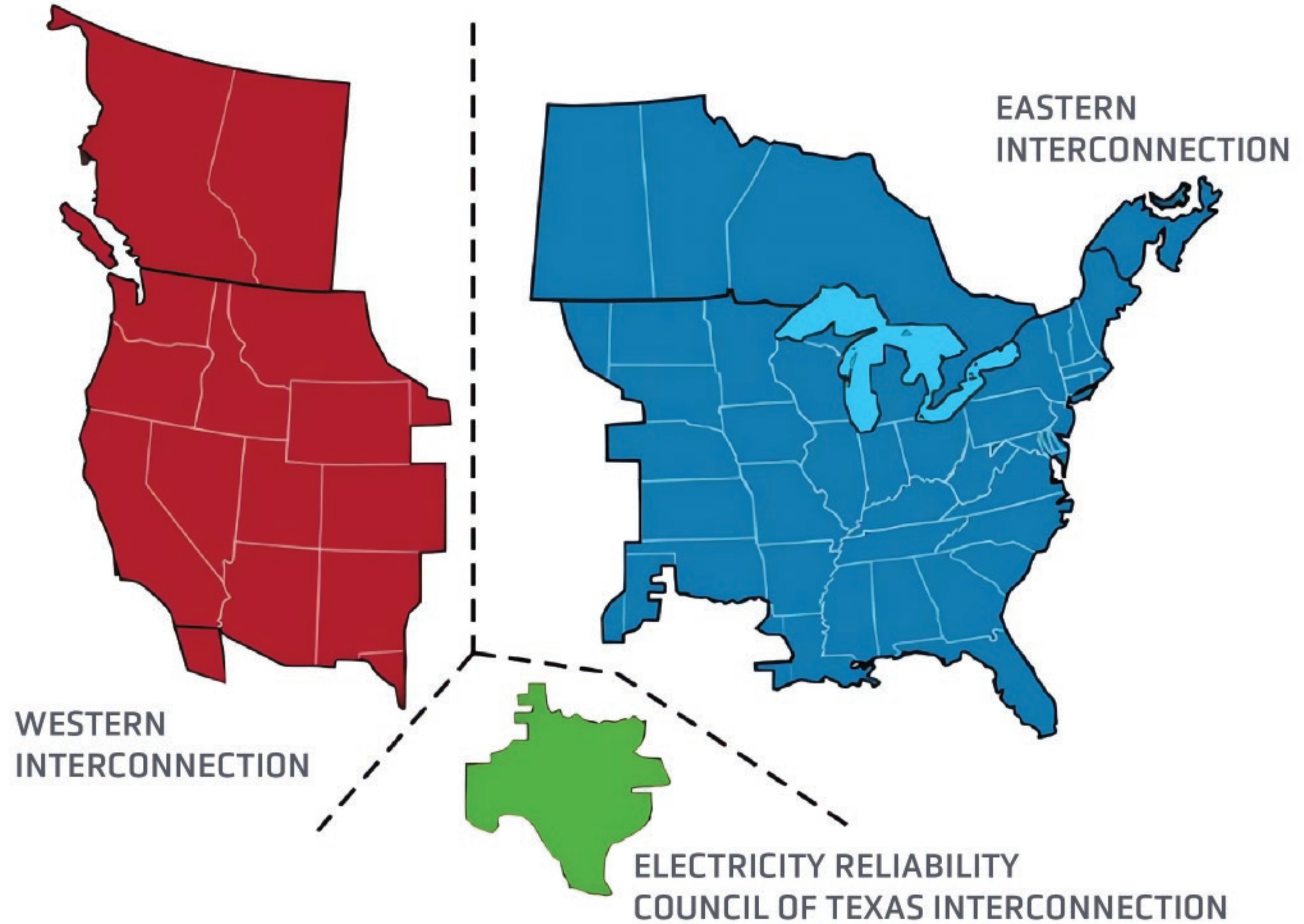




However, as technological advancements and the need for clean energy becomes more pressing, some companies have turned an eye towards nuclear power generation again. In 2019, the triad of Georgia Power Company, Oglethorpe Power Corporation, and Municipal Electric Authority of Georgia were issued up to $12 billion in loan guarantees from the U.S. Department of Energy to construct Vogtle Units 3 and 4 in Waynesboro, Georgia, one of which was completed and brought online in 2023 and the second in 2024 (*DOE, 2019*). On June 10, 2024, TerraPower broke ground on their 345 MWe Natrium reactor in Kemmerer, Wyoming (*TerraPower LLC, 2024c*).

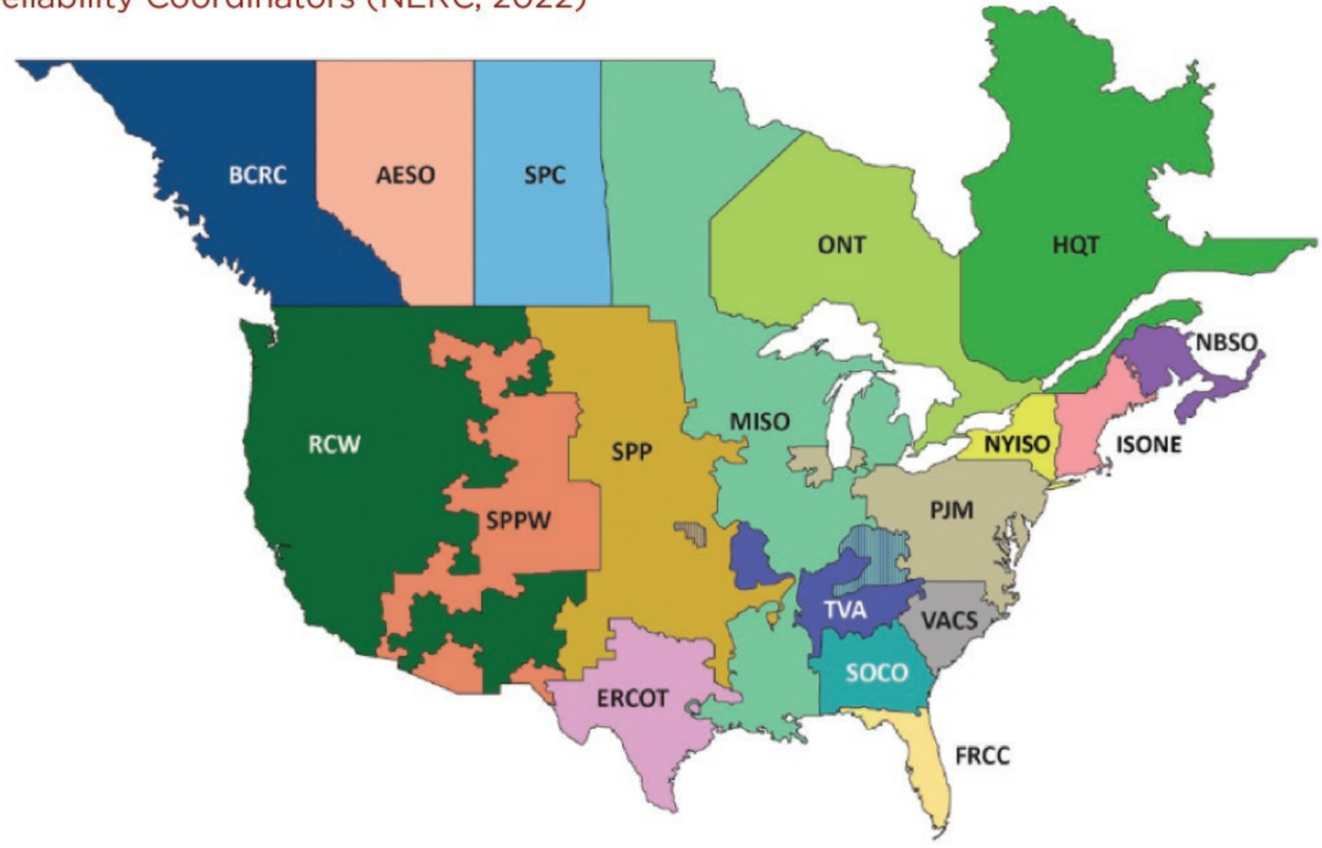
In addition to constructing a nuclear power plant itself, the electricity generated needs to be transmitted and distributed to the appropriate places. While there is nothing special about any given electron moving across the power grid generated by a nuclear power plant over a coal-fired power plant or wind turbine, the physical infrastructure of the U.S. electric grid and how it is administrated are still relevant factors, particularly when considering where an appropriate location might be.

Figure 3:
Map of the North American Electricity Interconnections (Cole et al., 2014)



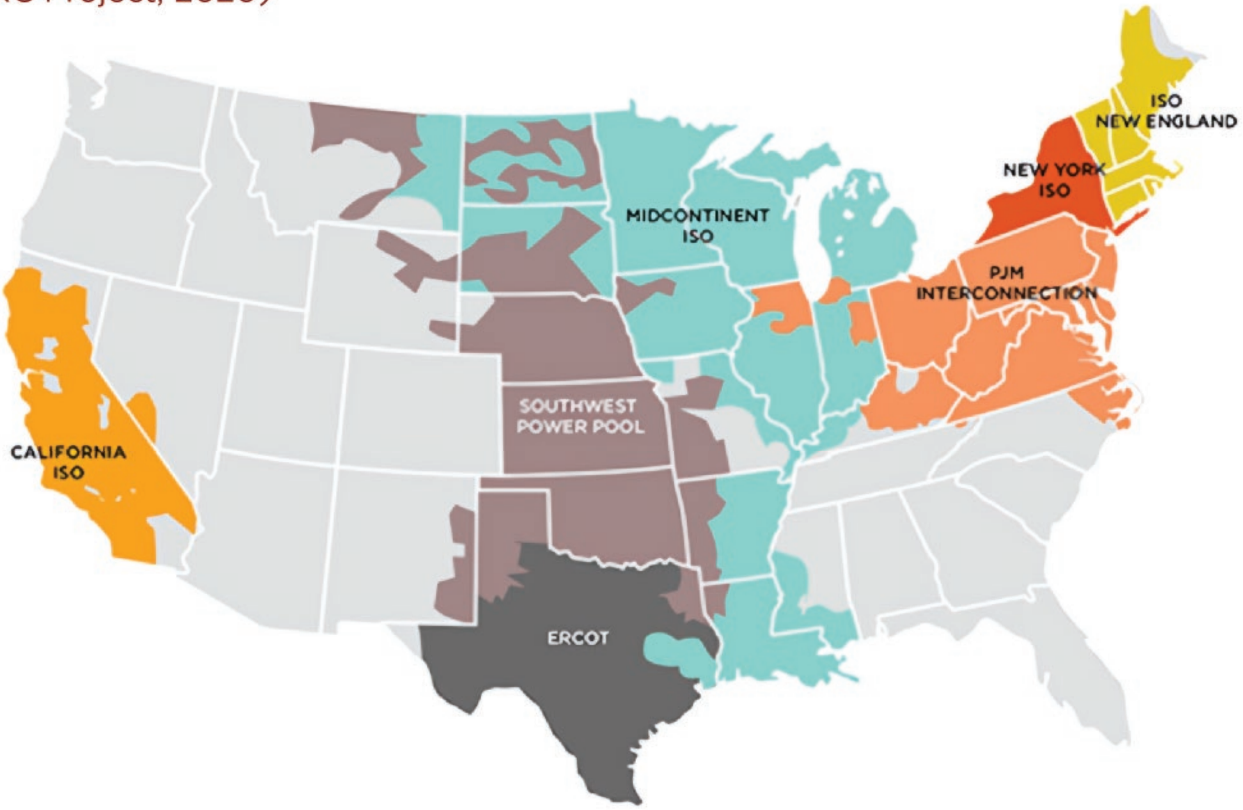
The U.S. bulk power system is divided into three electricity system networks which are shown in Figure 3: the Eastern Interconnection, the Western Interconnection, and the Texas Interconnection. The main takeaway is that it is challenging to send electricity generated in Wyoming to any other location that is not within the Western Interconnection as transfers of electricity between interconnections are currently extremely limited. Responsibility for the operation of the electric grid is delegated to the North American Electric Reliability Corporation (NERC), which further subdivides these duties into smaller management zones that are operated by Regional Entities. Wyoming is located in the Western Interconnection, which is managed by the Western Energy Coordinating Council (WECC). Maintaining the reliability of the electric grid is a task that falls to the aptly named Reliability Coordinators (RCs). As seen in Figure 3, Wyoming generators receive reliability coordination services from two of these RCs: RC West (operated by the California Independent System Operator (CAISO)) and the Southwest Power Pool (SPP).

Figure 4:
Reliability Coordinators (NERC, 2022)



Voluntary electricity markets, along with the control and monitoring of the U.S. electric grid, is largely borne by regional transmission organizations (RTOs) and independent system operators (ISOs) as shown in Figure 5. These entities ensure that electricity makes its way from wholesale generators to consumers by balancing the supply and demand for electricity in real time. ISOs originated in 1996 from the Federal Energy Regulatory Commission's (FERC) Order Nos. 888 and 889, which encouraged transmission owners to form ISOs, while in 1999, Order No. 2000 promoted utilities joining RTO (FERC, 2024a). ISOs and RTOs have the same purpose, and as the electric grid has evolved, the distinction has become muddled to the point that the terms are now interchangeable. The unlabeled light gray areas in Figure 5 are regions where an ISO or RTO is not currently operating. Instead, electricity in these areas is delivered by utilities, some of which are regulated by state entities such as Wyoming's Public Service Commission (PSC). While most utilities in Wyoming participate in real-time wholesale electricity markets operated by CAISO and SPP, none of them have joined an ISO or RTO. However, the possibility of doing so is an ongoing discussion in the industry.

Figure 5:
Regional Transmission Organizations and Independent System Operators (Sustainable FERC Project, 2020)

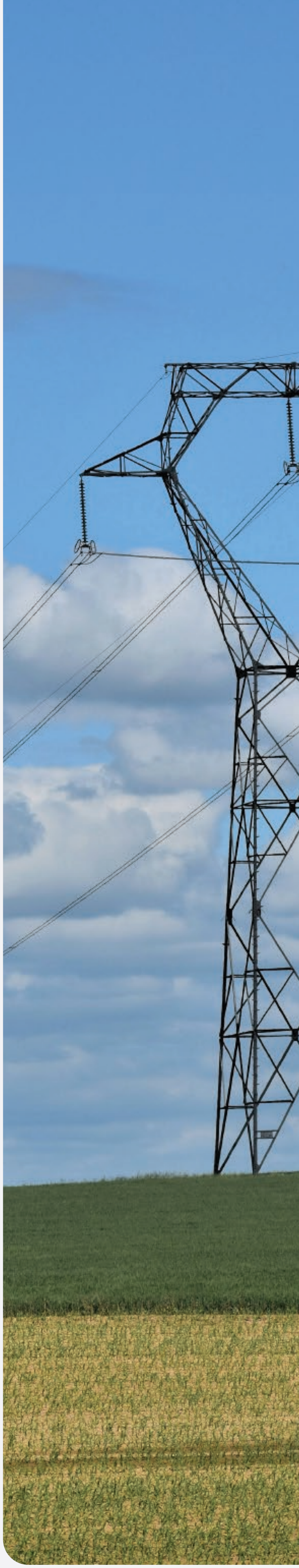


While some regulated utilities voluntarily participate in electricity markets, they are compensated, in part, through a cost-of-service revenue model governed by State commissions that allows for an authorized rate of return for capital investments. This revenue model, along with the single ownership of generator, transmission, and distribution efforts (referred to as vertical integration), grants a natural monopoly to a regulated utility within a specific certificated territory.

The vertically integrated regulated utility model may lead to generation resources may not be economically competitive in a wholesale electricity market environment. From the perspective of a regulated utility, this may encourage greater capital investments as this is a key part of how they are compensated. Given the capital-intensive nature of constructing a nuclear reactor, these regulated utilities may be incentivized to diversify from coal, natural gas, and wind into nuclear power. However, such a project would still need to be approved by the PSC along with a determination that the associated costs are prudent for ratepayers.

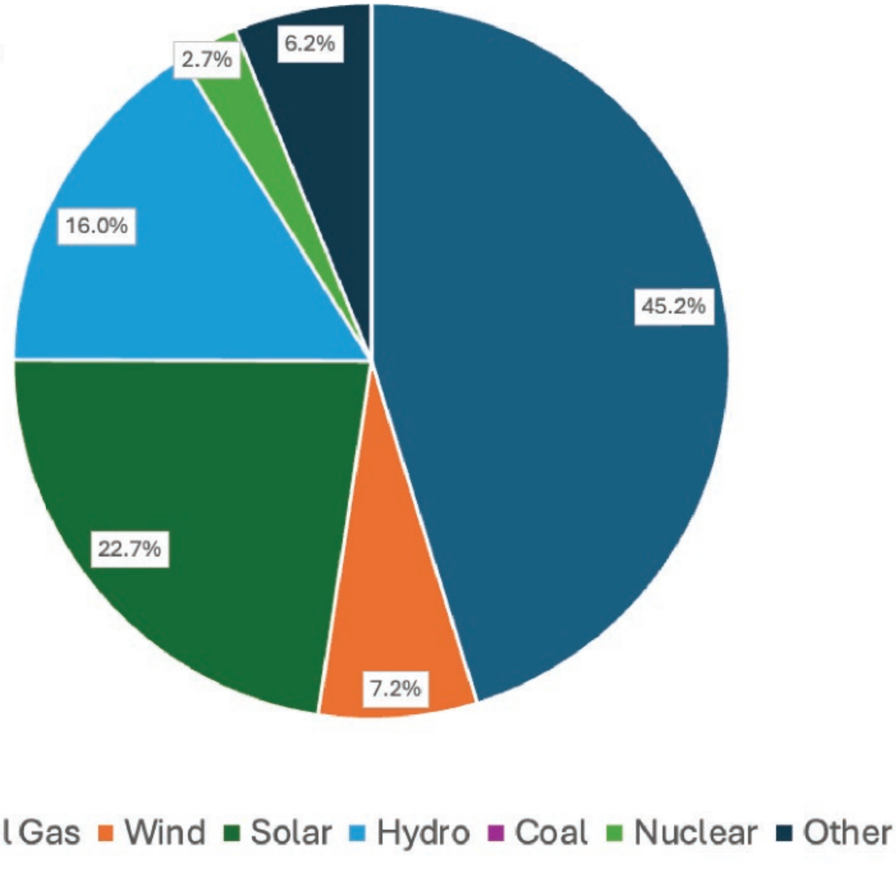
Wyoming is served by three investor-owned utilities, but much of the State is served by rural electric cooperatives. Recent efforts by SPP to expand its electricity markets into the Western Interconnection have led to the offering of the Western Energy Imbalance Service (WEIS), a real-time electricity market that includes the Wyoming Municipal Power Agency (WMPA), the Western Area Power Administration, Tri-State, Basin Electric, and Black Hills Energy (SPP, 2021). Similarly, CAISO established the Western Energy Imbalance Market (WEIM) in 2014. The WEIM is a real-time electricity market that now serves parts of Arizona, Oregon, Nevada, Washington, California, Utah, Idaho, and Wyoming. SPP is developing Markets+, a day ahead market, currently in phase one of tariff development (SPP, 2024). CAISO's Extended Day-Ahead Market (EDAM), recently approved by the FERC is scheduled to come online in 2026. PacifiCorp has indicated it will join the EDAM when it becomes operational. Given their unique structures, some context around the practical differences between CAISO and SPP may be instructive.

CAISO oversees a competitive wholesale electricity market in California and ensures the reliability of its transmission grid. It facilitates open access to the transmission and engages in long-term planning. CAISO manages the electric grid by centrally dispatching generation and coordinating the movement of wholesale electricity in California. Its market offerings include energy (day-ahead and real-time), ancillary services, and congestion revenue rights. As previously mentioned, the WEIM was launched in 2014 and operates outside of California.



In part, CAISO is incentivized to expand outside its state borders to meet demand and due to its need to satisfy generation profile requirements set by California (FERC, 2024b). It will require more low-carbon electricity imports to fulfill legislatively set targets. While this can be achieved in the short-term with transmission lines connecting with the West, such as the proposed TransWest express transmission line from Wyoming to Nevada to supply electricity from wind farms, long-term planning may require more robust participation from states willing to export their low-carbon electricity, such as potential future nuclear power generators or the high density of wind generation found in Wyoming (Hurlbut et al., 2023). CAISO's electricity generation profile by fuel type can be seen in Figure 6. It has a large percentage of nuclear and renewable generation resources (Nyberg, 2024). Nuclear produced 8.2% of the electricity generated in the State while making up only 2.7% of the nameplate capacity(California Energy Commission, 2024). The intermittency of renewable generation incentivizes the use of natural gas, a quickly dispatchable source which makes up 43.3% of California's generation capacity to subsidize the supply of electric power at times when solar and wind generators cannot provide adequate supply to the grid (EIA, 2024g).

Figure 6:
Generation Capacity Profile by Type for CAISO 2023[2]



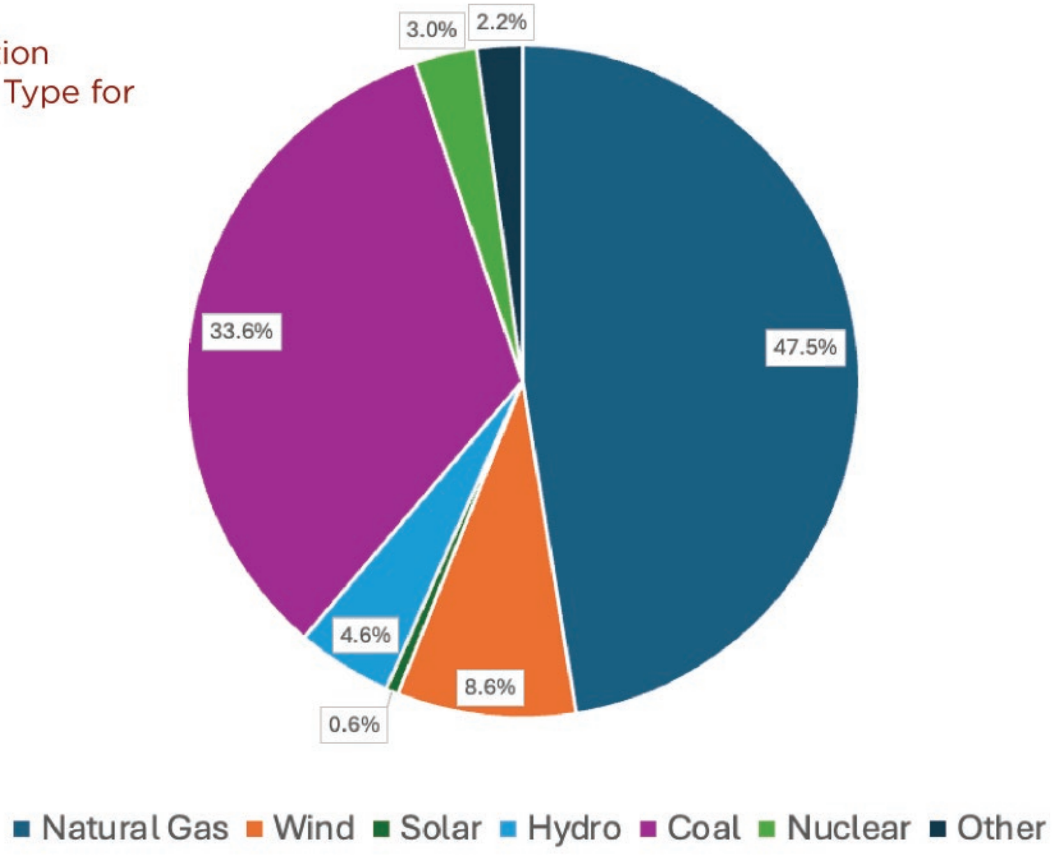
[2] Data for chart is from the California Energy Commission-1304 Quarterly Fuel and Energy Report (California Energy Commission, 2024)

SPP is “a nonprofit corporation mandated by the Federal Energy Regulatory Commission (FERC) to ensure reliable supplies of power, adequate transmission infrastructure, and competitive wholesale electricity prices on behalf of its members” (SPP, 2024a). Based in Little Rock, Arkansas, SPP oversees generation resources and transmission assets across segments of 14 states, including Arkansas, Iowa, Kansas, Louisiana, Minnesota, Missouri, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, and Wyoming. In 2007, SPP began operations in the Eastern Interconnection of its real-time Energy Imbalance Service (EIS) market, coinciding with its approval by the FERC as a Regional Entity. Functioning as the reliability coordinator for the NERC region, the SPP Regional Entity oversees adherence to reliability standards (FERC, 2024c).

In March 2014, SPP implemented its Integrated Marketplace in the Eastern Interconnection, comprising of a day-ahead energy market, a real-time energy market, and an operating reserve market. The integrated marketplace optimizes the deployment of energy and operating reserves by economically dispatching resources in a manner to increase efficiency and reduce electricity costs. Additionally, SPP’s Integrated Marketplace features a market for transmission congestion rights. The issue of transmission congestion is expected to escalate with increased electricity generation and inter-regional transfers among states which may impact long-term planning for nuclear power generation in portions of Wyoming under the coordination of SPP. Expanding its Eastern Interconnection footprint in 2015, SPP incorporated the Western Area Power Administration – Upper Great Plains (WAPA-UGP) region, the Basin Electric Power Cooperative, and the Heartlands Consumer Power District.

The difficulty associated with intermittency can be observed in capacity and generation data for SPP. Figure 7 provides the accredited capacity of SPP, which adjusts the capacity for total grid reliability. Figure 8 shows the actual amount of electricity produced by each energy source. While wind contributes 8.6% of reliable system capacity, wind generation produces 38% of all electricity. This indicates that wind generation in SPP is timing constrained adding to total system costs.

Figure 7:
Accredited Generation Capacity Profile by Type for SPP[3,4]



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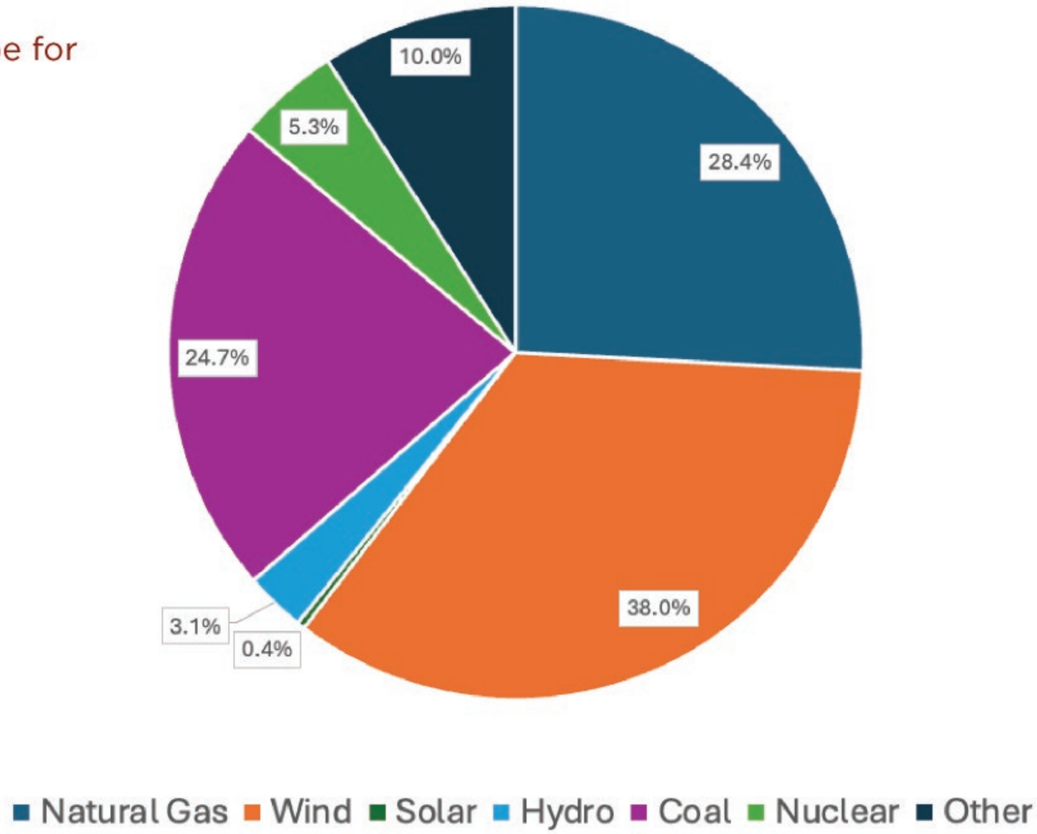
[3] Accredited capacity is a calculated value which accounts for the availability of the resource (SPP, 2024b).
[4] Accredited generation data comes from (SPP, 2024)

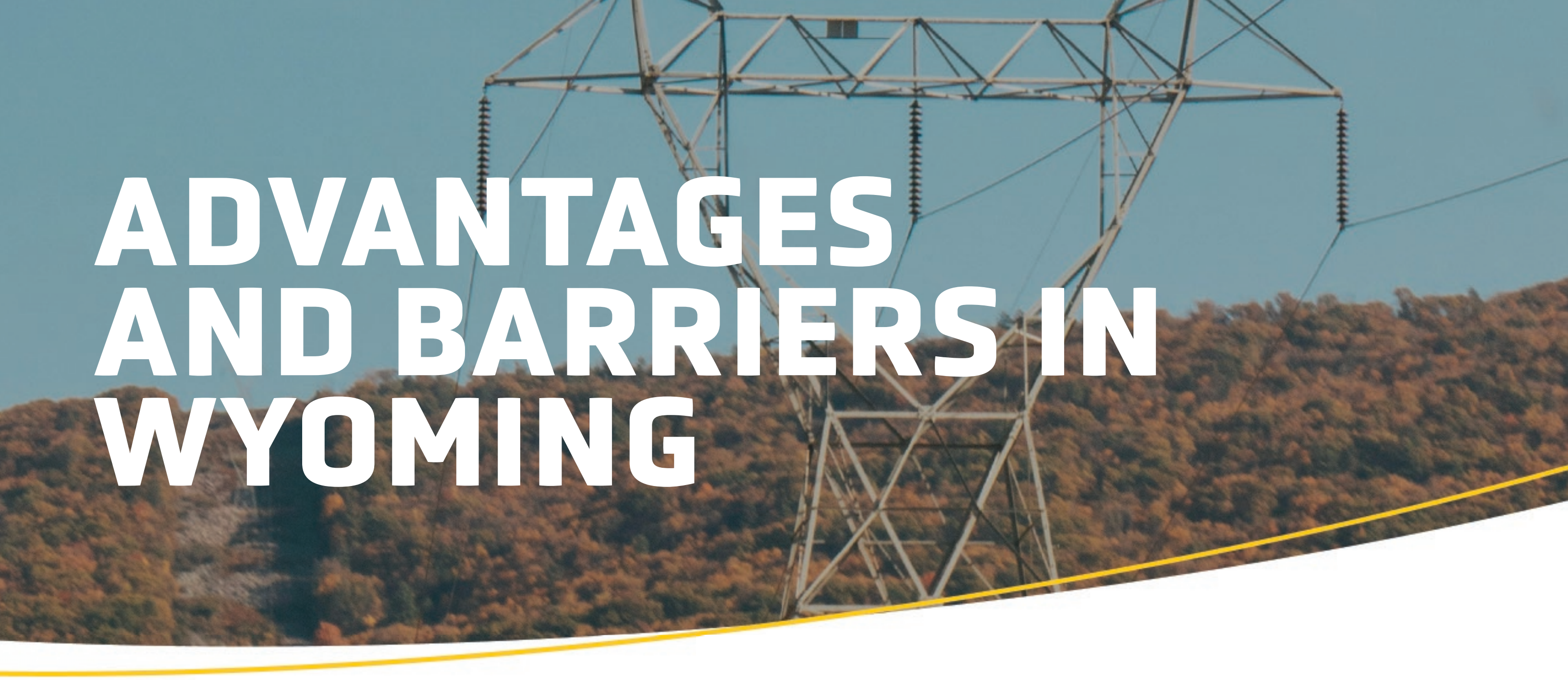
Figure 8:
Generation by Type for SPP[5]



Unlike CAISO, the SPP generation resource profile relies on coal, wind, natural gas, and hydro generators to provide baseload generation resources. SPP dispatches a large number of natural gas generators when demand is particularly high during peak hours and to balance the intermittency of solar and wind generation resources. Combined, these factors may indicate that the western portion of Wyoming coordinated by CAISO is a less risky long-term prospect for the construction of a nuclear power plant, having more reliable returns due to stabilizing natural gas and regional balancing plans.

From a practical perspective, a company considering where to build a nuclear power plant may be less concerned about which electricity market they can participate in than the population density, water availability, and other geographical considerations of a region, but it may aid in narrowing multiple otherwise viable sites.

5 Total yearly energy production by fuel type in 2024 (SPP, 2024).



ADVANTAGES AND BARRIERS IN WYOMING

A set of empirical and qualitative analyses are applied to contextualize the opportunities and challenges related to fostering investment in Wyoming nuclear reactors. A scoring system ranging from *severe obstacle* (red) to *major advantage* (green) is given to each category of development (see Gebben & Peck, 2023). The preceding six sections identify this score for the categories of: 1) economic factors; 2) existing industry in Wyoming; 3) tax structures; 4) location specific effects; 5) legal consideration; and 6) available technology. At the beginning of each section, the *Scoring Criteria* subsection provides the score and rationale. For those seeking a more thorough explanation, a detailed discussion of the steps used to identify the score is provided in the *Analysis* sub-section.

4.1 ECONOMICS

Major Obstacle

Economic Barriers: Scoring Criteria

Economic considerations are scored as a major obstacle to developing a nuclear generated electricity industry in Wyoming. Under currently available technology, nuclear reactors are more costly per unit of electricity generated compared with other options. Natural gas and a subset of wind turbines are cheaper alternatives to nuclear power plants, preventing profit maximizing firms from selecting this technology. The developing TerraPower Wyoming Project received $2 billion dollars in matched federal subsidies which allowed this investment obstacle to be overcome (Pequeño IV, 2024; Powers & Rubin, 2021; TerraPower LLC, 2025). Without additional subsidies[6], cost reductions through technologic and logistical innovations, or an increase in natural gas prices, nuclear energy will be sub-economic in the Wyoming market, which is classified as a major obstacle.

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[6] On top of existing subsidies which include programs in the Inflation Reduction Act. A removal of these programs further challenge industry growth.

Economic Barriers: Analysis

The central economic obstacle to establishing a nuclear electricity market in Wyoming is the cost of advanced nuclear power compared to alternative electricity sources. In an open electricity market, the price of electricity is driven by the lowest cost source of production. The levelized cost of electricity (LCOE) is a metric to compare the cost of electricity across generations sources. LCOE is calculated by averaging the net present cost of electricity production, including upfront costs, fixed costs, and long run average operating costs divided by the total electricity produced during a recovery period. LCOE has some shortcomings, it excludes system costs caused by intermittency, lacks a measure of the social costs to pollution, and does not provide a premium for portfolio diversification (EIA, 2023e). However, the LCOE is a standard first order measure of the economic competitiveness of various energy sources (EIA, 2023e; NEA, 2021a).

One metric of the feasibility of nuclear reactor additions is the gap between the LCOE of the lowest cost energy source[7], and the LCOE of advanced reactors. This lowest cost electricity source effects the average U.S. electricity price, which in turn changes the revenues of nuclear reactors. Currently the lowest cost energy source that is not constrained by weather considerations is natural gas, with a combined cycle turbine estimated to have a LCOE of $47.85 per MWh by 2028 (EIA, 2023b).

To see how natural gas costs influence nuclear reactor projects, consider a simplified economic model[8] of the supply of natural gas turbines when the demand for electricity increases. If demand factors lead to an average wholesale price of electricity of $50 per MWh, new additions of natural gas capacity will average $2.15 of profit for every MWh generated. This encourages investment in natural gas turbines. The result is an outward shift in the electricity supply, which in turn lowers the price of electricity. This electricity supply increase from natural gas capacity additions will continue until the electricity price approaches $47.85 per MWh, and expected profits are $0[9]. This pushes the average price of electricity in the US towards $47.85 per MWh.

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7 Which is not constrained by location such as wind, solar.

8 Under a simplified economic model where LCOE perfectly captures the value of various energy sources, and any number of turbines can be produced for a LCOE of $47.85.

9 It should be noted that the LCOE includes a term for the time value of money. An investment in a natural gas turbine, when the LCOE equals the price electricity does provide absolute profits. There is a "economic profit" of zero because there are no better investment options, but the absolute profit is equal to the average rate of return of alternative investments over the project life.

Some energy sources with geographic limitations, such as wind, might have a LCOE that is less than $47.85 per MWh. This allows for regional variation in deployment mix. For example, the same wind turbine design will produce more electricity in Wyoming than in Nevada due to higher average wind speeds, leading to lower LCOE in Wyoming. The LCOE of wind turbines deployed in 2028 are expected to range from $37.62-$85.45 per MWh, before tax deductions, or $15.39-$63.21 per MWh when including tax write offs and subsidies (EIA, 2023b; U.S. Bureau of Labor Statistics, 2025a). Due to regional variation in wind quality, economic incentives will encourage the deployment of wind farms in select regions, even as natural gas establishes the ceiling price. However, it should be noted that system costs are *underestimated in a LCOE comparison*, so wind projects may be overvalued by this metric, when compared to natural gas or nuclear reactors. In regions with cheap renewable resources advanced reactors must be cost competitive with both natural gas and these low emission renewable electricity sources.

The gap between the LCOE of nuclear and natural gas must be overcome for widescale deployment. To identify the challenges presented by reactor costs, the EIA Annual Energy Outlook (AEO) estimated LCOE of various electricity sources in 2028 is provided in Table 3.

Table 3:
LCOE of U.S. Electricity Sources Added After 2028[10]

Plant Type	Capital	O&M	Variable	Transmission	Tax Credit	Total
Solar	$30.83	$11.12	$0.00	$4.21	-$20.16	$26.01
Wind, Onshore	$41.96	$11.78	$0.00	$3.24	-$22.18	$34.80
Geothermal	$26.97	$19.72	$1.47	$1.70	-$8.09	$41.78
Natural Gas	$16.00	$3.12	$27.33	$1.39	N/A	$47.85
Hydroelectric	$58.40	$16.06	$4.65	$2.39	-$17.52	$63.97
Advanced Nuclear	$69.63	$19.45	$11.32	$1.29	-$22.18	$79.52
Biomass	$50.02	$22.96	$32.14	$1.46	-$20.16	$86.42
Coal	$64.66	$7.95	$26.07	$1.37	N/A	$100.05
Wind, Offshore	$100.36	$39.04	$0.00	$3.08	-$30.11	$112.38

[10] Selected average LCOE reported from the EIA 2023 Annual Energy Outlook data set (EIA, 2023b). Inflation adjusted from 2022 dollars to December 2024, using the CPI index (U.S. Bureau of Labor Statistics, 2025a).

To add to this metric, the deployment order implied by these LCOE values (lowest LCOE to highest) and the relative cost difference compared with natural gas of various power plant types are provided in Table 4 . These values are given before and after relevant tax credits are applied, showing how future changes to the tax code could affect the deployed energy mix.

Table 4:
Comparison of Relative LCOE Costs[11]

		After Tax Credit		No Tax Credit	
Plant Type	**Constrained**	**LCOE Rank**	**Difference from Natural Gas**	**LCOE Rank**	**Difference from Natural Gas**
Solar	☒	1	-46%	1	-4%
Wind, Onshore	☒	2	-27%	4	+19%
Geothermal	☒	3	-13%	3	+4%
Natural Gas		4	0%	2	0%
Hydroelectric	☒	5	+34%	5	+70%
Advanced Nuclear		6	+66%	7	+113%
Biomass		7	+81%	8	+123%
Coal		8	+109%	6	+109%

On average the EIA estimate of LCOE for an advanced nuclear reactor is $79.52 per MWh after tax credits. Due to regional variations in construction costs and taxes this value can be as low as $73.24 per MWh which is 53% higher than the natural gas LCOE (EIA, 2023b, 2023e). Advanced nuclear is the sixth most expensive energy source overall but is the second most cost-effective energy source that lacks a location constraint. This makes the relative cost of natural gas turbines a major obstacle to nuclear reactor deployment. Natural gas turbines can be deployed in much of the county; therefore, a proposed nuclear reactor site will be compared with the alternative of natural gas generation. Where this LCOE difference is large, profit seeking firms will select natural gas over nuclear, limiting U.S. reactor development.

11 *Ibid.*

The available tax advantages of nuclear reactors, including those provided by the Inflation Reduction Act, significantly reduce the LCOE gap between natural gas and advanced nuclear projects. Tax incentives shrink the LCOE disparity by 58%, shifting advanced reactor LCOE from being 113% higher than natural gas to 66% higher. This gap remains significant in establishing the timeline of wide scale nuclear reactor deployment. Learning rates from technology innovation, and deployment experience reduce reactor costs over time (see section 4.2). The current tax incentives for nuclear reactors shorten the window to wide scale deployment making nuclear generation capacity outlooks sensitive to policy changes.

An alternative LCOE estimate is considered due to the significance of project specific costs. A recent evaluation considers the LCOE of adding an AP1000 reactor to an existing power plant. The model accounts for the new tax advantages afforded to nuclear capacity installments and the acquired industry experience from the Vogtle project. This report finds that the LCOE of the Vogtle additions would have been $86 per MWh if construction was shortened to six years, and newly available tax credits were applied (Kozeracki et al., 2023). However, when accounting for additional cost reductions generated by supply chain developments and instillation experience, the LCOE would reach $60 per MWh (Kozeracki et al., 2023). This would place an advanced reactor as having a 25% larger LCOE than equivalent natural gas sources. The estimated range of LCOE for nuclear projects with a “early of a kind” schedule is $61 to $122 per MWh, with a median of $91.5 per MWh (Kozeracki et al., 2023).

The DOE estimated advanced nuclear LCOE of $60 per MWh was identified by adjusting the actual costs of the Vogtle unit two and three. This method is most applicable to the expansion of existing facilities with developed infrastructure[12]. Such an expansion has been proposed in Wyoming. Two additional units were announced to be in early development at the Natrium Kemmerer power plant in 2022 (PacifiCorp, 2022). However, these units were removed from PacificCorp’s Integrated Resource Plan beginning in 2023 (PacifiCorp, 2024). Future market shifts could bring these units back into play due to the lower expected LCOE compared to the US average for new advanced nuclear builds.

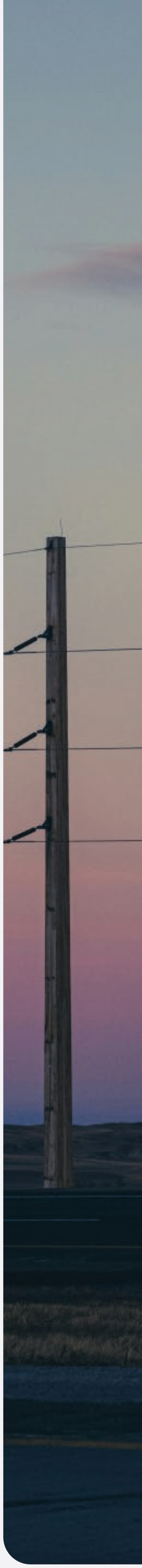
[12] The EIA LCOE estimate is most applicable to new builds

There is empirical evidence that natural gas cost reductions are the central reason for constrained nuclear reactor profitability. A time-series regression analysis evaluated the wholesale price of electricity received at 33 nuclear reactors. The method estimates the relative importance of three factors that affect electricity price, including electricity demand, wind generation, and natural gas price. Natural gas price reductions were identified as the most important driver of revenue reduction at nuclear reactors. Depending on the location of the reactor, reduction in natural gas prices accounted for between 50% and 86% of the observed electricity price decline. (Jenkins, 2018)

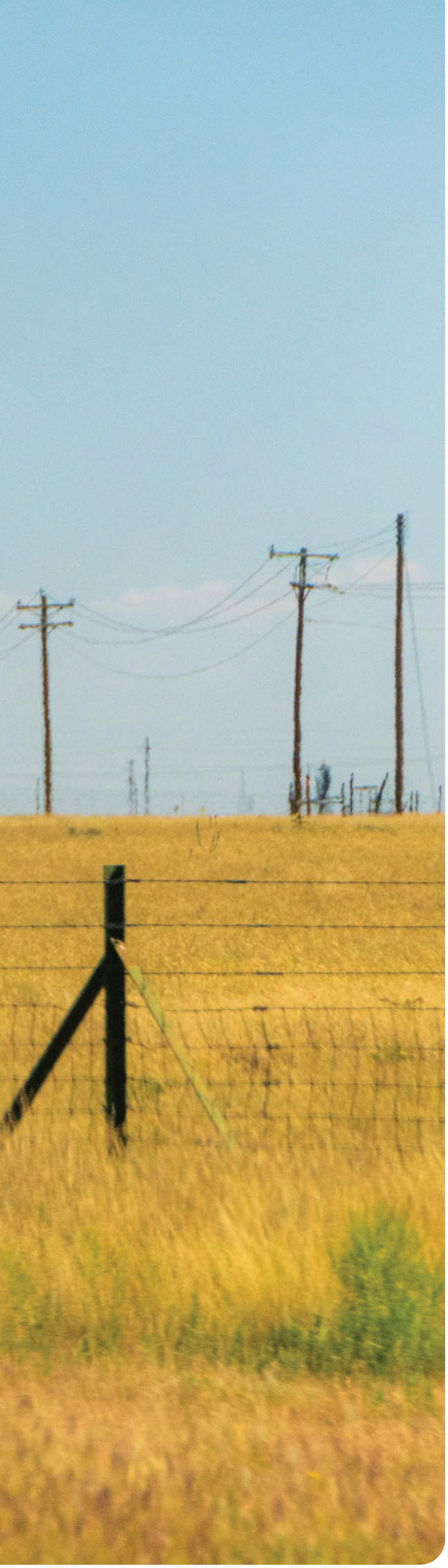
Significant strides have been made to improve nuclear reactor economics. Innovations have contributed to nuclear reactors having a lower LCOE than a new ultra-critical coal project which has a LCOE of $100 per MWh compared with nuclear at $79.52 MWh(EIA, 2023b). However, this does not reduce the economic obstacles score. If the price of natural gas increased above pre-shale revolution levels, then advanced nuclear and coal power plants would become feasible deployment options. Because the LCOE costs are similar, the two technologies would be distributed based on local cost considerations, such as the distance from coal mines and state carbon pricing. As it stands, the same economic drivers which could lead to 25% of coal capacity being retired by 2029, likewise limits nuclear reactor growth (Brown, 2022). This makes the cheap natural gas afforded by U.S. shale development the main obstacle to nuclear reactor development in Wyoming, although this industry provides other benefits to the State.

While LCOE tells an important story about the feasibility of Wyoming nuclear sector growth, there are other factors to consider. For example, some ISO's have implemented a capacity market. A public utility seeking to provide a stable supply of electricity to consumers may wish to pay a premium for available capacity. Even though this premium does not maximize net private profits, assuring excess capacity exists on the grid limits risk of curtailment during peak demand periods. To meet these goals, a futures market is established where a power producer is paid to guarantee capacity is available at a given date. Bids are made for this obligation, and the lowest cost bid is accepted. These contracts can then be sold on the market, allowing new firms to take responsibility for providing the promised capacity.

Capacity markets provide a unique advantage to nuclear produced electricity projects. Because of the dynamics of nuclear reactors, large capital costs occur upfront with moderate operating costs taking place over the life of the project. An ISO with a capacity market incentivizes nuclear projects by ensuring a level of return for the large capacity availability. Further, this payment is made up front, reducing the project's exposure to the risk of stranded assets if electricity prices decline. The availability of these markets has been found to increase the revenue of nuclear reactors by an average of $4[13] per MWh with a range of $4.5 and $3.5 per MWh (Haratyk, 2017).



[13] $3 per MWh is inflation adjusted from 2016 dollars to 2024 values (Haratyk, 2017; U.S. Bureau of Labor Statistics, 2025a).



While Wyoming does not operate a capacity market the economic effects of such a system can be mirrored by State policy. Since the State electricity market is vertically integrated, regulators can account for capacity considerations when approving additions. The allowable rate of return for nuclear projects can be set such that capacity is valued at the same rate as in an open capacity market. Such an outcome is not guaranteed as the benefits of capacity incentives are hotly debated. A recent proposal by PJM for a capital market has been met with resistance from a number of organizations, including those representing renewable energy firms, and rate payer advocacy groups with concerns about plan costs (Howland, 2025).

Another reason why a nuclear electricity project may be undertaken despite having a higher LCOE than natural gas is to provide a diverse portfolio of electricity production. Establishing a mix of energy production methods in Wyoming reduces the risk of an energy specific shock to cost overruns. For example, consider the uncertainty in natural gas prices. If all of Wyoming electricity comes from natural gas, then an increase in the price of natural gas will create an unavoidable rise in electricity prices. The advantage of energy production portfolio management extends both to government run markets, and private sector power producers (Acemoglu et al., 2017; Fleten et al., 2018). This effect can be compared to the advantages of having a diverse investment portfolio. Even if natural gas electricity production is expected to provide the highest returns on investment, developing some nuclear capacity reduces the risk of loss to rate payers. This can decouple short run and long run expected profits. In the short run, adding nuclear capacity as a hedge is likely to raise the average cost of electricity. However, over a long enough time horizon, this risk reduction can result in increased returns.

A related benefit of developing nuclear capacity is that fuel disruption is minimized. The onsite fuel supplies at reactors are typically sufficient to operate for over a year. This avoids disruption concerns that are present in natural gas combined cycle turbines, where a gas pipeline outage will halt generation. Adding stable nuclear reactors is one way to manage this risk of supply shocks.

A lower bound estimate of LCOE can be made by combing a few of these factors. From a starting point of $73.24 LCOE (EIA, 2023b), adding a capacity payment of $4 per MWh (Haratyk, 2017)[14], and a 30% reduction of costs by reusing capital at an existing coal facility and additional technological advancement (EPRI & King, 2023; Hansen et al., 2022; Lohse et al., 2024a), LCOE could be reduced to $48.47 per MWh. This would place the current reactor costs in line with natural gas turbines. Notably natural gas turbines can also benefit from payments for capacity or reusing existing infrastructure, so natural gas would still be more cost effective under these assumptions, but under ideal circumstances new reactors may enter the picture.

TerraPower was able to overcome the cost obstacles associated with nuclear power receiving 2 billion dollars in federal support to match private investment (Pequeño IV, 2024; Powers & Rubin, 2021; TerraPower LLC, 2025). Funding opportunities like this could reduce the private cost of a nuclear reactor by half, moving the private LCOE of nuclear reactors to $39.76 per MWh which is below that of natural gas. Based on the previous analysis, more modest DOE funding could promote nuclear additions in Wyoming at locations where costs are lower than for new builds, such as capacity expansion at the Kemmerer facility. However, without any direct support, market factors constrain near term nuclear expansion in the State.

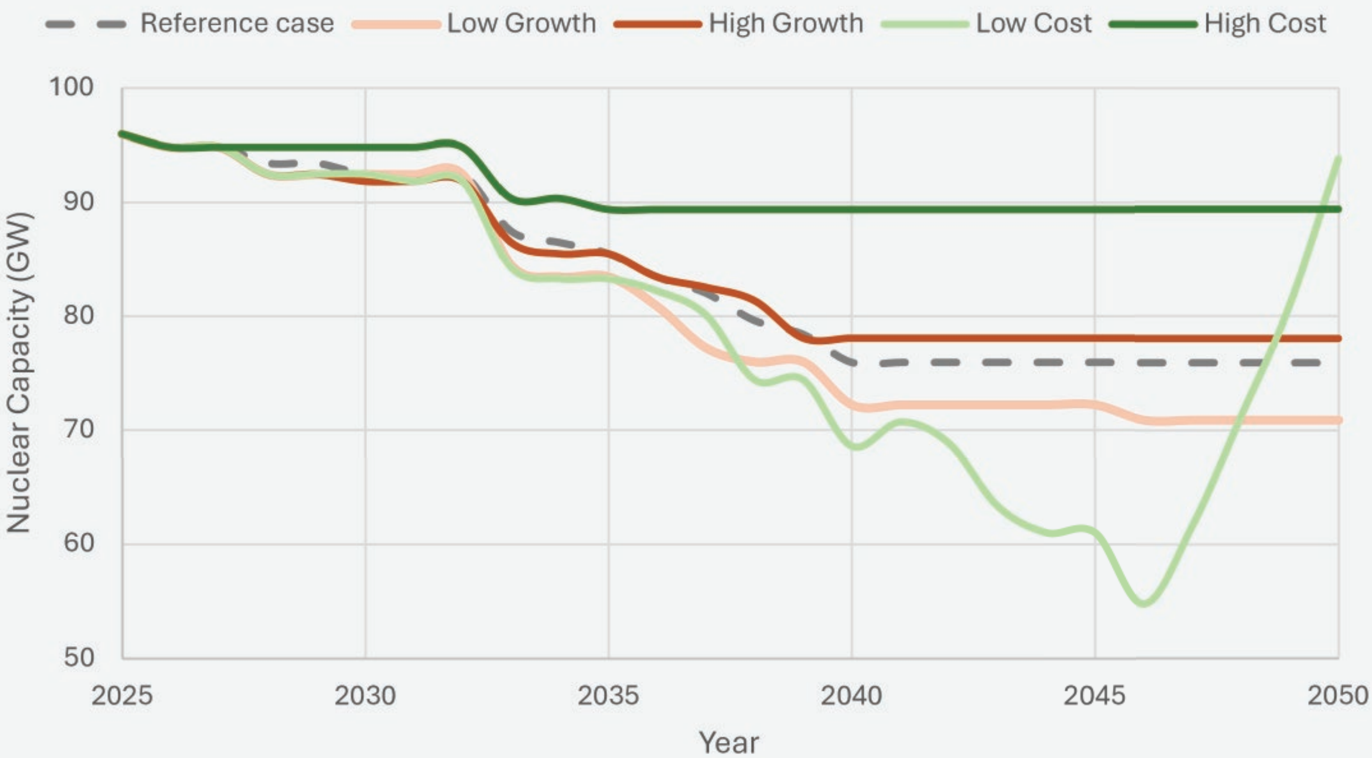
To continue development of nuclear reactors without subsidization in Wyoming, one of two economic conditions must change. Either natural gas prices must substantially increase, or technology must develop (reduced reactor cost) . Consequently, economic considerations are placed as a major obstacle to nuclear reactor development in Wyoming, requiring additional financial support to be economically viable.

However, economic conditions may change so uncertainty in future nuclear reactor competitiveness is considered. One model of nuclear energy development is the EIA's 2023 Annual Outlook Report (AOR) (EIA, 2023a). A subset of economic scenarios from the EIA forecast are presented in Figure 9. Here the expected total U.S. nuclear capacity is evaluated under five scenarios 1) the reference case 2) high economic growth, 3) low economic growth 4) when costs of low carbon emission energy sources decline, 5) when costs of low carbon emission sources increase.

[14] Assuming the State regulators place a value of $4 per MWe of capacity. Here the Wyoming Public Service Commission is treated as valuing capacity addition decisions based on the market price of capacity observed in other regions. This market signal provides information about reasonable rates the State could pay for capital. Payments for capacity above this rate are likely to be economic inefficient.

[15] When accounting for possible future leaning rates that reduce reactor costs, it is feasible to reduce capital costs by as much as 50% by 2050 (see Section 4.4).

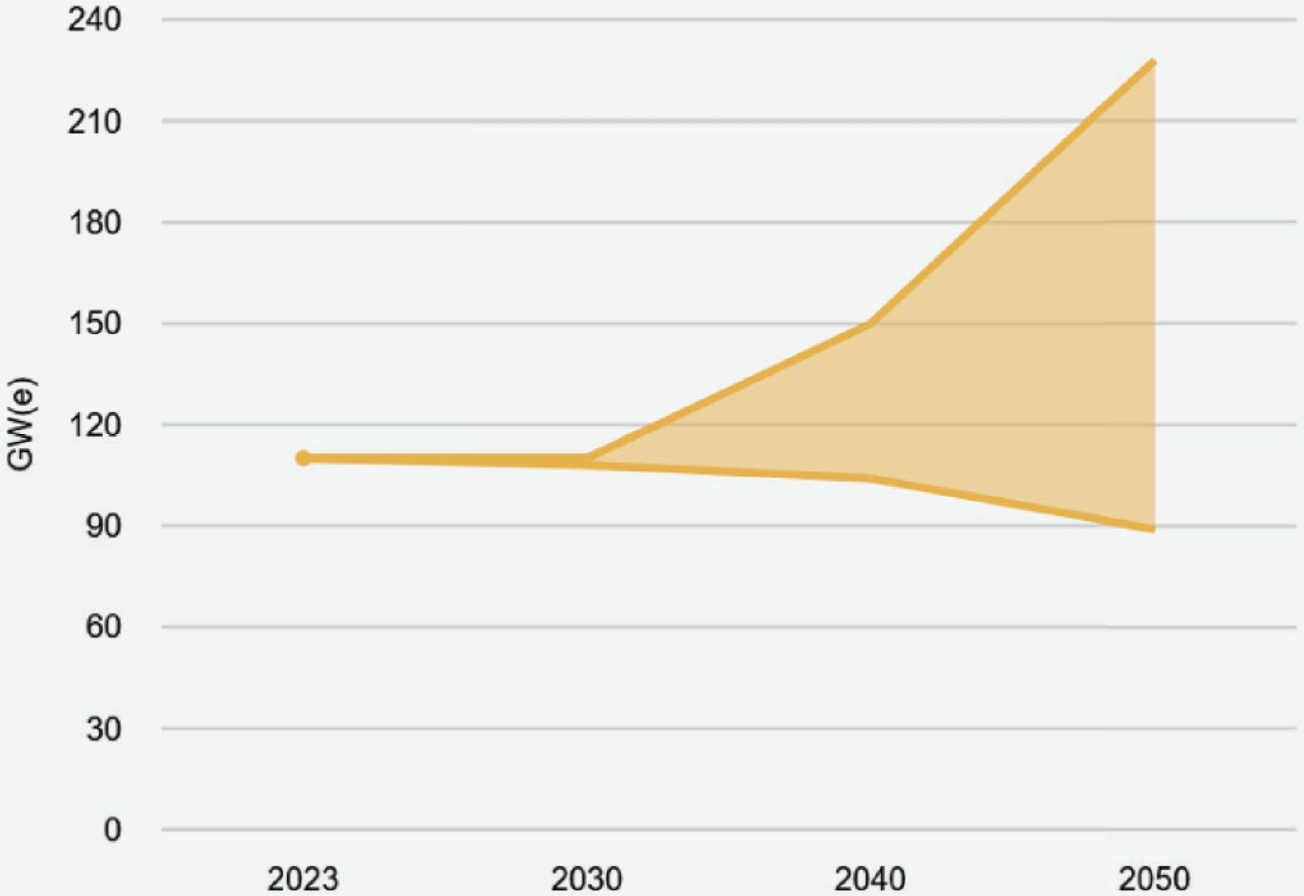
Figure 9:
EIA U.S. Nuclear Capacity Forecast[16]



The International Atomic Energy Agency (IAEA) produces a series of forecast for global nuclear power production (IAEA, 2022, 2024). This report includes region specific estimates of capacity. This is used as a second source of estimated nuclear expansion, and the IAEA North America capacity growth model is provided in Figure 10.

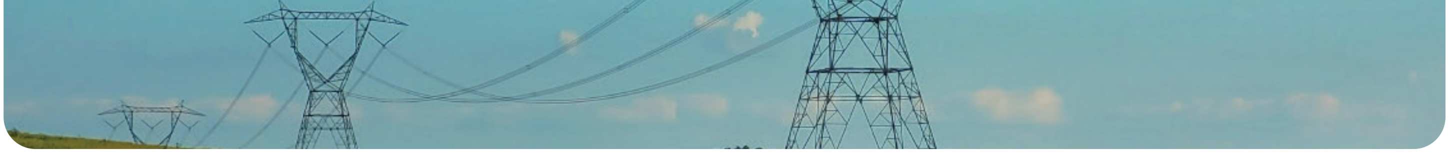
[16] Data source used to create this figure comes from (EIA, 2023a)

Figure 10:
Nuclear Generation Capacity Forecast in North America(IAEA, 2024)



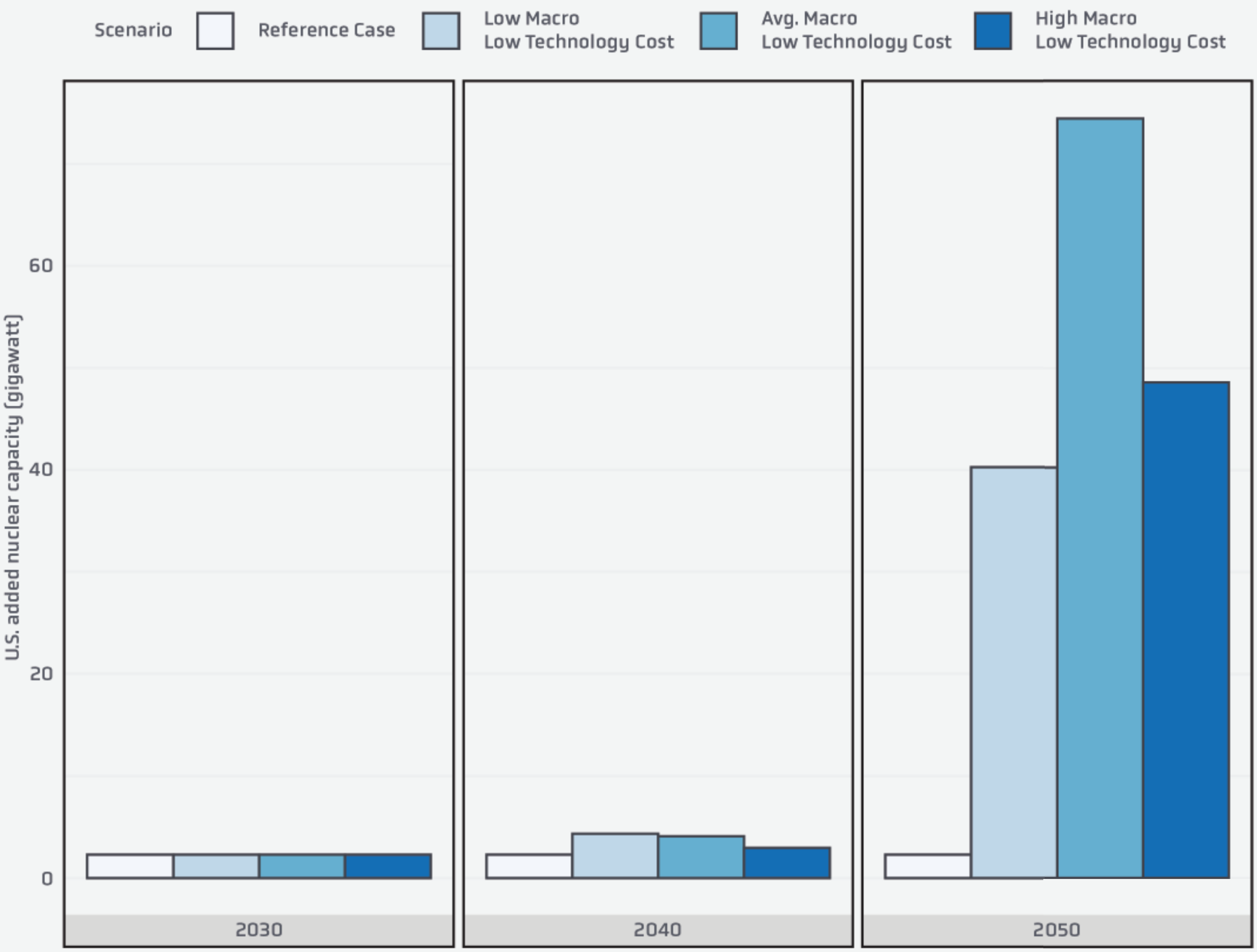
Both the EIA and IAEA reports provide a range of outcomes under different economic scenarios up to 2050. The models agree that in the reference case nuclear power output in the U.S. will remain constant until at least 2030. After this point the models deviate when in the upper bound estimates. The IAEA projects that technological innovation, emission targets, and growth in electricity demand can lead to over a 100% increase in North American nuclear capacity. The EIA estimate finds that an absolute reduction in U.S. nuclear nameplate capacity will occur by 2050 under all scenarios.

Counter intuitively, the scenario which assumes low carbon technology costs decline shows the steepest drop in nuclear capacity until 2045. In early years a decrease in the LCOE of alternative low carbon energy sources, such as solar, induces faster nuclear retirement. In later years nuclear costs catch up leading to a reversal in trend.



However, even if nuclear electricity output is predicted to fall by the EIA, new nuclear power plants can be added to replace a portion of the retired capacity. Figure 11 uses the EIA AEO data set to demonstrate that nuclear power plant additions can change as economic scenarios are realized (EIA, 2023a). The technological cost of nuclear power production is the main driver of the forecasted nuclear additions. Each EIA model without low technological costs is identical to the reference case. Based on this fact, three scenarios are compared to the reference case, all assuming low nuclear technology costs in the future. The models compare expectations of nuclear additions under low, average, and high U.S. macro-economic growth.

Figure 11:
Added U.S. Nuclear Capacity Under EIA Forecasts[17]



[17] Data is collected using the EIA open data Table 9 cumulative planned and unplanned additions (EIA, 2023a).

Under this upper bound estimate the U.S. would add between 40 GW of nuclear capacity (116 Natrium sized facilities) and 74.4 GW of capacity (216 Natrium sized facilities) to the grid by 2050.

Additionally, market analysis firms have generated forecasts of U.S. nuclear growth by 2050. Wood Mackenzie's Lens Power forecasts place total capacity growth at 11% by 2050 (Crooks, 2024). Similarly CITI Group global models of nuclear development establish a median estimate of 12% growth in U.S. nuclear nameplate capacity over this period (CITI Group, 2024). In both model's nuclear nameplate capacity is predicted to expand at a higher rate globally than in the U.S., with worldwide nuclear nameplate capacity doubling by 2050.

This deviation between U.S. and global trends can be explained by the same economic obstacles identified for Wyoming nuclear expansion. An analysis by the Nuclear Energy Agency found that under a $37[18] per ton carbon tax the global average LCOE of nuclear reactors is the lowest of any technology that is not constrained by weather factors (NEA, 2021a). The only regional exception is the U.S. where gas combined cycle turbines would continue to have a LCOE of under $60 per MWh which is less than the projected nuclear LCOE. The abundance of shale gas in the U.S. suppresses regional gas prices thereby leading to comparatively low North American LCOE of natural gas generation. In comparison the advanced nuclear LCOE in Japan, a population dense island nation, is lower than any other electricity source, including wind and solar (NEA, 2021a). These factors benefit U.S. consumers by reducing the cost of electricity, but makes deployment of nuclear reactors economically challenging relative to the rest of the world.

Based on these forecasts, the lower bound estimate of nuclear deployment is that no growth will occur, which would make the TerraPower Kemmerer project the only developed reactor in Wyoming. All models indicate that deployments are not yet economically feasible, requiring future market changes which begin to take effect between 2030 and 2050. This places the present economic obstacle score as a major obstacle, although it is reasonable to expect this score to be reduced in the future.

[18] Adjusted from 2020 dollars to 2025 dollars (U.S. Bureau of Labor Statistics, 2025a).

EXISTING INDUSTRY

Moderate Advantage

Existing Industry: Scoring Criteria

Some existing Wyoming industries provide benefits to a potential nuclear power plant in the State, while other industries limit development. Overall, these countervailing considerations are scored as a *moderate advantage*.

Abundant low-cost electricity generation sources, including natural gas and wind dampen prices received by nuclear power producers. Wind power in particular increases the economic benefits of time flexible energy sources. Traditional nuclear generators are a baseload source that cannot easily adapt to the timing challenges posed by the intermittent supply of wind power.

However, the existence of coal power plants provides opportunities to reduce nuclear costs by repurposing some of the capital investment at retired facilities. These savings can be significant and allow Wyoming to be a first mover in the nuclear sector. Further industrial uses at trona mines, data centers, and refineries provide a potential use for small modular reactors (SMR) and micro reactors. Balancing these considerations, the overall score is a moderate advantage for Wyoming nuclear reactor development.

Existing Industry: Analysis

TerraPower has begun construction of an advanced Natrium reactor near the mine-to-mouth Kemmerer Coal Mine, which is currently fueling PacifiCorp's Naughton Power Plant. This coal-fired power plant is scheduled for conversion in 2026. The proximity of the reactor to the Naughton Power Plant allows for access to existing infrastructure and facilitates supporting the provision of electricity to customers in Wyoming and nearby regions.

The Natrium power plant contributes to the existing industries' score directly by establishing the nuclear sector in Wyoming. As a first mover in U.S. advanced reactor deployment, the State can attain a localized competitive advantage from industry agglomeration and expertise.

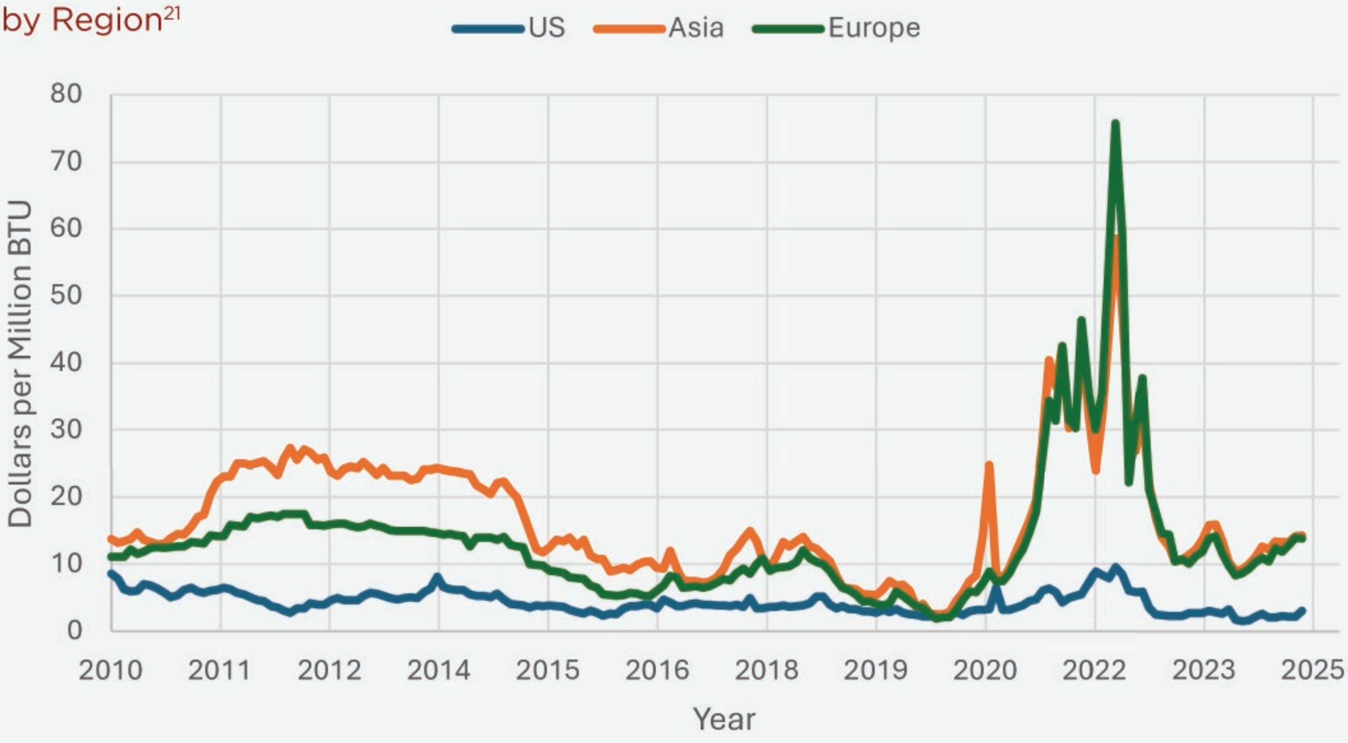
[19] Similar cost savings are associated with reusing existing infrastructure for non-nuclear electricity generation. Portions of the Naught Power Plant will be transitioned to natural gas (Caitlin Tan, 2024).

Other existing Wyoming industries which affect the feasibility of nuclear produced energy include coal power plants, natural gas production, and wind generation. Each of these power sources affects the feasibility of developing nuclear power in Wyoming in a different way.

The commercial price of natural gas in Wyoming is near the national average at $11.07 per thousand cubic feet compared to $11.23 per thousand cubic feet (EIA, 2025b, 2025c). Wyoming is a major supplier of natural gas but due to a developed interstate pipeline system, prices are prevented from being depressed in the State. Wyoming natural gas producers export gas when prices are higher in other states, allowing local Wyoming natural gas prices to mirror national price trends.

This is important because the lowest cost source of electricity generation[20] capacity is natural gas turbines. As discussed further in Section 4.1, U.S. natural gas production lowers the price of electricity thereby increasing the economic obstacles of developing nuclear generated electricity. While this does not uniquely challenge nuclear generation in Wyoming, it does dampen U.S. nuclear development generally when compared to the rest of the world. Figure 12 plots a time series of U.S. natural gas prices, compared with European, and Asian liquid natural gas (LNG) prices.

Figure 12:
Price of Natural Gas by Region[21]



[20] Other than wind and solar which face regional constraints from weather.

[21] Data source for prices from the international monetary, from which are inflation adjusted to December 2023 using the U.S. CPI. (International Monetary Fund, 2025c, 2025a, 2025b; U.S. Bureau of Labor Statistics, 2025a)

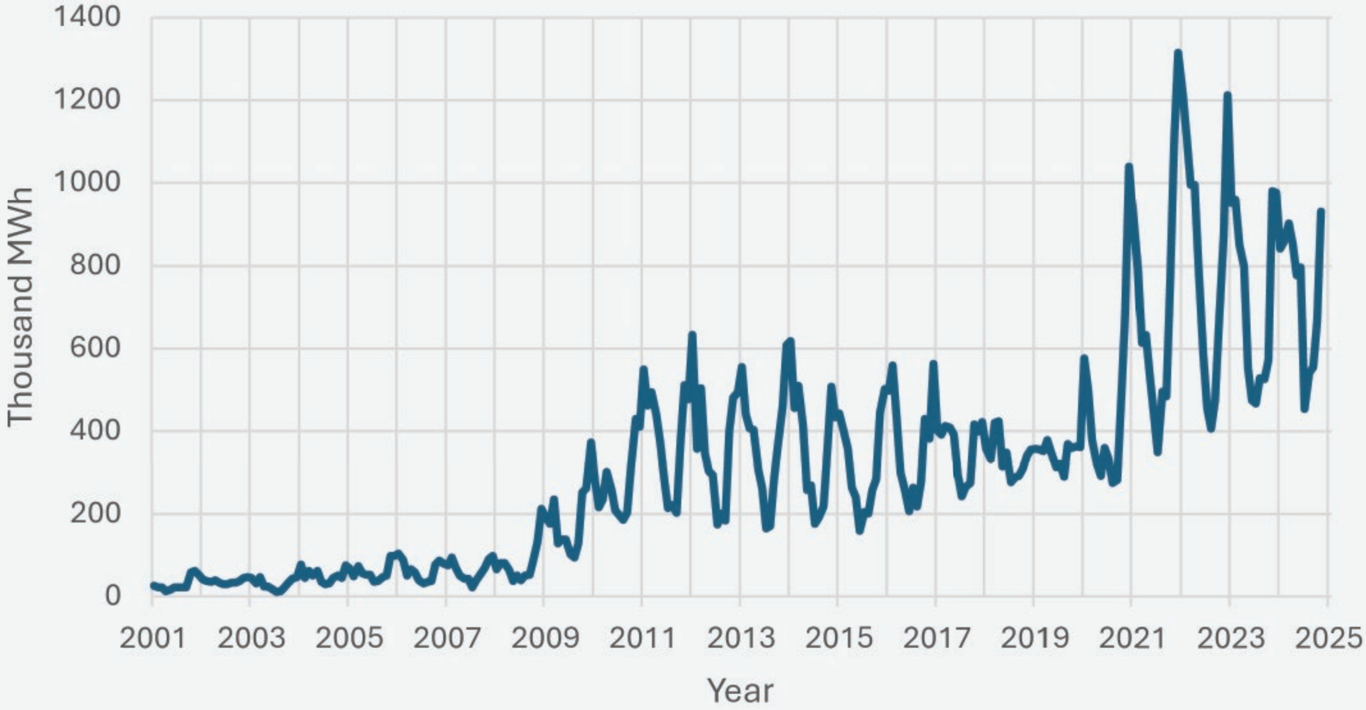
It can be noted that U.S. natural gas prices are consistently lower than in other regions. Prices converged in 2020, as COVID 19 responses reduced the quantity of natural gas consumed globally (Tsai, 2021). This demand shift lowered prices, reducing the relative gap between the U.S. and Europe. Other than this brief window, the low-cost shale gas produced in the U.S. has kept natural gas prices low relative to the global average. Natural gas is unique in this manner, because it is more costly to compress as LNG and transport it to other markets, than to transport the gas regionally via pipelines. A product like crude oil is closer to a pure commodity where prices are identical globally. As a result, U.S. gas is sold at a discount in North America where existing infrastructure lowers transportation costs.

This natural gas price differential is one factor that explains the global development trends of nuclear energy. The IAEA forecasts a significant expansion of nuclear reactors in Asia, but a potential retraction of nuclear energy development in the U.S. (IAEA, 2022). Similarly, an EIA forecast of energy production finds that no new nuclear reactors are expected to come online in the U.S. unless costs are reduced by 40% (EIA, 2023d). A NEA analysis found that under a global carbon tax the U.S. would be the only nation where the levelized cost of electricity from nuclear reactors, would remain above that of natural gas (NEA, 2021a). A major reason for this split in global and U.S. nuclear deployment trends is the low-cost alternative of natural gas, which makes nuclear power more attractive in nations with limited natural gas availability.

Another alternative source of electricity in Wyoming is wind. The levelized cost of wind generation depends on the speed and consistency available in a region. Since natural gas has the lowest marginal cost of electricity production, wind generation is developed where the levelized cost is competitive with natural gas. As a result, the average LCOE of wind generation deployed in 2022 is $37.80 per MWh, comparable with the combined cycle LCOE of $37.05 per MWh (EIA, 2022).

If natural gas prices do climb, we can expect an expansion of wind energy in the State somewhat hampering opportunities to deploy nuclear reactors. Only after the high-quality wind resources are developed will nuclear reactors be cost competitive with wind. The trend in Wyoming wind generation is provided in Figure 13.

Figure 13:
Monthly Wind Generation in Wyoming (EIA, 2024a)



As wind generation in the State expands, the effect on intraday electricity becomes more pronounced. Nuclear reactors act as a base load energy source, facing a low operation cost but high upfront cost (Gebben, 2024a). This encourages nuclear electricity sources to operate constantly, with recent capacity factors averaging 93% (EIA, 2023f).

Unlike nuclear reactors, wind turbines vary energy output throughout the day based on weather. Without battery storage, wind turbines produce electricity strictly based on the current wind speed. This means that when the wind is active in periods of low grid load, the value of electricity is lowered by wind generation, and a negative price is possible. Where prices are negative, constraints on the grid require energy to be used. Under these conditions adding more electricity to the grid generates additional costs to an ISO.

This effect is evident in Figure 14 and Figure 15. Figure 14 plots where the location marginal price of electricity is frequently negative. Figure 15 shows the correlation between a grid's energy mix and the relative ratio of positive and negative location marginal costs.

Figure 14:
Locations With Frequent Negative Electricity Prices (See et al., 2021)

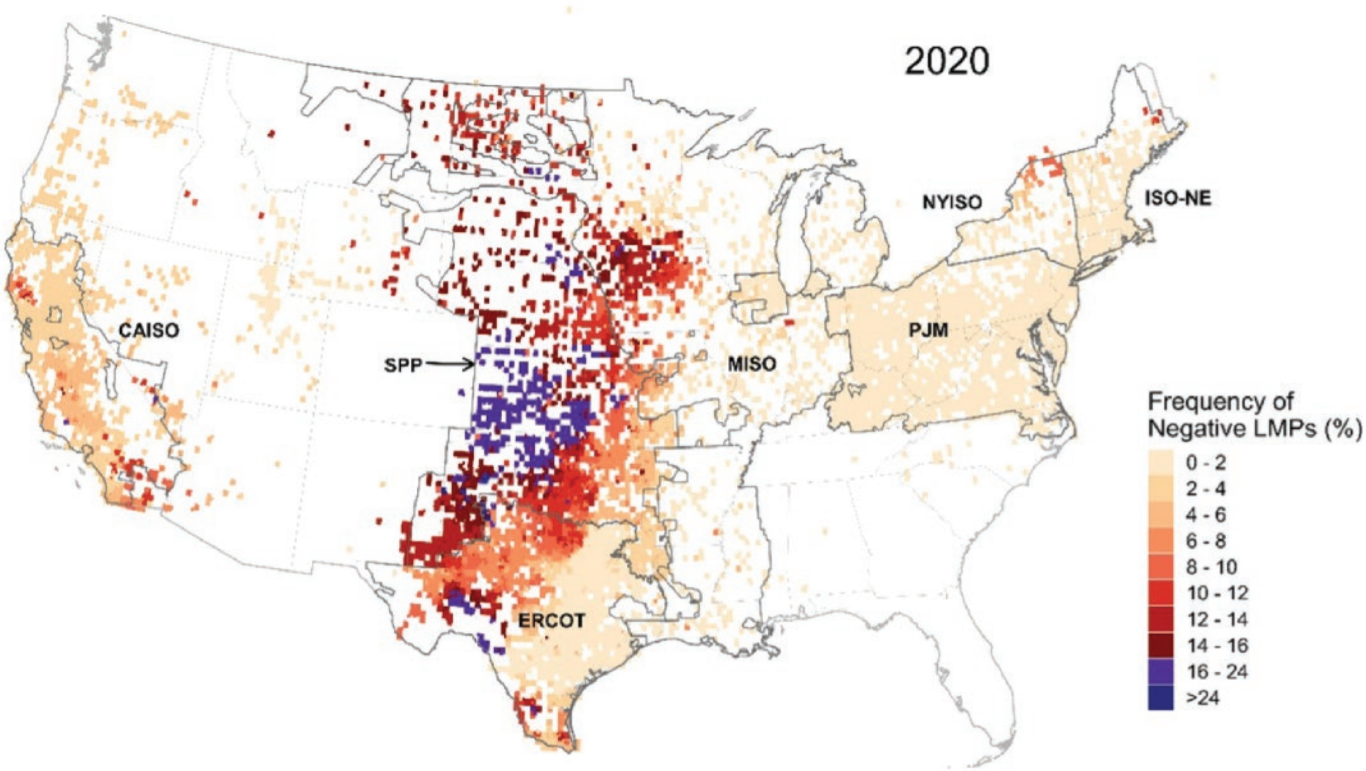
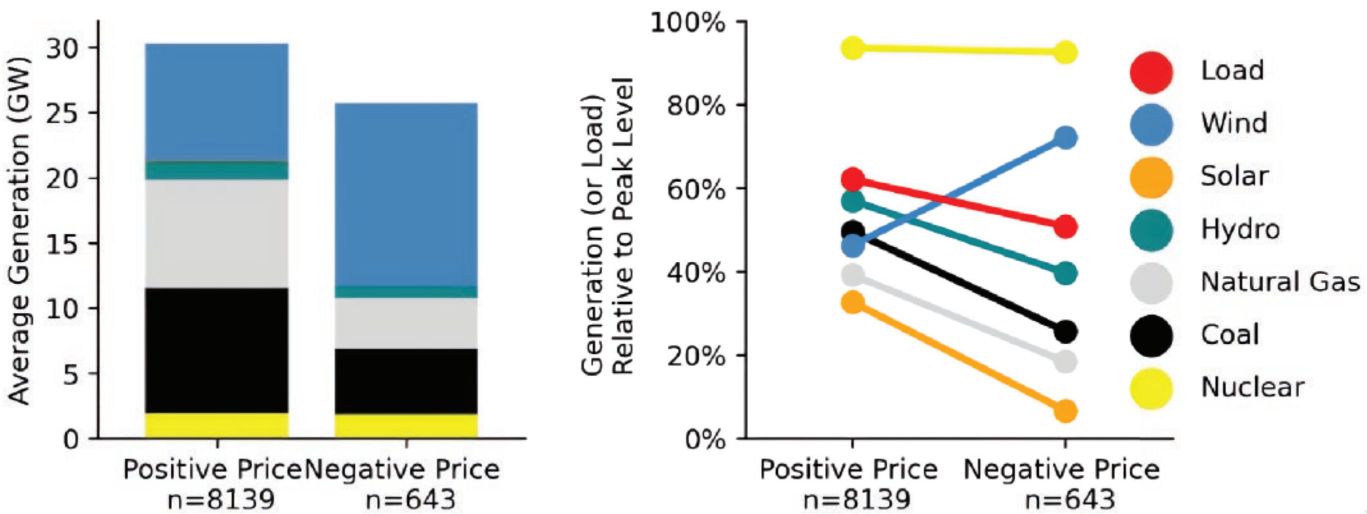


Figure 15:
Correlation of Wind and Other Energy with Negative Prices (See et al., 2021)



Strikingly, the central corridor of the U.S. where high quality wind resources are viable have the most frequent negative electricity prices. This is supported by the strong correlation between dependency on wind energy and the distribution of negative prices.

This is significant to the profitably of nuclear reactors. A standard LWR won't shut off during negative price periods inducing additional losses . Where wind resources are a significant portion of a grid's capacity, it is beneficial for a reactor to be able to flexibly supply electricity. Yet a standard LWR has limited ability to adjust capacity and negative prices lower the total average value of the produced electricity. Even if the LCOE of nuclear was comparable to natural gas, this effect creates a preference for flexible natural gas[23].

For example, a nuclear reactor selling electricity in the SPP footprint would have received 15.8% less revenue in 2023 relative to an equivalent electricity source that is able to turn off during negative prices (EIA, 2024d). This obstacle can be substantially mitigated through technological innovations (see section 4.4). Salt cooled reactors can use salt cooling mechanisms like a battery. Storing more heat in the salt when prices are negative and then using that stored energy to boil water and run a turbine once prices increase.

Alternatively, this challenge can be lessened by a repeal of federal tax credits for wind electricity but would not be eliminated. Wind subsidies make otherwise marginally profitable wind projects economically viable, increasing overall wind market penetration. This in turn increases the occurrence of negative prices. However, many U.S wind projects have a competitive LCOE without subsidization[24], and the final average LCOE of U.S. wind will remain the same without a subsidy[25] (EIA, 2022; Ray, 2021).

Unlike natural gas and wind electricity resources, the existence of coal power plants provides an advantage to building nuclear reactors in Wyoming. As aging coal power plants are retired, there is an opportunity to reuse some of the existing infrastructure for nuclear electricity. For example, existing transmission lines can be applied to reduce the cost of transporting the nuclear generated electricity to market. This lowers the capital cost of creating a nuclear power plant by between 15%-35%, depending on site specific factors (Hansen et al., 2022).

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[22] This does not apply to advanced designs such as those utilized in the Kemmerer Natrium reactor which utilize heat storage. See Section 4.4 for additional details about the effect of technology on market timing obstacles.

[23] An alternative method of handling this obstacle is to develop a richer system of industrial application, or hydrogen production. See (Gebben, 2024a) for a discussion of this topic.

[24] Ranging from $30.27-$58.22 per MWh (Ray, 2021). Values are inflation adjusted to 2024 values.

[25] The average LCOE before and after a tax subsidy for wind will remain the same based on economic principles. The LCOE of wind projects varies by location. High quality wind sites have low LCOE and poor-quality locations have high LCOE. If the subsidy were removed, fewer locations could be operated at a profit. However, the high-quality locations would continue to turn a profit. Development of wind projects would halt were the unsubsidized LCOE is equal to the expect returns of a turbine. Therefore, the marginal LCOE would be set by the market price of electricity and remain (roughly) the same without a subsidy. Total wind generation capacity would decrease, but the marginal LCOE of the remaining wind facilities would remain the same.

Reactor designs like the TerraPower Natrium model, would be the most advantaged by this coal to nuclear conversion. These advance designs decouple the nuclear system from the steam cycle, increasing the number of potentially reusable coal electricity generation components which would not need to be recertified by the NRC. (Hansen et al., 2022). Alternatively, innovate energy applications, such cogeneration of heat for industrial use, or hydrogen production can be used to provide an outlet for the nuclear energy produced in low demand periods (Gebben, 2024a). Hydrogen generation using nuclear energy is being developed at scale at the Nine Mile Point and Energy Harbor reactor sites, through DOE projects, although additional development is required for the technology to be deployed nationally (DOE, 2023; Gebben, 2024a; World Nuclear News, 2022).

The timing of coal plant closures affects the economics of a nuclear conversion. For example, the Natrium nuclear project replaces some of the retired capacity near the Naughton Power Plant. However, absent the financial support to develop additional nuclear capacity, Pacific Corp and Rocky Mountain Power have currently elected to convert remaining units to utilize natural gas turbines. Some of the cost savings of repurposing a coal power plant to nuclear apply to natural gas, putting the two energy sources in competition for a coal power plant conversion opportunity.

Given the current low cost of natural gas, a typical coal power plant conversion will look towards natural gas before a nuclear reactor conversion. However, it is anticipated that there will continue to be declines in the cost of advanced reactors (see Section 4.4). This makes operating coal power plants a distinct advantage for future advanced nuclear reactor deployment in Wyoming. A delay in coal retirement dates provides an opportunity for advanced reactor costs to decline before applying the additional benefits of capital reuse. This in turn can accelerate the deployment of nuclear reactors in the State, in the case where the timing of coal retirements optimally algin with nuclear reactor efficiency gains.

Previous evaluations of coal to nuclear viability applied a metric of the Oak Ridge Siting Analysis for power Generation Expansion (OR-SAGE)[26] to operating coal power plants across the country. Of the sites evaluated in Wyoming seven had no identified obstacle, and three had one criteria increasing the difficulty of developing a nuclear reactor (Hansen et al., 2022). While the private data of this report does not allow us to identify which power plants fall into each category, it appears[27] that all Wyoming coal power plants can be converted to nuclear based on this preliminary screening method.

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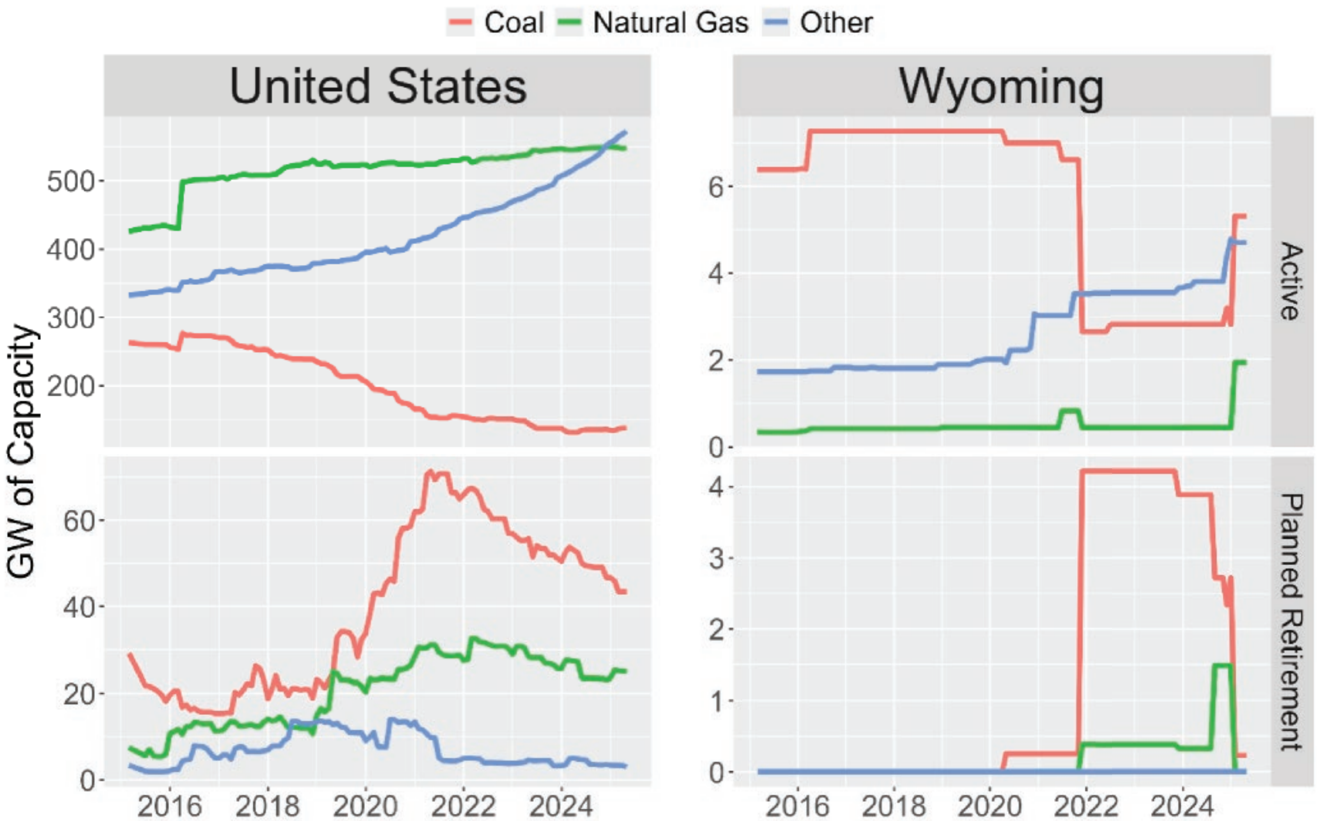
[26] See the outline of this procedure in (Belles, Mays, Blevins, et al., 2012; Belles, Mays, Omitaomu, et al., 2012)

[27] We performed a review of the EIA data set used for this report (EIA, 2023c; Hansen et al., 2022). In the EIA report there are only ten unique entity ID, location pairs of operating electricity utility coal generators in Wyoming during August 2021. Using this definition of a site implies that all coal generation sites in Wyoming are scored at one or below for challenges of conversion using the OR-SAGE method.

Figure 16 shows the trend of Wyoming coal capacity retirement plans. Recently Rocky Mountain Power has announced plans to continue operations at their existing coal facilities, pushing out the expected time frame of coal retirements amenable to nuclear conversion (PacifiCorp, 2024).

Figure 16:
Changes in Capacity Scheduled to Retire[28]



Total nameplate capacity of various energy sources is plotted in Figure 16. The top row plots the nameplate capacity of operating power plants which have not reported a planned retirement date to the EIA, the bottom row provides this same sum for active power plants with a scheduled retirement date. The left column shows the generalized trend in other U.S. States and the right column plots the capacity trends in Wyoming. The planned retirement capacity corresponds to the expectations at the time the EIA report was created, this date is plotted on the x-axis.

[28] Data used to create this figures was gathered from each EIA 860 monthly preliminary release (EIA, 2025a) combined with EIA860 annual reports prior to 2016 (EIA, 2024b). The capacity is the total nameplate of any given source.

Wyoming had no coal capacity slated for retirement until 2020, with a large increase in planned retirements beginning in 2021. This corresponds to the peak period of expected coal retirements in the U.S. Market factors such as increasing energy costs contributed to these cancelled retirements.

There has been a 94% reduction in the nameplate capacity of power plants planned to be retired in Wyoming since the peak in 2022. This reduces the amount of coal capacity immediately available for nuclear conversion but increases opportunities in the future, when nuclear reactor costs will be lower than today. Notably a portion of the Wyoming cancelled retirements were changed to natural gas conversions, which reduces the available capacity for a future nuclear retrofit.

Assuming a capacity factor of 60% from coal power plants, and 92% for nuclear reactors (EIA, 2014), the infrastructure used at all Wyoming coal power plants could support up to 8.85 Natrium sized 345 MWe reactors (EIA, 2025a). It is unlikely that most of these coal power plants will be transitioned to nuclear power going forward, but this provides an upper bound estimate of the available nuclear capacity able to benefit from reduced cost through the utilization of existing capital. The recent and substantive extension of coal operating plans limits this potential in the near term, but could provide new opportunities down the line.

The advantages of coal to nuclear conversion interact with the challenges generated by high wind capacity in the State. A map of the current electricity generation capacity in Wyoming is provided in Figure 8, showing how these two factors may interplay.

Figure 17:
Location of Wyoming Power Plants (Knight et al., 2020)

In Southeast Wyoming, a Laramie River Station conversion would face the largest additional challenge from intra-day price variation[29] due to the large quantity of wind generation. Coal facilities in the Northeast and Southwest are less likely to face these challenges but are still impacted by State prices influenced by wind generation.

[29] Or if the generator is not in a day ahead market, the balancing authority will face additional challenges caused by the negative social cost of additional intra-temporal electricity additions.

Other existing Wyoming industries can utilize SMR technologies including data centers, trona mines and other industrial applications. Data centers require consistent power from onsite generators which provide an avenue for nuclear electricity to receive a price premium. Google has made a power purchase agreement with Kairos to develop 500 MW of SMRs at various locations by 2035 (Kairos Power & Lewis, 2024). Similarly, Microsoft has signed a purchase agreement with Constellation Energy, kickstarting the reactivation of Three Mile Island in Pennsylvania (Kimball, 2024b). Prometheus Hyperscale has planned a 1 GW data center in Evanston Wyoming, acquiring a non-binding purchase agreement for nuclear produced electricity from Oklo fast reactors (Kimball, 2024b; Oklo Inc., 2024a). Further State funding has been provided to test the BANR microreactor at Wyoming trona mines providing information about cost effectiveness in the State (Wolfson, 2023). SMRs can also be deployed in the State to utilize applications which require consistent heat, including oil refineries, trona mines, and hydrogen production. See (Gebben, 2024a) for additional information about the use of SMRs in Wyoming industries.

Overall existing industries produce a moderate advantage for the State. The existence of a robust energy sector provides opportunities for nuclear reactor projects to utilize transmission infrastructure, and reuse capital at retired coal facilities. In fact, Wyoming was an earlier mover in advanced nuclear, due to the capability to utilize some capital at Naughton power plant for the TerraPower fast reactor. Further, if advanced reactors continue to be innovated, multiple Wyoming industries can utilize SMR designs in production. However, the low-cost energy sources available in the State, such as natural gas and wind, restrict the immediate expansion of nuclear power in Wyoming. The alternatives available limit the aggregate existing industry score to a *moderate advantage*.

TAX STRUCTURE

Major Advantage

Tax: Scoring Criteria

Wyoming's tax code and federal government incentives provide a *major advantage* for building advanced reactors in the State. At the federal level, the Inflation Reduction Act of 2022 provides tax benefits for energy communities such as Wyoming. The State has exempted advanced nuclear reactor projects from the nuclear power production tax.

These cost savings are unique to Wyoming, providing a reason to locate projects in the State. This places the tax score as a *major advantage*.

Tax: Analysis

While Wyoming imposes a direct tax on nuclear produced electricity at a rate of $5 per MWh this tax is unlikely to bind. Updates to the tax code provide exemptions which can extend to all advanced reactor projects.

Wyoming Statutes (2024) 39-23-101, part C states.

> ***"Except as otherwise provided in this subsection, no tax shall be imposed on any advanced nuclear reactor operated in accordance with W.S. 35-11-2101. Beginning July 1, 2035, a taxpayer shall only qualify for the exemption authorized under this subsection for any month that not less than eighty percent (80%) of the advanced nuclear reactor's uranium used for producing electricity was sourced from uranium mines located in the United States."***

The only potential added cost from this provision is the requirement that 80% of all uranium be sourced in the U.S.

The 80% requirement is not a disadvantage for advanced reactors at current uranium prices, but could dampen this tax advantage under economic conditions where U.S. uranium production is limited. These situations are discussed in more detail in a previous analysis of SMRs applied to direct heat uses (Gebben, 2024a).

Based on the supply elasticities found in previous research (Gebben, 2024b) and the market structure of nuclear energy, the most likely outcome is that all Wyoming power producers will continue to purchase U.S. sourced uranium. A trend encouraged by projects designed to develop domestic uranium infrastructure through the Inflation Reduction Act of 2022 (DOE, 2024b). Since uranium is a small portion of the total cost of nuclear power production compared to capital, the added fuel cost will be more than offset by this tax credit. A 1% increase in price paid by the Wyoming power producers will induce 0.66% uranium production (Gebben, 2024b). So long as this cost escalation is less than the tax benefit, 80% of uranium used in Wyoming will be produced domestically.

Other than the specific tax on nuclear produced electricity, Wyoming provides significant tax savings for nuclear reactor projects. Wyoming is found to have the lowest average effective corporate tax rate of any State, especially for large projects such as nuclear power plants (Gebben & Peck, 2024; Walczak, 2022). The State imposes no corporate income tax, or individual income tax.

Other capital-intensive energy projects such as wind turbines have been found to be especially affected by the tax structure, where taxes are primarily paid in the form of sales taxes during construction, and property taxes after operations begin (Godby et al., 2018). Similarly, a report from TerraPower indicates that produced electricity is not likely to be taxed by Wyoming, with sales and property taxes being the most significant tax consideration for the project (TerraPower LLC, 2024a). A comprehensive estimate of the level and timing of taxes that will be paid by an advanced nuclear facility is presented in Section 5.

A second tax advantage comes from federal programs. The Inflation Reduction Act applies tax credits to low carbon energy sources and some of these credits can be applied to nuclear energy.

Importantly, this tax credit is increased in specific regions. A bonus credit of up to 10% can be applied for designated energy communities[30]. This tax credit can be applied as either a production tax credit or an investment tax credit. Based on the project specifics, a company can choose to receive the benefits as a fraction of capital investment or in net production.

One way to qualify for this credit is if the project is in a census tract[31] where a coal mine was closed after 1999 or a coal-fired electric generation unit retired after 2009. A map of counties qualifying for this tax credit is provided in Figure 18. Much of Wyoming can qualify for this added tax incentive due to the long-standing coal industry in the State.

[30] See (The Interagency Working Group on Coal and Power Plant Communities and Economic Revitalization, 2024)

[31] Or an adjoining census tract.

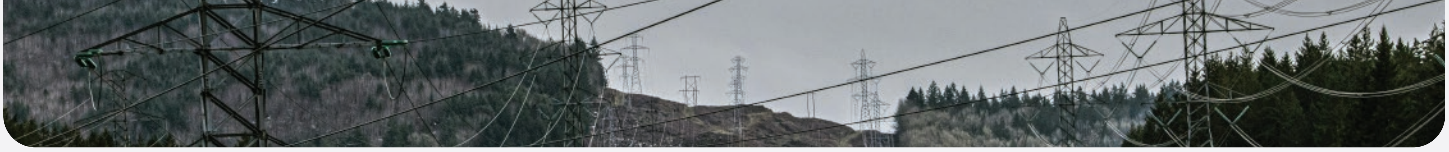
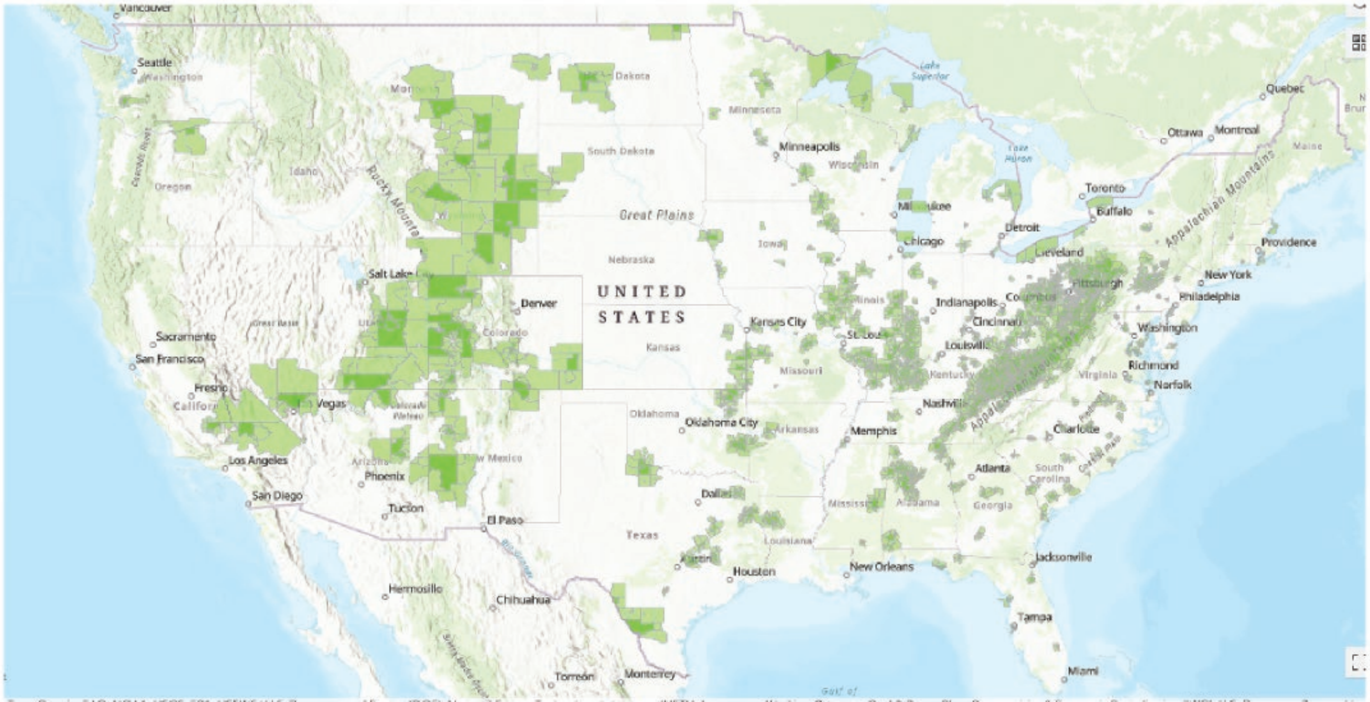


Figure 18:
Coal Closures in the Continental U.S. (DOE, 2024a)



The combination of possible federal tax credits can reduce overnight capital costs[32] of SMRs by as much as 37% (Lohse et al., 2024b). The significant federal tax incentives for advanced nuclear electricity production, with special benefits to Wyoming projects, further adds to the major advantage tax score.

TECHNOLOGY

Moderate Obstacle

Technology: Scoring Criteria

Technology is scored as a moderate obstacle to increasing the amount of nuclear produced electricity in Wyoming. Advanced reactor technologies have the potential to reduce the cost of nuclear electricity substantially. However, these cost reductions will take time to accumulate and allow new projects to be developed. It is unlikely that non-subsidized nuclear reactors will be cost competitive until these technologies mature.

[32] Overnight capital costs are the total construction costs, without including interest paid on loans.

Additionally, sodium fast reactors are being deployed at the Kemmerer Natrium project. This technology provides unique incentives to develop future Wyoming reactors. A salt cooling system increases the cost savings associated with coal power plant conversion, and increases returns when prices are suppressed by high levels of wind electricity generation. While technological constraints do not uniquely hinder the Wyoming nuclear industry, innovation will promote U.S. nuclear development resulting in more opportunities in Wyoming.

Technology: Analysis

Technological development is an essential component to lowering existing barriers to expanding nuclear produced electricity in Wyoming. Due to the low cost of electricity in the U.S., cost savings in nuclear technology are required to cement nuclear energy as an economical electricity supply.. Further, innovations in advanced reactors have the potential to mitigate challenges that uniquely affect Wyoming industry.

The consequence of a range of technological developments for nuclear reactors can be modeled in the learning rate. Experience with reactor deployment, factory form standardization, engineering improvements, and technological enhancements all contribute to long term reduction in reactor costs. The learning rate is an estimate of the cumulative percentage reduction in reactor costs that results from a doubling of total reactor deployment.

While nuclear produced electricity is currently not cost-effective in the U.S., learning rates have the potential to reduce overnight capital costs. A learning rate of between 5-10% per doubling of output of SMRs has been identified in the literature (Steigerwald et al., 2023). However, the actual learning rate is likely to be closer to the upper portion of this range at 9.5%, when accounting for the fact that most SMR designs are first-of-a-kind design (Lohse et al., 2024b). Assuming this 9.5% learning rate, capital costs can be reduced by 50% after 2050, with 35 GW of capacity deployed (Lohse et al., 2024b). Such a large reduction in costs would make nuclear reactors cost competitive with natural gas alternatives when accounting for price uncertainties (Gebben, 2024a).

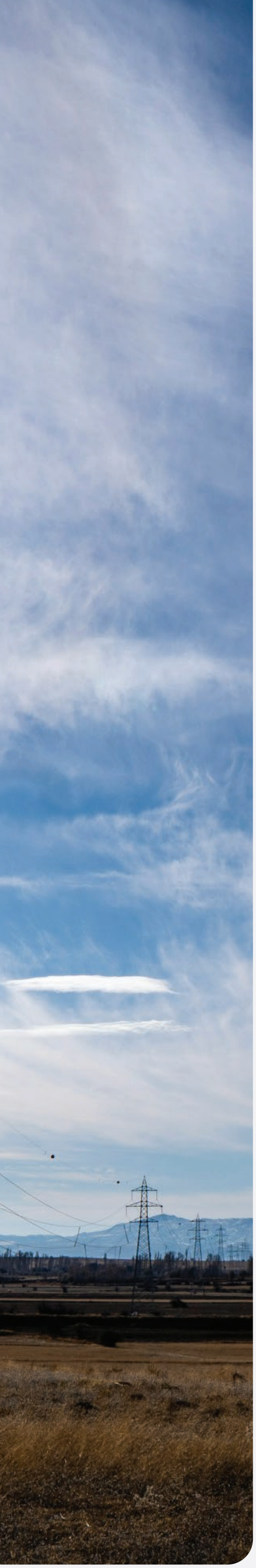
The estimates of learning rates for advanced reactors take a wide range of values. Some estimates in the U.S. are negative due to cost overruns that have increased over time, while Asian countries have had consistent cost reductions observed as more advanced reactors are deployed (Eash-Gates et al., 2020; Matsuo & Nei, 2019; Stewart & Shirvan, 2022). An average of recent estimates from the literature places the learning rate of advanced reactors at 8%, which is lower than the learning rate of the rapidly developing SMR market (Lohse et al., 2024b). Some of these cost savings come from duplicating specific design elements, with a first-of-a-kind nuclear reactor costing 19% more than reactors with previous deployment[33] (Lohse et al., 2024b). However, for this learning rate to result in market readiness, existing technologies must continue to be deployed, and existing technologies must be honed.

This in turn places a restriction on immediately developing nuclear produced electricity in Wyoming. A literature review of expected U.S. development of nuclear energy finds a trend that advanced reactors will be added to the grid only in the mid to long term (after 2040 or 2050) (Ford & Schrag, 2019; Joskow & Parsons, 2009; Lohse et al., 2024b; Thomas & Ramana, 2022). This places the technology score for nuclear produced electricity in the *moderate obstacle* range. Promising technology is available and continues to be researched, but without additional improvements, the State cannot develop the sector absent direct support for nuclear projects.

However, another technological innovation could affect deployment and costs through a demand effect. Recently there has been corporate interest in developing nuclear projects in the service of data centers. The high energy use of artificial intelligence models has changed the demand considerations of the electricity market. Global electricity use from data centers rose by 6% between 2010 and 2018, reaching 1% of global electricity use (Masanet et al., 2020). This increase in consumption was driven by new additions of data centers, as energy efficiency improved by 20% over this period (Masanet et al., 2020).

Only the future will tell whether data center growth or efficiency gains will dominate future electricity consumption trends. However, technology firms have begun to hedge their bets by investing in future nuclear electricity projects. Google has acquired a power purchase agreement with Kairos to develop 500 MW of SMRs at various locals by 2035 (Kairos Power & Lewis, 2024). Microsoft has developed a purchase agreement with Constellation Energy revitalizing the three mile island power plant in Pennsylvania (Kimball, 2024b). Amazon has likewise made an agreement to purchase power from the existing Susquehanna Steam Electric Station reactor (American Nuclear Society, 2024).

[33] Log-log the coefficient of a nth of a kind reactor dummy predicting overnight capital costs is -0.22. Which translates to a 19% decrease in costs.



Other planned data center nuclear projects are more speculative. Oracle's chairman made an announcement that the company is developing a data center which will run off of three SMRs, the location and timing of this project has not been announced (Kimball, 2024a). Relevant to Wyoming, Oklo Inc. is in the process of developing SMRs which can be easily deployed at various locations (Oklo Inc., 2024b). The company has come to a non-binding purchase agreement totaling 2,100 MW of capacity, with 100 MW of capacity targeting a Wyoming data center (Gooding, 2024; Oklo Inc., 2024c).

These planned projects point to a potential market advantage of nuclear reactors. Currently advanced nuclear reactors are unable to compete with the LCOE of alternative energy sources such as natural gas. In order for such projects to become economical, firms must consider the electricity produced by nuclear reactors to be a substantially differential product from other sources, so that the prices between nuclear electricity and wholesale electricity can deviate.

In the case of the Amazon and Google projects there is evidence that this price deviation has occurred. Both firms cited a corporate zero emissions target as a reason for the nuclear acquisition (American Nuclear Society, 2024; Kairos Power & Lewis, 2024). Further, of the portfolio of zero emission energy sources, nuclear reactors provide a stable, large, and scalable source of electricity. Data centers seeking to operate with constant electricity consumption will pay a premium for onsite electricity generated as a base load. This combination allows some SMR projects to be attractive to data centers prior to economies of scale being achieved. While these firms could purchase electricity from the gird at a lower cost, there is a high value placed on reliability, and low emissions.

The TerraPower Project will provide on the ground experience with sodium fast reactors (SFR), a technology that can distinctly advantage Wyoming as a hub for nuclear produced electricity. SFRs provides two important advantages for deployment in the State. First, SFRs have the potential for application at retiring coal power plants. The Natrium design allows for the primary salt coolant to be separated from the intermediate steam cycle. This in turn allows for the reuse of components from a coal power plant in the nuclear system. By isolating the nuclear components from the electrical generation, fewer components must be certified, allowing SFR designs to increase cost savings when converting coal power plants relative to LWR designs. (Hansen et al., 2022). Consequently, future advancements in SFR technologies will uniquely position Wyoming to attract nuclear electricity production in the State. Alternatively existing designs can be modified to incorporate similar sinks for energy, potentially adding a separate salt storage system.

A second advantage of SFRs and similar system designs utilizing heat storage is that they mitigate the challenges faced by nuclear operators when negative marginal prices are induced by a saturation of wind turbines. As explained in Section 4.2, markets with a high concentration of wind generation will have periods of negative electricity prices. When wind turbines provide more electricity than can be balanced on the grid, an extra cost is created to utilize the excess energy. Large LWR have shut off costs, and are, therefore, unable to easily adjust electricity production hour-by-hour. However, the salt cooling system provides a means to sell electricity in periods where the highest rate of return is achieved. This is because the molten salt can act as a large thermal battery. If electricity prices are negative, the reactor will continue to operate, sinking the energy into super heating the available salt but not generating electricity. Once electricity prices increase, the stored heat can be used to produce steam which runs the electricity generation system.

Under the simplifying assumption that a nuclear reactor generating electricity in the SPP RTO footprint will receive the localized marginal price[34], SFRs[35] would receive 15.8% more revenue compared to a traditional LWR (EIA, 2024d). Wind generation is expected to continue to grow in the State (Maio, 2024), making heat storage technology a unique opportunity for Wyoming nuclear electricity producers. The TerraPower project in Kemmerer provides an advantage for the State but additional cost savings are required for future SFRs to be deployed in Wyoming. With future SFR cost reductions, the technology score would be reduced from a moderate obstacle to a minor obstacle.

[34] Specially this assumes that the additional of a SFR reactor will not significantly change the localized marginal price of the SPP. This is plausible when the additions are small but is not true when the capacity addition are large. If a large amount of SFR nameplate capacity is added the supply shift will lower prices generally, and the ability to time the deployment of electricity will help to stabilize intraday price variations.

[35] Or system using a heat storage mechanism.

LOCATION

Minor Advantage

Location: Scoring Criteria

Wyoming's location provides a *minor advantage* to the growth of nuclear produced electricity. Regions of Wyoming have low population density, stable slopes, and low seismic activity. These areas of the State are amenable to permitting a nuclear reactor and reduce costs associated with operating risks. These advantages are more pronounced for SMRs but there is also sufficient land for large reactors.

There are alternative locations outside of Wyoming with similar attributes, which limits the location score to a *minor advantage*. Nuclear projects can develop in Wyoming, but the location advantages are not a unique draw to the State.

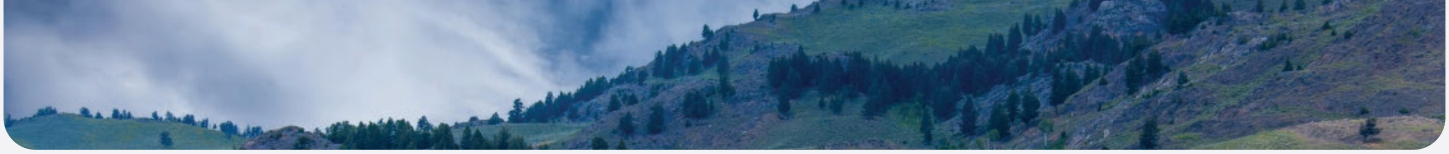
Location: Analysis

Location specific factors affect the profitability of nuclear produced electricity projects. The unique characteristic of Wyoming, therefore, changes the economics of future nuclear sector growth.

To assess these factors, location obstacles are analyzed across the country (Belles, Mays, Blevins, et al., 2012). The method as applied in an Oakridge Report includes ten factors which make licensing or operating a nuclear reactor more difficult. Cutoff criteria are developed for each category. For example, any region with a higher population density than 500 people per square mile is determined to face a difficulty siting a nuclear reactor. These specific criteria are provided in Appendix B. The ten categories included in this analysis are:

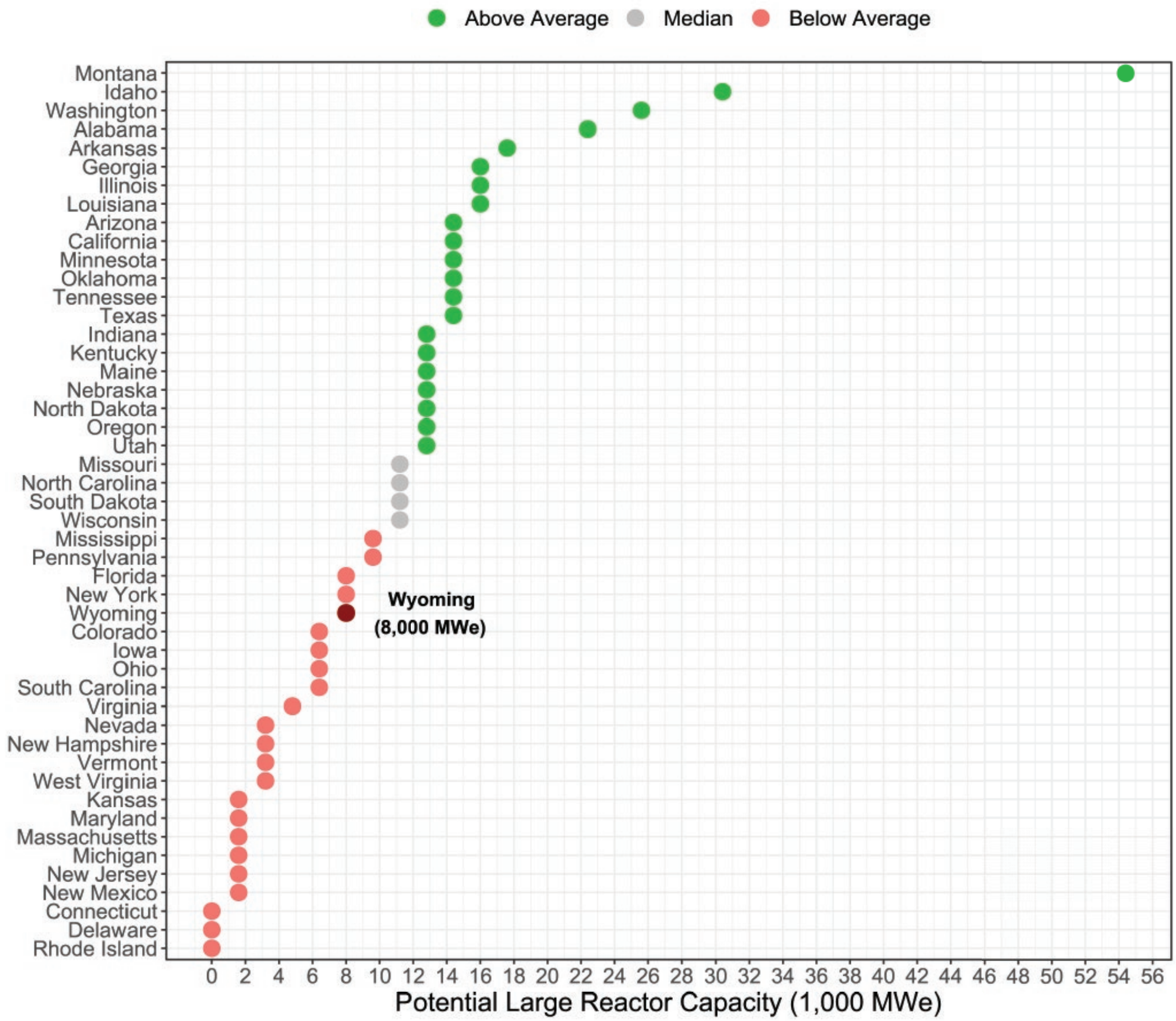
1. Cooling water availability
2. Population
3. Earthquake peak ground acceleration
4. Fault lines
5. Protected lands
6. Slope of land
7. Landslide risk
8. Wetlands
9. Floodplain
10. Location of hazardous facilities.

Avoiding challenges from each of these location factors provides a significant advantage for a nuclear project. While it is possible to receive NRC approval for a project with any number of difficulties arising from these factors, additional engineering costs would be incurred to ensure safety. Further, locating a reactor in a region with low risk of natural disaster increases profits indirectly. By avoiding high risk areas, insurance costs are minimized at the facility since insurance rates account for the expected risk of a severe natural disaster. All else equal, there is an economic advantage to developing in regions that rank favorably among these ten criteria.



Previous research has evaluated these scores for large nuclear power plants with a nameplate capacity of 1600 MWe and small power plants with a capacity of 350 MWe (Belles, Mays, Blevins, et al., 2012). We plot the percentage of land in each U.S. state that has no location difficulties based on these previous findings. Further, the potential capacity of nuclear generated electricity based on these location restrictions is ranked for all U.S. states. Figure 19 plots the maximum nameplate capacity of nuclear reactors in a state while avoiding any location challenges, while Figure 20 provides the percentage of land in each State that has no location-based challenges.

Figure 19:
Large Reactor Maximum State Capacity[36]



36 Data used as an input to this figure comes from (Belles, Mays, Omitaomu, et al., 2012)

Figure 20:
Large Reactor Land Quality[37]

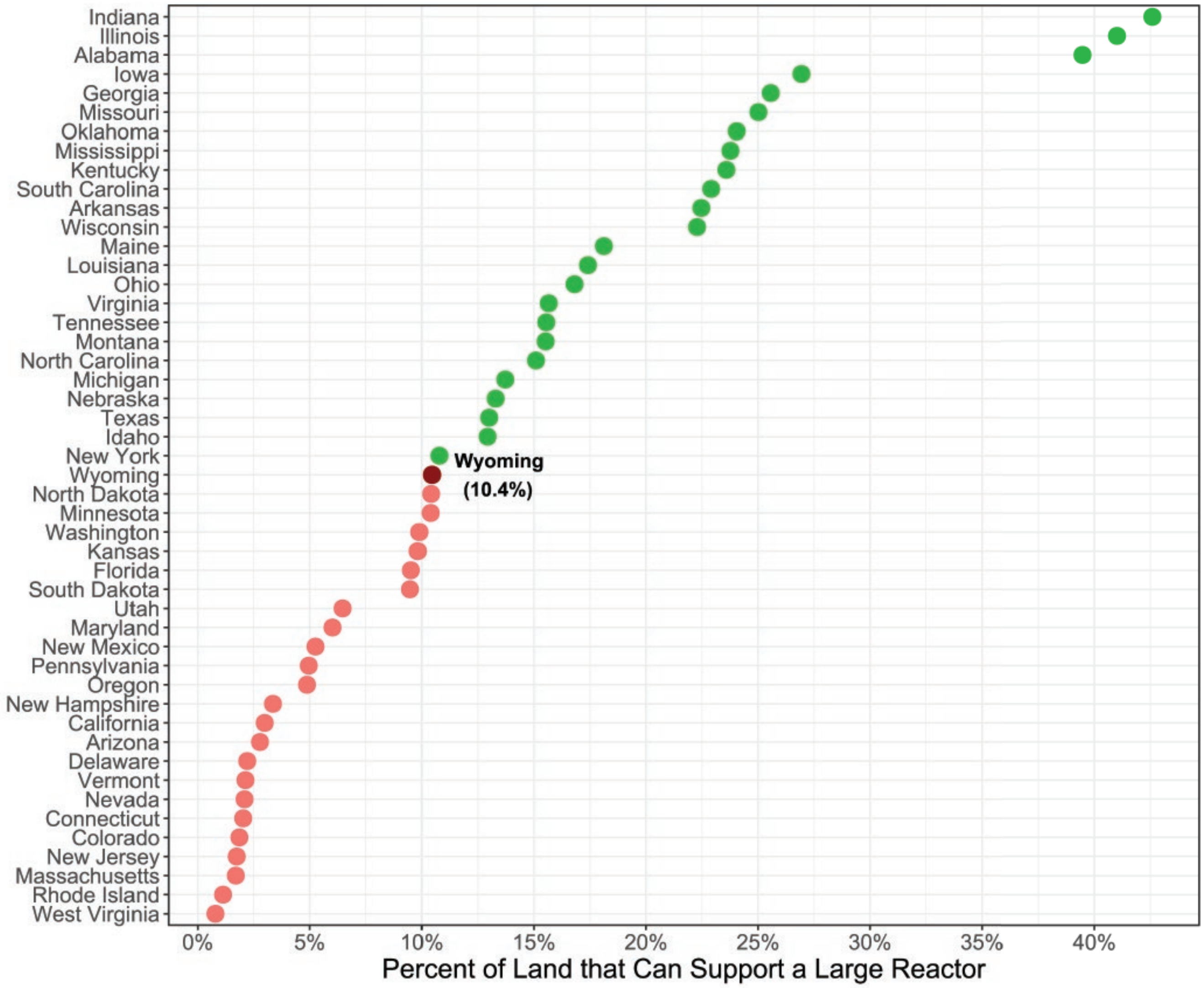


Figure 20 suggests that the average amount of high-quality land for nuclear reactors in Wyoming is at the national median. However, Figure 19 indicates that the total maximum nameplate capacity of nuclear in Wyoming is lower than average. This discrepancy is especially pronounced when accounting for the area available in each State. Appendix A reproduces the charts using the metric of maximum nameplate capacity per square mile, where Wyoming ranks 40 out of 50 States.

[37] *Ibid.*

This is driven primarily by water access in Wyoming. Traditional large reactors require significant volumes of water for electricity production, and to avoid overheating during an emergency. Arid regions of Wyoming are limited by a water availability tolerance required to ensure operational safety.

Further, as capacity is added in the State, less water is available downstream for additional reactors to be developed. Some states, like Montana, have land suitable for reactor construction which is near large rivers. 15% of the land in Montana can be easily applied to nuclear electricity generation, which is comparable to Wyoming's 10.4%. However, the gap in the total potential nuclear capacity grows with Montana having 54 thousand MWe, compared to Wyoming max capacity at 8 thousand MWe. Because the Missouri River originates in Montana, a higher amount of available land can simultaneously be applied to nuclear reactor development. Either state can easily find a location for one new large reactor with 1600 MWe capacity. Yet, after five reactors are developed, Wyoming water restrictions apply and identifying new locations becomes difficult.

However, this upper boundary of production is unlikely to constrict development in the State. The U.S. is the world's leading producer of nuclear generated electricity, and adding the identified 8 thousand MWe of nameplate capacity in Wyoming would account for a 64% increase in U.S. generation capacity (EIA, 2024f). The more relevant outcome of this restriction is the alternative uses of this land and water. The identified optimal locations have not been screened for current ownership. In some cases, these sites will not be available for sale, reducing the total number of potential sites. Due to Wyoming's low population, this effect will improve the relative location score when compared to other states, but the estimated maximum capacity of 8 thousand MWe is an upper bound prediction. Also, the development of a reactor reduces the availability of water, which creates a social cost where supplies are limited.

These results are also assessed for small reactors, which require less water to safely operate. Figure 21 estimates the total available small reactor capacity, and Figure 22 provides the distribution of land with no identified obstacles to construction.

Figure 21:
Small Reactor Maximum State Capacity

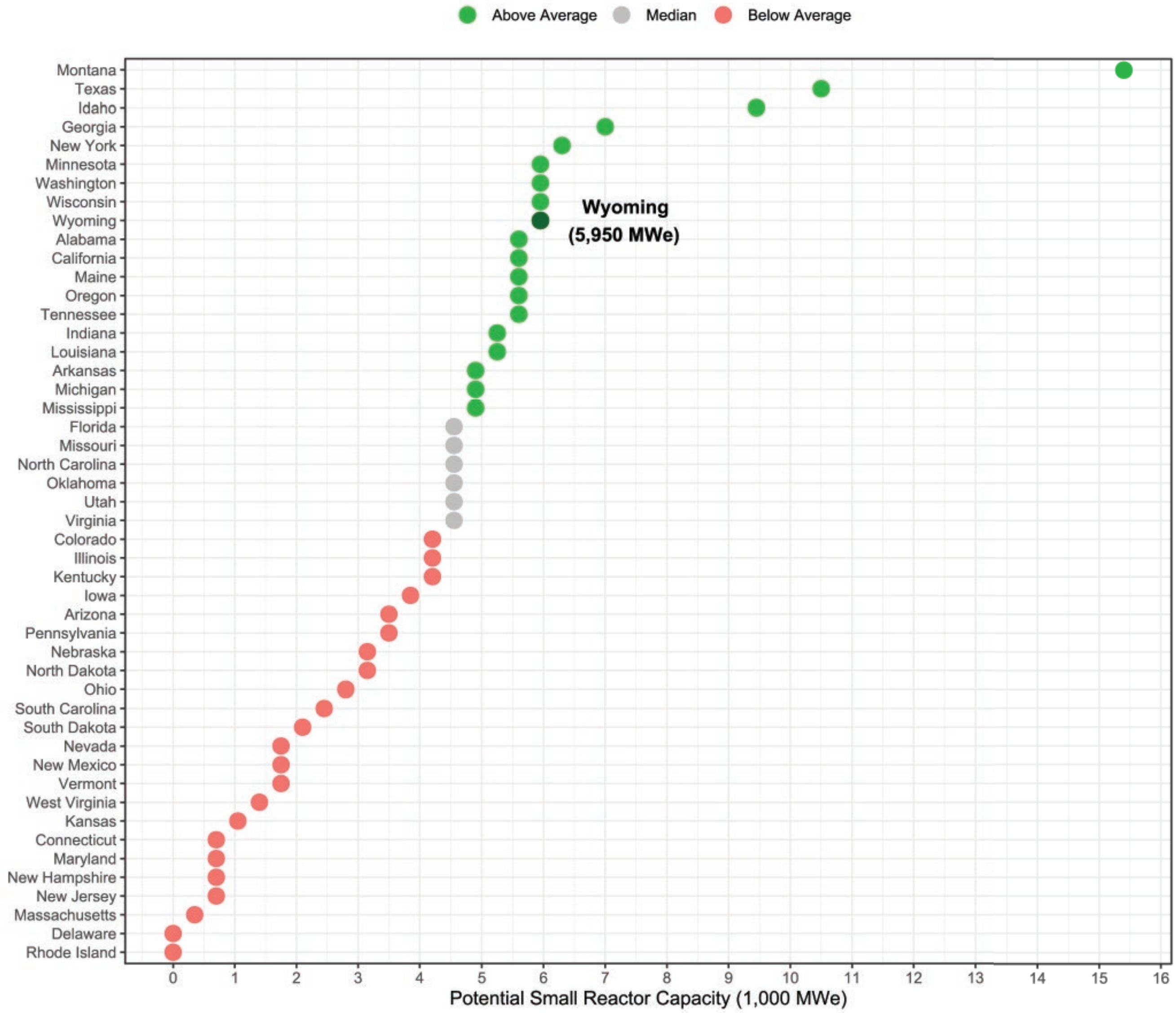
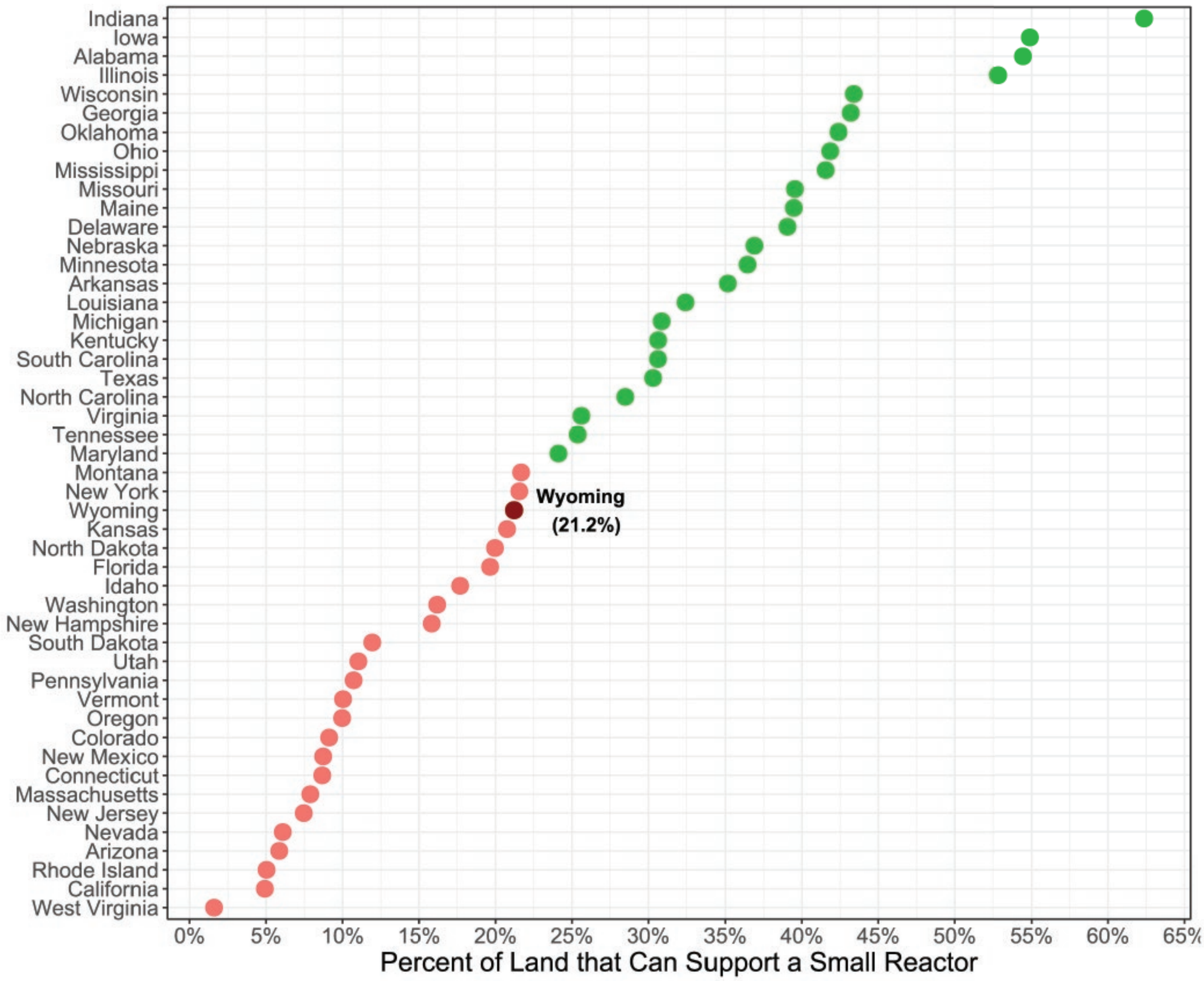


Figure 22:
Small Reactor Land Quality[38]



Small reactor designs have less difficulty being built in the State. Wyoming ranks highly in terms of maximum potential capacity in Figure 21, despite being similarly situated in terms of percentage of optimal land in Figure 22. This is because the restrictions on water availability are lessened by the small reactor designs. Smaller sources of water can be utilized for reactor placement, increasing the number of locations that can simultaneously operate a reactor. The current TerraPower facility falls in the range of this small reactor design at 345 MWe, and additionally reduces water requirements through SFR design (see Section 4.4) (TerraPower LLC, 2024b).

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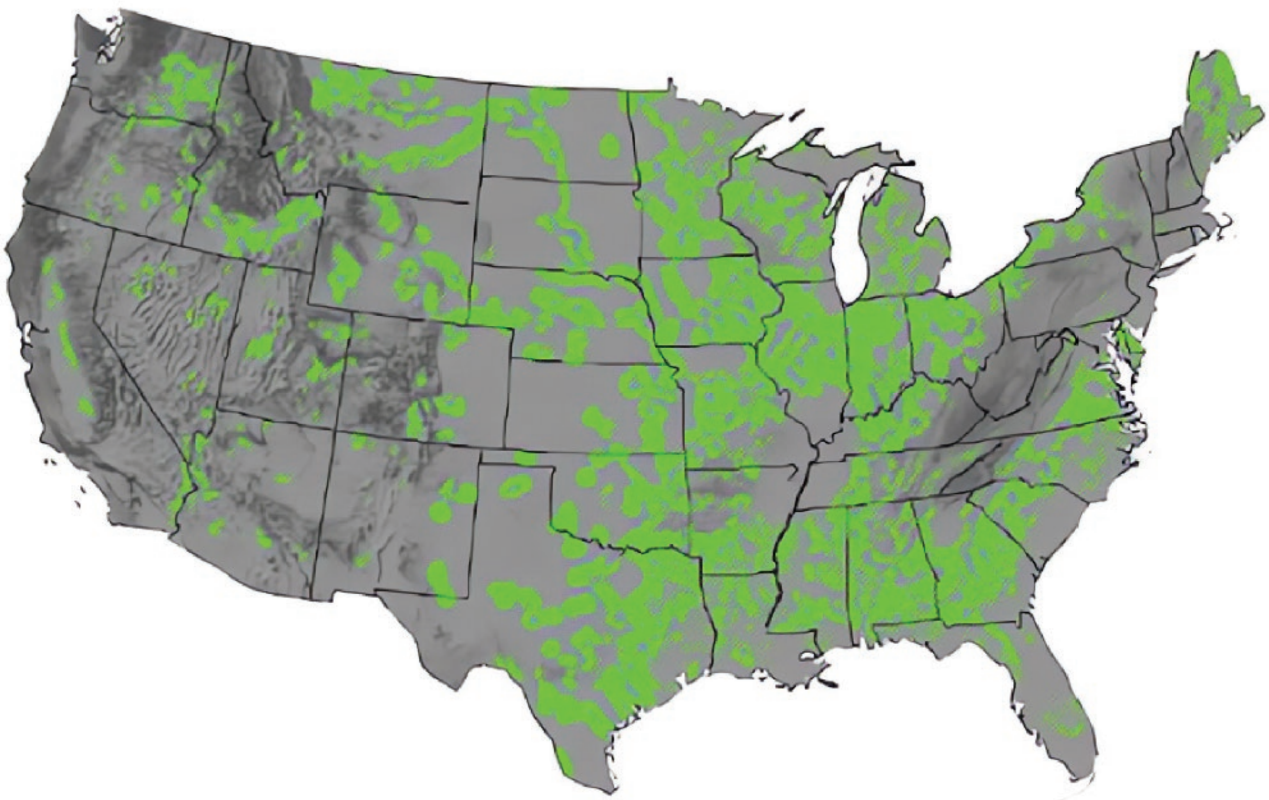
[38] Ibid

SMR designs have a small footprint[39], which allows them to be deployed modularly across the nation in order to meet industry needs (Black et al., 2021). This provides flexibility in location for industrial heat uses of nuclear not available for large scale light water reactor projects. Further, SMR designs can increase the scope of available land by using either an air or salt cooled system, or by tapping into aquifer or municipal course of water for cooling (Belles, Mays, Omitaomu, et al., 2012).

The outcome of mitigating these water constraints can be found by comparing Figure 23 and Figure 24. Figure 23 plots all locations capable of establishing a small reactor requiring 50 acres, while including water availability limits. Figure 24 removes the minimum stream flow constraint on SMR location.

Figure 23:
Regions With No SMR Siting Difficulties (Belles, Mays, Omitaomu, et al., 2012)



Based on selected input values

Oak Ridge National Laboratory

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[39] The TerraPower Kemmerer reactor is not a SMR, although it falls into the small design footprint definition in the Figure 22.

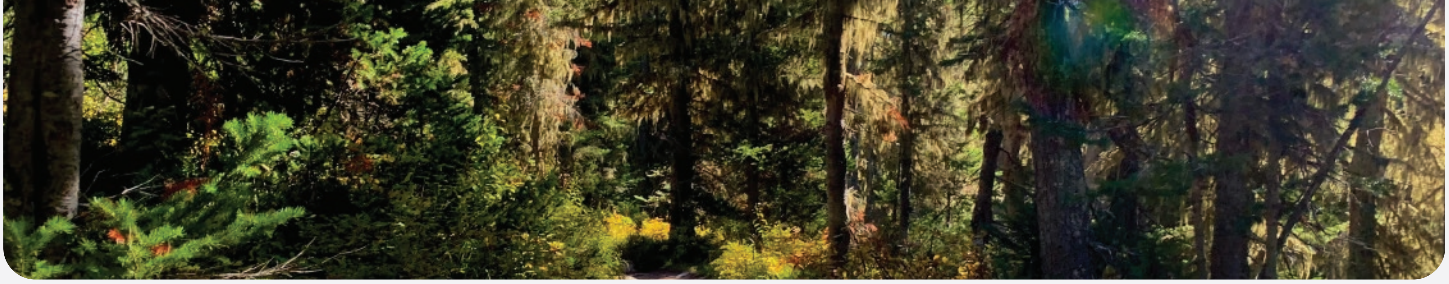
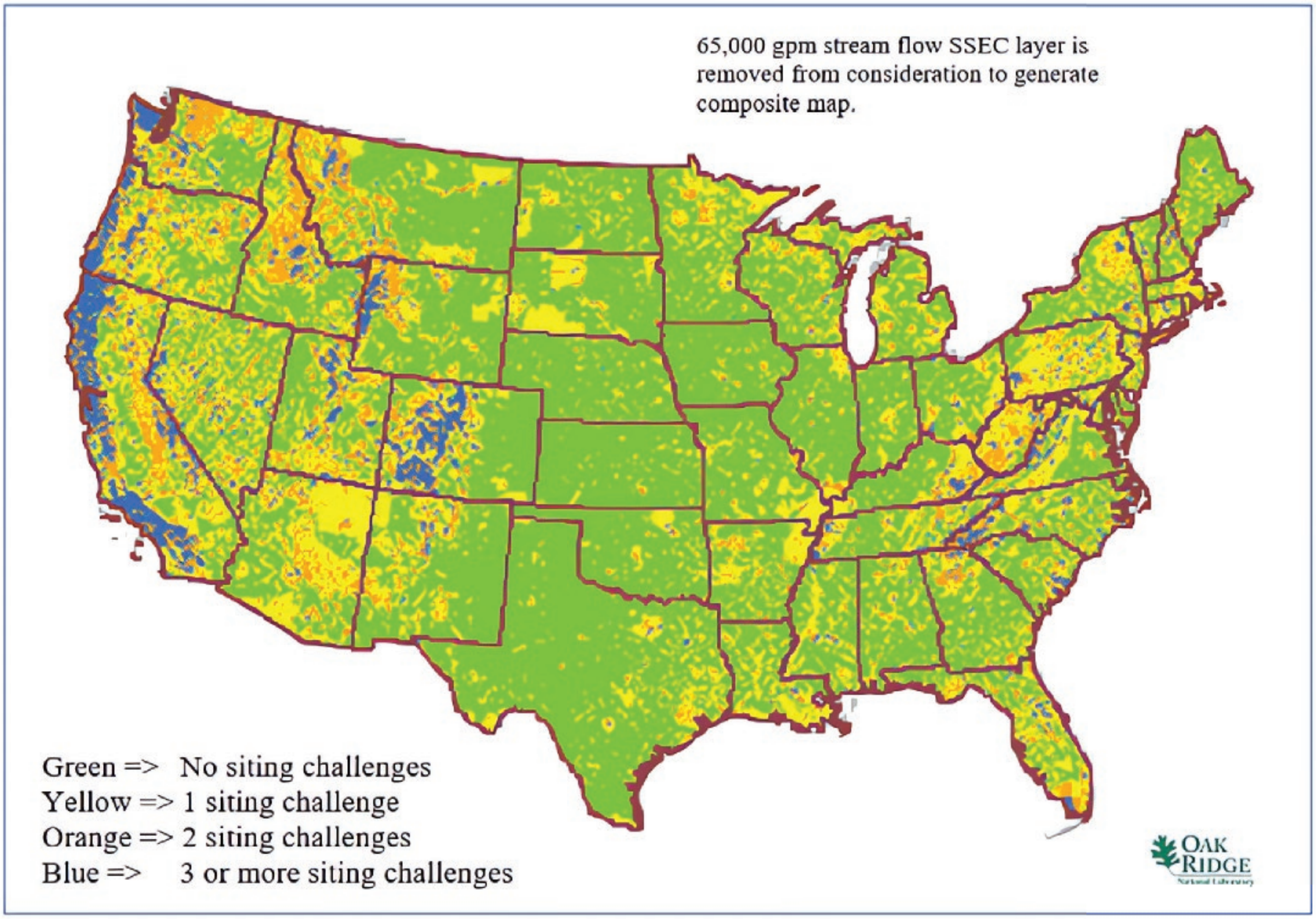


Figure 24:
SMR Regional Siting Challenges Without Water Consideration (Belles, Mays, Omitaomu, et al., 2012)



After excluding water sourcing obstacles from this analysis, most of Wyoming can host a SMR without any licensing difficulties. The primary remaining limitations come from steep terrain and protected land use in northwest Wyoming.

An additional location advantage comes in the form of future grid interconnection changes. PacifiCorp is set to expand transmission capacity to Southern Utah, capitalizing on expanded reach in growing population centers (PacifiCorp, 2024). Such capacity expansion would reduce regional electricity price differences and allow nuclear reactors to receive a higher rate of return. This in turn would mitigate some of the existing industry challenges associated with high intermittence, explained in Section 4.2.

Overall location considerations are scored as a minor advantage for increasing nuclear generated electricity in Wyoming. Between 10% and 21% of the State has no identified location obstacle for developing a nuclear reactor. Portions of the State have very low population density, mild terrain, and affordable land, with existing transmission lines. Unless there are unexpectedly high levels of nuclear power development, there will be enough land that is suited for reactor deployment to make Wyoming a viable location for small or large nuclear power plants. This is placed as a minor advantage, because these location considerations are not unique to the State, and alternative locations are equally feasible.

LEGAL

State Legal	Federal Legal
Minor Obstacle	Minor Obstacle

Legal: Scoring Criteria

Federal licensing costs for nuclear projects can be substantial, and payment to the NRC is set at an hourly rate, which does not provide an economic incentive for the NRC to reduce operating hours. NRC licensing rules create a *moderate obstacle* to the development of innovative first-of-a-kind designs which require additional licensing costs. However, designs which have already been deployed face fewer obstacles and are scored as having a *minor obstacle.* The cost of federal compliance does not uniquely limit nuclear projects in Wyoming and there are opportunities to deploy reactors with an established track record at subsequently lower licensing costs, placing the overall federal legal score as a minor obstacle to Wyoming deployment.

At the State level, Wyoming rules create a minor obstacle to nuclear reactor development. The federal licensing requirements are stringent, and Wyoming State rules require additional filings which overlap with these federal rules. While much of the work necessary to complete these State reports is already completed for federal compliance, this adds a cost to Wyoming projects. These regulatory expenses are small relative to total project costs, but are unique to Wyoming projects, establishing a score of a *minor obstacle* in Wyoming reactor growth.

Legal: Analysis

Federal legal requirements can add significant cost to nuclear projects. Prior to operating, various NRC licenses will be required, depending on the project plan specifics. These include operating licenses, materials licenses, site permits, and design certification. The NRC also requires that a privately created environmental report and technical report be submitted, with additional hours required by the NRC staff to review.

The U.S. takes the second longest time to fully license a reactor at 11 years, compared to a OECD average of 6.9 years (NEA, 2021b). Currently any work completed by NRC staff requires a payment rate of $320 per hour (NRC, 2024). This can lead to significant cost escalation, especially for innovative designs. For example, licensing costs of the NuScale advance reactor design totaled $82.6[40] million (Gilbert et al., 2021). After being permitted to operate, nuclear power plants are charged an average $5.5 million in annual NRC fees (NRC, 2024). A recent executive order, seeks to address this disparity targeting a reduction in NRC licensing times such that construction and operating licenses take no more than 18 months to complete (DOE, 2025). Executive orders can be modified making them difficult to rely on when making energy project investments(CERPA & Bennett, 2024). Still a reduction in licensing times will reduce the current legal analysis score for firms with upcoming projects.

Based on historic applications, a range of potential costs for the NRC to complete licenses are estimated using the hourly rate of $320 per hour. These different licensing's costs are provided in Table 2.

Table 5: Expected Cost of Various NRC Licenses in Million USD (Valencia, 2023)

	Low	Middle	High
License Amendments	$0.01	$0.08	$0.58
Combined Licenses	$14.2	$28.6	$57.2
Early Site Permits	$4.70	$9.34	$20.8
Design Certifications	$34.70	$57.60	$82.53

[40] 70 million dollars was inflation adjusted from May 2021 values to January 2025 values (U.S. Bureau of Labor Statistics, 2025a).

However, these estimated costs vary significantly by project, and some designs can be deployed at a low overall licensing cost. For example, design certification is developed independently from the reactor location and so it is not required to be replicated at each new site utilizing a particular design. Further, an early site permit is a review which is independent of the design and is not always necessary.

This variation in licensing costs establishes different obstacle scores depending on the project details. A first-of-a-kind reactor, with multiple license amendments, is the most constrained by NRC licensing rules and faces an overall score of a moderate obstacle. However, established designs, utilizing cost saving measures, are less affected by these compliance costs and so are described as having a minor obstacle. The overall score ranks the feasibility of deploying any reactors in Wyoming, so this lower score is preferred. Such reactors can be issued with NRC licenses in Wyoming without being overly burdened by added costs. Yet, decreasing licensing costs could have a significant impact on the State, by increasing the rate of innovation and development of advanced reactors.

Wyoming requires additional licensing costs, including environmental reports, technical feasibility, and economic evaluations[41]. Presently, these added costs provide a minor disadvantage to licensing a nuclear reactor. Allowing the NRC requirements to be sufficient for Wyoming nuclear specific licensing would provide a notable cost advantage elevating the state legal score to a minor advantage in Wyoming.

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[41] See discussion of theses added costs in (Joint Minerals, Business & Economic Development Committee, October 8, 2024-AM, 2024)

BENEFITS AND COSTS

GENERAL BENEFITS AND COSTS

There exist both generalized benefits and costs for developing a nuclear produced electricity sector in Wyoming. Some of the benefits include creating a regional hub of nuclear industrial development (Gebben & Peck, 2024), providing a demand driver for Wyoming produced uranium (Gebben, 2024b), national energy independence, and diversifying the State's electricity generation portfolio.

The social costs linked to nuclear power generation are attributable to increased risk of radiation exposure or death to the public. However, nuclear produced electricity has the lowest mortality addition rate of any electricity source. The global average mortality rate associated with nuclear energy is 0.04 deaths per million MWh of electricity produced, compared to oil at 36 , U.S. coal at 15 , and wind at 0.15 deaths per million MWh of electricity produced. (Brook et al., 2014)

In Wyoming, TerraPower has evaluated the risk adjusted potential for radiation leakage from the facility, providing metrics for social costs related to this exposure. The passive safety features of the reactor lead to a low expected radiation risk to nearby residents. The risk of radiation exposure is equivalent to 0.001% of background radiation. As a result, the total expected social costs caused by radiation from a Wyoming reactor is only $430 with an upper bound of $1,100. (TerraPower LLC, 2024a)

This radiation social cost is significantly less than the risks induced by increasing traffic in Wyoming as a consequence of commissioning a new reactor. The current valuation of a statistical life (VSL) used by the federal government is $13.2 million (Department of Transportation, 2024). Because the operation of the facility is expected to lead to 0.1 more traffic fatalities during operations (TerraPower LLC, 2024a), a social cost of $1.32 million per year can be assed for traffic fatalities during operations. During peak construction a total of 0.9 fatalities per year is predicted (TerraPower LLC, 2024a), at a social cost of $11.88 million. Assuming that the number of traffic fatalities is proportional to total employment at the facility, the combined cost of traffic fatalities is $37.8 million, when applying a 6% discount rate[42].

Further an assessment of cost due to traffic injuries is made. TerraPower estimates that during operation 2.6 traffic injuries will occur per year, and 24 traffic injuries will take place during peak construction. Based on the Wyoming Department of Transportation (WDOT) traffic accident data the expected social cost of an average Wyoming accident is found to be $783,000 (Cropper et al., 2011; WYDOT, 2025b). This procedure is outlined in Appendix C. The result is an estimated $58.3 million in social costs from traffic accidents, when applying a 6% discount rate.

These results should be interpreted in the proper context. In total this is a cost of $96.1 million, but VSL estimates can vary by as much as 40% (Cropper et al., 2011). Further it is important to note that this is the expected VSL without any adjustments. If, for example, road improvements are made with the tax revenue acquired from the project these numbers will decline. Further, the total cost should be compared to the alternative scenarios. An equivalent coal facility may induce as many traffic accidents as the nuclear project. These costs are not tied to nuclear generation per se and apply broadly to any industrial development project. The net welfare change caused by new traffic patterns is unclear given that the accident rates of alternative development paths are unknown.

Despite the limitations of this estimate, the result provides economic insights. First, these costs can be compared in magnitude to the expected State revenues from the project. Where the tax income exceeds this value, it is likely that the project will provide a net benefit to the State, and the tradeoffs are favorable to continue development. Second, it indicates the value of improving traffic safety in counties with a new reactor. The cost of reducing accidents through road maintenance, crosswalk installations, and traffic monitoring can be compared to this increase in incidence of accidents and fatalities. Finaly, the social costs can be contrasted with the expected cost of radiation. While radiation exposure is a unique attribute of nuclear generated electricity, this risk is very small when compared to standard traffic hazards associated with industrial growth in any sector.

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[42] Based on total construction employment estimates yearly average construction employment peaks after month 40 (TerraPower LLC, 2024a). The 12-month rolling average at this point implies an average of 4.5*10^-5 traffic fatalities per construction job in each month. During operations a fatality rate of 0.1 per 250 jobs per year is applied (3.3*10^-5 per job-month).

ECONOMIC IMPACTS

Outcomes in employment and tax revenue from nuclear generated electricity in Wyoming are estimated under various nuclear development rates. Based on the model described in detail below, it is projected that a single 345 MWe reactor will support 673 full-time jobs per year. The State and local tax revenue collected by the project are dynamic, peaking at $21 million during the end of the construction period. Each nuclear reactor addition has a net present value in tax returns of $297 million at a 6% discount rate.

The benefits and costs of the nuclear electricity generation sector in Wyoming are evaluated using an input-output model (Leontief, 1986). In these models, the inputs of one sector are treated as the output of another industry, and the system of equations is balanced with available region-specific data. The model applied comes from IMPLAN[43], which includes sector level data unique to Wyoming, allowing for the economic impacts to be tailored to the unique economic linkages in the State.

Because the Kemmerer nuclear power plant utilizes a modern reactor deployed in Wyoming, we use this project as a reference to model future economic impacts in the State. Data about the expected employment rate, and spending patterns of this project are uniquely useful because they are recent estimates and Wyoming specific. Applying data from existing power plants would bias an economic model because older Generation III reactors have different spending patterns, and the tax code and regulations of other states are not applicable to Wyoming. The current project data eliminates some of these complex location and timing factors. This provides a unique opportunity to assess the specific outcomes of Wyoming nuclear electricity sector growth. We first develop a generalized tax model based on the social impact estimates of the TerraPower environmental report (TerraPower LLC, 2024a). The employment levels and direct tax payments are modeled for three operations: development and construction, operation, and closure and decommissioning. Model assumptions are explained in this section but additional details are provided in Appendix E.

[43] For more information on the IMPLAN modeling process, visit IMPLAN.com

While building off cost and employment data from the Kemmerer project plan, the model is of a generic future reactor in Wyoming. Each project has unique economic considerations based on the design and location. The final employment rate, and tax payments of an induvial project will deviate from this generalized model. For example, the model is not directly applicable to the Kemmerer site, as assumptions are made about a feasible property tax decline rate for a typical reactor site. The assumed property tax decline rate is not identical to the realized Kemmer property tax payment schedule. Economic impact analysis of new nuclear projects should be evaluated independently once specific data becomes available. What this model is useful for is forecasting the average economic outcomes of Wyoming nuclear projects where the project specific details are inherently unknowable. While some future projects may have higher or lower tax returns than predicted, the average economic impacts across Wyoming projects will be approximated by this model.

Direct employment numbers are collected from TerraPower plans for each month from the pre-construction phase until the facility is fully operational (TerraPower LLC, 2024a). These employment estimates are provided in Figure 25.

Figure 25:
Employment Changes Occurring During Construction and Operation of a Nuclear Reactor[44]

[44] Data applied comes from (TerraPower LLC, 2024a).

Based on this job creation schedule, we apply an IMPLAN model to forecast induced and indirect job additions. These are new employment opportunities which are created by the spending patterns of the project. For example, employees living near the facility will make purchases at local restaurants, require housing, and use local amenities. Purchases used to maintain the reactor, such as uranium fuel and power system management, also affect local employment levels.

Three impacts are estimated based on the jobs during the various reactor phases. First, the economic impact of hiring the expected number of construction jobs in each year is assessed. Because the number of jobs change across the year, we apply the weighted average number of jobs in the year providing an input of person-years of employment. These jobs are added to the "construction of new power and communication structures" category in IMPLAN. Jobs that are associated with operating the reactor, but that begin prior to operation are treated similarly but are assigned to the "Electric power generation – Nuclear" category.

The TerraPower assessment assumes that 95% of construction workers will migrate from outside of the immediate counties of the project (TerraPower LLC, 2024a). While workers will come from outside the county and outside of the State, the average U.S. savings rate is under 5% as of December 2025 (U.S. Bureau of Economic Analysis, 2025). Based on this we assume that 5% of income is removed from the State while 95% is recirculated locally, which is evaluated in the export coefficients of the model. While many workers will migrate from outside of the State, they are expected to spend most of their paycheck in Wyoming until operations end.

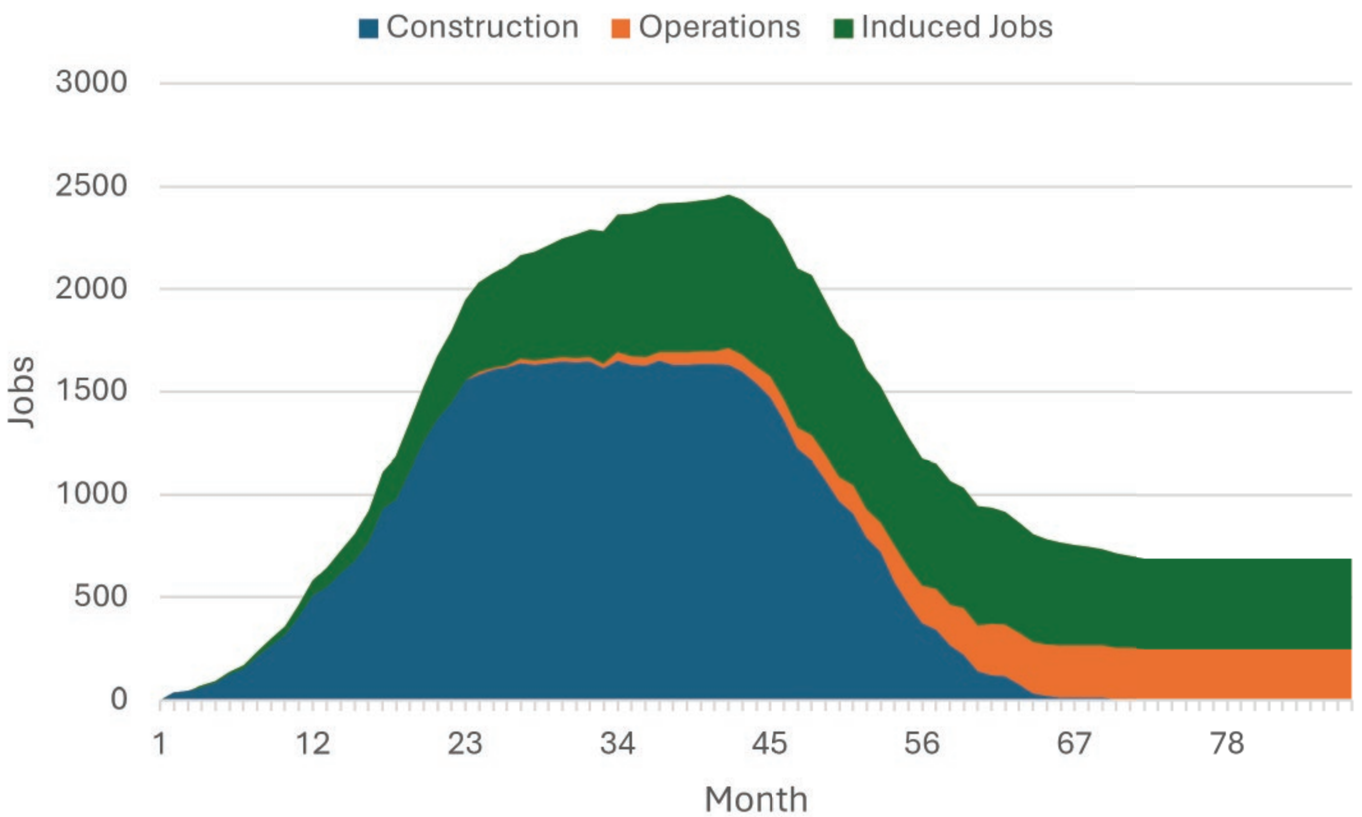
Because Wyoming does not have existing nuclear reactors, we create a hypothetical region to assess the economic impacts. In this region, all observed economic linkages in Wyoming are maintained, but a new 345 MWe nuclear reactor is added to the State. The spending pattern of this reactor is derived from existing spending patterns of other U.S. reactors. Based on an average wholesale electricity price of 6.9 cents per KWh, this reactor adds $200 million of annual output after five years of construction and testing (EIA, 2024d).

The average salary of a job associated with operating the reactor is assumed to be $155,840 (TerraPower LLC, 2024a), with an additional $25,000 in benefits. Direct taxes paid by the facility are set to zero in IMPLAN and are calculated independently.

Finally, the outcomes from decommissioning the facility are found, after the reactor operates for a 60-year licensed operating period. Based on the most recently retired nuclear power plant plans, the first year of retirement costs a total of $168 million spent on the environmental and other technical consulting services, as remediation plans are developed by engineers (Stoddard, 2013). After this, the average annual retirement cost takes place over 50 years, which is split between $12.8 million in industrial maintenance and $5.5 million in environmental and consulting services in each year (Stoddard, 2013). Because a portion of environmental consultants and engineers do not move to a project site and rather travel to the location for a short period of time, we assume that only 60% of the consultant income from the plant retirement is spent in Wyoming.

Based on these findings, the total direct employment of Figure 25 is augmented with the input-output induced employment in Figure 26.

Figure 26:
Total Employment Changes from a Wyoming Nuclear Reactor

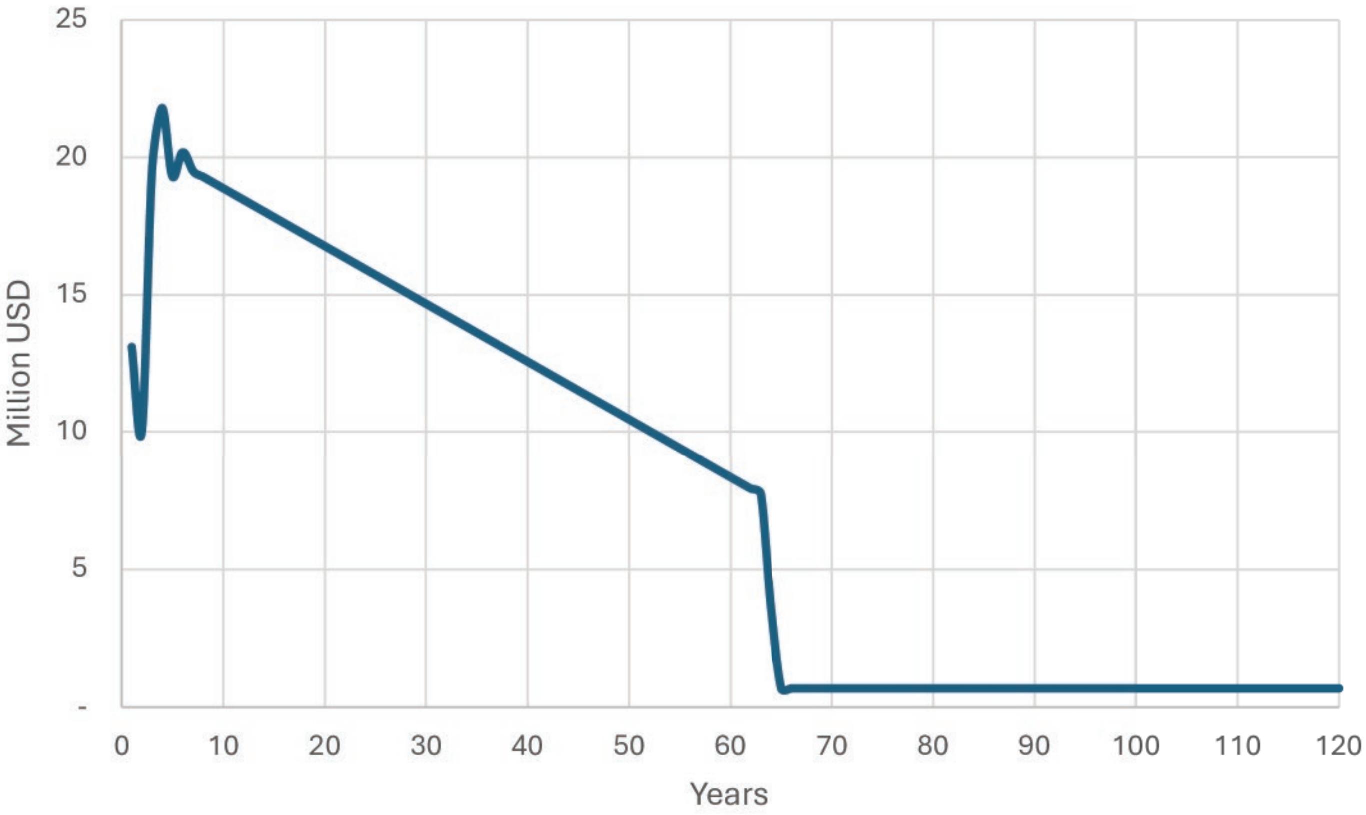


Wyoming employment caused by the facility would peak after 45 months, with a total of 2,500 active jobs. After the facility becomes fully operational, the input-output model predicts a total of 673 new permanent jobs in Wyoming. Of these, 423 jobs are induced or indirect.

Turning to tax outcomes, we first assess the direct tax rate paid at a 345 MWe facility. The two largest sources of tax revenue will come from property taxes and sales taxes for goods purchased for construction. Property tax and sales tax payment estimates are provided by TerraPower for the first five years of construction[45]. These property tax estimates account for an increase in the assessed value of the land as additions are made. Property taxes for the TerraPower facility will peak at a $115 million dollar assessment, with $12.2 million due in the first year of operation(TerraPower LLC, 2024a). A straight-line depreciation method is applied to this rate over the 60 year operating life of the facility.

Indirect and induced State and county tax revenues are added to these payments by applying the input-output model. Indirect effects account for the additional tax revenue created by stimulating purchases across the supply chain, while induced effects capture the results of individual purchases made because of the increased household income (Demski, 2024). The total forecasted tax revenue increase at the State and county level over the project life are provided in Figure 27.

Figure 27:
Reference Case Reactor Wyoming Tax Generation



[45] See table 4-4-14 of the Natrium environmental report (TerraPower LLC, 2024a).

Total tax revenues for Wyoming will peak five years after project initiation. At this point in time, the property value will be maximized, sales taxes will be paid to complete the project, and the temporary construction jobs salaries will contribute to spillover effects. However, after this peak, a significant portion of the workforce will move away, and the land value will begin to deprecate. After 30 years, the dominant source of tax revenue will be from the indirect effects associated with the spending patterns of the project, and the salaries of the 250 full-time employees operating the facility, which add to sales taxes and local property taxes. Finally, after 60 years revenues steeply decline as the project is retired and the only source of tax revenues result from expenditures on closure and remediation.

A single net present value (NPV) metric of the State and county tax revenues is assessed with this baseline project model. Because the tax revenues change over time, the NPV of tax revenues generated by a new Wyoming reactor is calculated with an assumed discount rate. A discount rate which treats money received one year in the future to be worth 6% less than present dollars is used. However, the NPV is calculated for a range of social discount rates which can be used as an alternative assessment criterion. The NPV estimates at these rates is provided in Table 6.

Table 6: Net Present Value of Taxes from a Wyoming 345 MWe Reactor

Discount Rate	NPV (million)
0%	$934
2%	$569
4%	$394
5%	$339
6%	$297
8%	$238
10%	$198
12%	$170
15%	$141

These results are utilized for estimations of the potential gains to Wyoming in different growth paths of U.S. nuclear energy. We performed a meta-review of U.S. nuclear reactor installation growth paths, to determine a lower bound, middle growth, and upper growth scenario for Wyoming (CITI Group, 2024; Crooks, 2024; EIA, 2023a; IAEA, 2024). The results of the four identified studies are elaborated in Section 4.1. Individual calibrations are made to each model, in order to make the predictions comparable across models. The assumptions made are elaborated in Appendix D.

To apply these results to Wyoming, a simplifying assumption is made that the State will acquire 1% of all nuclear capacity additions. This would maintain the States current ratio of total U.S. electricity generation (EIA, 2024c).

From each report a nuclear nameplate capacity is found for the U.S. under every growth scenario. The capacity additions are averaged across the studies, to determine the cardinal baseline growth paths used to calculate expected Wyoming tax benefits.

Based on this procedure, the middle case scenario is that two Natrium sized reactors will be constructed in Wyoming by 2050[46]. Under a low projected economic forecast, total U.S. capacity is expected to decline in each model. In this scenario a single reactor is applied to the State outcomes, representing the extant TerraPower operation. The upper bound is 5.5 345 MWe reactors being developed in Wyoming[47].

Since the net present value of future tax revenue depends on the timing of reactor development and the discount rate, we model future deployment rate based on the observed characteristics of the deployment path in each model (See Appendix D). Based on this average growth rate a NPV value is assed at various discount rates, which accounts for uncertainty in the timing of these reactor construction dates. We highlight the outcomes under three discount rates. Using a 2% discount rate values future tax revenue at a high relative value, often used as an intergeneration discount rate for government projects. A 6% discount rate is close to an average market rate of return, the NPV under this rate represents the equivalent lump sum which could be invested in alternatives and yield the same income for the State. The 10% discount rate represents the market rate of return for a high-risk investment, such as new oil wells where a premium return is necessary to account for overall risk.

In the low growth scenario, one reactor is constructed. This yields $569 million in State and local taxes at a 2% discount rate, $297 million using a 6% discount rate, and $198 million at a 10% discount rate. In the middle scenario the probability weighted NPV of the tax revenue is $971 million at a 2% discount rate, $404 million at 6%, and $235 million at 10%. Finally, in the high growth scenario, the discounted NPV is $2,378 million at 2%, $778 million at 6%, and $365 million at 10%.[48]

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[46] The four estimates are one reactor added in the EIA reference case (just TerraPower), 1.92 using the Wood Mackenzie model, 1.95 using the CITI group model, and 3.30 from the IAEA model. This averages to 2.042 345 MWe built in Wyoming.

[47] The IAEA addition of 240 GW equates to 7.6 added reactors. The EIA upper estimate comes from the scenario that low carbon technology costs decline and there is average economic growth adding 75.5 GW and 3.8 benchmark reactors in Wyoming (EIA, 2023a). The upper bound Wood Mackenzie estimate is not available in a public data set and is excluded. The CITI group upper bound estimate is 125 GW of added U.S. nuclear capacity, or 5.23 benchmark reactors in Wyoming. These average to 5.54 benchmark reactors.

[48] An executive order made on May 23rd 2025 places a target for U.S. nuclear capacity additions at 300 GW by 2050 (DOE, 2025).If this policy goal is reached that would represent approximately a 30% increase in the high outcome scenario. Because this is outside of the range of the economic forecasts the executive order will need to spur significant legal and economic changes in the U.S. for the full 300 GW additions to be realized.

CONCLUSION

The study evaluated the opportunities and barriers for new electricity generation from nuclear energy in Wyoming. Factors which encourage the development of nuclear produced electricity were identified. Tax incentives were categorized as the most significant draw to the State, providing sustained economic benefits to nuclear projects that are uniquely targeted to Wyoming projects. Future cost reductions in advanced nuclear reactors can spur commercial growth, but current economic considerations are found to constrain adoption.

The identified economic factors related to nuclear power plants are mixed in Wyoming. These factors include:

Factors Supporting Development

1. Tax exemptions in Wyoming for advanced nuclear projects, coupled with federal support for projects constructed in energy communities.
2. The existence of coal power plants in Wyoming provides an opportunity to reuse stranded assets improving project economics, at a later date when older facilities are retired.
3. Portions of Wyoming have stable seismology, flat terrain, and low population amenable to nuclear reactor operations.

Barriers to Development

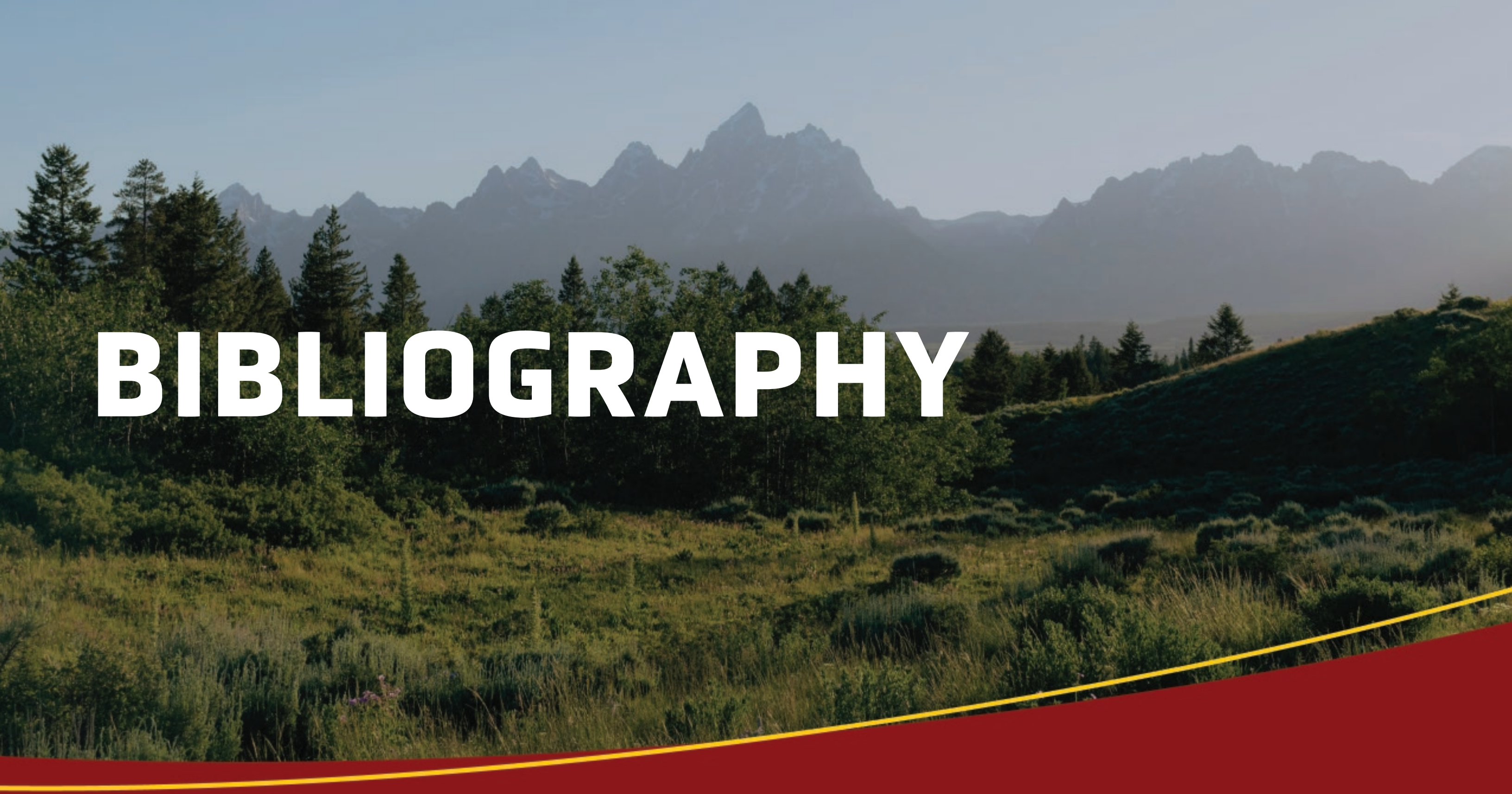
1. Wyoming natural gas is a more cost-effective method of electricity generation, unless there are future nuclear cost reductions.
2. Many advanced reactors are still in the development stage, making long-term forecasts of costs and revenues uncertain. Future learning can reduce this obstacle to industry adoption.
3. The cost to license a reactor in the U.S. is high relative to other nations. Wyoming rules overlap with NRC guidelines adding an additional cost to developing a Wyoming reactor.

Wyoming is positioned to develop nuclear reactors as technological innovation drive down project costs. Currently, the price of natural gas creates a major obstacle to developing nuclear projects. It is difficult to financially justify the addition of a commercial nuclear reactor when alternatives provide higher returns on investment. However, repeated deployment of advanced reactors, such as the Kemmerer TerraPower Project, are expected to result in future cost reductions. As capital costs are reduced, Wyoming is well situated to be an industry leader in nuclear electricity generation.

Under a scenario of high nuclear reactor deployment, the tax and employment benefits to Wyoming would be substantial. Each additional reactor deployed in the State could have a peak employment of 2,500 people leveling out at 673 long-term jobs. The associated State and county taxes from a reactor deployment would peak at $21 million dollars per year with a decline as the reactor approaches retirement. In total, this would add $297 million to the States' treasuries in net present value. Under a pathway of rapid U.S. nuclear deployment, over five reactors of this size could be developed in Wyoming, contributing $778 million of taxes to the State.

Ultimately, a Wyoming nuclear supply chain depends on the ability to construct and operate nuclear reactors. This report is the cornerstone in a series of six studies evaluating the stages in the nuclear supply chain. These other dependent sectors include, uranium mining (Gebben, 2024b), uranium enrichment (Gebben & Peck, 2023), component manufacturing (Gebben & Peck, 2024), direct heat applications of nuclear reactors (Gebben, 2024a), and spent fuel management (Gebben & Cooley, 2025).
A common scoring criterion was applied to each stage, allowing for the advantages and obstacles of Wyoming growth to be compared across nuclear sectors. Further, the potential economic benefits and costs associated with establishing these industries was estimated, helping to compare the costs and benefits across the supply chain.

This final report encapsulates the general tenor of the opportunities in Wyoming. Current U.S. reactor growth is constrained by global and national markets. Supply and demand factors create interconnections of the nuclear supply chain with a range of industries, including oil production, consumer demand for energy, and manufacturing costs. The complex web of economic interactions makes the addition of nuclear reactors in Wyoming challenging at present. However, there are significant uncertainties in future technological innovations and market trends. Feasibly, economic developments will attenuate the obstacles to nuclear capacity expansion, creating a ripple effect in the supply chain. Wyoming is found to be capable of being a part of future growth in several nuclear industries, including electricity generation.



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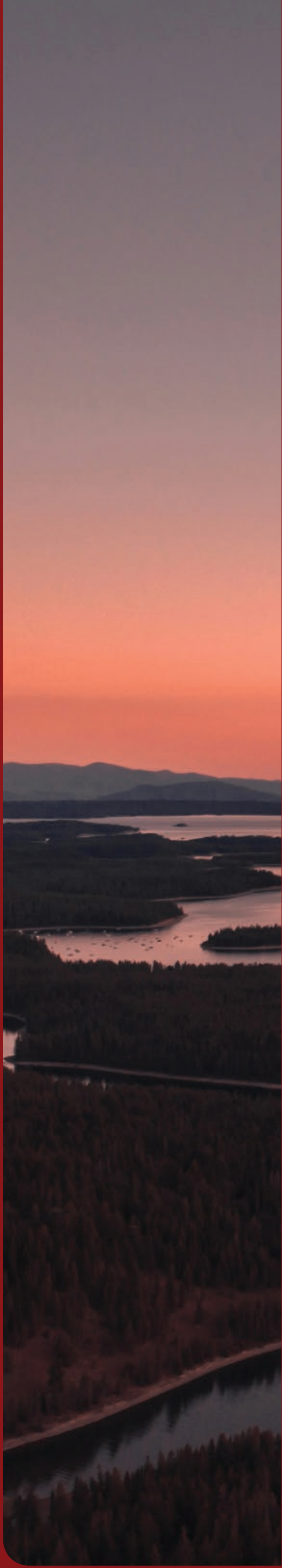

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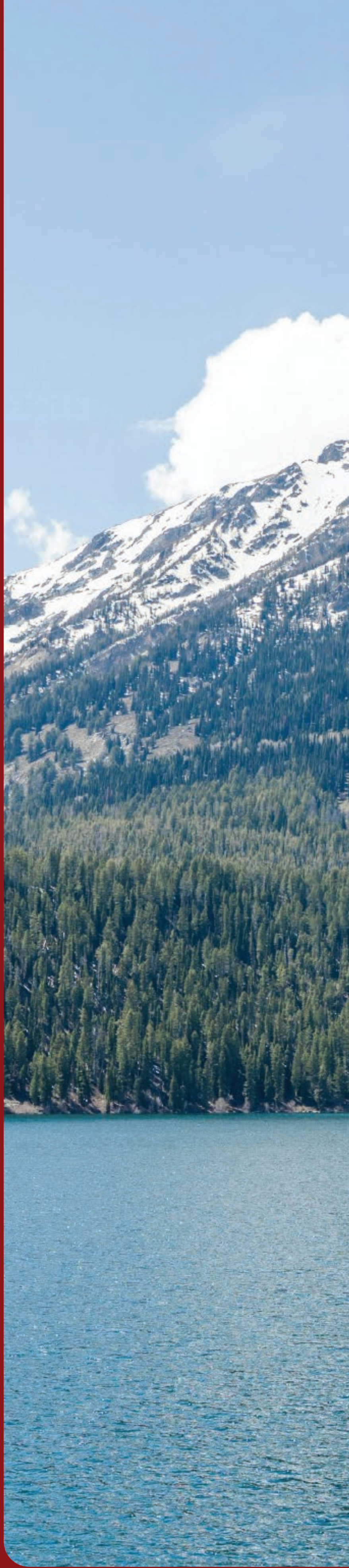
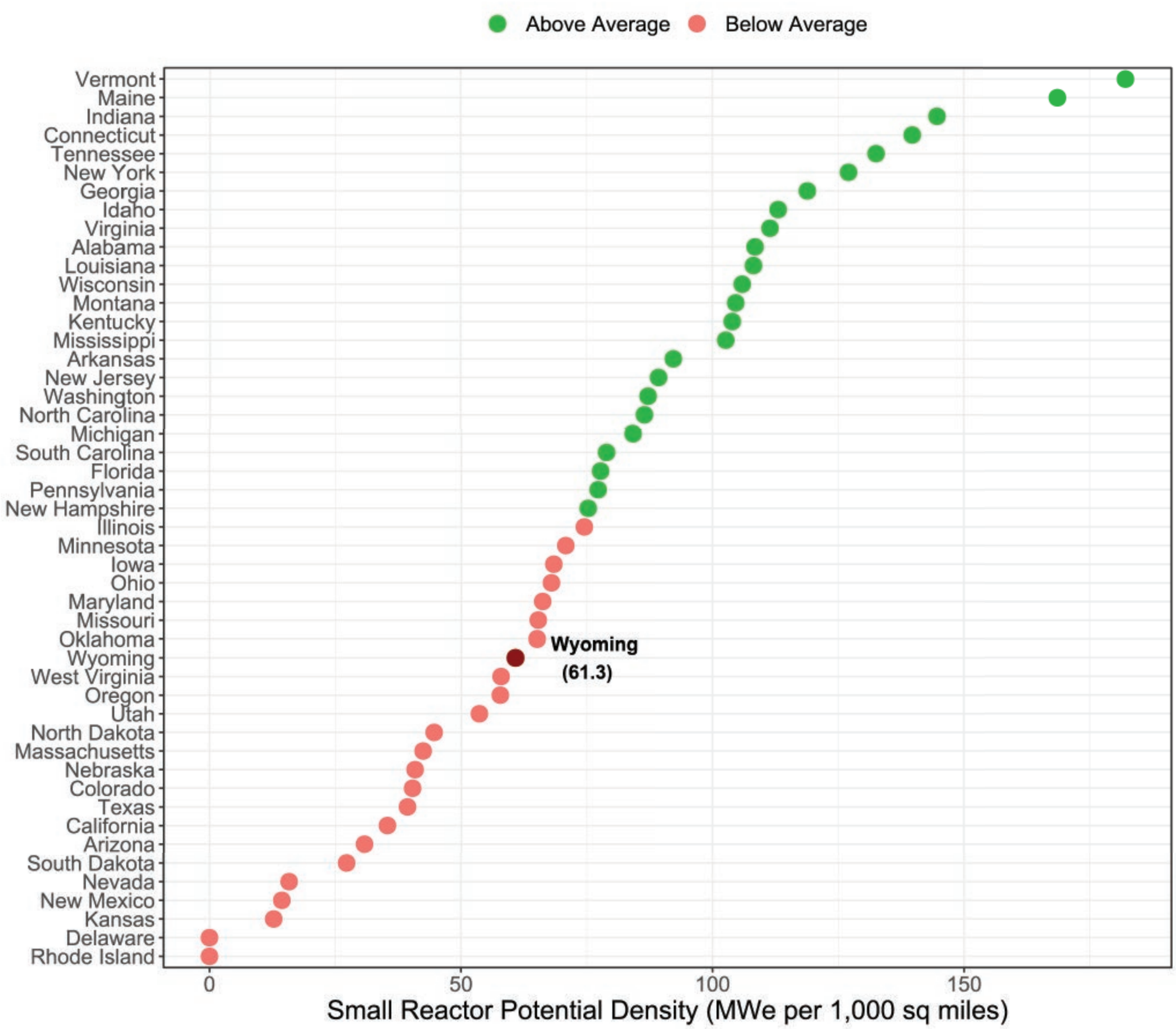


APPENDICES

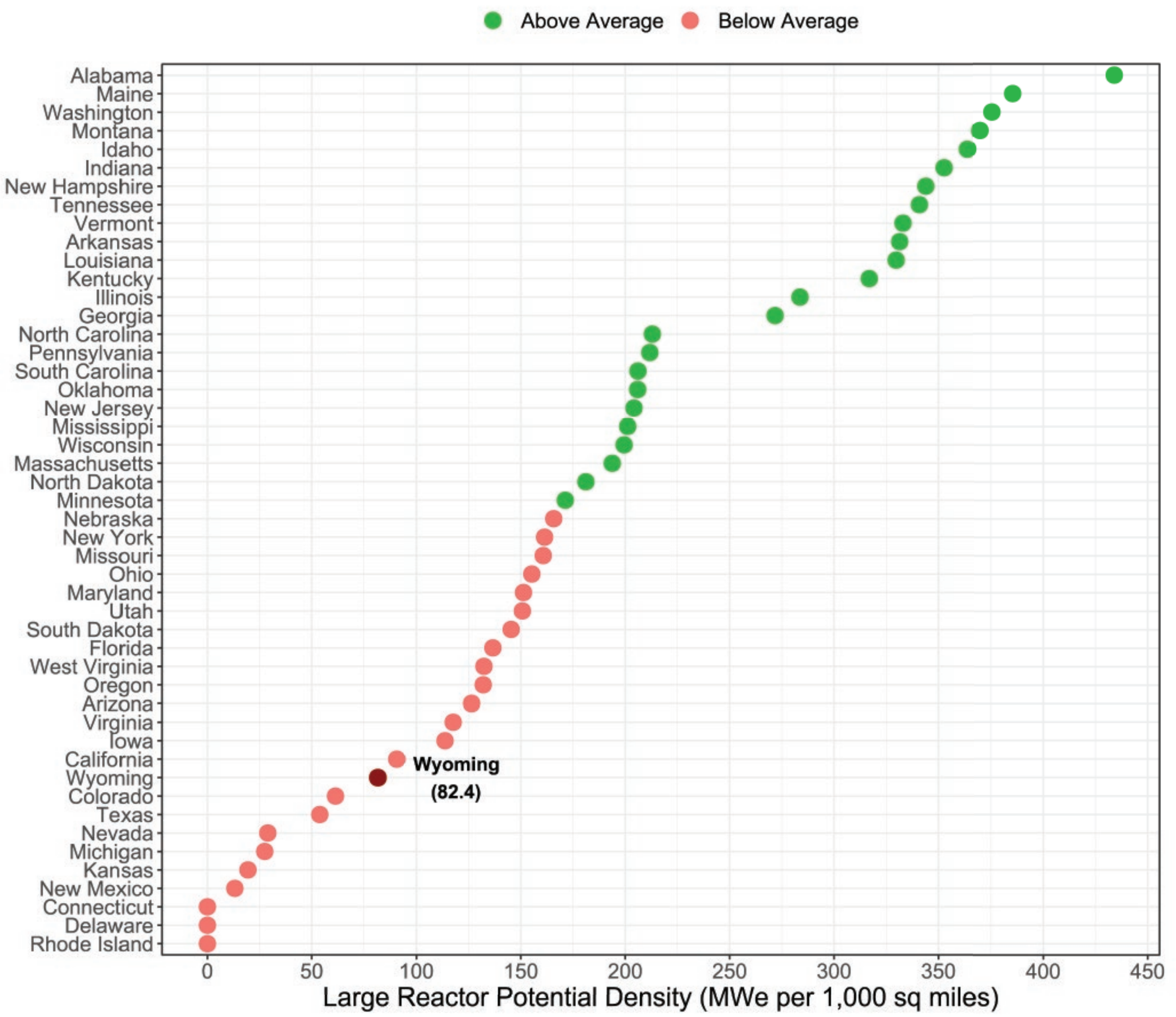
APPENDIX A: AVERAGE POTENTIAL NUCLEAR CAPACITY IN A STATE PER SQUARE MILE

Figure 28:
State Comparison of Small Reactor Land Availability[49]



[49] Data used as an input to this figure comes from (Belles, Mays, Omitaomu, et al., 2012)

Figure 29:
State Comparison of Large Reactor Land Availability[50]



50 *Ibid.*

APPENDIX B: OAKRIDGE SELECTION AND EVALUATION CRITERIA OF LOCATION FACTORS

Below is the set of standards used to score the suitability of a unit of land for nuclear reactor development (Belles, Mays, Blevins, et al., 2012). Violating any of these conditions increase the index score. Only areas with a score of zero are considered in Figure 19, Figure 20, Figure 21, and Figure 22.

- Land with a population density greater than 500 people per square mile (including a
- 20-mile buffer) is excluded.
- Land with safe shutdown earthquake peak ground acceleration (2% chance in a 50-year
- return period) greater than 0.3g is excluded.
- Land too close to identified fault lines (length determines standoff distance) is excluded.
- Protected lands (e.g., national parks, historic areas, wildlife refuges) are excluded.
- Land with a slope greater than 12% (~7°) is excluded.
- Land with a moderate or high landslide hazard susceptibility is excluded.
- Wetlands and open water are excluded.
- Land that lies within a 100-year floodplain is excluded.
- Land areas that are more than 20 miles from cooling water makeup sources with at least
- 200,000 gpm are excluded for large reactor plant applications.
- Land located in proximity to hazardous facilities is avoided.

APPENDIX C: EVALUATION OF THE SOCIAL VALUE OF AVOIDED ACCIDENTS

The U.S. Department of Transportation provides a range of discount factors for the social cost of a traffic injury, as compared to a traffic fatality. The social value of avoiding traffic injuries is estimated based on the Maximum Abbreviated Injury Scale (MAIS) which is a metric of injury severity. The value of avoided injuries relative to a full VSL is provided in Table 1.

Table 7: Relative Disutility Factors by Injury Severity Level (Cropper et al., 2011)

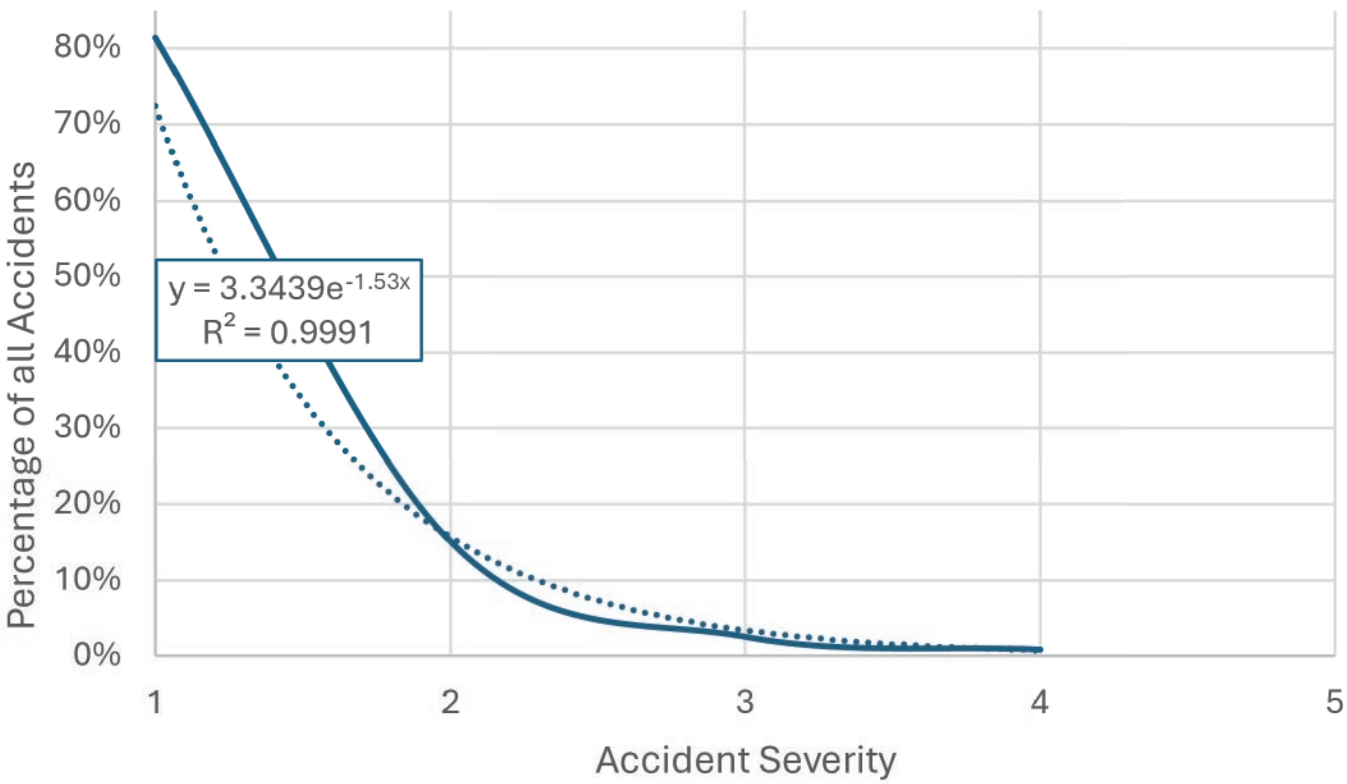
MAIS Level	Severity	Fraction of VSL
MAIS 1	Minor	0.003
MAIS 2	Moderate	0.047
MAIS 3	Serious	0.105
MAIS 4	Severe	0.266
MAIS 5	Critical	0.593
MAIS 6	Unsurvivable	1.000

To provide a first approximation of the value of an avoided accident for Wyoming, the distribution of accident severity must be applied to the total accident numbers. Unfortunately, WDOT does not provide the injuries based on this scale. We collect the most recent State traffic accident data, to establish a best estimate of this MAIS distribution (WYDOT, 2025b).

In 2023, there were 13,503 total crashes in Wyoming. Of these 10,994 crashes created damage to vehicles but without a reported injury (WYDOT, 2025b). 2,041 crashes were reported as a serious crash, which includes any minor injury or reported injury without observable harm (WYDOT, 2025a, 2025b) . 347 crashes resulted in serious or severe injury, but not death, and 121 crashes were fatal (WYDOT, 2025b).

An accident severity score is applied to this data, ranging from 1 to 4. A score of 1 corresponds to an accident which damages a vehicle, a score of 2 is a minor injury, a score of 3 is a serious injury, and a score of 4 is a fatal accident. The probability of an accident in Wyoming falling into each of these categories is provided in Figure 30. An exponential best fit line is calculated for this chart.

Figure 30:
Distribution of Traffic Accident Severity in Wyoming[51]



This information is used to estimate the average MAIS score for a Wyoming traffic accident. A MAIS score of 1 or 2 will fall into WYDOT classification 2. These accidents result in an observable injury but are not severe. Further the MAIS scores from 3 to 5 are within the 3 severity score created for Wyoming accidents, creating a serious or life threating injury but not death.

We assume that the distribution observed in Figure 30 holds within categories. For convenience we assume that a MAIS 3 corresponds with a WYDOT severity of 3, a MASI 4 corresponds to a WYDOT severity of 3.3, and a MAIS 5 corresponds to a WYDOT severity of 3.6. Similarly, we assume a MAIS 1 corresponds to a WYDOT severity of 2, and a MAIS 2 corresponds to a WYDOT severity of 2.5. While it is difficult to assess the proper continuous distribution intersection of two discrete categorical variables, this assumption provides a starting point for the value of an injury. Adjustments to these assumptions will affect the predicted outcome but are not likely to significantly change the overall estimate since the total discrepancy is bound by the ranges.

Based on the estimated distribution function in Figure 30: 55% of non-fatal Wyoming accidents are a MAIS 1, 25.8% are a MAIS 2, 9.5% are a MAIS 3, 5.7% are a MAIS 4 and 3.4% are a MAIS 5.

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[51] Data for this figure comes from (WYDOT, 2025b)

This results in a weighted average accident value which is equivalent to 0.059 of a VSL, or $783,000 dollars. This places the average accident as just above a “moderate” accident in the MAIS classification. While the median accident is “minor” the most server accidents pull up the average expect social cost.

The TerraPower environmental report estimates that there will be 2.6 accidents during operations and 0.1 deaths. This implies that the ratio of accidents to fatalities is 26 to 1. The net present value of traffic fatalities was previously estimated to be $37.8 million, when discounted at 6% (see section 5). $37.8 million discounted at the identified ratio of fatalities to accidents (0.059) is $2.34 million. Applying a ratio of 26 to 1 accident to fatalities, results in an estimated value of $58.3 million as a result of traffic accidents generated from the construction and operation of a TerraPower sized reactor. In total, a cost of $96.1 million could be attributed to traffic accidents and fatality risks linked to the project.

APPENDIX D: FORMULATION OF LOW, MIDDLE, AND HIGH GROWTH SCENARIOS

A meta-review of U.S. nuclear reactor installation growth paths was performed, to determine a lower bound, middle growth, and upper growth scenario for Wyoming. However, each model provides variations in how the results are communicated. So further adjustments are made to develop the lower, middle and upper total capacity growth for each model allowing for a direct comparison between each report. These reports include (CITI Group, 2024; Crooks, 2024; EIA, 2023a; IAEA, 2024).

To make each report comparable an adjustment is made to account for retired capacity. Two of the reports provide only the total U.S. capacity forecasted in 2050. However, this understates total nuclear reactor additions since new reactors will be added that replace older nuclear capacity that is retired. Based on the EIA Annual Energy Outlook reference case 21.1 GW of nuclear capacity will be retired by 2050. This value is added to the net growth estimates.[52]

An adjustment is also made to the IAEA reported forecast, since they do not sperate the expected capacity additions of the U.S. and Canda, reporting a North American result. We assume that the current ratio of nuclear generated electricity is maintained between the two nations. This equates to 87% of all additions being produced in the U.S (NEI, 2024). This assumption seems plausible considering Canadian expectations of nuclear additions. Projections of nuclear growth under an expanded carbon neutral policy place the relative growth of nuclear capacity at 85% of existing capacity (Canada Energy Regulator, 2023). This would correlate with the IAEA upper bound scenario, which projects a total North American increase of 107% (IAEA, 2024). Given the large range in upper bound estimates, we consider this difference small enough to allow the relative ratio of nuclear power between the two countries to be used for forecasting. Further the IAEA does not provide a reference case scenario and instead focuses on the upper and lower bounds of growth. We average the upper and lower estimates to acquire a middle scenario from this report.

[52] Or estimated decline. For example, a low growth scenario may estimate a decline of 20 *GW* in U.S. nuclear capacity, the total additions are then 21.1 *GW* - 20 *GW*=1.1 *GW*

Finally, under all models, we assume that the TerraPower project will be completed in Wyoming. The projects capacity is subtracted from the U.S. growth total and added to Wyoming directly. This means the minimum prediction of any model is that Wyoming acquires 345 MWe of nuclear capacity.

Next, we identify the timing of reactor expansions based on these reports. Each of the models provides a different expansion path which informs our simplified average development paths. In the EIA model, added capacity does not begin until 2040, after which growth averages 2% per year. The IAEA upper bound estimate has two distinct periods, a slower growth rate between 2030 and 2040, and an accelerated growth rate until 2050. We combine these two approaches, in our estimate. We assume that there is a slow expansion rate from 2030 to 2034, this rate is doubled in 2035, which is again doubled in 2040. This model treats the probability that Wyoming capacity is added as more probable with time. This places the average probability weighted date of a reactor being built in Wyoming as 17.55 years (middle of 2042), based on Monte Carlo simulations (code available upon request). At a 2% discount rate the NPV of reactor tax benefits would be reduced by 29.4% when built in 17.55 years compared to a project starting today. At 6% the project tax value would be reduced by 64.0%, and at 10% the project tax NPV would be reduced by 81.2%.

APPENDIX E: MODEL ASSUMPTIONS OF THE GENERALIZED WYOMING REACTOR TAX MODEL

In this appendix the model assumptions of the State and local tax model of a generalized Wyoming nuclear reactor are highlighted.

First, it should be noted that only State and local taxes are provided for this model. The outcome is focused on the Wyoming effects, and federal taxes are left for future research, nor are alternative value metrics provided such as total economic output, or profit.

We evaluate three sources of taxes. Property taxes paid to the county, sales taxes paid to the State (but shared with the county at a 31% ratio), and induced economic effects not related to direct spending at a reactor.

The State $5 MWh nuclear generation tax is assumed to be non-binding (see Section 4.2). Unless there are extreme constraints on uranium supply, Wyoming reactors can purchase U.S. source uranium meeting the exemption requirement. Similarly, Wyoming Statue 39-15-105, provides a sales tax exemption for:

> ***"Sales of power or fuel to a person engaged in the business of manufacturing, processing or agriculture when the same is consumed directly in manufacturing, processing or agriculture;"***

This exemption is expected to apply to uranium purchase.

The TerraPower environmental report provides a direct estimate of tax returns which we use to develop a benchmark reactor tax estimate. Sales tax payments for construction are identified as $1,179,767 in year one, $1,905,876 in year two, $4,237,054 in year three, $2,940,616 in year four, $1,609,469, and $347,415 in year five. See table 4.4-12 of the TerraPower environmental report for original data (TerraPower LLC, 2024a).

These estimations are based on the assumption that all construction expenditures will be made in the county, and that none of the purchases will be tax exempt. The report states that:

> ***"Of course, not all construction expenditures will be taxable and not all materials and services will be purchased or used in Lincoln County, so these impacts are likely overstated to the extent that some expenditures will be exempt from sales and use taxes and some materials and services will be purchased and used outside of Lincoln County" (TerraPower LLC, 2024a)***

To provide a more conservative sales tax estimate for a generic nuclear project model we assume that 15% of purchases are tax exempt or are otherwise not eligible for out of State taxes. This adjustment does not apply to the purchases actually made by TerraPower but is used as a model for similar projects that have this 15% exemption rate.

Turning to property taxes, the TerraPower environmental report provides multiple years of expected property tax liability. These include $11,184,652 in 2024, $3,073,031 in 2025, $7,288,215 in 2026, $10,207,065 in 2027, $11,842,250 in 2028, and $12,195,298 in 2029. See table 4.4-15 of the TerraPower environmental report for original data.

The property tax rate of an individual reactor project will be set based on that year's mill levy, and local assessors' standards of property evaluation. Furthermore, a project can negotiate changes to this rate. The environmental reports state that:

> ***"It is estimated the total property tax by the final year of construction will be approximately $12.2 million (Table 4.4-14). Notably, these estimates do not reflect any negotiated tax arrangements, such as payments-in-lieu of taxes or other plant valuation agreements, between the plant's taxing jurisdictions or the State. At this time, no such arrangements have been made, but they are routinely made by nuclear power producers and local and State governments."(TerraPower LLC, 2024a)***

We do not assume a negotiated rate but do account for a reasonably expected decline in assessed value which could lower the tax payment of a typical reactor over the operating life. To account for changes to the property tax paid overtime we apply a discount method of project capital for the purpose of property tax payments. A straight-line depreciation method is used where the property values decline as a ratio of the remaining salvageable property. For any year the property tax payment is assumed to be:

$$Peak\ tax * \left(1 - \frac{remaing\ life}{60}\right) = Present\ tax$$

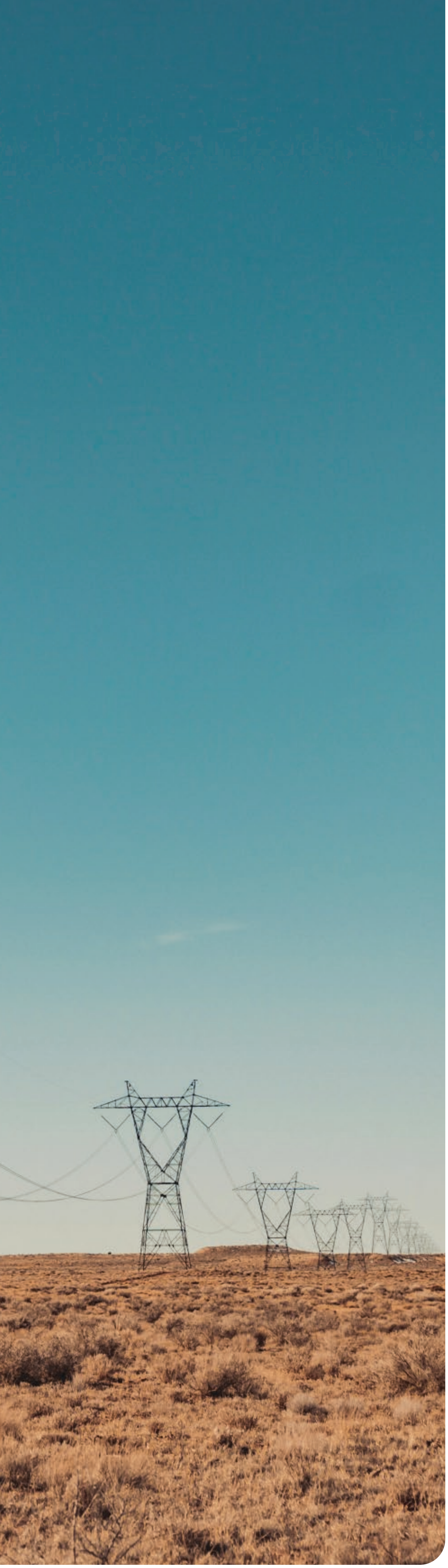
$$\$12.2\ million * \left(1 - \frac{60 - Years\ since\ start}{60}\right) = Present\ tax$$

This is not the expected tax payment schedule of the Natrium project as the first year of operation is estimated to induce $7.5[53] million in property tax revenue by 2030 whereas the straight-line method predicts a property tax value of $12.0 million. However, we apply this as a plausible rate of depreciation for an assessor to make on a future reactor project in the baseline model. Further if a project is expected to have salvageable assets this tax rate will be increased. We assume that the project life is 60 years, without any salvageable value at the end of that period.

We next turn to induced and spillover effects, generated by local spending. When a new worker is hired, that worker spends some portion of their salary in the Wyoming economy. This in turn supports a range of industries from restaurants to gas dealerships and induces taxes on new spending. Home values may increase by providing new property taxes.

To account for these effects, the IMPLAN model is used. Multiple input-output models are created to provide a dynamic State and local tax effect. First the effect of construction income is assessed. The number of construction personnel hired to work on the Kemmerer Unit 1 is provide in each month, in the environmental report (see Table 3.3-8) (TerraPower LLC, 2024a). We benchmark the monthly data by defining the 16 months before construction starts as month zero. Total construction employment in a given year is calculated by averaging the number of construction personnel in each 12 month period.

[53] See Table 5.4-4 of the Kemmerer Unit 1 Environmental report (TerraPower LLC, 2024a)



The number of added construction employees for a given year is provided as an input to IMPLAN. For example, year one is calculated to average 183.58 person-years of employment. We create an impact which is an addition of 183.58 total employment in the " Construction of new power and communication structures" category of IMPLAN. No assumption is made about the total labor income of these workers allowing IMPLAN to apply Wyoming specific averages for construction worker pay. IMPLAN does not recirculate taxes paid on production in the economy (IMPLAN Data Team, 2024). We therefore set the Taxes on Production and Imports, Net of Subsidies (TOPI) value of the model to zero. We prefer to apply the direct calculation of sales and property taxes explained above. However, by setting TOPI to zero, IMPLAN provides some additional direct tax payment estimates, such as payroll taxes, and housing effects resulting from the hiring of these employees in addition to the indirect and induced spending effects.

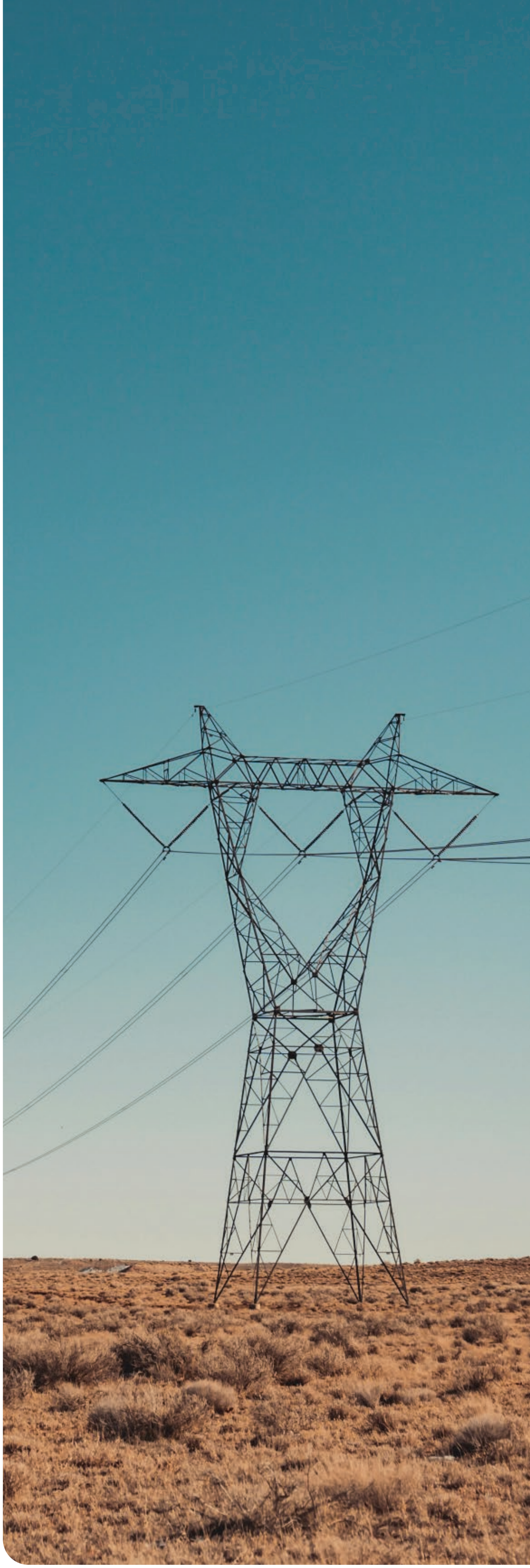
The same monthly employment data is provided for the predicted operational workforce at the Kemmerer facility (see Table 3.3-9 of the environmental report). Again, the average number of employees in each year is calculated, but this time for the operational work force. The wage of each employee is assumed to be $155,840 per year (TerraPower LLC, 2024a), in addition we assume there are $25,000 of yearly benefits. The tax effects from hiring operational workers are estimated as a shock to employment in the "Electric power generation – Nuclear" sector, with a "Total Labor Income" equal to $180,840 times the average number of operators in a given year.

Input-output models are created for each of the first five years of the project from preplanning to full operation. Any one year's impact is calculated as the total of the construction force employment change and the operator employment change. After this period each year of operation applies an input-output model of a shock of 250 operators on site, with an assumed $200 million in project output. Based on an average wholesale electricity price of 6.9 cents per KWh (EIA, 2024d).

From the IMPLAN models the direct, indirect, and induced tax effects are summed for State, county, and sub county categories (Including general and special districts). Federal tax payments are not considered in the present analysis but are provided by the IMPLAN model results. Because the TOPI is set to zero the direct tax effect includes only the direct taxes associated with hiring new workers such as payroll tax. The induced and indirect effects account for the multiplicative outcomes of wage spending locally, including the resulting sales taxes and employment changes. We also calculate the induced employment effect from this model, finding that the local spending during operation will generate an additional 424 jobs per year that are not directly associated with operating a nuclear reactor.

Finally, the facility closure is modeled after 60 years of operation. We assume that there is an industry output increase of $168.3 million in the "Environmental and other technical consulting services" labor category in the first year of project closure related to planning. 40% of this income is assumed to leak out of the State due to higher rates of out-of-state consultants for this environmental planning. This is followed by 60 years of remediation with an industry output increase of $12.792 million per year in "Maintenance and repair construction of nonresidential structures" and $5.5 million per year in "Environmental and other technical consulting services". These values are adjusted numbers informed by previous remediation plans (Stoddard, 2013).

The IMPLAN model results are combined with the estimated direct tax payments from sales taxes made for construction purchases, and the project property taxes which follow a straight-line depreciation method after a peak to $12.2 million dollars paid at the end of the construction period. The resulting State and county total taxes are provided in Figure 27, and induced jobs from the IMPLAN model presented in Figure 26.



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