



UNIVERSITY OF WYOMING

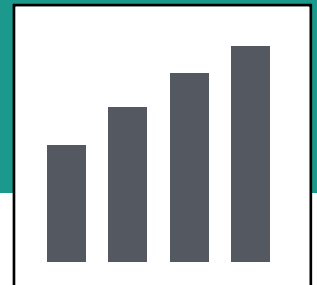
SCHOOL OF ENERGY RESOURCES
NUCLEAR ENERGY
RESEARCH CENTER

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White Paper Title:

**Wyoming residents' perspectives
desires, and values related to nuclear
energy in Wyoming**



Selena Gerace | 2022

NUCLEAR ENERGY RESEARCH CENTER WHITE PAPERS

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The objective of the NERC White Paper Series is to share preliminary research conducted on nuclear-related energy issues in Wyoming as they emerge to serve as a public resource. The authors of the papers are solely responsible for the content of their contributions. The working papers can be found at <http://www.uwyo.edu/ser/research/centers-of-excellence/nuclear-energy-research-center/resources.html>

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School of Energy Resources
Nuclear Energy
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Wyoming residents' perspectives, desires, and values related to nuclear energy in Wyoming

Selena Gerace

July 21, 2022

1. Introduction

For nuclear energy to be adopted in Wyoming, either as microreactors embedded in industrial systems or as part of zero-carbon energy hubs, residents of the state will need to be supportive of having nuclear energy generation in their state and/or near their communities. Public disapproval can stymie energy development projects, making the permitting process slow, costly, and ultimately unsuccessful in some cases. While microreactors have several potential benefits over conventional carbon-emitting forms of energy (such as natural gas or diesel) and over renewables that typically require large amounts of land (such as wind and solar), nuclear energy has historically suffered from negative public perceptions, which may make industries hesitant to invest in them. For industries to feel confident in adopting microreactor technology, it is important to understand Wyoming residents' current perceptions of energy in general, their perceptions of nuclear energy in particular, their desires for the future of their communities and the future of Wyoming, and what they value most about Wyoming. To do these, we explore three recent studies of Wyoming residents' perceptions, desires, and values to determine what opportunities and barriers they present to adoption of nuclear technologies in Wyoming.

2. Wyoming Residents' Perceptions of Energy and Carbon-Neutrality

Wyoming's strong relationship to energy can't be overstated. Wyoming has been a top fossil energy producing state for decades, ranking as the number one coal producing state, the eighth crude oil producing state, and in the top ten of natural gas production.¹ Energy-related mining, energy processing, and electricity generation are major sources of tax-revenue and jobs.² Indeed, royalties, severance payments, and other taxes from energy industries provide a significant portion of the State of Wyoming's annual revenue.^{3,4} Between 2015-2020, the State of Wyoming and Wyoming localities generated an average of 59% of their annual revenue from fossil fuel production and extraction, totally \$4,264 million annually, and over \$7,000 per resident.⁵

However, as fossil energy production has been in decline due to pressure to transition to low-carbon alternatives, Wyoming's relationship to energy has begun to change. Since 2008,

¹ U.S. Energy Information Administration. "Wyoming State Energy Profile." Accessed October 2020. <https://www.eia.gov/state/print.php?sid=WY>

² U.S. Energy Information Administration. "Wyoming State Energy Profile." Accessed October 2020. <https://www.eia.gov/state/print.php?sid=WY>

³ Wyoming Department of Administration & Information, Economic Analysis Division. "Special Reports and Presentations." Accessed October 2020. <http://eadiv.state.wy.us/SpecialReports/SpecialRep.html>

⁴ State of Wyoming Legislative Service Office. "Budget Shortfall Introduction." May 2020. https://wyoleg.gov/InterimCommittee/2020/03-202005265-0405262020_BudgetShortfallFINAL.pdf

⁵ Raimi, Daniel, Emily Grubert, Jake Higdon, Gilbert Metcalf, Sophie Pesek and Devyani Singh. 2022. "The Fiscal Implications of the US Transition away from Fossil Fuels." Resources for the Future.

coal production has declined from 450 million short tons to just 218 million short tons in 2021.⁶ Natural gas production has declined from 2.5 billion MCFs in 2009 down to less than 1.4 billion MCFs in 2021.⁷ While oil production has actually increased from a low of 51 million barrels in 2009 up to 85 million barrels in 2021, it has been highly volatile and uncertainties loom about future production.⁸ All of these changes have dramatically impacted jobs and tax revenue in Wyoming, and state leadership is responding to these changes. In his 2021 State of the State address, Wyoming Governor Mark Gordon declared that the state's goal is to be net-negative in carbon dioxide (CO₂) emissions. He emphasized that the path to achieving this goal would not be to abandon Wyoming's fossil resources, but rather to invest in carbon capture technology along with diversifying Wyoming's energy industries to include a wide variety of other low-carbon resources.⁹

In light of these changes, it is interesting to take stock of how Wyoming residents currently conceive of their relationship to energy and what they want their relationship to energy to be in the future. Two recent studies that have surveyed Wyoming residents have found that residents still strongly support energy industries and believe them to be important. A 2019 study called *Social License for Wyoming's Energy Future: What Do Residents Want?*, focused of understanding the *social license* (information community permission) for different types of energy development in Wyoming. Results indicated that residents support both fossil fuel and renewable energy, with well over 50% of residents supporting natural gas, oil, solar, wind, and coal (*Figure 1*). Likewise 58% of residents reported that they want the amount of fossil fuel development to increase (*Figure 2*) and 70% of residents reported that they want the amount of renewable development to increase (*Figure 3*).¹⁰ Interestingly, when residents were asked about newer or less prevalent energy-related industries (energy storage, uranium, carbon capture and storage, and rare earth elements), they did not receive as strong of support, but they also did not strongly oppose them. Rather, a large percentage of residents reported being *neutral or not sure* about these energy-related activities.¹¹

⁶ Wyoming Geological Survey. 'Wyoming Coal.' Accessed May 2022.

<https://www.wsgs.wyo.gov/energy/coal.aspx#:~:text=Since%201865%2C%20more%20than%2012.5,and%20Lincoln%20counties%20in%20Wyoming>

⁷ Wyoming Oil and Gas Conservation Commission. 'Graph Gas Production. Accessed May 2022.

<https://wogcc.wyo.gov/data>

⁸ Wyoming Oil and Gas Conservation Commission. 'Graph Oil Production'. Accessed May 2022.

<https://wogcc.wyo.gov/data>

⁹ <https://www.wyoenergy.org/news/energy-opportunities-from-governor-gordons-2021-state-of-the-state/>

¹⁰ Western, Jessica and Selena Gerace. 'Social License for Wyoming's Energy Future: What Do Residents Want?' 2021. University of Wyoming's School of Energy Resources.

http://www.uwyo.edu/haub/_files/_docs/ruckelshaus/pubs/2020-wyomings-energy-social-license-report.pdf

¹¹ Western, Jessica and Selena Gerace. 'Social License for Wyoming's Energy Future: What Do Residents Want?' 2021. University of Wyoming's School of Energy Resources.

http://www.uwyo.edu/haub/_files/_docs/ruckelshaus/pubs/2020-wyomings-energy-social-license-report.pdf

Wyoming residents' support & opposition for types of energy production

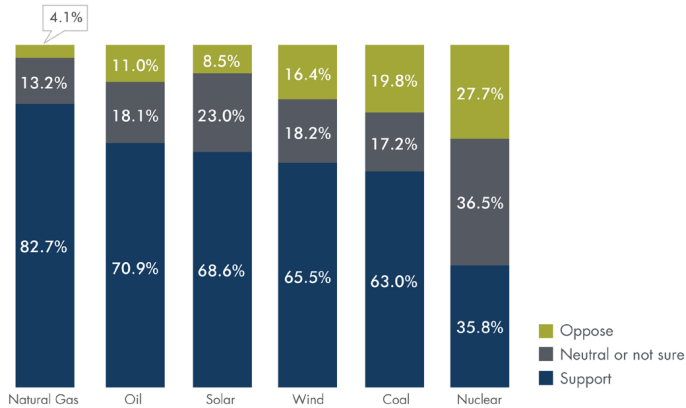


Figure 1: Percentage of Wyoming residents who support or oppose different types of energy production from 2019 Social License study¹²

Wyoming residents' opinions about the amount of fossil fuel development

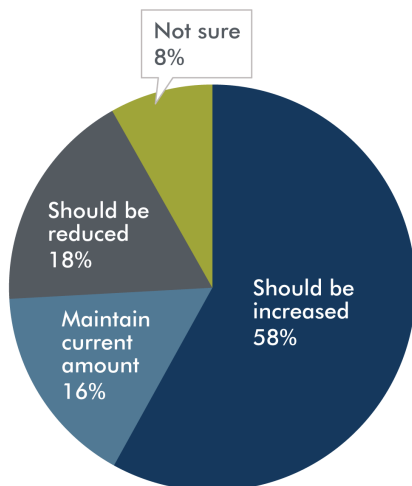


Figure 2: Wyoming residents' preferences about fossil fuel production from 2019 Social License study¹³

¹² Western, Jessica and Selena Gerace. 'Social License for Wyoming's Energy Future: What Do Residents Want?' 2021. University of Wyoming's School of Energy Resources.

http://www.uwyo.edu/haub/_files/_docs/ruckelshaus/pubs/2020-wyomings-energy-social-license-report.pdf

¹³ Western, Jessica and Selena Gerace. 'Social License for Wyoming's Energy Future: What Do Residents Want?' 2021. University of Wyoming's School of Energy Resources.

http://www.uwyo.edu/haub/_files/_docs/ruckelshaus/pubs/2020-wyomings-energy-social-license-report.pdf

Wyoming residents' opinions about the amount of renewable development

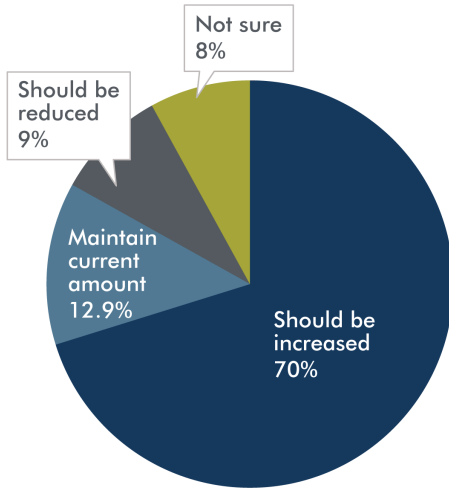


Figure 3: Wyoming residents' preferences about renewable energy development from 2019 Social License study¹⁴

Wyoming residents' support & opposition for other minerals and technologies

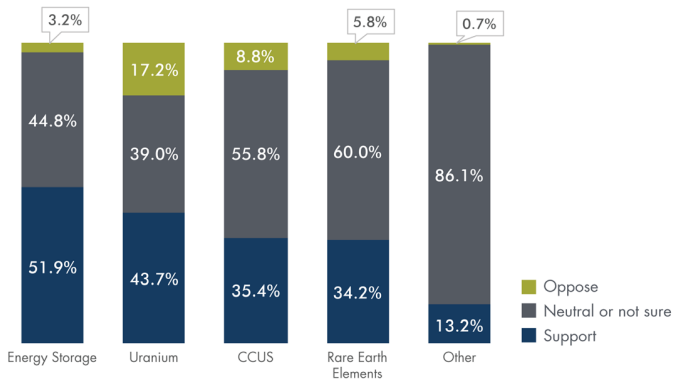


Figure 4: Percentage of Wyoming residents who support or oppose other types of energy-related industries from 2019 Social License study.¹⁵

Another study conducted in 2021 focused on Wyoming residents' perceptions of the concept of 'carbon-neutrality' or 'net-zero' carbon emissions—meaning the amount of CO₂

¹⁴ Western, Jessica and Selena Gerace. 'Social License for Wyoming's Energy Future: What Do Residents Want?' 2021. University of Wyoming's School of Energy Resources. http://www.uwyo.edu/haub/_files/_docs/ruckelshaus/pubs/2020-wyomings-energy-social-license-report.pdf

¹⁵ Western, Jessica and Selena Gerace. 'Social License for Wyoming's Energy Future: What Do Residents Want?' 2021. University of Wyoming's School of Energy Resources. http://www.uwyo.edu/haub/_files/_docs/ruckelshaus/pubs/2020-wyomings-energy-social-license-report.pdf

released into the atmosphere is less than or equal to the amount of CO₂ that is being removed from the atmosphere, so there is no net increase in atmospheric CO₂. This study, called *Wyoming Community Perspectives on a Net Zero Carbon Energy Economy*, found that 94% of Wyoming residents believe that energy industries were extremely or very important to their communities (Figure 5).¹⁶ Similarly, 94% of residents reported that it is extremely or very important for Wyoming to continue supplying energy to the region in the next 20-50 years. While the survey used in this study did oversample counties in Wyoming that have more energy development and energy industries, it still suggests a strong continued desire for energy industries to be an important part of Wyoming's economy.¹⁷

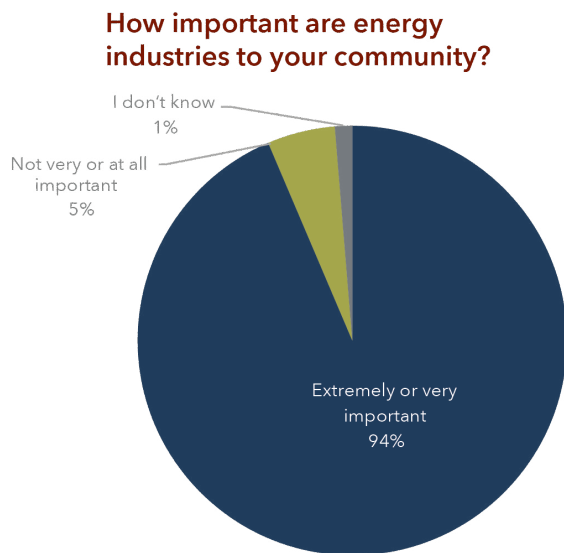


Figure 5: Importance of energy industries to Wyoming communities in 2021 Net-Zero study.¹⁸

In contrast to the Social License study, this Net-Zero study found that residents believe fossil fuel industries were much more important than renewable (Figure 6). However, again, this study focused on counties that are more dependent on fossil energy industries for jobs and tax revenue.

¹⁷ Western, Jessica and Selena Gerace. 'Wyoming Community Perspectives on a Net Zero Carbon Energy Economy' 2021. University of Wyoming's School of Energy Resources. http://www.uwyo.edu/ser/research/centers-of-excellence/energy-regulation-policy/_files/net-zero-survey.pdf

¹⁸ Western, Jessica and Selena Gerace. 'Wyoming Community Perspectives on a Net Zero Carbon Energy Economy' 2021. University of Wyoming's School of Energy Resources. http://www.uwyo.edu/ser/research/centers-of-excellence/energy-regulation-policy/_files/net-zero-survey.pdf

How important are different energy industries to your community currently?

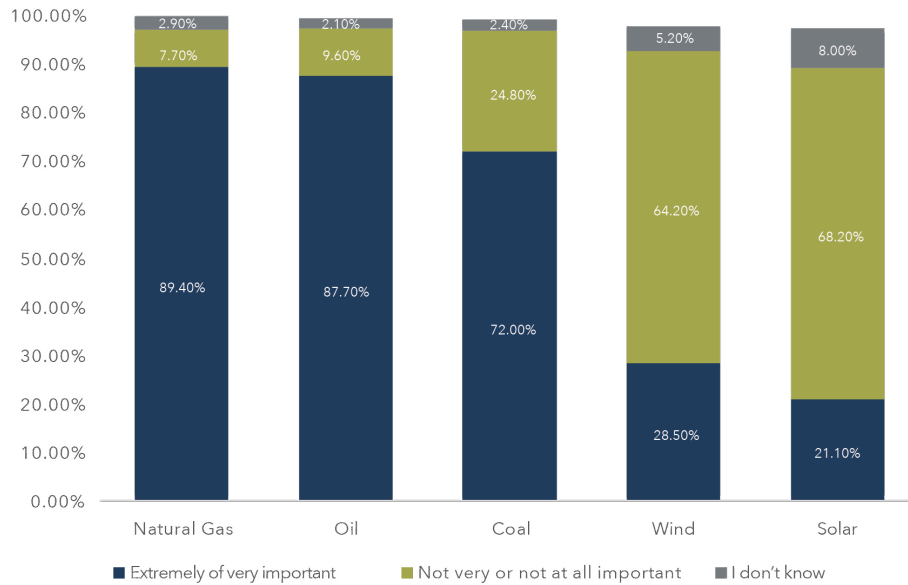


Figure 6: Importance of different energy industries to Wyoming residents in 2021 Net Zero study.¹⁹

This study also found that there was far less consensus among Wyoming residents about the importance of achieving carbon-neutrality. Residents were divided on this topic with 52% believing carbon-neutrality is important and 43% believing it is not (5% reported that they don't know how important it is).²⁰ However, there was far less division among residents about whether the country is going through an energy transition. 73% of residents do believe that the country is going through an energy transition and 63% believe that it will be a long-term transition. Additionally, most residents reported being concerned that the transition would harm many of the attributes they value about their communities (Figure 7).²¹

¹⁹ Western, Jessica and Selena Gerace. 'Wyoming Community Perspectives on a Net Zero Carbon Energy Economy' 2021. University of Wyoming's School of Energy Resources. http://www.uwyo.edu/ser/research/centers-of-excellence/energy-regulation-policy/_files/net-zero-survey.pdf

²⁰ Western, Jessica and Selena Gerace. 'Wyoming Community Perspectives on a Net Zero Carbon Energy Economy' 2021. University of Wyoming's School of Energy Resources. http://www.uwyo.edu/ser/research/centers-of-excellence/energy-regulation-policy/_files/net-zero-survey.pdf

²¹ Western, Jessica and Selena Gerace. 'Wyoming Community Perspectives on a Net Zero Carbon Energy Economy' 2021. University of Wyoming's School of Energy Resources. http://www.uwyo.edu/ser/research/centers-of-excellence/energy-regulation-policy/_files/net-zero-survey.pdf

How concerned are you that such a transition may harm any of the following attributes in your community?

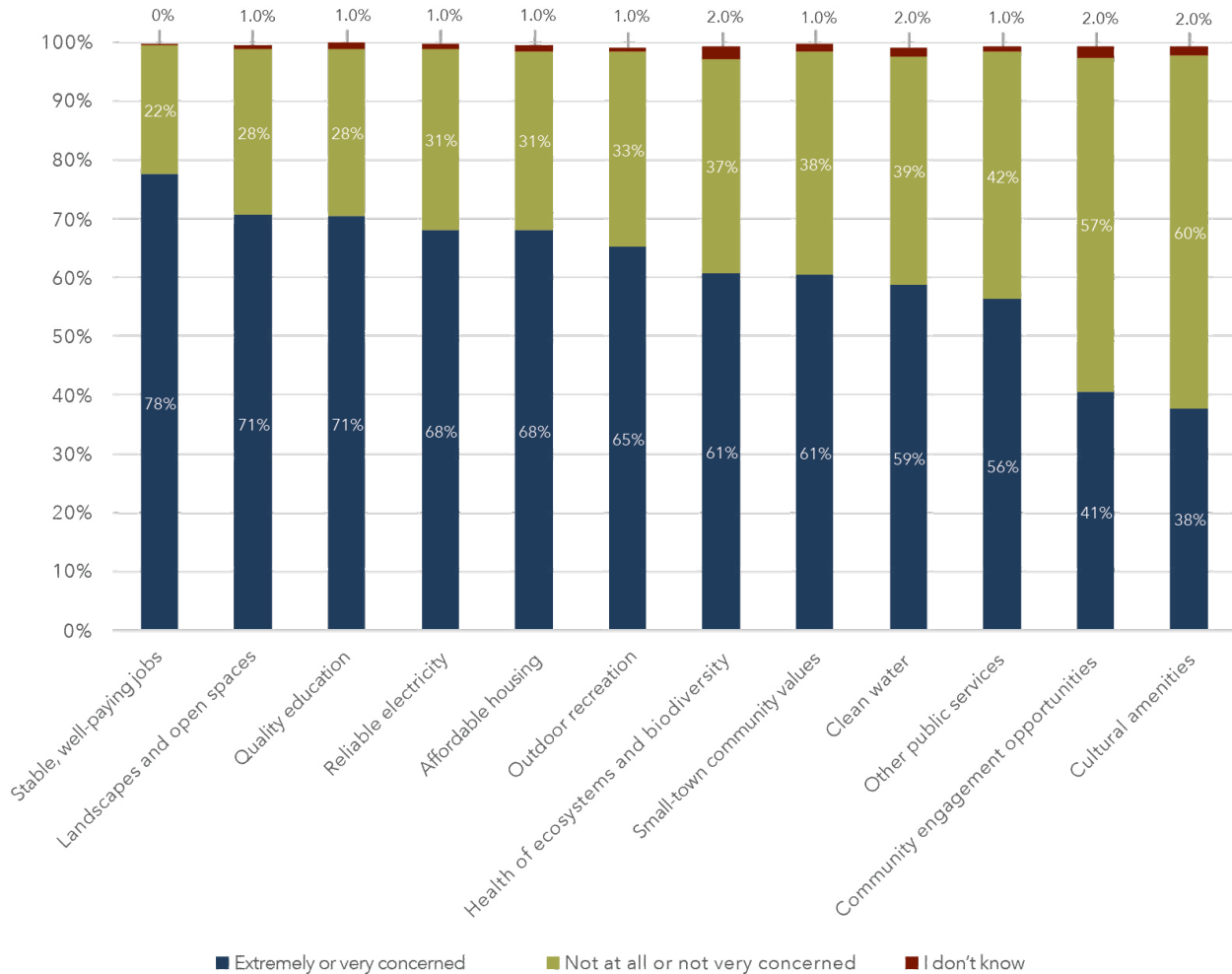


Figure 7: Percentage of stakeholders concerned with state attributes related to transitioning to carbon-neutrality within Wyoming from 2021 Net-Zero study²²

Together, the results of these studies provide insight into important opportunities for the adoption of nuclear technologies in Wyoming and potential barriers:

Opportunities—

- Wyoming residents are open to newer and less developed energy-related industries. As we saw in Figure 4, residents didn't report high opposition to these less well-established industries. Rather, they reported being *not sure*. This indicates openness to learning more and an opportunity for more information to increase support for these industries. It also suggests that Wyoming residents would feel similarly about other new energy develop such as microreactors.

²² Western, Jessica and Selena Gerace. 'Wyoming Community Perspectives on a Net Zero Carbon Energy Economy' 2021. University of Wyoming's School of Energy Resources. http://www.uwyo.edu/ser/research/centers-of-excellence/energy-regulation-policy/_files/net-zero-survey.pdf

- Almost all Wyoming residents believe energy industries are currently important to their communities and that it is important for Wyoming to continue supplying energy to the region in the next 20-50 years. This, coupled with residents' concerns that the energy transition will harm the attributes they value about their communities, suggests that residents may be open to new types of energy production to replace economic opportunities being lost due to declines in conventional energy production and to support communities.

Barriers—

- Wyoming residents still strongly support fossil energy. This suggests strong attachment to fossil energy industries and possible resistance to transitioning away from them. Fossil energy industries are tied to many Wyoming residents' identities—generations of people have worked in these industries, they have provided livelihoods to families, and communities have been built around them.
- Wyoming residents are strongly divided on the importance of carbon neutrality. This also may reflect attachment to fossil energy industries and resistance to anything that may threaten them. The concept of carbon-neutrality could be seen as a threat to a way of life that has included working in fossil energy production or living in communities which are closely identified with those industries.

3. Wyoming Residents' Perceptions of Nuclear Energy

These same two studies also asked Wyoming residents about their views on nuclear energy generation. The 2019 Social License study found that only 35.8% of residents support nuclear energy generation (*Figure 1*). However, 36.5% reported that they *weren't sure*. Nuclear energy was the type of energy generation with the least support, but it was also the one that people reported the most uncertainty about. This uncertainty suggests that many residents are not opposed to nuclear energy generation, but simply aren't familiar enough with it to evaluate the potential trade-offs.²³

The 2021 Net Zero study found much more support for nuclear energy generation with almost 60% of respondents reporting that they support it. This is greater support than for either wind (51.4%) or hydrogen (47.8%). There was also less opposition to nuclear (21.1%) than to wind (33.9%) (*Figure 8*).

The 2019 Social License study also asked residents about their level of support for or opposition to uranium mining. Almost 44% of respondents reported that they support uranium mining (*Figure 4*). And, similar to respondents' views on nuclear energy generation, there was a high percentage of respondent (almost 40%) who reported that they *weren't sure* about it. Again, this suggests that residents don't think they have enough information to evaluate the benefits and drawbacks of this industry.

²³ Western, Jessica and Selena Gerace. 'Social License for Wyoming's Energy Future: What Do Residents Want?' 2021. University of Wyoming's School of Energy Resources. http://www.uwyo.edu/haub/_files/_docs/ruckelshaus/pubs/2020-wyomings-energy-social-license-report.pdf

How supportive of or opposed to the following carbon-neutral energy industries are you?

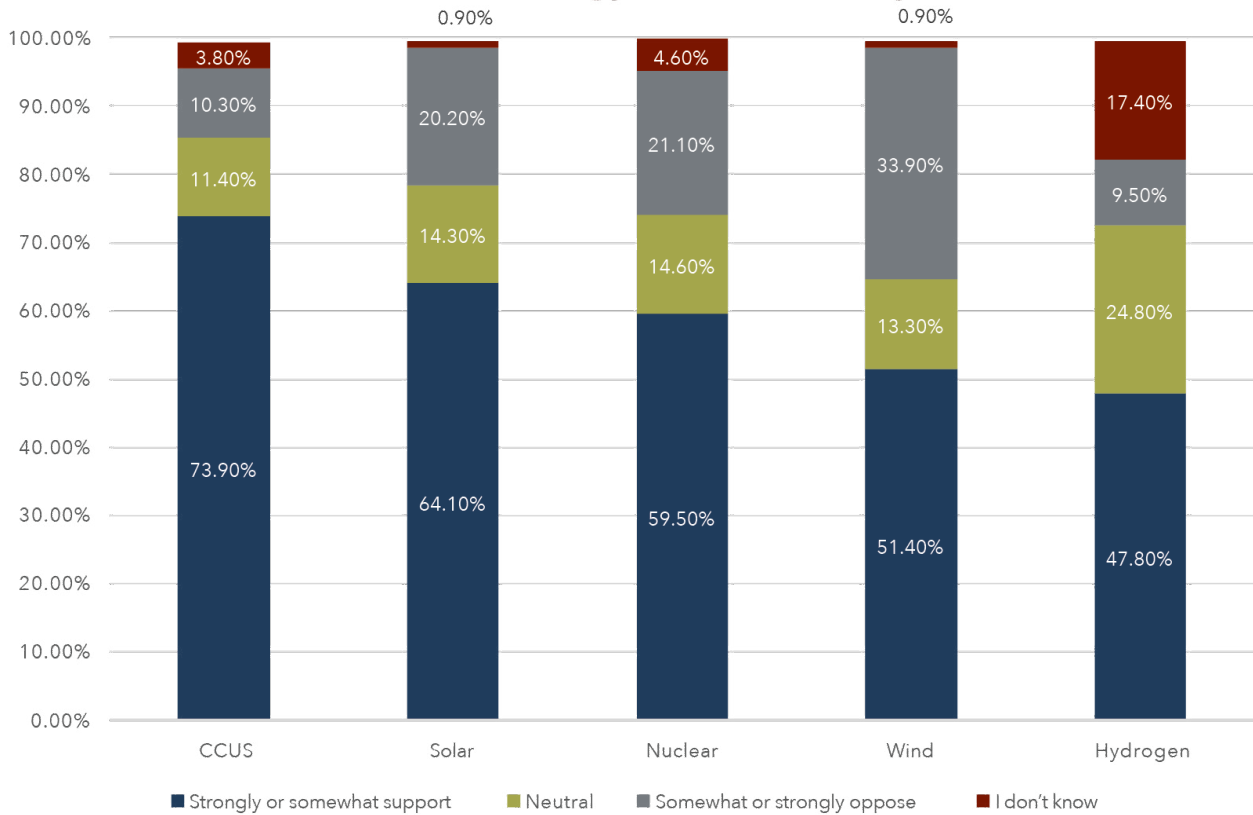


Figure 8: Levels of support among Wyoming residents for carbon-neutral energy types in 2021 Net-Zero study²⁴

Again, the results of these two studies suggest both an opportunity and a barrier for adoption of nuclear technologies in Wyoming:

Opportunity—

- Support for nuclear energy seems to be increasing among Wyoming residents. Some of the difference between the relative high level of support in the 2021 Net-Zero study and the much lower level of support in the 2019 Social License study is mostly likely due to the higher percentage of energy-dependent residents that were sampled. Those residents are more used to working in energy industries and having energy industries in or near their communities so they may be more open to new types of energy development. Other changes that occurred between 2019 and 2021, including increased volatility in energy markets as a result of public policy (temporary ban on oil and gas leases on public lands) and the global COVID-19 pandemic, may have also affected the increased support for nuclear energy. Finally, the announcement that TerraPower would site a small module

²⁴ Western, Jessica and Selena Gerace. 'Wyoming Community Perspectives on a Net Zero Carbon Energy Economy' 2021. University of Wyoming's School of Energy Resources. http://www.uwyo.edu/ser/research/centers-of-excellence/energy-regulation-policy/_files/net-zero-survey.pdf

reactor outside of Kemmerer, WY inspired much public support and excitement for developing a nuclear industry in Wyoming.

Barrier—

- Many Wyoming residents are still unsure about nuclear energy or oppose it all together. This was evident in both studies. While this does suggest an opportunity for outreach and education to increase support, it also shows that not enough has been done yet and much would need to be done before there is widespread support for nuclear energy among Wyoming residents.

4. Wyoming Residents' Desires for the Future of their Communities

The 2019 Social License study used results from their analysis to develop three themes that represent common perspectives of Wyoming residents.²⁵ These themes can be thought of as three overarching *points-of-view* that can help us understand what Wyoming residents desire, including types of energy they support, what they value, and what they are concerned about. There is no order or ranking among these themes in terms of which is most common in Wyoming or most strongly believed.

These three themes are:

Theme I: Renewable

- Strong support for renewable energy
- Strong support for non-energy industries (e.g. information-based)
- Motivated by concerns about climate change and other environmental factors
- Concern for well-being on workers and community
- Least support for nuclear

Theme II: Economic

- Most concerned about Wyoming's economy
- Support for conventional energy
- Support for newer energy development such as carbon capture and storage
- Strong support for new technologies
- Belief that addressing climate change is important because it matters to Wyoming's economy
- Open to nuclear energy

Theme III: Quality-of-Life

- Most concerned about quality-of-life factors such as jobs, health insurance, wildlife, and reliable and cost-efficient energy
- Little preference for any particular type of energy

²⁵ Western, Jessica and Selena Gerace. 'Social License for Wyoming's Energy Future: What Do Residents Want?' 2021. University of Wyoming's School of Energy Resources.
http://www.uwyo.edu/haub/_files/_docs/ruckelshaus/pubs/2020-wyomings-energy-social-license-report.pdf

- Concerns that the costs of an energy transitioning will be borne disproportionately by vulnerable populations
- Most supportive of nuclear energy of the three themes

These themes also suggest opportunities and barriers to adoption of nuclear energy technologies in Wyoming:

Opportunities—

- Wyoming residents represented by *Theme 2* and *Theme 3* are either open to or supportive of nuclear energy. This suggests that many Wyoming residents’ desires for the future of their communities and the state could include nuclear energy development.
- Wyoming residents represented by all three themes express concerns about Wyoming communities. These concerns manifest in different ways in each theme—concerns about workers and communities, concerns about the economy, concerns about jobs, health care, and reliable energy—but these concerns all revolve around a desire for the people and places of Wyoming to be safe, prosperous, comfortable places to live and work. A major component of creating this will be economic development, job opportunities, and tax revenue, all of which the development of nuclear energy could provide.

Barriers—

- Wyoming residents represented by *Theme 1*, who are more concerned about environmental issues and well-being of workers, are less open to nuclear energy. Concerns about the environmental impact and health and safety, may outweigh the opportunities that nuclear energy could provide for these residents.
- Residents represented in *Theme 1* and *Theme 2*, support conventional and renewables more than they support nuclear. This suggest that many Wyoming residents would still prefer energy to be generated by something other than nuclear.

5. Wyoming Residents’ Values

Exploring the values of Wyoming residents can also help us understand potential opportunities and barriers to adoption of nuclear energy. The 2019 Social License study analyzed Wyoming residents’ values by asking them to assess how important a series of 14 values about Wyoming were to them (*Figure 9*). (Note: these values represent what residents value about Wyoming itself, not just values in general.)²⁶

Respondents reported that the top three attributes they value about Wyoming are:

1. Aesthetics
2. Biological diversity
3. Recreation

²⁶ Western, Jessica and Selena Gerace. ‘Social License for Wyoming’s Energy Future: What Do Residents Want?’ 2021. University of Wyoming’s School of Energy Resources. http://www.uwyo.edu/haub/_files/_docs/ruckelshaus/pubs/2020-wyomings-energy-social-license-report.pdf

These values indicate that Wyoming residents have a strong place-based identity. They value Wyoming for its landscapes, open-spaces, wildlife, and access to the outdoor recreation. These qualities that make Wyoming unique and are specific to place are what residents love about their home state.

The next two top values were *economics* and *community*. These values indicate a desire for economic diversification and a desire to stay in their communities. Residents value Wyoming for the communities they live in and for the economic opportunities it presents. They want to be able to support themselves and their families and they want to be able to stay in their communities.

Wyoming residents' values

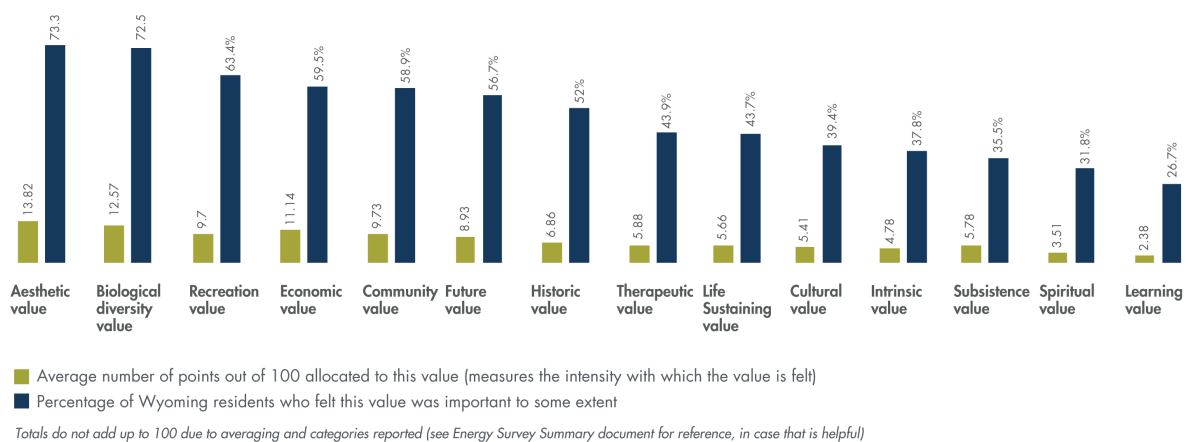


Figure 9: Assessment of importance of fourteen values to Wyoming residents from 2019 Social License study.²⁷

Another recent study explored a different aspect of Wyoming residents' values. Published in 2018, the study titled *Citizen preference for possible energy policies at the national and state levels* by Mark Peterson and David Feldman, focused on what citizens of eight states value about the outcomes of energy policies. Residents of all states (Colorado, Kentucky, Massachusetts, Minnesota, Nevada, New York, North Carolina, and Wyoming) reported that the outcomes they value the most are: 1) environmental quality, 2) energy costs, 3) job creation, and 4) greenhouse gas emissions.²⁸

The study further broke 'job creation' into two categories: 1) Traditional energy jobs and, 2) Renewable energy jobs. Of these five outcomes, Wyoming residents valued each in almost equal amounts, with the exception of renewable energy jobs which were valued much less. Wyoming residents reported the highest value for energy cost (16.3%), then traditional energy

²⁷ Western, Jessica and Selena Gerace. 'Social License for Wyoming's Energy Future: What Do Residents Want?' 2021. University of Wyoming's School of Energy Resources.

http://www.uwyo.edu/haub/_files/_docs/ruckelshaus/pubs/2020-wyomings-energy-social-license-report.pdf

²⁸ Peterson, Mark and David Feldman. 'Citizen preference for possible energy policies at the national and state levels' 2018. Energy Policy.

jobs (16.1%), then greenhouse gas emission (15.7%), then environment (15.3%), and lastly renewable energy jobs (8.4%).²⁹

It is interesting to note that Wyoming residents reported that they highly value outcomes of energy policies related to *energy costs* even though Wyoming, as an energy-exporting state, could benefit from high energy costs. However, this survey specifically focused on the ‘impact policy has on *my energy costs*.’ As such, respondents’ reported values are reflective of their concerns about their personal costs and the impact on their personal budget. It is not reflective of any impact policies may have on the profits or losses of energy industries in Wyoming or how that would impact jobs or tax revenue.

Also notable is that these values for energy policy outcomes mirror what Wyoming residents value about Wyoming as reported in the 2019 Social License study—qualities related to the environment, landscapes, and economics. The low preference for renewable energy jobs also is reflected in Wyoming residents’ opposition to wind energy development as seen in the 2021 Net-Zero study.

Peterson and Feldman’s study of energy policy outcome values also addressed the role of risk aversion. They found that risk aversion influences people’s willingness to adopt new energy policy, with results indicating that fear about potential negative outcomes have a greater impact on how much people support a new energy policy than anticipation for potential positive outcomes. In other words, if people fear that a new energy policy may have negative consequences this will decrease their support almost two times as much as any anticipation of positive outcomes will increase their support. These findings are in alignment with the social science theory known as Prospect Theory which contends that people have a greater fear of potential “loss” than support for potential “gain.” In other words, people are cautious about change and would often rather maintain the status quo than to try something that may have negative consequences.³⁰

We see this risk aversion reflected in Wyoming residents’ preferences to maintain or increase fossil fuel development compared to their high level of uncertainty of nuclear energy generation, as reported in the 2019 Social License study. People prefer the industries they are more familiar with and are concerned about merely replacing jobs with new technologies which may pose unknown risks and from which local benefits are not well defined.

Once again, the findings from these studies suggest an opportunity and a barrier for adoption of nuclear energy:

Opportunity—

- Wyoming residents strongly value Wyoming as a place with unique attributes—landscapes, open-spaces, biodiversity, recreation—and want to be able to stay here and enjoy the life-style that those attributes provide. They also value Wyoming for economic opportunities and for communities. This indicates that there may be more support for nuclear energy projects which have the capacity to provide these economic opportunities and which will allow Wyoming residents to stay in the places they love by supporting communities so they thrive economically.

²⁹ Peterson, Mark and David Feldman. ‘Citizen preference for possible energy policies at the national and state levels’ 2018. Energy Policy.

³⁰ Peterson, Mark and David Feldman. ‘Citizen preference for possible energy policies at the national and state levels’ 2018. Energy Policy.

Barrier—

- Risk aversion may make residents hesitant to adopt new technologies that are unknown. The findings by Peterson and Feldman suggest that people are more influenced by fear of loss related to change than by anticipation of potential gain. Residents may resist new energy technologies because they are uncertain about their impacts. This is probably especially true in regards to nuclear energy because it has historically been associated with high-profile and high-consequence potential negative outcomes (e.g. meltdowns, waste storage) which has created public resistance. Even though 4th generation nuclear technologies are purported to be safer than conventional nuclear technologies, this is unlikely to diminish the risk aversion among Wyoming residents. Not only is the distinction between the technologies probably not well understood, 4th generation nuclear technologies are still new and have not been widely developed or used. While there are significant differences in risks between conventional nuclear energy and 4th generation nuclear technologies, this is probably not well understood by most Wyoming residents.

6. Conclusions:

The current body of literature on Wyoming residents' perceptions, desires, and values helps to inform our understanding of the opportunities and barriers to adoption of nuclear technologies in Wyoming. Overall, these opportunities and barriers fall into a few broad categories:

Opportunities:

- Wyoming residents still strongly identify with living in energy producing communities and an energy producing state and they want that to continue in the future. Most are also open to new types of energy development.
- The majority of residents acknowledge that an energy transition is happening, meaning they know that energy industries are shifting and long-term changes are likely.
- Many residents either support nuclear energy or report not being sure, indicating a level of openness for them to learn more and increase their support. This level of openness also seems to be increasing over time.
- Residents strongly value Wyoming as a place with unique attributes that offers a way of life they want to continue. They want to remain in their communities and want economic opportunities that allow their communities to thrive.

Barriers:

- Residents are divided on the importance of carbon neutrality and are still strongly supportive of fossil energy, indicating that there may be resistance to change.
- Many residents are still unsure about nuclear energy. While, many residents seem open to nuclear energy, more education and outreach are needed to obtain widespread support for nuclear energy development.
- People are opposed to risk. Considering the high-profile, high-consequence potential negative outcomes associated with nuclear energy, fears about the risks may outweigh desires for potential benefits. It's possible that, if benefits could be quantified or guaranteed through an enforceable agreement, support for nuclear energy could increase since it would lessen uncertainty and increase trust that the community would receive the benefits. For example, Community Benefit Agreements are legally binding agreements

between communities and developers which guarantee specific benefits from a project will go directly to the community. These benefits could include hiring within the community, contributing to economic trust funds, or providing workforce training opportunities.³¹

Assessing the opportunities and barriers presented by Wyoming residents' perceptions, desires, and values can help identify potential paths forward for developing nuclear technologies in Wyoming. It is promising to recognize that the primary attributes that residents value about Wyoming are not out of alignment with nuclear technologies. They value Wyoming as a place to have access to open-spaces and outdoor recreation, a place that supports biodiversity and healthy landscapes, and a place that allows for economic prosperity and thriving communities. Adoption of nuclear technology could support these values by offering low-carbon, low-footprint energy that provides economic diversification.

This indicates that if nuclear energy development is structured in a way that is in alignment with Wyoming residents' values, it could be successful by taking advantage of the opportunities presented, and addressing the barriers. To do this, projects including nuclear generation should:

- Provide economic opportunities for the people of Wyoming and Wyoming communities. This includes, providing well-paying permanent jobs, generating tax revenue, and supporting the health and safety of workers, residents, and the communities where they operate.
- Be operated in a way that is consistent with being good stewards of the land. Residents will need to be confident that operations and waste storage will be done in a way that will not negatively impact the landscapes, open-spaces, biodiversity, or recreational opportunities.
- Address unknowns and uncertainties around new energy technologies and nuclear energy in particular. Public concern about nuclear energy is still prevalent, as is risk aversion in general. For nuclear energy industries to be successful, they will need to provide truthful, timely, and transparent information to communities to build trust and support. Providing guarantees of benefits through enforceable agreements, such as Community Benefit Agreements, could also help to reduce risk aversion and increase community support for nuclear energy.

³¹ 'Community Benefit Agreement (CBA)' US Department of Energy Office of Economic Impact and Diversity. Accessed July 2022. <https://www.energy.gov/diversity/community-benefit-agreement-cba-toolkit>