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Can Nuclear Power Go Local?

With origins in the Cold War military-industrial complex, nuclear power struggles to reinvent itself as part of the inclusive, democratic future envisioned by progressives.

Pushing meaningful climate and decarbonization policies through a divided Congress will require support from a broad coalition that brings together progressive-left climate groups that focus strongly on environmental justice and more centrist groups concerned especially with economic growth and international competitiveness. If nuclear energy could earn the support of both groups, it could contribute a great deal of green energy to the grid and enable ambitious climate policies. Although support for infrastructure spending and jobs in proposed climate legislation could benefit nuclear energy, the renewed focus on environmental justice has many on the left questioning nuclear's role in the future. We propose that some of these reservations could be overcome—but only if the nuclear industry significantly changes its modus operandi, embracing not just new technological pathways, but also a more democratic, inclusive approach to how it does business.

Where the opinions are

There has long been a partisan divide over support for nuclear power, with Republicans favoring the technology by a 15–20% margin over Democrats. But views are not divided purely by party; they also ebb and flow over time and in response to other events. Opinion polls have found that support for nuclear power has ranged from 40% to 80% over the last decade, and hovered around 50% over the last five years. Since the 1970s, support for nuclear energy has generally been high when concern over energy security was also high, for example during the 1970s oil crisis, or in the early 2000s during the Iraq War. Support for nuclear tends to fall—and opposition grows—following major nuclear power accidents such as Three Mile Island, Chernobyl, and Fukushima.

Although public opinions on nuclear power mirror outside events in a sensible way, our experience in trying to cultivate constructive public debate about nuclear energy is that pro-nuclear groups portray opposition to nuclear power as a problem of faulty risk perception, "anti-science" attitudes, or a bad-faith position taken in service to a preference for either fossil fuels or renewable energy. Nuclear power advocates tend to casually bat away opposition by saying it is due to an inferior understanding of the technology, a simple deficit that can be resolved through additional education and better communication.

At the same time, nuclear advocates are quick to point out that new advanced nuclear designs can address many of the historic challenges of nuclear power, such as safety and economics, and should thus allay public opposition.

But neither more communication nor technological innovations are likely to change the underlying driver of opposition to nuclear energy for progressives: a view that the technology is inherently antidemocratic and doesn't fit with the small-scale, decentralized clean energy future they envision. For example, in opposing the proposed American Nuclear Infrastructure Act of 2020, a group of more than 100 environmental advocacy organizations argued that nuclear was "uneconomical, environmentally unjust and harmful," and recommended that investment should instead go to "address structural inequities and injustices that undermine our safety, health, economic security, and sustainability."

To ensure that nuclear energy can make a meaningful contribution to an environmentally sustainable future, it will first need to earn broad public support. To do this the nuclear industry will need to fundamentally rethink its

history and how it operates today. The first step will be to acknowledge the real drivers of opposition to nuclear energy, especially among progressives.

How nuclear power lost progressives

There are, of course, many legitimate reasons to harbor distrust of nuclear energy. For the general public, opinion surveys over the years show that opposition is largely influenced by the high-profile accidents that have occurred. But for policymakers, especially in the growing progressive movement, more pressing are the justice issues that include a history of exploitative and environmentally harmful practices in siting and maintaining uranium mines, secrecy and radiological pollution from atomic weapons production and atmospheric testing, corruption in the private utilities that own and operate nuclear reactors, and politically divisive approaches to waste management and disposal.

This kind of thinking is now the norm in the Democratic party. The Biden-Sanders Unity Task Force, which aimed to bring together different factions of the party, called for investing in "advanced nuclear that eliminates risks associated with conventional nuclear technology, while ensuring environmental justice and [that] overburdened communities are protected from increases in cumulative pollution."

That's a tall order because the environmental and social justice concerns around nuclear power and its fuel cycle are real. Demographic data on communities that host different types of nuclear facilities suggest that power plants, which often provide high-paying jobs and economic benefits for the local community, tend to be sited in predominantly white, wealthy areas. On the other hand, mining and other fuel cycle facilities, which are associated with riskier and often temporary cleanup jobs, have disproportionately impacted Indigenous and underserved communities.

Nuclear power advocates, however, have failed to grasp the importance of these injustices. As momentum was building over the past two years around the Green New Deal, some in the nuclear community objected because they were not included in this ambitious climate legislation. Michael Shellenberger of the pro-nuclear group Environmental Progress argued that excluding nuclear from a Green New Deal would actually "increase greenhouse gas emissions," and called for a "Green Nuclear Deal" in testimony before the House Committee on Science, Space, and Technology.

This reaction epitomizes what is wrong with modern nuclear advocacy. The Green New Deal was centered on building a broad coalition focused on environmental and economic justice. But nuclear proponents argued that they should be included without showing how they were or could be aligned with those underlying progressive values. This isn't to say that nuclear couldn't be included in a future Green New Deal—in fact, we're working to do just that—but to make that possible, the sector will need to do something it's never done before: put in the hard work to understand and address the underlying causes of opposition to nuclear.

While Congress has not yet passed Green New Deal legislation, its framework and ethos have made it into the Biden administration's climate plan, in particular the linking of climate change action and environmental justice. The next four years will be crucial for making serious progress in stopping climate change, but they will also be make-or-break for the domestic nuclear industry. Whether there's a place for new advanced nuclear technologies in a sweeping clean energy transition will ultimately depend on the sector's ability to embrace progressive changes in its governance, educational pipeline, and approach to community engagement and siting. Ultimately, the nuclear industry should stop expecting public support and figure out how to earn it by answering opponents' real concerns.

The nuclear industry will need to fundamentally rethink its history and how it operates today. The first step will be to acknowledge the real drivers of opposition to nuclear energy.

Why Homer Simpson loves nuclear power plants

In theory, it might seem easy to convert people who support climate policy to support nuclear power, but that has not proven to be the case. Many nuclear proponents were initially optimistic that growing concern for climate change would increase support for nuclear energy, as studies in the United States and the United Kingdom found that a climate framing increased support in public opinion surveys. Yet this motivation may ultimately be limited by underlying worldviews. Public attitude surveys across the UK and the European Union have found that the people most concerned about climate change are the least supportive of nuclear power.

To get a deeper sense of why greens oppose nuclear power, one has to look closely at what has been called by risk researchers the "white male effect," the significant

gender and racial gap in support for nuclear, with white men being much more supportive of the technology and judging the risks to be lower than other, comparable groups.

Early studies of this gap in risk perception focused on presumed differences in rationality or education, with white males being better educated in the relevant sciences. But large surveys in the 1990s and early 2000s found that the risk perception gap between white males and everyone else applies across many environmental, biological, and technological risks, while women and men of color generally hold attitudes toward risk that are more similar to each other. And while this white male gap is found across such risky and disparate subjects as drinking alcohol and severe storms, some of the statistically largest differences in risk perception are related to nuclear power and nuclear waste.

More recent studies have offered two explanations for the white male effect that together speak to deeper attitudes and values. First, the vulnerability hypothesis suggests that attitudes about risk among women and people of color reflect their historical lack of power and control in society, a disempowerment that has indeed left them more vulnerable to a variety of risks. A second hypothesis positions risk perception in people's underlying beliefs about how the world should be structured. This cultural worldview hypothesis posits that groups who are more risk tolerant also show strong commitments to institutional hierarchy and individual freedom. Groups that are more risk-averse, in contrast, are more committed to egalitarian and communitarian approaches to social organization.

Table 1. **PERCENTAGE DIFFERENCE BETWEEN ALL OTHER GROUPS AND WHITE MALES IN ASSESSING TECHNOLOGIES AS HIGH RISK**

RISK	Percentage Difference in "High-Risk" Response Rate Between All Other Groups and White Males
Nuclear power plants	+21.5
Stored nuclear waste	+18
Chemical manufacturing	+17.5
Pesticides	+15.5
Coal/Oil burning power plants	+10.5
Radon in homes	+8.5
Cellular phones	+6.5

From a study by the decision scientists Melissa Finucane, Paul Slovic, C. K. Mertz, James Flynn, and Theresa Satterfield, published in 2000.

These contrasting worldviews are also correlated with gender, race, and political party, helping to explain other apparent gaps in support for different technologies. So when one looks closely at the phenomenon, it may be less about white men than about who sees the world as best ordered by hierarchies (e.g., companies and government bureaucracies) or individuals (acting in the economic marketplace) and who sees it as best ordered by egalitarian communities. Indeed, an analysis by leading researchers who study risk and culture found that the influence of worldviews on risk perception was much more important than either level of education or gender.

When we understand the white male effect, we can see the nuclear power industry through the eyes of others: with its very large, utility-owned power plants, the industry is the epitome of hierarchical worldviews. Not only that, decisions about acceptable risk have been decided, in large part, by politically and economically powerful men, most of whom are white, and whose own perceptions of risk are quite different from those of other cross sections of the broader public.

New nuclear technologies may address technological and economic risks, but technological innovations alone will do very little to address incompatible worldviews or the distribution of social and economic power. Indeed, in its evolution into a more climate-focused endeavor, the environmental movement has expanded its focus to fixing issues of equity and justice as a part of the climate response, seeing nuclear power as part of a hierarchical past rather than part of the egalitarian future that they envision.

Yesterday's hierarchy, today

This strong association with a hierarchical worldview has real, and deep, roots in nuclear's history in the United States. After World War II, the massive collection of scientific infrastructure, capabilities, and people that made up the Manhattan Project were transitioned into a new peacetime effort under the auspices of the Atomic Energy Commission (AEC). As the project's mission shifted from building the bomb to stewardship of existing weapons, cleanup of their toxic legacies, and development of civilian nuclear power capabilities, the underlying hierarchies remained. The top-down, highly stratified organizations pulling from the ethos of military and engineering cultures carried through to this new organization.

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In the 1940s, close collaborations between the AEC and the US Navy favored nuclear reactor design choices that could power submarines, but could also share supply chains with commercial reactors. In the civilian power sector, the AEC stimulated corporate investment in building nuclear reactors by financing research and development activities at commercial power demonstration plants as well as financing the reactor portion of the power plants. Many of the large industrial firms that partnered with AEC, such as Dow Chemical and Westinghouse, were already military contractors.

Through the 1960s and early 1970s, the AEC served as both promoter and regulator of nuclear energy—an obvious conflict of interest by today's standards. Up to then, the siting process for nuclear plants was basically "decide-and-announce." In 1974, the AEC's regulatory function was assigned to the new, independent Nuclear Regulatory Commission, which was established on the heels of the National Environmental Policy Act of 1970. The act required federal agencies to perform environmental assessments for potential projects, and thus nuclear plant siting should have become a more democratically transparent process. But in practice, project developers simply adjusted to a "decide-announce-defend" model, with significant time and money going to fight lawsuits from local groups trying to stop nuclear projects. Even so, the convergence of public opposition, economic forces, and technological competition led to a gradual decline in the nuclear industry following the Three Mile Island accident.

Similar issues played out in the 1980s with the siting of a permanent nuclear waste repository, where Yucca Mountain in Nevada was chosen in large part because the state lacked the power to oppose the decision. Not only has nuclear energy's reputation suffered as a result of this stacked political process, but progress on nuclear waste disposal has also stalled for decades because of the opposition that it triggered.

While nuclear technologies have been deeply shaped by the specific worldview of the end of World War II, the beginning of the Cold War, and the emergence of the military-industrial complex, the US nuclear industry seems not to have absorbed any of the lessons of its 50 years of declining fortunes and influence. Meanwhile, the political and economic context for energy has evolved radically. From power-sector deregulation to the rise of alternative energy sources, to a preference for decentralized energy technologies, changes specific to the energy sector have reflected emerging cultural values including economic competition, environmental sustainability, and local self-reliance. Meanwhile, such values outside energy have also evolved, including the environmental and civil rights movements of the 1960s, feminism in the 1970s, and the more recent focus on environmental and economic justice.

Through all this the nuclear energy industry has barely changed. Today, nuclear energy remains big, hierarchical, and available only to large investor-owned utilities, despite existing in a dramatically different world and energy market than it was originally created for.

The difficulty of making an old chicken lay a new egg

Not only does the nuclear sector have a long, troubled narrative that's hard to fix, the same can be said of the energy-generating plants themselves. Almost all the nuclear reactors operating in the United States today were built before Chernobyl. They were built before 9/11 changed the nation's idea of domestic security, before Fukushima, and before cybersecurity became a concern. As a result of their age, improvements in safety and security at existing reactors have often come with a high price tag—when some reactors are already having trouble competing with cheap natural gas in deregulated power markets. Compounding this problem, the failure to establish a permanent repository for spent fuel has meant that nuclear waste has been sitting at nuclear power plant sites around the country for decades.

A wave of new nuclear companies are now developing the next generation of advanced technologies, and they have a promising opportunity to reset how the industry operates. Many of the new reactor designs reflect attempts to solve historical challenges of nuclear power, such as the potential for fuel meltdown, the difficulties of nuclear waste storage, or the high costs of plant construction.

But almost no one is looking at the nontechnological drivers of opposition to nuclear energy. If new nuclear technologies are deployed as they have been in the past, with little attention to public views about plant approval processes and siting, or to the costs borne by communities near uranium mines and processing plants, they are unlikely to gain the critical support from progressive climate advocates.

Little communitarian nukes on the prairie

Nuclear doesn't have to be big and hierarchical. Some advanced nuclear design concepts could enable new business and deployment models that align better with progressive values. For example, microreactors that generate under 10 megawatts of power are small enough to be owned by a municipal utility or even a rural electric co-op where they could serve a few thousand households. The first of these microreactors will likely be expensive enough to make sense only for off-grid and remote communities already paying high electricity prices. But even production of a few dozen units could bring down the costs of factory fabrication to the point where they are cost-competitive with fossil fuels. Such technologies will not automatically reverse years of distrust, but they could facilitate more democratic deployment models that could help build that trust.

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Whether these new technologies actually change public opinion around nuclear will ultimately depend on the behavior of the nuclear industry. There are a few examples of positive change. The first small modular reactor project will likely be built by NuScale for Utah Associated Municipal Power Systems, a state-supported nonprofit that provides energy services to municipal utilities across Utah, California, Idaho, Nevada, New Mexico, and Wyoming.

While engaging with such a broad set of communities has proved challenging, this project is a first-of-a-kind business model for nuclear power, and looks very different from how nuclear has been built in the past. Rather than adopting an investor-owned utility model, this group has created a municipal co-op model similar to those often used to fund large-scale renewable projects. Each municipality buys in for the amount of carbon-free energy it needs, and there are provisions for communities to pull out if their needs change or they lose faith in the effort for any reason. The final size of the project could be scaled to demand. With its first-of-a-kind reactor, the group has also secured significant federal support to help reduce project risk. The process is messy, but also democratic and ultimately highly community-centered. If the project proves successful, it could provide a good model of how to foster genuine community buy-in for new nuclear projects.

A second positive example is the Energy Communities Alliance, a group that represents the interests of communities that host US national laboratories and other federal energy facilities. Alliance members have recently formed a new initiative to lobby for advanced nuclear projects in their communities. Each of the 13 member communities, which include such facilities as the Idaho National Laboratory and the Savannah River Site, have legacy nuclear experience, and many have capable local nuclear workforces. Nuclear history and technologies are a part of the fabric of these communities, and they are eager to remain leaders as the sector continues to evolve. As the national transition to clean energy begins in earnest, communities hosting extraction and processing infrastructure for coal and natural gas may also be interested in the early adoption of advanced nuclear technologies.

But such examples are uncommon. The nuclear industry has generally failed to meet the opportunities of the moment, and rather than being open to change has maintained the stance that has led to its current plight.

What should the nuclear sector be doing to make itself part of the political and technological pathway to confronting climate change? The industry could start by acknowledging past injustices around mining and environmental pollution, and advocate for expanded funding for cleanup efforts. The Biden-Harris climate plan calls for 40% of climate investments to go to traditionally underserved communities. The nuclear industry should develop a plan that shows how it can help this effort specifically, delivering benefits to lower-income populations and communities of color. Society needs to ensure that there is more equitable access to nuclear technologies for those who want them and can benefit from them, especially when they come with high-paying jobs.

Policy at the federal level can also help. Beyond expanded funding and an accelerated timeline for cleanup at legacy weapons production sites, new funding for advanced reactor demonstrations should come with requirements for community engagement, ensuring that projects have local support. Federal tax incentives such as the production tax credit for renewables should be expanded to include nuclear so that the technology can compete with fossil fuels. While the first commercial demonstrations of advanced nuclear will benefit from federal support, early adopters will likely need subsidies, such as those benefiting renewables and electric vehicles, to encourage and accelerate adoption.

A federal clean energy standard could also drive demand for nuclear, while forcing developers to compete on cost. The government should meanwhile restart efforts to manage nuclear waste. Congress and federal agencies can learn valuable lessons from countries such as Sweden and Finland about how to gain local acceptance for waste repositories.

The challenges of community acceptance and support are not unique to nuclear power. The last decade has seen robust, local opposition to many projects that could be critical to deep decarbonization, including transmission lines, solar arrays, and offshore wind farms. Local opposition to infrastructure, energy, and industrial projects has a much deeper historical pedigree, of course, including opposition to nuclear plant construction, which started in the 1970s. While sometimes dismissed as *not in my backyard* protests, our perspective is that they reflect the desire of communities to have a voice in their own development. A new model for community engagement around energy projects may therefore be important not only for getting more nuclear built, but for the future of clean energy itself.

Nuclear energy does have a big role to play in the climate response. But the industry will need to innovate more than just the technology to earn trust and demonstrate its ability to work with other sectors and groups on this shared mission. To significantly reduce greenhouse gas emissions by 2050, the United States will need to build a lot of new green infrastructure, including high-voltage transmission lines, grid-scale storage, and charging infrastructure for electric vehicles, to go along with zero-carbon generating capacity that next-generation nuclear can offer. If the nation can create siting processes that empower communities and leave them in charge of their energy future, it will ease the transition to 100% clean energy.

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IVÁN NAVARRO
Loop, 2016; neon light, LED light, aluminium, wood, paint, mirror, one-way mirror and electric energy; 60 × 12 inches. Image © Courtesy Gallerie Templon, Paris – Brussels