Why Local Governments and Communities Support New Nuclear Development

Strategic communities are the foundation of the next generation of nuclear energy

Energy Communities Alliance
2022

Introduction

Local communities want clean energy development. Across the country, these communities know how to tout the abundant and reliable carbon-free energy source, including small modular reactors (SMRs) and microreactors, as a selling point to attract businesses and spur economic development. Similarly, leading businesses and the federal government are requiring their facilities to reduce their carbon output or become carbon free in the coming decades.

The United States faces a range of energy challenges, from seeking energy security to addressing climate change. The solutions lie in our local communities, serving as the hosts of groundbreaking energy and environmental projects throughout our nation's history.

In communities across the country, government officials, the workforce, manufacturers, economic development entities, businesses, and educational institutions are partnering to make progress on new nuclear development – especially SMRs. Communities are supporting new nuclear to demonstrate:

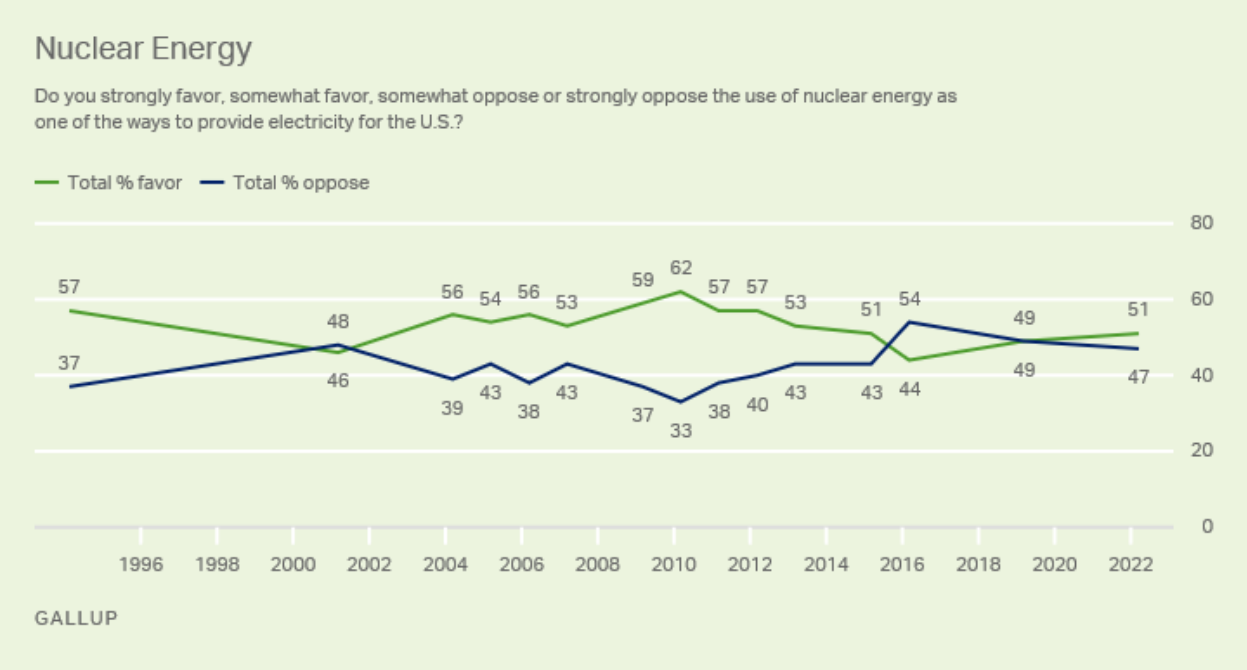
1) **Nuclear is a reliable source of clean and carbon free energy;**
2) **Nuclear projects create economic diversity and workforce opportunities;**
3) **Nuclear power makes the region and community economically competitive; and**
4) **Nuclear is critical for energy independence, reliability, and security.**

Momentum builds for new nuclear

Nuclear energy is growing in popularity among Americans

Support from local communities and constituents is key as a new generation of nuclear energy projects are demonstrated and deployed. Americans' sentiment regarding nuclear energy has vacillated between support and opposition over the last few decades. But in recent years, support for nuclear has trended upward, creating momentum for communities to adopt new nuclear technologies.

The rise of new nuclear technologies such as SMRs and microreactors coincides with increasing favorability for nuclear energy over the last six years. According to Gallup, over half of Americans (51%) support nuclear energy as part of the energy portfolio of the United States, an increase of 7% over the past six years.[1]



Interest in advanced nuclear is also growing for applications by the military. The U.S. Navy has historically relied on nuclear to power vessels, namely submarines and aircraft carriers, which revolutionized naval warfare. Pentagon officials recently announced that the Department of Defense will now build a nuclear microreactor, dubbed Project Pele, that is smaller than an SMR, has enhanced safety features and can be put up in days, then taken down and moved to another location.[2] This can help the military power an area when responding to an emergency, power rural military bases, and their demos could help other advanced nuclear development and licensing preparedness.

Capitol Hill follows suit with bipartisan support for nuclear energy

The growing popularity of nuclear energy in the U.S. population is also reflected by strong bipartisan cooperation on pro-nuclear energy legislation.

[1] In Depth: Topics A to Z: Energy. Gallup. Updated 2022. https://news.gallup.com/poll/2167/energy.aspx.
[2] South, Todd. "Pentagon to build nuclear microreactors to power far-flung bases." *Military Times*. April 15, 2022. https://www.militarytimes.com/news/your-military/2022/04/15/pentagon-to-build-nuclear-microreactor-to-power-far-flung-bases/.

In 2020, Congress passed the *Nuclear Energy Leadership Act*, which created the Advanced Reactor Demonstration Program (ARDP). The ARDP is set to provide $160 million in initial funding to partner with private industry to demonstrate advanced nuclear technologies. Even more, Congress provided over $2.4 billion through 2025 for the ARDP in the Bipartisan Infrastructure Law (BIL).

As advanced nuclear technology is demonstrated and deployed, Congress also allocated $6 billion for the Civil Nuclear Credit Program in the infrastructure law to support continued operation of existing nuclear reactors. These tax credits are aimed at preventing the premature closure of reactors, which are currently providing over half of the nation's clean electricity.

In the most recent session of Congress, several other bills sponsored by legislators on both sides of the aisle have been introduced to address deployment, regulatory activities, and funding for new nuclear.

In 2021, a bipartisan slate of senators introduced the *American Nuclear Infrastructure Act*, which addresses both the existing and next generation of reactors by providing incentives to preserve the existing fleet, support licensing of advanced nuclear technologies, and improve domestic nuclear energy supply chain infrastructure.

Later in 2021, the leaders of the Senate Energy and Natural Resources Committee introduced the *Fission for the Future Act*. Their bill would "prioritize communities that have retiring coal or other fossil generating facilities and assist in the reutilization of sites to deploy advanced nuclear power plants."[3]

State legislatures making progress for new nuclear development

For various reasons, states are also taking action to pave the way for new nuclear. Some states may be seeking ways to transition from coal to nuclear; others may be seeking to meet clean energy goals or improve grid reliability.

In West Virginia, for example, the state repealed a ban on the construction nuclear power plants this year.[4] In another significant move, Indiana's legislature passed bills this year that would create a regulatory framework for increased use of new nuclear technologies.[5]

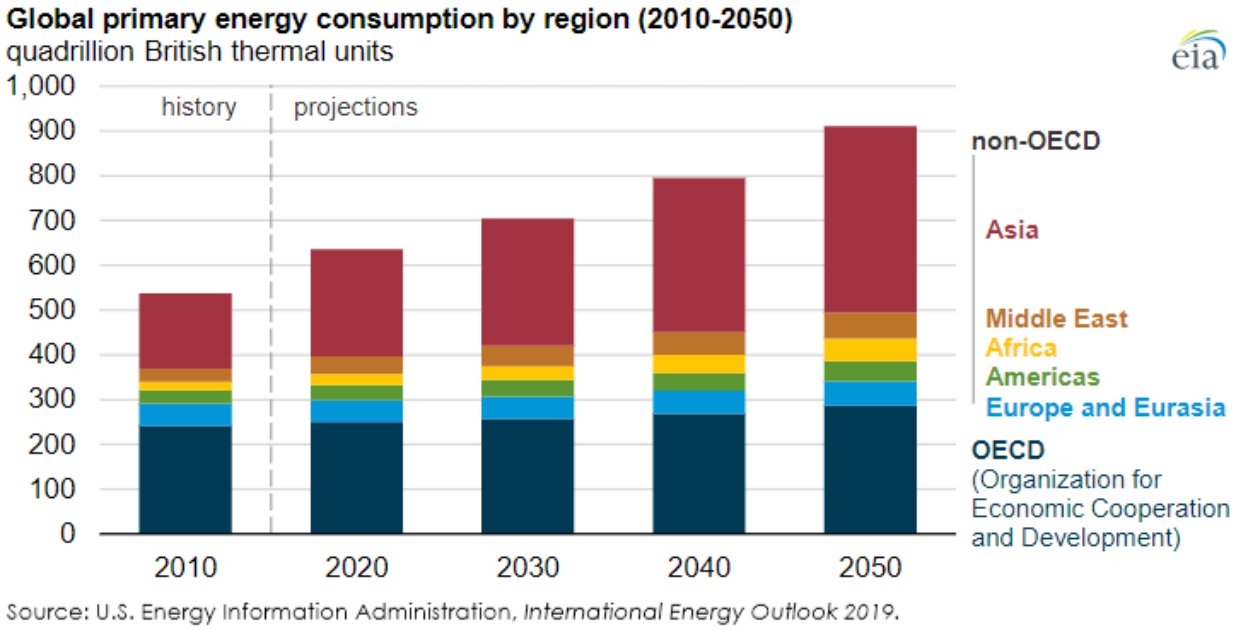
Additionally, this year both Wyoming[6] and Kentucky[7] have advanced measures to support development of advanced nuclear projects and study the feasibility of such projects, respectively.

[3] Manchin, Barrasso Introduce Fission For The Future Act. Senate Committee on Energy & Natural Resources. December 16, 2021.
[4] West Virginia Legis. Senate. SB 4. Reg. Sess. 2022.
[5] Indiana Gen. Assembly. Senate. SB 271. Reg. Sess. 2022.
[6] Wyoming Legis. House. HB 131. Reg. Sess. 2022.
[7] Kentucky Gen. Assembly. Senate. SCR 171. Reg. Sess. 2022.

Why are communities supporting new nuclear?

Nuclear is a reliable source of clean energy

World energy consumption is projected to grow by nearly 50% by 2050.[8] In order to meet this growing demand, as well as achieve the Administration's goal of using 100% carbon pollution-free electricity and a 50-52% reduction in net greenhouse gas pollution by 2030, nuclear power must be in the energy mix.



Source: U.S. Energy Information Administration, *International Energy Outlook 2019*.

In 2020 alone, over 471 million metric tons of greenhouse gases – the equivalent of removing 100 million cars off of the road – were avoided through the use of nuclear power in the U.S., according to data reported by the Nuclear Energy Institute.[9]

According to a 2021 report by the Nuclear Innovation Alliance, "[i]n the United States, existing nuclear power plants provide as much carbon-free electricity as wind, solar, and hydro power combined. In addition to providing clean electricity, advanced reactors can also decarbonize non-electric sectors by providing district or industrial heating, producing hydrogen, and desalinating water. Together with renewable energy and other carbon-free energy sources, nuclear power can enable the U.S. to reach 100% clean energy by 2050."[10]

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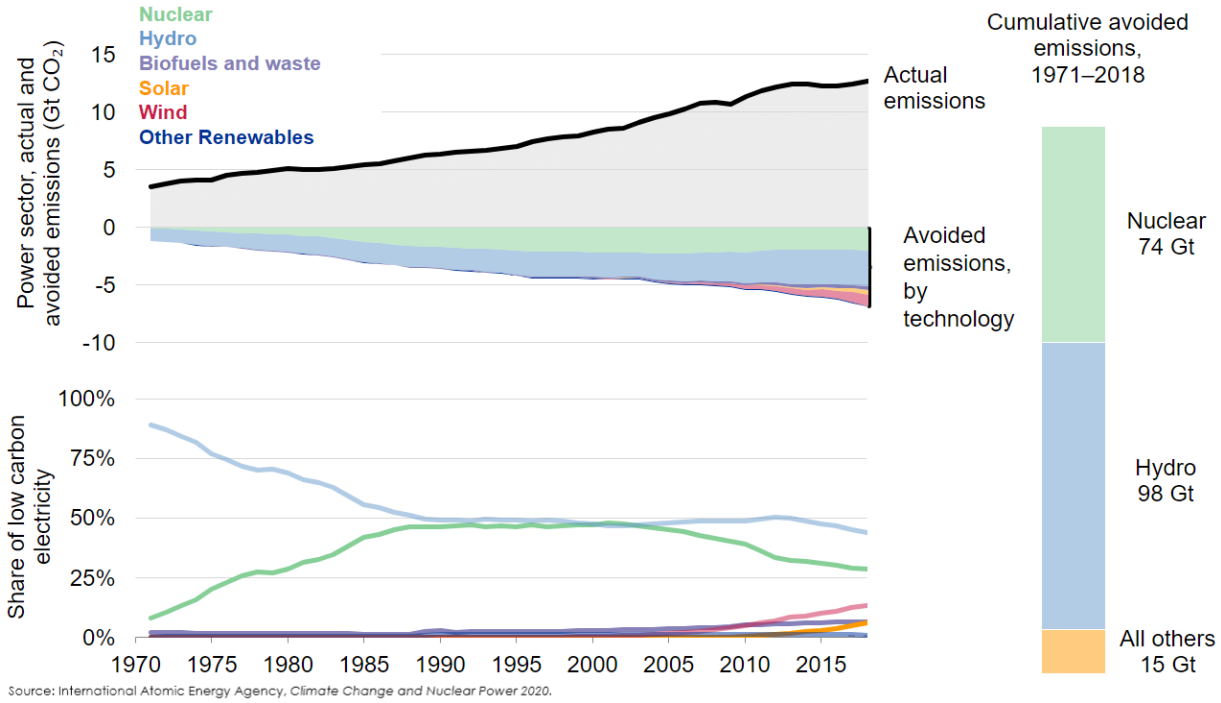
[8] U.S. Energy Information Administration. "EIA projects nearly 50% increase in world energy usage by 2050, led by growth in Asia." September 24, 2019. https://www.eia.gov/todayinenergy/detail.php?id=41433.
[9] Nuclear Energy Institute. "Annual Greenhouse Gas Emissions Avoided by the U.S. Nuclear Power Plants." Updated May 2021. https://www.nei.org/resources/statistics/emissions-avoided-by-us-nuclear-industry.
[10] Ibarra, Jr., Victor and Megan Casper. "Advanced Reactors for State Policymakers, In Brief." *Nuclear Innovation Alliance*. October 2021. https://nuclearinnovationalliance.org/advanced-reactors-state-policymakers-brief.

In 2022, Bloomberg Law reported on findings by the European Union's scientific body, concluding that "nuclear energy is the most reliable source of clean energy." The article explains that "in 2020, the capacity factor (an index of energy supply reliability) of nuclear power plants in the U.S. was 92.5%, compared to 41.5% for hydro, 35.4% for wind, 24.9% for solar photovoltaic (PV), and 20.5% for thermal solar."

"Going beyond climate concerns, nuclear energy also has one of the smallest footprints compared to other clean energy sources—1.3% of the land area required for solar photovoltaic and 0.3% of the land area required for wind," the article states. "Building nuclear plants also requires less than 10% of the construction materials (concrete, steel) per unit energy generated than other zero-carbon alternatives."[11]

The International Atomic Energy Agency (IAEA) has also reported on the role of nuclear power in mitigating climate change.

"Nuclear has a strong track record of CO_2 emission avoidance. Annual CO_2 emissions of the global electricity sector would have been around 2 gigatonnes higher over the past decade if electricity from nuclear power plants had instead been supplied using the average global fossil fuel generation mix," according to IAEA.[12]



[11] Teplinsky, Elina; Buongiorno, Jacopo; and Lovering, Jessica. "Nuclear Power is Critical for the World's Climate Crisis." *Bloomberg Law*. February 8, 2022. https://news.bloomberglaw.com/environment-and-energy/nuclear-power-is-critical-for-the-worlds-climate-crisis.

[12] International Atomic Energy Agency. "Climate Change and Nuclear Power 2020." 2020. https://www.iaea.org/topics/nuclear-power-and-climate-change/climate-change-and-nuclear-power-2020.

IAEA has published various reports on nuclear energy and climate change, concluding in one report that "nuclear power can play an important role in responding to climate related challenges. Depending on specific national circumstances and priorities…nuclear power can foster not only GHG emissions reductions but also other aspects of sustainable energy development."[13]

Further evidence of international support for nuclear is found in the inclusion of the energy source in the European Union's (EU) Taxonomy Regulation, a list of officially approved "green" investments that provides investors with guidance on economic activities that can be considered environmentally sustainable. Supporters of nuclear power, including 12 EU member states who publicly backed its inclusion on the list, say that nuclear is a low-carbon power source that must be part of any energy mix to tackle climate change.[14]

Nuclear projects create economic opportunities

Expansion of the nuclear energy industry can bring economic opportunities to communities in the form of a skilled workforce, high paying jobs, and an expanded tax base.

A 2013 study calculating the total annual economic impact of the Diablo Canyon Power Plant – which is now in danger of being shut down – in California found the plant has an economic impact of $2 billion nationwide, $1.1 billion in California, and $920 million in its surrounding counties. The report also estimates that the plant's operations created nearly 10,400 jobs nationally, including more than 4,500 in California. The plant's operation also generated about $181 million in federal, state, and local taxes in 2011. At the local level, it pays more than $25 million in property taxes that support local school districts, public safety and health programs, and other services. Its operations also generated more than $5 million in local sales taxes, which fund important public functions. The study also found that if the plant were to shut down – currently a very real possibility – the annual economic impact of remaining site operations would plummet 99 percent.[15]

According to the 2021 U.S. Energy and Employment Report, the median energy wages for nuclear power workers is $39.19 compared to the median wage in the energy field as a whole, which hovers around $25 an hour.[16] This can translate to economic development opportunities in communities hosting nuclear projects.

NuScale, an SMR developer, estimates that each NuScale Plant will employ about 305 people full-time, with 1,200 peak construction jobs. Domestic supply chain for manufacturing 36 modules per year will also generate about 12,000 manufacturing jobs, and most of the permanent power station

[13] International Atomic Energy Agency. "The Potential Role of Nuclear Energy in National Climate Change Mitigation Strategies." 2021. https://www-pub.iaea.org/MTCD/Publications/PDF/TE-1984web.pdf.
[14] European Parliament Press Release. "Taxonomy: MEPs do not object to inclusion of gas and nuclear activities." June 7, 2022. https://www.europarl.europa.eu/news/en/press-room/20220701IPR34365/taxonomy-meps-do-not-object-to-inclusion-of-gas-and-nuclear-activities.
[15] Mayeda, Patrick and Riener, Kenneth in cooperation with Pacific Gas & Electric Company. "Economic Benefits of Diablo Canyon Power Plant." June 2013. https://www.pge.com/includes/docs/pdfs/shared/edusafety/systemworks/dcpp/PGE_Economic_Impact_Report_Final.pdf.
[16] U.S. Department of Energy. "2021 U.S. Energy and Employment Report." July 1, 2021. https://www.energy.gov/policy/us-energy-employment-jobs-report-useer.

positions will pay an average of $85,000 a year. According to the August 2018 Regional Economic Development of East Idaho Report, the SMR will generate about $2 billion in direct and indirect benefit from manufacturing and construction activities over the 4 years of the construction period.[17]

The TerraPower Natrium reactor planned for deployment in Kemmerer, Wyoming demonstrates how advanced nuclear projects can also utilize the existing workforce for filling new nuclear jobs.

According to a 2021 article published by the U.S. Department of Energy Office of Nuclear Energy, "[h]undreds of workers will be needed to fabricate complex parts and components, thousands of skilled construction workers will be required to build the nuclear and energy islands, and hundreds of plant operators, maintenance crews, and security staff will be needed full-time to operate one of the most-advanced nuclear reactor systems in the world."[18] These jobs can be performed in large part by the existing coal-based workforce in the town.

Nuclear power saves consumers money

In addition to creating economic opportunities in communities, nuclear projects help to save consumers money. According to current data from NEI, nuclear saves consumers an average of 6% on electricity bills and adds $60 billion to the U.S. GDP.[19] Not only does nuclear energy save money for consumers, but it is also becoming cheaper for communities to produce. According to 2020 data published by NEI, overall costs of generating nuclear power have been reduced by 32% since their peak in 2012.[20]

In 2021, a watershed clean energy law passed in Illinois included a key provision committing the state to keep its existing nuclear power fleet online. Now, utility customers in the northern part of the state and around Chicago are saving an average of $237 a year on their energy bills because of that legislation, according to state regulators.[21]

According to a 2019 report by the Congressional Research Service, titled "Advanced Nuclear Reactors: Technology Overview and Current Issues," "some [advanced nuclear reactor] designs would utilize simpler systems or increased automation to reduce human labor costs during operation. Many advanced reactor developers contend their designs would improve upon the thermal efficiencies of older generations of nuclear plants by operating at higher temperatures or

[17] NuScale Power, LLC. "Powering the Next Generation of Nuclear." 2019. https://www.nuscalepower.com/newsletter/nucleus-summer-2019/powering-the-next-generation-of-nuclear.
[18] U.S. Department of Energy. "Next-Gen Nuclear Plant and Jobs Are Coming to Wyoming." November 16, 2021. https://www.energy.gov/ne/articles/next-gen-nuclear-plant-and-jobs-are-coming-wyoming.
[19] Nuclear Energy Institute. "Nuclear Powers a Brighter Future." https://www.nei.org/fundamentals/nuclear-powers-a-brighter-future.
[20] Nuclear Energy Institute. "Nuclear by the Numbers." August 2020. https://www.nei.org/resources/fact-sheets/nuclear-by-the-numbers.
[21] Illinois Commerce Commission Press Release. "CEJA Carbon Mitigation Credit Results in Hundreds of Dollars of Utility Relief for ComEd Customers." April 27, 2022.

through use of more efficient power conversion technologies. More-efficient plants may be able to reduce their payback periods relative to their less efficient peers."[22]

Advanced reactors will be constructed in a wide range of sizes, and their owners will be able to tailor their electricity generation to meet their energy demands. This is particularly important for smaller companies, rural electric cooperatives or municipal agencies and for isolated and distributed applications.

Nuclear is critical for energy independence, reliability, and security

The Russian invasion of Ukraine has underscored the importance of energy independence, reliability, and security. Nuclear provides a mechanism to achieve these goals.

A 2022 article published by the Aspen Institute highlights Germany as an example of the potential downfalls of neglecting nuclear in a nation's energy portfolio.

"The country invested hundreds of billions in renewables to replace its nuclear power plants. But as nuclear plants were phased out, Germany needed dependable gas-fired plants to make up the difference," according to the article. "Instead of declining, emissions reached an all-time high in 2021. And it's been expensive. German electricity rates have become the highest in Europe. With the Russian threat to their supply of natural gas, Germany is now backtracking and considering how to reopen its reactors."

The Aspen Institute article also raises the critical fact that "nuclear power is the only non-carbon energy production method that has proven to work at grid-scale…At present, the only existing technology for abundant, clean, reliable power is nuclear fission."[23]

The 2019 CRS report also raises important points about how advanced nuclear projects are equipped to manage security concerns.

"Advocates contend that many advanced reactor designs would be more resistant to weapons proliferation than existing [light-water reactors] because of factors such as "sealed" or difficult-to-access core designs, infrequent refueling, smaller inventories of fissile materials in the core, and remote monitoring capabilities, among others," the report states. "Some designs may produce waste that is less attractive for weapons proliferation for a variety of reasons."

The report affirms that "for existing nuclear power plants in the United States, security and proliferation risks are generally considered to be low, given the current fuel cycle and safeguards regimes in place…The variety of advanced nuclear power plant designs have the potential to further reduce this relatively low risk, or to increase the risks, depending on the technical and policy choices and how they are implemented."[21]

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[22] Congressional Research Service. "Advanced Nuclear Reactors: Technology Overview and Current Issues." April 18, 2019. https://crsreports.congress.gov/product/pdf/R/R45706.

[23]Budinger, Bill and Bauman, Paul. "A Secure Energy Future Needs Nuclear Power." *The Aspen Institute.* March 14, 2022. https://www.aspeninstitute.org/blog-posts/a-secure-energy-future-needs-nuclear-power/.

Additional risks in the supply chain for nuclear projects may be reduced by increasing the domestic production of uranium fuel. In 2021, owners and operators of US nuclear plants purchased the equivalent of about 46.74 million pounds of uranium, according to the U.S. Energy Information Administration. Only 5% of these purchases were domestic, and 14% came from Russia.[24]

Addressing potential community concerns

Discussion about nuclear projects must include the question of risk. Conversations about nuclear cannot focus solely on the technical facts of risk; they must address how people *feel* about the facts.

Community outreach and education efforts are necessary to ensure the public is aware of the risks and benefits associated with new nuclear development and to address local concerns. A local community needs to have as much information as possible to ensure it can fulfill its most important role: protecting the health, safety, and quality of life of its citizens.

Once a local community determines it is interested in hosting a nuclear facility, the community and local government officials must engage, provide education and outreach addressing the potential benefits and risks, and create opportunities for public comment. These efforts will demonstrate legitimacy and transparency in decision-making, which can alleviate concerns and help build support.

Education and outreach efforts may include:

- Hosting meetings for the community with site managers, contractors, utilities and economic development entities;
- Creating public information centers and campaigns online and in community centers;
- Coordinating programs with local universities and community colleges; and
- Building websites and producing written materials for distribution − such as fact sheets or issue briefs − that explain the pros and cons of nuclear initiatives.

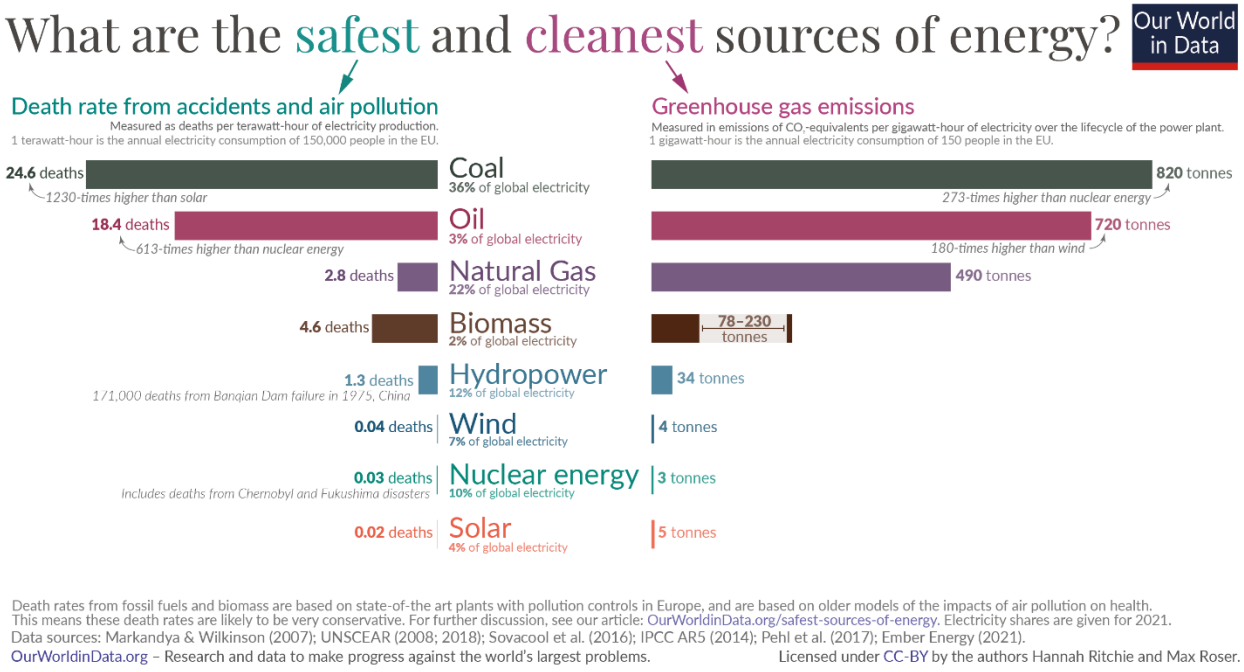
Health and safety

Regarding the health and safety of a community, it is important to contextualize nuclear within other energy options. All energy sources have some negative effects, but they differ enormously in size, and nuclear is among the safest and cleanest energy sources available.

According to a 2020 report by Our World in Data, there are three main categories of negative consequences of all energy sources. The first is air pollution: at least five million people die prematurely every year as a result of air pollution. The second is accidents. This includes accidents that happen in the mining and extraction of the fuels (coal, uranium, rare metals, oil, and gas) as well as accidents that occur in the transport of raw materials and infrastructure, the construction of power plants, or their deployment. The third is greenhouse gas emissions, a major driver in climate change and its negative impacts.

[24] U.S. Energy Information Administration. "Nuclear explained: Where our uranium comes from." July 7, 2022. https://www.eia.gov/energyexplained/nuclear/where-our-uranium-comes-from.php.

In all three aspects, according to the report, nuclear is a vastly safer and cleaner energy source than others, especially compared to fossil fuels. Nuclear energy, for example, results in 99.7% fewer deaths than coal, 99.6% fewer than oil, and 97.5% fewer than gas. Additionally, as shown in the chart below, nuclear emits the lowest levels of greenhouse gases while being at nearly equivalent safety levels with renewable energy sources.



Communities discussing the health and safety impacts of nuclear projects may also be concerned with radiation exposure. Radiation affects humans by depositing energy in body tissue, which can cause cell damage or cell death. The extent of damage to the body tissue depends upon the total amount of energy absorbed, the time period and the dose rate of the exposure, and the particular organs exposed.[25]

Traditional nuclear power plant operations account for less than one 1/100 of 1 percent (<0.01%) of the average American's total radiation exposure.[26] Radiation doses for workers are controlled by installing physical shielding inside plants, limiting the time workers spend in areas with high levels of radiation, and using remote handling equipment for operations in the reactor core. Shielding at nuclear power plants also protects nearby residents. Protective measures for workers and residents would similarly be in place for advanced nuclear projects.

In the unlikely event of an emergency, all nuclear power plants in the United States have mandatory emergency preparedness plans for protecting the public from radiation exposure and the potential release of radioactive material into the environment. EPA has developed guidance and recommended actions to protect the public. Communities are also involved in emergency

[25] U.S. Environmental Protection Agency, Radiation Risks and Realities. EPA-402-K-07-006. March 2007. p. 8
[26] U.S. Environmental Protection Agency, Radiation Risks and Realities. EPA-402-K-07-006. May 2007

planning and training to help ensure emergency response teams can deal with a potential radioactive emergency.

Waste

All nuclear reactors produce radioactive material during the energy-creating process of fission. Much of this waste* is stored safely on an interim basis in pools, dry cask storage, and cannisters at the site of its production. In a 2019 article, the IAEA reported that spent nuclear fuel from SMRs could be handled according to methods presently used for existing reactors.[27]

As directed by the Nuclear Waste Policy Act Amendments Act of 1987, spent nuclear fuel and high-level radioactive waste were originally destined for permanent storage in the Yucca Mountain Nuclear Waste Repository. However, due to political factors, this course for disposal is not currently under consideration.

For communities hosting U.S. Department of Energy (DOE) federal facilities, where waste is now being stored on an interim basis, the absence of a disposition path for waste stands in the way of completing the riskiest environmental cleanup in the country and mitigating the risks to human health and the environment created by DOE in these communities. In some cases that waste serves as a barrier to site reuse as local communities work to ensure the economic health and growth of their communities. The waste issue may also cause a community to lose trust in DOE's commit to and interest in support the community's vision over time.

Recent efforts by DOE, however, including the renewal of a consent-based siting process for an interim storage facility, have demonstrated the Department's ongoing efforts to managing current and future waste, and to supporting host communities. DOE has also demonstrated a commitment to limiting the amount of waste produced from advanced nuclear reactors specifically.

As a complementary solution to the question of waste, co-location of waste management facilities with advanced nuclear projects can be an incentive for host communities looking to ensure future viability and resiliency.

**While this report uses the term waste, we acknowledge that used nuclear fuel may be reprocessed in order to provide fuel for further power generation.*

[27] Chatzis, Irena. "Small Modular Reactors: A Challenge for Spent Fuel Management?" *IAEA Bulletin*. August 8, 2019. https://www.iaea.org/newscenter/news/small-modular-reactors-a-challenge-for-spent-fuel-management.