

Atomic Perspectives: Understanding Divergent Views on Nuclear Power
By: Sydney Hanning

San Onofre is one of the most visited state parks in California. It is known for its world-renowned surf breaks, diverse aquatic wildlife, and of course its bordering nuclear power plant. The San Onofre Nuclear Generating Station (SONGS) appears as two concrete hemispheres, each with a short pillar on top, inspiring locals to gift it the prophetic name “nuclear boobies.” The structure became a landmark on the scenic beachfront and provided a low-carbon source of power to over 2.3 million households.¹

In 2013 after defects were found within the steam generators, an issue unrelated to radiation exposure, the California Coastal Commission voted to decommission the plant rather than allow for repairs. Anti-nuclear sentiments are largely responsible for this plant’s decommissioning, as well as an overall decrease in nuclear power throughout America. Despite the majority of American Association for the Advancement of Science members supporting the construction of more power plants, and up to 79% of AAAS physicists supporting nuclear power, the prevailing negative public opinion surrounding nuclear power seems to have reigned supreme.²

Much of scientists' affinity towards nuclear power stems from its overall sustainability and efficiency when compared to other power sources. While in operation, nuclear power plants produce almost no greenhouse gas emissions and the International Atomic Energy Agency reports that over the last 50 years nuclear power has reduced CO₂ emissions by the equivalent of two years of energy-related emissions.³ While other energy sources such as wind and solar are cleaner than nuclear, their intermittent nature makes them currently unreliable for establishing a stable and consistent power output for large communities. The high energy density and efficiency of nuclear power make it a viable low-carbon solution to reach climate change goals, at least until other renewable energy sources become available to support the public’s large energy needs.

One critical reason that explains why the general public opposes nuclear power is because of its association with nuclear weapons. The United States and the Soviet Union’s early civilian nuclear energy programs were both a result of heavily classified initiatives to build nuclear weapons. This intertwined history creates a perception in the eyes of the US public that associates nuclear power with the potentially catastrophic consequences of nuclear warfare. When examining a database of historical US surveys, 60% of questions asked about nuclear

¹ Songs. “Home.” *SONGS*, 20 Oct. 2023, www.songscommunity.com/.

² “Elaborating on the Views of AAAS Scientists, Issue by Issue.” *Pew Research Center Science & Society*, Pew Research Center, 23 July 2015, www.pewresearch.org/science/2015/07/23/elaborating-on-the-views-of-aaas-scientists-issue-by-issue/.

³ IAEA. (2020, September 4). *What is the clean energy transition and how does nuclear power fit in?*. IAEA. <https://www.iaea.org/bulletin/what-is-the-clean-energy-transition-and-how-does-nuclear-power-fit-in#:~:text=During%20operation%2C%20nuclear%20power%20plants,of%20global%20energy%2Drelated%20emissions.>

weapons while only 39% asked about nuclear energy.⁴ While the impacts of nuclear warfare are important to understand in today's political climate, connections between nuclear weapons and nuclear energy prevent the public from receiving the benefits of nuclear power.

While people may associate this type of power with bombs, it is also important to note that nuclear reactors do not possess the capabilities to explode like a nuclear bomb. The unique arrangements and special materials present in nuclear bombs are simply not present in nuclear power plants. Explosions such as the one that occurred at Fukushima were caused by high pressure gasses built up in a small area, with neither nuclear fusion or fission taking place like it would for a nuclear bomb. Nuclear reactors cannot cause a nuclear explosion because the fuel is not compact enough to allow an uncontrolled chain reaction, with water and core structural materials slowing neutrons down before they reach other fissile atoms.⁵ Reactors such as the one at Massachusetts Institute of Technology are built with a negative temperature coefficient, meaning it is designed to shut down on its own as temperature increases. Because public apprehensions often link nuclear power to destructive tendencies, it is crucial to dispel misconceptions that nuclear reactors lack the conditions for a nuclear explosion. Modern nuclear reactors' unique designs, safety features, and materials fundamentally differ from those associated with nuclear weapons, ensuring a controlled and safer operation.

It's unavailing to describe the public's opinions on nuclear power without first mentioning the terrible accidents which helped shape them. The three major reactor accidents in the 60 year civil history of nuclear power; Three Mile Island, Chernobyl, and Fukushima, were a result of insufficient containment measures which ultimately led to a tragic, yet numerically small, loss of life. Several hundred people die from coal mining each year to provide energy, while only 2-4 people die from radiation exposure (most of which is from abandoned medical or industrial equipment).⁶ Similar to how accidents in any other major industry such as aviation or healthcare are studied to address shortcomings, nuclear power plant accidents have been intensely analyzed in a manner which has led to increased safety measures. In 2010 the Nuclear Energy Association reported that today's reactors reduce the theoretically calculated frequency of a severe nuclear power plant accident by a factor of 1600.⁷ While past accidents should be taken seriously and never forgotten, they do not discredit nuclear power to the extreme that many believe it should.

While many locals surrounding SONGS were able to make light of their proximity to nuclear power, one key factor negating the public's acceptance of these projects has been named

⁴ Baron, Jonathon, and Stephen Herzog. "Public Opinion on Nuclear Energy and Nuclear Weapons: The Attitudinal Nexus in the United States." *Energy Research & Social Science*, vol. 68, no. 101567, 1 Oct. 2020, p. 101567, www.sciencedirect.com/science/article/pii/S2214629620301432#, <https://doi.org/10.1016/j.erss.2020.101567>.

⁵ MIT. "Frequently Asked Questions | MIT Nuclear Reactor Laboratory." *Mit.edu*, 2020, nrl.mit.edu/about/faq#:~:text=Can%20the%20reactor%20explode%3F.

⁶ World Nuclear Association. "Safety of Nuclear Reactors - World Nuclear Association." *World-Nuclear.org*, Mar. 2022, [world-nuclear.org/information-library/safety-and-security/safety-of-plants/safety-of-nuclear-power-reactors.aspx#:~:text=There%20have%20been%20two%20major](https://www.world-nuclear.org/information-library/safety-and-security/safety-of-plants/safety-of-nuclear-power-reactors.aspx#:~:text=There%20have%20been%20two%20major).

⁷ "World Nuclear Association - World Nuclear Association." *World-Nuclear.org*, [world-nuclear.org/](https://www.world-nuclear.org/).

the Not In My Backyard movement, or NIMBY. NIMBY supporters object to hazardous or unsightly structures near the area in which they live, although many do not oppose these same projects elsewhere. Proponents of NIMBY exist on either side of the political spectrum, by both halting wind and solar initiatives for aesthetic reasons or stopping nuclear power projects due to their perceived health concerns. Nevada NIMBY supporters terminated the Yucca Mountain nuclear waste storage project, a plan that could have massively reduced today's carbon related problems by increasing nuclear power generation.⁸ NIMBY is a dangerous philosophy because it prioritizes local interests over broader societal needs, halting clean energy initiatives that are crucial in stabilizing our planet's climate.

Modern NIMBY agendas are mostly undertaken by middle to upper-class individuals. This trend can be attributed to wealthier groups wanting to protect their community's image, yet it can be especially harmful because these are groups with the resources needed to stop projects from coming to completion. In the case of nuclear power, scientist's faith in the technology often comes secondary to the public's perception. In America Three Mile Island is often brought up as an example of a US sanctioned plant that malfunctioned, however, the negative impacts associated with this accident are highly debated. The *World Nuclear Association* states that while some radioactive gas was released after the accident, there was not enough to cause a dose above background levels to local residents.⁹ Other studies have tried to investigate if there was an increase in cancer rates after the incident, but the observed increase could not be tied to radiation emissions.¹⁰ The study also found that increases in cancer following nuclear reactor accidents could be tied to increased screening in these areas following the disaster.

NIMBY supporters may rely on people's dissatisfaction with living near nuclear power plants, yet those who understand the science are more likely to advocate for the safety of nuclear power. In a survey of 500 scientists from *American Men and Women of Science* taken just a year after the Chernobyl disaster, 46% of scientists answered that they would rather live near a nuclear power plant than an airport, coal-powered power plant, chemical plant, or oil refinery.¹¹ Scientists' willingness to live near these sites demonstrates a misconstrued idea that they are incredibly risky.

Living near nuclear power plants can actually cause residents to be more accepting of the energy source. Through a process referred to as the proximity effect, prolonged closeness to

⁸ Cohen, Ariel. "NIMBYism Is a Bipartisan Energy Problem." *Forbes*, www.forbes.com/sites/arielcohen/2022/09/14/nimbyism-is-a-bipartisan-energy-problem/?sh=182032aa3f73. Accessed 1 Feb. 2024.

⁹"Three Mile Island | TMI 2 | Three Mile Island Accident. - World Nuclear Association." *World-Nuclear.org*, World Nuclear Association, Apr. 2022, world-nuclear.org/information-library/safety-and-security/safety-of-plants/three-mile-island-accident.aspx.

¹⁰Hatch, M C, et al. "Cancer Rates after the Three Mile Island Nuclear Accident and Proximity of Residence to the Plant." *American Journal of Public Health*, vol. 81, no. 6, 1 June 1991, pp. 719–724, www.ncbi.nlm.nih.gov/pmc/articles/PMC1405170/.

¹¹Bisconti Research. "The Scientific Consensus on Nuclear Power Plant Safety One Year after Chernobyl." *Bisconti Research, Inc.*, www.bisconti.com/blog/the-scientific-consensus. Accessed 1 Feb. 2024.

nuclear units leads to people regarding them through a framework of ordinariness.¹² NIMBY's aversion to nuclear power serves as a positive feedback loop that prevents nuclear power from being normalized by those who oppose it most. This can help explain why SONGS, located near a popular beach town, was embraced by some local residents while newcomers often viewed the structure as an eyesore. Not every community should be expected to give their power plant a provocative pet name, but there is something to be said about the benefits of normalizing the once taboo. The proximity effect sheds light on the complex dynamics between residents and nuclear power plants, stressing the role of familiarity in shaping perceptions. NIMBY resistance reinforces a divisive narrative, impeding a societal acceptance of nuclear energy.

Historical associations, public misconceptions, and the tangible impacts of major accidents all play a role in shaping public opinion regarding the use of nuclear power. Despite the scientific community's endorsement of nuclear power for its sustainability and efficiency, negative perceptions are fueled by incidents like Three Mile Island, Chernobyl, and Fukushima. The NIMBY movement further complicates this issue by prioritizing localized concerns over global energy needs. While the proximity effect provides the potential for increased acceptance through familiarity, informing the public about the realities of nuclear power is crucial in creating a more realistic understanding of the nuclear power process. A more informed public perception of nuclear power's role in fighting climate change through a low-carbon energy solution will allow this often misunderstood power source to champion a more sustainable future.

¹² Poumadère, Marc, et al. "Public Perceptions and Governance of Controversial Technologies to Tackle Climate Change: Nuclear Power, Carbon Capture and Storage, Wind, and Geoengineering." *Wiley Interdisciplinary Reviews: Climate Change*, vol. 2, no. 5, 17 Aug. 2011, pp. 712–727, <https://doi.org/10.1002/wcc.134>.

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