Draft

Home Page - Yesterday's Myths, Today's Reality: The Truth About Modern Nuclear Power

Brief summary:

The focus of modern day energy production is to find an energy source that can produce enough energy while being green. Nuclear power only generates 12 grams of carbon dioxide per kWh, which is about 68 times less than coal's output of 820 grams of carbon dioxide per kWh ("Carbon Dioxide Emissions From Electricity"). Currently, fossil fuels dominate the field of energy production with ~60%, renewables at 31%, and nuclear at just 9% in 2024 (Héctor et al 1-2).

Despite the safety, energy output, environmental friendliness, and readiness of modern nuclear power,it's opposed by the US public because of fear and skepticism holding it back. Accurate information about today's reactor designs can change that.

Research Question: How can accurate public understanding of modern nuclear power's benefits beat the public's skepticism and fear, leading to nuclear energy's adoption as an energy source?

This website was a school project created by Michael D. and Joseph D. for ENG 111, Fall 2025.

Home Page - Yesterday's Myths, Today's Reality: The Truth About Modern Nuclear Power pictures and video

https://www.youtube.com/watch?v=hl9-0orGOu4

What’s the problem

Despite the benefits and use of nuclear energy, it is still opposed by most of the public in the US because of their perception of nuclear energy. The biggest reasons are:

- Fear of another accident like the Chernobyl meltdown and radiation release into the environment.

  Héctor et al show how “the general public [perceive] nuclear energy with ‘fear’” (21).
- Worry of nuclear proliferation - the spread of nuclear technology to other groups that do not already have it. “[p]ossibly the strongest argument against nuclear energy is the risk of nuclear proliferation” (Engler and Wherden 290).
- Nuclear reactors are expensive and slow to build. Nuclear power plant build costs are “estimated between $14 billion and $30 billion” and an average build time of about “five [to] ten years” (Locknear).

It hasn’t been solved yet because of anti-nuclear sentiments, regulations from the 70s and 80s, and focus on old risks instead of modern fixes.

What’s the problem pictures

Timeline and where

Dec. 20 1951: First Electricity from a Reactor.

In Idaho, at the National Reactor Testing Station, an experimental nuclear reactor provided power for the building it occupied. It did not provide power for a grid and remained classified. (Ellison)

June 26, 1954: First civilian nuclear power plant opens.

The Obninsk, a Russian reactor, was connected to the grid and supplied power to homes. (Ellison)

Mar. 28 1979: Three Mile Island partial meltdown.

Three Mile Island was a reactor in Pennsylvania that, due to a cooling failure, had a partial meltdown. No one died but this event did start and fuel anti-nuclear protests and sentiments. (Ellison)

Apr. 26, 1986: Chernobyl Meltdown.

Reactor 4 at the Chernobyl Nuclear Plant in Ukraine exploded after a flawed test. The power surge caused an explosion in the core and tons of radiation was released. Around 30 people died in the first three months because of radiation. This was the last major human error accident to occur. (Ellison)

Mar. 11 2011: Fukushima Daiichi Meltdown.

On Mar. 11th, 2011, an earthquake caused a tsunami to hit the Japanese Fukushima Daiichi I nuclear power plant. The flooding led to emergency generators failing, causing loss “of the cooling agent” (Ellison).

July 17, 2024: First Gen IV Reactor in the US Officially Approved.

Kairos Power began development of a Gen IV Reactor at Oak Ridge in Tennessee. (Szondy)

Sep. 16, 2024: First SMR in the US is under construction.

The Nuclear Regulatory Commision gave Abilene Christian University the construction permits to build an SMR on campus. (Ireland)

This problem takes place all across of the US, but is most prevalent in states with lots of coal plants which produce a lot of pollution.

When and where pictures

Obninsk reactor

Three Mile Island

Fukushima Plant

Who does it affect

The failure to implement modern nuclear reactors does not just harm the atmosphere, it affects everyone across the US. Energy sources that produce high amounts of pollution, like coal and gas, are still very prevalent today. Coal leads to 161 fatalities per TWh whereas nuclear is only at 0.04 fatalities per TWh, even when factoring in events such as the Chernobyl meltdown (Héctor et al 17). Everyone is affected, but the most affected are young children and the elderly who are more susceptible to pollution related diseases (*WHO*).

Khushboo Bharti, 31, is the parent to her one year old daughter Samaira. Ms. Bharti details how in the middle of the night "I remember her waking up with a violent cough that made her vomit several times" (Yadav). None of the “usual home remedies” worked and she ended up taking her to the hospital (Yadav). "On the way there, Samaira didn't react to anyone or anything. It was very unlike her, she is a bubbly child. She wouldn't even lift her head. It was the worst moment of my life" (Yadav). At the hospital, Samaria was eventually diagnosed with pneumonia, was treated with a “strong steroid nebulisation” and was on oxygen support for two days (Yadav). Ever since, Ms. Bharti is on edge and panics “[e]ven if she coughs just a few times” (Yadav).

Who does it affect pictures

Small Modular Reactors (SMRs) and Generation (Gen) IV Reactors

The nuclear industry has moved far beyond the 1960s and 70s designs. Reactor designs already exist today that solve and improve safety, cost, and energy production. These solutions are the SMRs and Gen IV Reactors.

SMRs:

- Produce up to 300 MW per unit, about ⅓ of traditional reactors.
- Can be factory built and shipped, cuts construction time and cost.
- Refuels every 3-7 years instead of every 1-2 years.
- Passive safety systems are implemented which cuts out the need for human intervention in the case of an emergency.

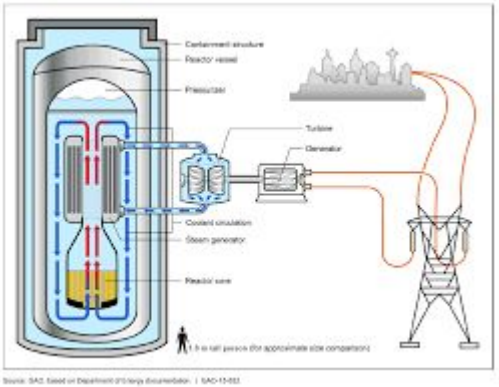
(Liou)

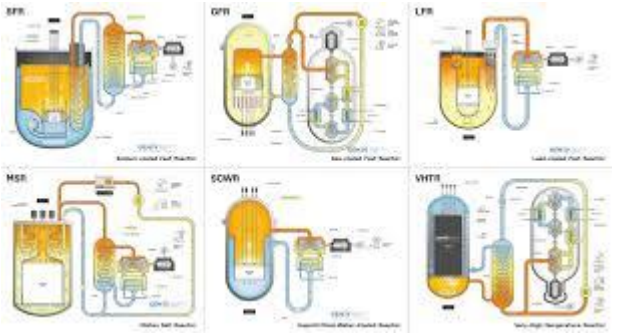
Gen IV Reactors:

- Uses nuclear waste as fuel in closed fuel cycles.
- Run at higher temperature for improved efficiency.
- Six new reactor types which are the Gas-cooled Fast Reactor (GFR), Molten Salt Reactor (MSR), Sodium-cooled Fast Reactor (SFR), Supercritical Water-cooled Reactor (SCWR) and Very-High-Temperature Reactor (VHTR)

(Héctor et al 8-9).

Small Modular Reactors (SMRs) and Generation (Gen) IV Reactors Pictures





Solution

Modern nuclear reactor technology already exists to make nuclear energy safer, cheaper, and more efficient than ever before. The solution is to teach the US public about SMRs and Gen IV reactor designs, how they compare to previous reactors, and the difference in safety between Chernobyl era reactors and modern day reactors. Three ways that would all work together to increase public perception and knowledge are:

- Featuring more books, articles, or sections in newspapers that inform and show comparisons of nuclear power.
- Holding more public speaking events, online or in person, to have real time talks/discussions with viewers or other members.
- Having the institutions in charge of the operation of nuclear power plants be transparent and engage with the community. Holding public hearings on current proceedings, sharing future plans, and showing what is going on inside of the reactors through real time dashboards are all ways to improve transparency.

Why this is the best solution: All of these solutions together cover a wide range of audiences on various social media or physical platforms that will help teach the US public. Establishing trust with those in charge of the power plants is also huge in influencing how the public perceives nuclear energy. Sweden and France are proof of two countries that built “trust and confidence in the nuclear industry” through transparency and informing the public (Lee).

Solution/what you can do pictures

What you can do

Here are three things you can do to help support the growth of nuclear knowledge that take just a minute to do. Join or donate to groups like the Nuclear Matters or Mothers for Nuclear. Send a message to your senator keep funding going for SMR licensing and the ADVANCE Act, an act passed in 2024 requiring the US Nuclear Regulatory Commission to modernize old nuclear regulations (*U.S.NRC*)

For more information go to the World Nuclear Association, the US Nuclear Regulatory Commision, and the IAEA.

Some organizations that support and spread nuclear awareness are Generation Atomic, Mothers for Nuclear, Nuclear Innovation Alliance, and Nuclear Matters.

Author info

Michael D. is currently a junior at Central Carolina Academy with a goal to enter the engineering field. Michael D. became obsessed with nuclear energy, going into lots of research, and saw just how useful and beneficial nuclear energy was as a zero emission energy source. Outside of School, Michael likes to read books, play video games on the Xbox, and practice Brazilian Jiu Jitsu.

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