NUCLEAR

A FALSE PROMISE FOR MONTANA'S ENERGY FUTURE

DECEMBER 2024

Today, many people are talking about nuclear energy as a solution to our energy and climate challenges. They claim that new, safer nuclear technology can provide electricity without harming the climate. Some even claim there will be no need to mine for fuel and no disposal of radioactive waste.

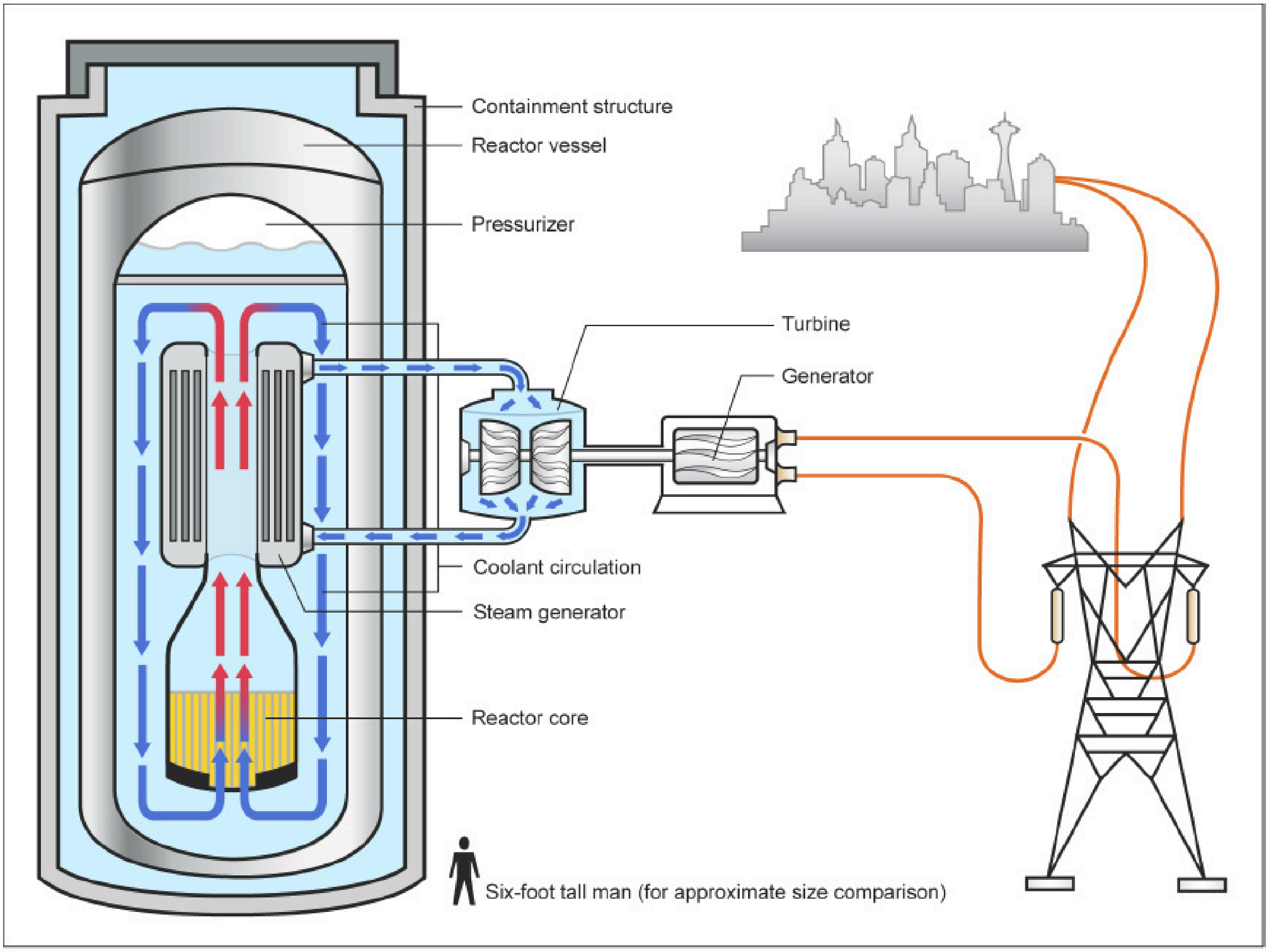
Unfortunately, the facts don't match the hype. While many look to what's referred to as small modular reactors as the answer to our energy problems, they overlook the fact that these small modular reactors don't exist, pose serious environmental justice concerns from mining for the fuel, have outrageously unaffordable price tags, and leave radioactive waste in communities forever.

A quick peek behind the curtain reveals that the hype of these unicorn-like proposed nuclear reactors is really just unsupported hope that ignores the very real concerns with this undeveloped and prohibitively expensive technology.

WHAT ARE SMALL MODULAR REACTORS?

Small modular reactors (SMRs) are nuclear fission reactors that are promoted as smaller, cheaper, and easier to build than conventional nuclear reactors. Unfortunately, everything about this new generation of nuclear reactors is undefined, from their actual size, to the safety of dozens of different types of proposed technologies that are proposed, to how much they will cost.

In Utah, many small municipalities joined with a developer named NuScale to bring a first-of-a-kind technology to the state. The project was abandoned in 2023 after cost projections over eight years tripled from $3 billion to $9.3 billion. $6 billion was sunk into the project before it collapsed, leaving Utah municipalities and the federal government with nothing to show for billions of dollars and years of delayed action on meeting energy needs.



Source: GAO, based on Department of Energy documentation. | GAO-15-652

CAN NUCLEAR ENERGY SOLVE THE CLIMATE CRISIS?

"I'M A REALIST AND A PRAGMATIST, I'M A SCIENTIST, I'M A GEOLOGIST BY TRAINING, AND IT'S JUST NOT POSSIBLE FOR NUCLEAR TO HAVE ANY KIND OF SIGNIFICANT IMPACT ON REDUCING CLIMATE CHANGE IN THE NEXT 20 YEARS."
ALLISON MACFARLANE, WYOFILE, JULY 2021

As physicist Amory Lovins points out, to argue nuclear and renewables are both vital for addressing climate is like saying that since caviar and rice are both food, they are both vital to reducing hunger.

Resources and time spent on expensive, slow options like nuclear drain resources from inexpensive, readily available solutions like renewable energy and storage. At best, nuclear plants take at least a decade to build, and historically have been plagued by construction and permitting delays.

Georgia's Vogtle plant, the only operational nuclear plant built in the U.S. in nearly 30 years, totaled $36.8 billion when the two new units came online in 2023 and 2024. Construction began in 2009, with an original $14 billion estimated cost. Georgia electricity customers have seen sharp increases in utility bills as a result of this debacle. Meanwhile, large renewable projects can be planned and built in a few years and cost far less. Even with massive taxpayer subsidies, nuclear power is the most expensive form of electricity in the U.S.

SMRS: HIGH COST, HIGH RISK

ESCALATING COSTS

The NuScale nuclear project near Idaho Falls demonstrates that SMRs are prone to the same trajectory of rising costs that have plagued most nuclear projects across America. Total project cost estimates started at $3.1 billion in 2015, rose to $4.2 billion in 2017, $6.1 billion in 2020, and finally to $9.3 billion in 2023 when the project was canceled. SMRs were branded as a move away from large, very expensive nuclear reactors, but designers now seek to increase their size to get back the economies of scale that were lost in shrinking the size of the reactor in original SMR proposals.

A FINANCIAL RISK

The SMR planned by NuScale and Utah municipalities was still in the design phase, and It followed the usual path of nuclear project cost overruns, delays, and failures. Neither the private financial sector nor large investor-owned utilities stepped forward to pay for it, putting the financial risk on smaller utilities and towns in Utah, as well as the federal government before the project collapsed altogether.

UNCERTAINTY & SECRECY

Many details of the NuScale nuclear project changed over time, and were kept from public view. The construction timeline was delayed by years with little explanation. While transparency is essential to good policy, the NuScale developers refused to disclose how they arrived at the changing price estimates, hid key developments from consumers, and failed to even disclose the withdrawal of the plant operator.

COST

NUCLEAR VS RENEWABLES

The costs of SMR-generated electricity can be summed up in one word: unaffordable. Early estimates of NuScale's project by Utah municipalities promised electricity at a cost of $55 per megawatt-hour ($55/MWh), but quickly rose to $58/MWh. NuScale estimated a cost of $65/MWh.

Cost estimates by major utilities like PacifiCorp and Idaho Power came in much differently still: $95/ MWh and $121/MWh respectively. Had the plant actually been built, there is no telling how high the final cost of power would've risen.

For reference, Lazard, an independent expert on energy costs estimates that the $36 billion Vogtel plant in Georgia costs $190/MWh to operate.

By comparison, the cost of energy from wind generation is presently in the $27-$73/MWh range, and utility-scale solar is between $29-$92/MWh, according to Lazard.

The track record for nuclear power development in the last few decades is bleak. A global study found that 97% of nuclear projects have ended with final costs exceeding initial budgets, with an average cost overrun of $1.3 billion. Two-thirds of all projects took more time than projected.

In the 1980s, American utilities lost $100 billion on nuclear plants that were never finished. More than 100 nuclear reactors have been cancelled in the U.S., nearly half of which had already begun construction. There is little reason to believe the new nuclear plant design will meet a different fate.

DOLLAR FOR DOLLAR, WIND AND SOLAR BEAT NUCLEAR POWER

NUCLEAR WASTE

Nuclear power makes up 18.6% of US energy production, but the U.S. does not have infrastructure for safe waste disposal. Many European countries reliant on nuclear power have invested billions in the infrastructure necessary to safely dispose of radioactive waste. To date, Finland hosts the only long-term storage facility in Europe at a price tag of $3.4 billion.

The U.S. government has been searching for a long-term disposal solution since the Reagan Administration. The Department of Energy considered nine possible permanent storage sites for nuclear waste before Congress directed it to only study Yucca Mountain, Nevada, abandoning the others for political reasons. After spending $15 billion on a disposal facility at Yucca Mountain, the site was abandoned in 2010 due to its geological unsuitability and strong political opposition. Today, the U.S. is no closer to a long-term storage solution.

SMRs generate power in a similar manner as traditional nuclear generators, creating the same amount of radioactive waste per unit of energy generated and posing the same challenges with safe waste storage. Nuclear waste can remain dangerously radioactive for hundreds of years to hundreds of thousands of years. Finland's storage site is designed for 100,000 years of storage.

"HIGH-LEVEL WASTES ARE HAZARDOUS BECAUSE THEY PRODUCE FATAL RADIATION DOSES DURING SHORT PERIODS OF DIRECT EXPOSURE.... IF ISOTOPES FROM THESE HIGH-LEVEL WASTES GET INTO GROUNDWATER OR RIVERS, THEY MAY ENTER FOOD CHAINS."

NUCLEAR REGULATORY COMMISSION

FUKUSHIMA-DAIICHI NUCLEAR POWER PLANT ON MARCH 11, 2011

JUSTICE ISSUES

Indigenous communities worldwide have disproportionately borne the brunt of uranium mining and radioactive contamination to supply the nuclear fuel cycle. It's estimated that more than 70% of known uranium deposits are on Indigenous land, but Indigenous Peoples are rarely involved in planning or profiting from the mines and instead must suffer from ongoing contamination.

For example, the vast majority of the 520 abandoned uranium mines on Navajo Nation lands have not been remediated. Uranium mines across Australia have similar legacies, with decades of activism from the Mirarr people against the Ranger and Jabiluka mine sites in Kakadu National Park. In 36 years, the Ranger mine has produced over 125,000 tons of uranium and experienced more than 200 accidents.

Ongoing nuclear plants near Indigenous populations also have a bad track record. Hanford Nuclear Site in Washington state caused dramatic increases in cancer rates among Indigenous peoples. Radioactive gases and fluids released between 1944 and 1977 directly affected fish and wildlife. Eight out of nine reactors at the facility were water-cooled from the Columbia River, affecting the fish that provide food and economic subsistence. Indigenous Peoples should be consulted and their concerns addressed prior to siting any nuclear facility nearby.

Unfortunately, today's international fervor around nuclear energy has driven up the price of uranium. From $30 a pound in 2021, the material's price has risen to over $100 in 2024, a 16-year high. This has driven renewed interest in uranium mining at sites new and old, including one mine's re-opening adjacent to Navajo land near the Grand Canyon that is strongly opposed by the Navajo Nation.

SALT LAKE TRIBUNE, 2017

A PERSISTENT INTEREST

Still, the U.S. and other world governments are committed to a "nuclear renaissance," and private companies are following suit. After the collapse of its flagship Utah project, NuScale now pursues an SMR project in Romania, projects for data centers in Ohio and Pennsylvania, and a "marine-based" SMR plant. Meanwhile, Bill Gates-backed TerraPower moves forward with a plant in Kemmerer, Wyoming.

Now, OpenAI's Sam Altman's Oklo is following in Nuscale's footsteps with plans to build an SMR at the Idaho National Lab near Idaho Falls. However, NuScale remains the only company with an SMR design that has been licensed by the Nuclear Regulatory Commission, one of the first steps any company must take in the long process of receiving approval for development of a project.

With the tremendous money being infused by the federal government in the nuclear industry, it's no wonder so many are championing this untested technology – and not all are above board. In a recent scandal involving over $60 million in bribes to secure a $1.3 billion ratepayer bailout for two nuclear plants in Ohio, the former Ohio House Speaker and former chair of Ohio's utility regulatory commission were each sentenced to 20 years in prison. Also facing charges for the scandal are former FirstEnergy executives who orchestrated the scandal.

THE CONNECTION

BETWEEN NUCLEAR ENERGY AND NUCLEAR WEAPONS

There's another layer to this renaissance of interest in nuclear energy, and that's the inseparable nature between nuclear energy and nuclear weapons development. The US Atomic Energy Commission was established in 1946 to soften the image of the nuclear bomb after World War II. This agency simultaneously promoted "peaceful" nuclear energy development while housing the US nuclear weapons program. The commission was folded into the Department of Energy (DOE) when it was established in 1977.

To this day, DOE manages both US nuclear energy programs and U.S. nuclear weapons programs, with about two-thirds of the agency's funding split between the two. Nuclear energy and nuclear weapons are inseparable due to the employment of very similar processes to develop enriched uranium fuel for each process. This connection likely drives the international governmental push for more nuclear energy despite its tremendous drawbacks.

THE BOTTOM LINE

If nuclear power could do as proponents suggest, producing cheap, abundant, safe, carbon-free energy, then MEIC would consider supporting it. However, given the outstanding issues of safe waste disposal, and the social justice implications of uranium mining – often on or adjacent to tribal lands – nuclear energy in its current form is a non-starter.

Cost, safety, waste disposal, social justice, and permitting and development timeframe lead to hefty skepticism on whether nuclear power will be the solution to the climate crisis that we so readily need.

FREQUENTLY ASKED QUESTIONS

Hasn't the military been using nuclear to generate energy for ages?

While the U.S. Navy uses nuclear reactors in some of its ships, this technology isn't large enough for utility-scale applications and is much too expensive for ratepayers to foot the bill. A well-funded military can justify this expense given the niche application of powering remote ships for months on end, but the average American family with access to much cheaper energy alternatives cannot make the same justification in its monthly utility bills.

What about nuclear fusion?

As opposed to fission, where energy is released from heavy radioactive atoms splitting apart in a chain reaction (the process harnessed in nuclear bombs), nuclear fusion is constantly underway in the Sun: Lighter atoms combine to form heavier elements, releasing energy in the process. While fusion is a great energy source in theory, it is exceptionally difficult to recreate the conditions from the Sun's core here on Earth's surface. After over fifty years of extensive scientific research, successful fusion "ignition" (more energy released than input in a reaction) was only recently achieved in December 2022 under stringent lab conditions and for only a tenth of a billionth of a second. Advancing nuclear fusion to the point that electricity can be generated, and at utility scale, is still decades away at the earliest. On the timescale necessary to mitigate the worst effects of climate change, fusion will not rise to the occasion. It remains to be seen if this technology will overcome the costly hurdles that have plagued traditional nuclear energy.

How can we transition away from coal and gas to clean energy without nuclear?

Nuclear power is not necessary for a reliable clean energy future. Renewable solar and wind energy, paired with storage technologies as part of an advanced electric grid, can reliably meet energy demand at all times of the day and in all conditions. However, what is needed is a buildout of our transmission system for an electric grid that is bigger than the weather, balancing electricity supply and demand through demand side management and efficiency programs.

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