

SIERRA CLUB NUCLEAR FREE CAMPAIGN



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"We envision an energy efficient world, powered by clean, renewable technologies, free from dirty, dangerous, costly nuclear power and its legacy of toxic waste".

We are in opposition to all aspects of the nuclear fuel chain from the environmental justice tragedy of uranium mining and reprocessing to the relicensing of old nuclear plants, and the public subsidies involved in the construction of new plants. We want safe secure transport and storage of radioactive waste. Most of all we want to the United States to stop generating nuclear power, weapons and the unavoidable radioactive waste that is the result of the fuel chain.

We are convinced that renewables and energy efficiency are the future of energy generation in this country. We support diverting the billions of dollars budgeted for nuclear projects to research, to create energy efficiency in industry and to develop storage capacity for renewables.

We are concerned after the nuclear disaster in Fukushima that we have reactors with similar designs on-line in the United States. Many of these reactors are located in seismic and flood zones that provide additional risk of disasters to people and the environment. We need to work to provide replacements for the power generated by these plants in order to protect our families and our economies.

NO NEW NUKES - TROUBLE IN PARADISE

Why Are We Building New Ones When There Is So Much Trouble With The Old Ones ?

New Nuclear Plants

- The proposed plants are not needed
- We have sufficient power now. Efficiency is already coming on board (as much as 40%), buying enough time to allow renewable energy to provide new source replacement.
- Extremely expensive nuclear energy would rob financial resources from clean energy efforts

Bad Economics

Wall Street doesn't want this risk. Why should we?

- Costs are paid by tax payers and rate payers through Loan Guarantees and CWIP (Construction Work in Progress) leaving little

fiduciary responsibility and accountability for the energy company

- Taxpayers on the hook if something goes wrong
- More expensive energy than other energy sources
- Uncontrollable costs including design issues, maintenance problems, waste disposal and cleanup have caused nukes to run over budget.

Waste Confidence

A recent court ruling overturned the Nuclear Regulatory Commission's (NRC) long-standing yet unsubstantiated Waste Confidence Decision, which claimed that the high level radioactive waste problem would be solved. Now, the NRC cannot license new nukes until it establishes a defensible policy, so it has frozen new licensing and renewals.

- No New Nukes should be built without a viable radioactive waste solution
- The current radioactive waste stream is already unmanageable and dangerous
- No sense creating new waste when there is no solution for the old waste which is piling up dangerously. Pools are overfull, creating a dangerous hazard.
- Cleanup for old plants has not even been properly addressed

Dangerous & Untested New Models

Experimenting with new reactor models doesn't lead to a secure energy future.

- Major catastrophic accidents at 3 Mile Island and Chernobyl occurred when they were new plants
- New Designs (API000) are unproven technology that have never been built. Fukushima design concerns are not addressed.



RETIRE OLD NUKES



Why are we risking our own Fukushima with outdated power plants that continue to create radioactive waste?

Sierra Club

The Sierra Club is focused on changing our energy sources to go beyond coal, natural gas and oil. Phasing out nuclear power plants is the next phase in this campaign. Our stand is that nuclear power is not clean power. We propose that nuclear power plants can be replaced by energy efficiency and renewables within our lifetimes. We propose that the U.S. follow in the steps of Germany, Italy and Switzerland by phasing out our nuclear reactors.

Vintage isn't Cheap

Many of the U.S. plants were constructed at least forty years ago. Their equipment is often old and in need of expensive overhauls. Crucial parts like boilers need to be replaced. This aging inventory is not only expensive to maintain but if you consider equipment fatigue, there are high risks of emergency events that endanger workers and neighboring communities.

Risky Design

There are 23 plants in the US that have the same containment design as the Fukushima plants. This brings up the question as to whether nearby communities are in jeopardy for disaster when the design fails again. Experts report that plants are being operated beyond the capability of their original design. Should we continue to take a chance?

Bad Siting

The location of nuclear power plants became an issue after Fukushima. We need to examine how many of our plants are located in a seismic zone, in a flood plain or on a coast. Poorly sited energy plants put large populations of people at risk.

Environmental Disaster

The fuel for nuclear power plants contaminates the environment before it reaches its destination. After being used in a nuclear reactor, the fuel becomes highly radioactive. There is no definitive answer to safely storing the radioactive waste. The Sierra Club supports waste stored in place in hardened casks. The club advocates not creating any more waste.

Economic Nightmare

To quote Senator Bernie Sanders of Vermont, "R&D and Price-Anderson insurance are still just the tip of the iceberg. From

tax breaks for uranium mining and loan guarantees for uranium enrichment to special depreciation benefits and lucrative federal tax breaks for every kilowatt hour from new plants, nuclear is heavily subsidised at every phase. The industry also bilks taxpayers when plants close down with tax breaks for decommissioning plants. Further, it is estimated that the cost to taxpayers for the disposal of radioactive nuclear waste could be as much as \$100 bn" Sanders, B. and Alexander, R. (2012).

Price-Anderson stems from the 1950's. This law lets nuclear power operators off the hook from paying the high insurance premiums that would be justified by the risks of operating a nuclear plant. What this means is that, if there is a Fukushima type event, the U.S. taxpayers will be the ones writing the checks.

THE "FRONT END" OF NUCLEAR POWER

Why is nuclear not the answer for climate change?

When the nuclear industry talks about nuclear power, they don't tell you about what goes on at the "front end"—that is, how a nuclear power plant gets its fuel. **Front-end industries are not only dangerous and expensive, but they also irreversibly pollute our lands and endanger public health and workers.** Mining, milling, enrichment and fuel manufacturing consume large quantities of fossil fuel energy, making nuclear power anything but "green".



Uranium Mining

Uranium occurs naturally in the ground, but when it is mined and exposed to air and water, radioactivity is released into the environment. In the United States, large-scale mining takes place chiefly in the West, where it heavily impacts Native American, Latino and low-income communities. Open-pit mines scar the land, while in-situ mines pollute aquifers and put communities' water supplies at risk. Mining accidents, loss of traditional lands, declining property values and public health concerns plague mining and milling communities.

Uranium Ore Milling

After uranium ore is mined, the milling process treats the ore to extract uranium from the rock. Over 99% of the rock is left over from this process, in the form of a toxic sludge referred to as tailings. Tailings are radioactive for 800,000 years and contain 85% of the ore's original radioactivity — plus other rock substances such as heavy metals and arsenic — along with the processing chemicals. Over the past 70 years, most uranium tailings were dumped into large, unlined piles. Cleanup and maintenance of tailing piles is costing taxpayers billions.

Uranium Enrichment

Enrichment is a technically complicated and energy-guzzling process that involves converting uranium to uranium hexafluoride and then “enriching” or increasing the amount of fissionable uranium-235 in the product. Taxpayers heavily subsidize enrichment for nuclear power plants, and totally subsidize enrichment for nuclear weapons. Enrichment plant waste is known as “depleted” uranium (DU), which has been used in armor-piercing shells and bunker-buster bombs.

Additional Front-End Processes

Fuel fabrication consists of forming enriched uranium into pellets, placing the pellets into fuel rods and putting the rods into assemblies. Special plants are built for de-conversion of chemically-reactive DU hexafluoride waste back to uranium oxide. Some commercial nuclear fuel manufacturers down blend highly-enriched uranium from dismantled nuclear weapons.

Mixtures of radioactive and chemical pollutants have so contaminated many front-end operations that some have become Superfund sites and others have been declared public health hazards by federal health agencies.

HIGH LEVEL WASTE

Why do we continue to make deadly waste?

In the United States, High Level Radioactive Waste, or HLW, is mainly defined as the irradiated, or spent, nuclear fuel that comes out of a reactor. The irradiated fuel is the number one source of HLW and must be remotely handled very carefully, as a single rod can give a lethal dose in a few seconds.

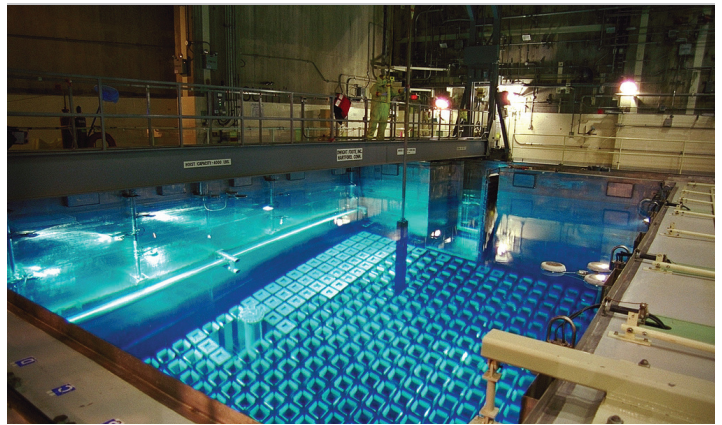
Every year, each of the 104 U.S. reactors produces 25-30 tons of irradiated fuel. As the uranium fuel undergoes the fission process, atoms are split, heat is released, and new radioactive atoms are created. When the fission process slows down, the fuel is “spent”, or “irradiated” and must be removed.

Reactors Shut Down

Reactors are shut down periodically to allow for removal of the irradiated fuel, and for new fuel to be loaded. When the irradiated fuel is removed, it is loaded into a pool of water, to cool thermally and allow some of the dangerous radioactivity to decay. The water in the pool contains a large amount of dissolved boric acid which is a heavy absorber of neutrons; this assures that the fuel assemblies in the pool will not go critical and begin the fission process again. It is critical that the water levels remain consistent to avoid a serious accident and release of radiation. The fuel remains in the pool at least 5-7 years.

Interim Storage

Once the fuel has cooled in the pools for 5 years, it can be removed and placed in casks, called “dry cask storage”. These casks can be arranged in bunkers and stored relatively safely for the short term. Most of the nation’s operating reactors are using dry cask storage as a way to manage the high level waste.



Irradiated fuel is stored in pools, in buildings with minimum containment. The pools require active maintenance and control. Loss of coolant accidents would release huge amounts of radiation.

Permanent Storage

The real question is what to do with this waste permanently. Originally the expectation was that several permanent geologic repositories would be located and built. In 1987, the Congress designated Yucca Mountain, Nevada, as the final and only National Nuclear Waste Repository. Due to serious technical difficulties as well as environmental, environmental justice and political problems, the site has not been licensed, and is not likely to be licensed. The current 2012 national inventory of 70,000 tons of irradiated fuel has nowhere to go and no permanent solution.

Sierra Club Policy

The Sierra Club opposes consolidating waste at any central “interim” storage site due to concerns about transport, cost, and the temptation it poses to promoters of reprocessing (which Sierra Club also opposes), and advocates instead that waste be kept at the reactors sites in Hardened On Site Storage, (HOSS) a more robust, secure and long lasting form of dry cask storage.

Sierrans around the country opposed Yucca Mountain because it was poorly sited. It could well be at least a century before enough repository space is ready to receive these casks. And if we continue to make waste at the current rate, or more if we build new reactors, several repositories will need to be built. The costs continue to mount, along with questions about the ethics of leaving deadly waste for generations millions of years from now.

Surely there are better, cheaper, safer ways to boil water that do not leave this toxic legacy for the world of the future.

– Arjun Makhijani

“LOW LEVEL” WASTE

Why is any radioactive waste considered “low-level”?

“Low-Level” Radioactive Waste

Despite the low misleading description, “low-level” radioactive waste is not low risk. It includes the same radioactive elements and isotopes (radionuclides) as high level waste – including the irradiated fuel rods in the core of nuclear power and weapons reactors. In fact, the same Plutonium atom that is “high level” waste if it is in a fuel rod becomes so-called “low level” waste when it leaks out through cracks or tiny holes in the cladding of the rods into the cooling water. The whole nuclear reactor itself, except the fuel rods, becomes so-called “low-level” radioactive waste.

Deadly Waste

Filters and resins used to remove radioactive materials from nuclear power reactor cooling water can become so heavily loaded that they can kill a person if exposed for just 20 minutes without shielding. If the Plutonium atom makes it past the filters and resins that are supposed to clean the cooling water, it becomes a “routine release” to the river, lake or ocean. The legal not “safe” levels are based on nuclear industry needs, not on protecting humans or other species.

Radioactive Waste in the Food Chain

Some radioactivity comes from splitting of the uranium atoms when they release their binding energy to turn the turbines and make electricity. These get into the food chain and the body and irradiate from within (example: Cesium-137 concentrates in muscle, Strontium-90 concentrates in bone and teeth displacing calcium, Iodine-129 concentrates in the thyroid). Very heavy radioactive elements like Plutonium, Neptunium and Americium are incredibly long-lasting and especially dangerous if inhaled or ingested because they emit alpha particles which are 10 to 20 times or more dangerous than gamma rays when lodged in the body. Once they escape from the fuel rods, they become “low-level.” Other “low-level” waste comes from activation by neutrons hitting nonradioactive materials and making them radioactive.

There is no safe level of exposure and there is no dose of radiation so low that the risk of a malignancy is zero.

– Dr. Karl Z. Morgan, dubbed the father of Health Physics

Radioactive Consumer Products

DOE makes all our nuclear bombs. In 2000, it banned metal from radiation areas going to commercial recycling (to make everyday

household and personal items), but in 2012 DOE is reversing the bans to make it cheaper to “clean up” the weapons complex. Sierra Club of Canada, in coalition with numerous organizations in both US and Canada, has taken a leading role in preventing radioactive metal steam generators from the Bruce nuclear reactors being shipped through the Great Lakes, across the Atlantic, to Sweden to be melted and released into the international metal supply. The consequences of this made the news when they found radioactive tissue containers found at a national home goods realtor. What is next? Children’s toys?

Sierra Club Action

In the 1980s, the Sierra Club adopted its “low-level” radioactive waste policy, calling for a redefinition of the term to exclude anything radioactively hazardous longer than the 100 year “institutional control period” required by the Nuclear Regulatory Commission (10CFR 61.59) for disposal sites.

“Low Level” Dumps

After hundreds of millions of dollars were spent searching for new waste disposal sites in 18 states over 3 decades, no new dump has opened — until April 2012 in Andrews County, West Texas. Sierra Club continues to challenge this troubled dumpsite.



Kick and roll burial technique: This may not be done anymore — barrels are now stacked in the ditches and no more cardboard boxes-- but the long-lasting waste from decades ago buried this way is still radioactively hazardous and could be leaking today.

The Sierra Club Nuclear Free Campaign is an offshoot of the Sierra Club Activist Network. Volunteers from the United States and Canada are working together to make a difference on these issues. We are interacting on the Activist Network through the No Nukes Activist Team, conference calls on specific issues, national action alerts, our act-net list serve, regional and national meetings.

If you face threats in your back yard or just want to make North America Nuclear Free, sign up for the campaign today at: http://sc.org/no_nukes

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