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Nuclear Energy: Pros and Cons

By [Presidio Buzz](#) | February 23rd, 2009 [93 Comments](#)

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There is no perfect energy source. Each and every one has its own advantages and compromises. This series will explore the **pros and cons of various energy sources**. Learn about other forms of **energy generation here**.

Nuclear power is once again considered a prominent alternative, despite the disregard it was met with in the 1970s. This is because it's now being touted as a more environmentally beneficial solution since it emits far fewer greenhouse gases during electricity generation than coal or other traditional power plants.



It is widely accepted as a somewhat dangerous, potentially problematic, but manageable source of generating electricity. Radiation isn't easily dealt with, especially in nuclear waste and maintenance materials, and expensive solutions are needed to contain, control, and shield both people and the environment from its harm.

The dialogue about using nuclear power – and expanding it – centers on weighing these risks against the rewards, as well as the risks inherent in other forms of power generation. These are just some of the issues involved.

An excerpt from [Design is the Problem](#), by [Nathan Shedroff](#), published by Rosenfeld Media

PROS

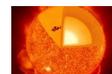
- Lower carbon dioxide (and other greenhouse gases) released into the atmosphere in power generation.
- Low operating costs (relatively).
- Known, developed technology "ready" for market.
- Large power-generating capacity able to meet industrial and city needs (as opposed to low-power technologies like solar that might meet only local, residential, or office needs but cannot generate power for heavy manufacturing).
- Existing and future nuclear waste can be reduced through waste recycling and reprocessing, similar to Japan and the EU (at added cost).

CONS

- High construction costs due to complex radiation containment systems and procedures.
- High subsidies needed for construction and operation, as well as loan guarantees.
- Subsidies and investment could be spent on other solutions (such as renewable energy systems).
- High-known risks in an accident.
- Unknown risks.
- Long construction time.
- Targeted for terrorism (as are all centralized power generation sources).
- Waivers are required to limit liability of companies in the event of an accident. (This means that either

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Solar Photovoltaics: Pros and Cons

no one will be responsible for physical, environmental, or health damages in the case of an accident or leakage over time from waste storage, or that the government will ultimately have to cover the cost of any damages.)

- Nuclear is a centralized power source requiring large infrastructure, investment, and coordination where decentralized sources (including solar and wind) can be more efficient, less costly, and more resilient.
- Uranium sources are just as finite as other fuel sources, such as coal, natural gas, etc., and are expensive to mine, refine, and transport, and produce considerable environmental waste (including greenhouse gasses) during all of these processes.
- The majority of known uranium around the world lies under land controlled by tribes or indigenous peoples who don't support it being mined from the earth.
- The legacy of environmental contamination and health costs for miners and mines has been catastrophic.
- Waste lasts 200 – 500 thousand years.
- There are no operating long-term waste storage sites in the U.S. One is in development, but its capacity is already oversubscribed. Yucca Mountain is in danger of contaminating ground water to a large water basin, affecting millions of people. It's difficult, if not impossible, for the U.S. to impose its will on the state of Nevada (or other places) if they don't want to host long-term storage of waste.
- There are no operating "next generation" reactors, such as high-temperature breeder reactors and particle-beam activated reactors, that are reported to produce less waste and have reduced safety concerns. Even if these technologies were ready, they wouldn't be deployable commercially for another two decades.
- Shipping nuclear waste internationally poses an increased potential threat to interception to terrorism (though this has not happened yet with any of the waste shipped by other countries). Increasing the amount of waste shipped, particularly in less secure countries, is seen as a significant increase in risk to nuclear terrorism.

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Nathan Shedroff graduated from [Presidio](#) in 2006 and currently runs the first [Design MBA](#) program at California College of the Arts

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scott • 3 years ago

Thanks you for this valuable bit of information, it really helps us students.

13 □ ▾ □ ▾ • Reply • Share ›

@mi • 3 years ago

i think we just too lazy to replace everything with solar stuff. we have the technology to do it.

12 □ ▾ □ ▾ • Reply • Share ›

bpb > @mi • a year ago

if we replaced everything with "solar stuff" we would have the entire earth covered with solar panels!!!!!!!!!!!!!!!!!!!!!!!!!!!!

13 □ ▾ 2 □ ▾ • Reply • Share ›

Dude > bpb • a year ago

I would laugh (not really) if the world becomes completely dark and all those solar panels are not going to work.

7 □ ▾ 1 □ ▾ • Reply • Share ›

Meh > bpb • 8 months ago

that would look cool

3 · 2 · Reply · Share ›

Hugu > Meh · 3 months ago

Half the time it's cloudy anyways. . .

4 · Reply · Share ›

Albonia · 9 months ago

The author is obviously anti-nuclear and obviously favors renewable energy. In my opinion, this is a heavily biased article that I can punch so many holes in.

"Known developed technology ready for market." It's been ready for over 60 years. Get with the times.

"Subsidies and investment could be spent on other solutions (such as renewable energy systems)." Guess what? The vice versa can be said with renewable energy! The stuff could be spent on nuclear energy instead of renewable energy! Again, obvious opinionated article.

"High-known risks in an accident." The risk of a meltdown, even a partial one, is extremely low. If you've ever researched the safety features that are included in a reactor, you would know how low the probability is. Sure we know about Chernobyl, Fukushima, TMI, but guess what? The extensive coverage of such accidents was distorted heavily by the mass media and distorted even further by the ignorant population that believed them. You would not believe how anti-nuclear the media is. Especially ABC.

"Target for terrorism (as are all centralized power generation sources)." This is blatantly false. Not only has a terrorist never attempted to blow up a nuclear power plant, there is, a) no

15 · 1 · Reply · Share ›

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lololaahaha > Albonia · 5 months ago

I agree with your terrorist thing, but your reasons are horrible. And get a life. and a also aren't you a bit biased yourself?

3 · Reply · Share ›

Lorraine · 4 years ago

What about the CO2 emissions created during the build of a a nuclear plant? That needs to be allowed for (in comparison to other energy souces) and added to the list of cons

7 · Reply · Share ›

Sunrise84 > Lorraine · 3 years ago

Nuclear produces near-zero greenhouse gas. Search: "Carbon Footprint of Electricity Generation"

Note to all: Stop passing on the old stories and rumors - use only authorative sources like the above. It's important to be able to know when a source is authoratative or not.

Richard

8 · Reply · Share ›

LTJX > Lorraine · 9 months ago

This is a really tiresome line of argument against nuclear power. What about all the CO2 emissions created by the manufacturing and assembling of wind farms or solar energy installations? All of the very heavy wind energy components must first be manufactured from metals, plastics and other substances which themselves must be mined, refined and transported in multiple steps. Not only the equipment, but also the employees, managers, contractors, etc must all have transportation out to remote sites and back home each day.

So from a CO2 perspective, exactly how is the building of a nuclear plant all that different from the building of any number of renewable energy plants - or any other modern structure for that matter? It's not that different. Therefore this becomes yet another in a long line of poorly thought out (and mostly emotional) objections to nuclear power.

Actually, the best form of nuclear power may be Liquid Fluoride Thorium Reactors (LFTR's) which can dramatically lower the risks of nuclear power, and which are much more efficient in using a Thorium/Uranium233 fuel cycle to produce energy (compared to use of a fuel cycle based on Uranium235/Plutonium, as found in existing nuclear plants). Also, Thorium is believed to be about 4 times more plentiful in the earth's crust than is Uranium. Not only do Thorium LFTR plants produce just a small fraction of the nuclear waste produced by current plants, they can also consume much of our existing nuclear waste stockpiles by adding certain amounts of this waste directly into the liquid Thorium/Molten Salt core of an operating LFTR plant. In this way LFTR designs can actually consume the still substantial heat of nuclear waste to generate useful electrical power from this formerly unwanted and greatly feared by-product.

7   · Reply · Share ›

LTJXXX > LTJX · 5 months ago

I'm pretty sure that nobody wants to read a page long article about what you think. And you have no life if you spend your free time making giant responses to random articles.

3   · Reply · Share ›

andy > LTJX · 20 days ago

It has lots of cons to it doesnt it. I no

0   · Reply · Share ›

Kinkfixer > Lorraine · a year ago

CO2 actually helps trees it does not hurt the enviornment

Q:what do we expell every time we breathe out

A:CO2 (this has been happening since Adam and Eve people(this is not new info)

GO Jesus!

9   3  · Reply · Share ›

NoOneYouKnow > Kinkfixer · a year ago

But not in the high amounts we're releasing.

4   · Reply · Share ›

□ □

Kinkmaker > Kinkfixer · 5 months ago

Dude, are you saying Adam and Eve are real? Who created God, btw?
Oh, yeah, he created himself. Because he was already created when he created himself.
Makes lots of sense.
Jesus, why did you do that??? = Jeezez, why did you do that???
=> Jesus is not real

3 □ □ □ · Reply · Share ›

Jan Angevine > Kinkfixer · a year ago

Nothing is toxic until there is too much of it. I suppose you could have a nip or arsenic and be fine, but a dab of it will kill you. That's the issue. We are producing too much CO2.

1 □ □ □ · Reply · Share ›

asdfa > Lorraine · 5 months ago

Your so dumb, nothing is fricking emitted when it is getting built

2 □ □ □ · Reply · Share ›

KleP · 4 years ago

what other type of energy will be able to fully relieve the need for fossil fuels? Wind? Solar? Geothermal? I dont think so.

5 □ □ □ · Reply · Share ›

Tim > KleP · 3 years ago

Not only will nuclear power not fully relieve the need for fossil fuels, it won't relieve it AT ALL for very long. The amount of Uranium on the earth isn't NEARLY enough to sustain us for long enough to relieve the need of fossil fuels, we're talking no more than 80 years for the remaining Uranium to be mined and used. What do you think happens when the Uranium is used up? You guessed it! Right back to fossil fuels again. Nuclear power is not a solution. It's a dangerous, potentially deadly, TEMPORARY fix.

Also, for your information...Wind and solar power is becoming more feasible every year. The efficiency of the wind and solar power plants are getting higher every year and could potentially be used to relieve our need for fossil fuels, at least more than nuclear power could. Geothermal energy is also usable as a reasonably permanent renewable resource. The plants are extremely expensive to make, but in time they will pay for themselves, since there are no known drawbacks of using geothermal energy yet.

You really should get your facts straight before posting something like that.

7 □ □ □ · Reply · Share ›

matt > Tim · 3 years ago

you need to think ahead rather than right now. do you realize how long 80 years is? look at how much technology has expanded in the last 30-40 years and

imagine how much it will expand, especially in the field of energy where there is such high demand. nuclear energy cannot be seen as a permanent fix, but rather as a procrastination device while we develop better technology to use renewable energy resources. you are obviously too small minded to think that much. im not saying youre wrong im just saying youre stupid

11   * Reply * Share ›

bbp > matt · a year ago

why do all your comments include stupid?

11   * Reply * Share ›

peete > matt · 3 years ago

I believe that you both need to do more research before you start throwing out opinions and accusing each other of being stupid. Nuclear power is a very debatable source of energy. Having many pros, along with many cons. Your point of arguement is flawed though. According to my research, the amount of uranium on the earth, and the amount of uranium used in the reaction process would supply the United States with enough energy to run at its current rate for approximetly 2,000 years. That is an extremely long time, and in that amount of time, our technology could come so far as to not require fossil fuels or nuclear power plants. This could happen, or this could not, we will never know until the time comes. As we wait though, you should both do more research before you accuse others of being 'stupid' when you yourselves are the ones that are uneducated.

11   * Reply * Share ›

Bobby > matt · a year ago

shut up get out of here no one needs your negativity

9   * Reply * Share ›

Tim > matt · 3 years ago

Well, sure. 80 years is a long time for the CURRENT generation. But think two generations from now. The bottom line is that nuclear power is not a permanent fix and that it's not a procrastination device. Yes, we might come up with other sources of energy, but then...that would just prove my point, which was that NUCLEAR ENERGY IS NOT A SOLUTION TO OUR DEPENDENCY ON FOSSIL FUELS. But obviously, you're too small minded to see that. I'm not saying you're wrong. I'm just saying you're just as stupid as I am.

5   * Reply * Share ›

johnathon mcdaniel > matt · a year ago

what was said by me earlyer gose for the both of you. and if you are wondering it was just JOHNATHON. and I agree with tim it will not last and for your information wind and solar energy feilds are moving up in technology

2   * Reply * Share ›

johnathon > matt · a year ago

look he is not stupid but you are if yo think about it when you look at the disaster in japan or cherynobal you will see that if an accedent happens it could result in a lot of distruction and here in America we have so many nuclear reactors that if one melts down it could cause a chain reaction.

2   · Reply · Share ›

Seth > Tim · 3 years ago

Nuclear energy is NOT a god source for power due to supply of Uranium, cost for the plants to run, high risks of danger, radiation problems, extreme radiation releases in the atmosphere during accidents and the long time that it takes waste to lose radioactivity

6   · Reply · Share ›

gus > Seth · 3 years ago

1. For how long will nuclear power be available? Present reactors that use only the U-235 in natural uranium are very likely good for some hundreds of years. Bernard Cohen has shown that with breeder reactors, we can have plenty of energy for some billions of year.

Cohen's argument is based on using uranium from sea water. Other people have pointed out that there is more energy in the uranium impurity in coal than could come from burning the coal. There is also plenty of uranium in granite. None of these sources is likely to be used in the next thousand years, because there is plenty of much more cheaply extracted uranium in conventional uranium ores.

2   · Reply · Share ›

Fluffi > Seth · 3 years ago

your point is who cares nuclear energy is a good energy source for the time being it gives us something while we wait for something better

2   · Reply · Share ›

bpb > Tim · a year ago

Tim is right. Nuclear energy requires lots of uranium 235 and the amount we have may last us 40 to 80 years. ALSO nuclear power plants have a high possibility of being terrorists targets.

2   · Reply · Share ›

klep > Tim · 2 years ago

Well lets look at total power output here. wind and solar range from kW to barely into Mega-Watts. Nuclear power is capable of guess what, here it comes, Giga-Watts (10^9). And you said efficiencies are getting better with wind and solar. well i hate to break it to you but it isn't sunny enough every where or windy enough everywhere to reach full efficiency. Efficiency that doesn't even come close to that

of coal or nuclear. and its more like 100 years for the uranium fuel supply. And that would last longer if we reprocess the fuel. SO get your facts straight before you write something so moronic.

also don't forget about fusion. Last i heard thats 20 to 30 years away from being perfected. well within the "80" years you claim.

2   * Reply * Share ›

Kinkfixer > klep · a year ago

fusion is cool

3   * Reply * Share ›

Kj > klep · 11 months ago

learn how to be a better scientist

1   * Reply * Share ›

Kinkfixer > klep · a year ago

i agree (as opposed to low-power technologies like solar that might meet only local, residential, or office needs but cannot generate power for heavy manufacturing).

1   * Reply * Share ›

johnathon mcdaniel > klep · a year ago

and if memory serves correctly fusion is the prosses of which the sun produces energy do you really want there to be a melt down with that amount of energy and heat

0   * Reply * Share ›

johnathon mcdaniel > klep · a year ago

well yes that is true but as i said if there is a melt down it will have catostrophic casualty reports.

0   * Reply * Share ›

lovecook > klep · 2 years ago

<http://www.stanford.edu/group/...>

mark z jacobson

found this on ted, writing a paper on it, usefull information check it out

0   * Reply * Share ›

LTJX > Tim · 9 months ago

There may be longer term issues with uranium supplies, especially with any large

degree of growth in traditional nuclear plants. But as I suggested in my prior post to this thread, the real energy treasure is thorium, which has hardly been mined at all until now, and is believed to be at least 4 times more plentiful than uranium in



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