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Monitored this issue:

Our review of Michael Shellenberger's book *Apocalypse Never* has outgrown itself so we've split it into three parts:

Book review: Michael Shellenberger goes full Trump with reheated conspiracy theories

Author: Jim Green – Nuclear Monitor editor, national nuclear campaigner with Friends of the Earth Australia

Name a self-promoting American who peddles falsehoods[1], contradicts himself, misrepresents and attacks climate change science and scientists, and thinks that environmentalism is a dangerous, quasi-religious cult.

That's right, Michael Shellenberger, who first came to prominence with his 2004 'death of environmentalism' attack on the environment movement[2], and has kept himself in the spotlight by promoting nuclear power, demonizing renewable energy ("renewables are worse for the environment than fossil fuels"[3]) and demonizing the environment movement that he claims to be part of.

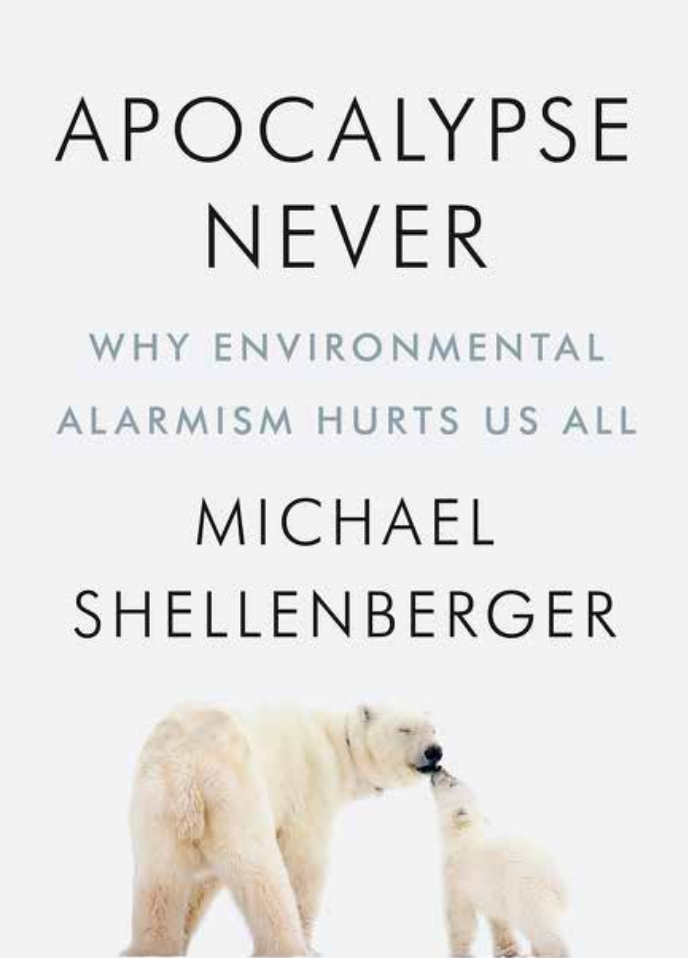
Shellenberger's latest round of self-promotion involves 'luke-warmism' – downplaying the risks associated with climate change and attacking environmentalists for climate 'alarmism'. That's the focus of his new book, *Apocalypse Never: Why Environmental Alarmism Hurts Us All*.[4] Shellenberger has been misrepresenting and attacking climate science since 2010 if not earlier[5] – so his luke-warmism is reheated, and there's certainly nothing new about his demonization of environmentalists.

Shellenberger's current efforts to misrepresent and attack climate science read like a PR campaign clumsily constructed by a fossil fuel company. In response to sea level rise 'alarmism', he reassures us that "Netherlands became rich, not poor while adapting to life below sea level".[6]

A number of factual rebuttals of Shellenberger's latest round of misinformation have been written, and more will follow.[7-11] *Climate Feedback* asked six scientists to review Shellenberger's lengthy opinion piece[6] which promotes his book.[12] They found its overall scientific credibility to be 'low' and most found it guilty of cherry-picking and misleading statements.

For example, Shellenberger's claim that "climate change is not making natural disasters worse" is inaccurate and contradicts numerous scientific studies linking climate change to temperature extremes, drought, precipitation patterns, and wildfires. His claims about species extinction are wrong, his claims about fires and their connection to climate change are misleading and contradict scientific studies[8], his claim that 100% renewables would require increasing the land used for energy from today's 0.5% to 50% is wildly inaccurate[12,13], and so on.

Daniel Swain from UCLA and the US National Center for Atmospheric Research said Shellenberger's article "presents a mix of out-of-context facts and outright falsehoods to reach conclusions that are, collectively, fundamentally misleading".[12] Jennifer Francis from the Woods Hole Research Center said that "many statements are half-truths or based on cherry-picked information" and "some are outright false."[12]



Right-wing, anti-environment supporters

Predictably, the right-wing, anti-environment media are amplifying Shellenberger's misinformation.[14,15] The Murdoch News Corp. press has been especially excited[15] – Shellenberger is "News Corps latest golden ''environmentalist' … pushing the Murdoch line against renewables" according to former Australian Prime Minister Kevin Rudd.[16]

Ketan Joshi joined the dots:[15]

"Shellenberger appeared three times on Sky News Australia, a News Corp outlet that relies heavily on major advertising dollars from several key fossil fuel companies and lobby groups; eg Hancock Prospecting and the federal and NSW Minerals Council. He wrote or featured in ten articles in The Australian, which regularly places full page advertisements from the coal lobby."

Climate science-denying organizations, including those with links to fossil fuel industries, are also falling over themselves to promote Shellenberger and his new book. You might think that Shellenberger would tailor his message to his far-right, anti-environment, science-denying audience. Surely the message they need to hear is that climate science denial is irresponsible and intellectually indefensible. But Shellenberger just trots out his usual lines: climate alarmism is rife; renewables are worse than fossil fuels; the environment movement comprises power-hungry, fossil-fuel funded ideologues; and nuclear power is a "problem" for environmentalists because its potential to deliver vast amounts of energy undermines their agenda "to take control of big sectors of the economy by being alarmist about climate change".[17]

Shellenberger sometimes walks back absurd claims if confronted. When asked in an interview to justify his assertion that climate change "is not making natural disasters worse"[6], he acknowledged that climate change is causing "more intense hurricanes, longer fire season, more heatwaves" but that adaptation has lessened their impacts.[18] When interviewed by sympathizers – i.e. anti-environment climate science deniers – Shellenberger doesn't walk back his falsehoods, but doubles down. "Climate needs to have its importance diminished", he told the Heartland Institute.[19] "The main function of the IPCC [Intergovernmental Panel on Climate Change] appears to be to terrify people. I don't know what else it does. … I'm not sure the organization needs to exist any more," he told his approving interviewers.

The fossil-fuel funded Heartland Institute promotes itself as "the world's most prominent think-tank promoting skepticism about man-made climate change."[20] Yet Shellenberger commended his Heartland interviewers for "sounding the alarm" about environmental alarmism. "Honestly, thank you guys for having been sounding the alarm on these issues for longer than I have," he said. "I'm sorry it took me so long to basically get into a position where I could tell the truth."[19]

The Shellenberger / Heartland Institute interview is mutual admiration from start to finish. The Institute's Donald Kendal said: "I shouldn't be speaking on behalf of the Heartland Institute, but I am pretty sure I can confidently say that we are in this mission with you and we would be glad to help in any way possible."[19]

Conspiracy theories, falsehoods, and pop-psychology

Tied to his growing affection for the anti-environment far-right is Shellenberger's willingness to subject environmentalists to bizarre, inaccurate attacks. Here's an example of a thin thread of evidence being blown out into a worldwide conspiracy theory. Friends of the Earth (FOE) US might (or might not) have received a donation in 1969 from an 'oilman' who supported a number of environmental groups and initiatives. Shellenberger leaps from one questionable factoid to a conspiracy theory directed at the entire environment movement, writing in *Apocalypse Never* that FOE "was pioneering the environmental movement's strategy of taking money from oil and gas investors and promoting renewables as a way to greenwash the closure of nuclear plants."

So the entire environment movement is a fossil fuel-funded conspiracy to shut down the competing nuclear power industry!

Shellenberger accuses FOE and Greenpeace of accepting donations "from fossil fuel … investors" and has ignored repeated requests to correct that falsehood.[1] He asserts that FOE is "fossil fuel-funded" and has ignored repeated requests to correct that falsehood. He asserts that donors and board members of FOE "are the ones who win the government contracts to build solar and wind farms, burn dirty "renewable" biomass, and import natural gas from the United States and Russia," and has ignored repeated requests to correct that falsehood. He asserts that FOE has hundreds of millions of dollars in its bank and stock accounts, and has ignored repeated requests to correct that falsehood. Shellenberger wrote in 2017 that "natural gas companies fund many of the anti-nuclear groups"[21] ... yet another falsehood.

Conspiracy theories, falsehoods, and lashings of pop-psychology: FOE's "agenda has never been to protect humankind but rather to punish us for our supposed transgressions "; FOE "oppose cheap and abundant energy" because of "Malthusian anti-humanism"; and FOE aims to keep "poor countries poor".[1]

Frenemies

Shellenberger's latest round of misinformation and self-promotion has attracted criticism even from some nuclear power advocates. Climate scientist Kerry Emanuel said he was "very concerned" about Shellenberger's opinion piece[6] and is reconsidering his position as an adviser to Shellenberger's lobby group Environmental Progress.[22] Emanuel said Shellenberger is "embracing disinformation" and that there is "plenty of evidence" that climate change is making natural disasters worse despite Shellenberger's claim to the contrary.

Climate scientist Tom Wigley said "some damage will be done" as Shellenberger's words "may be misrepresented by people who don't believe in human-caused global warming".[22]

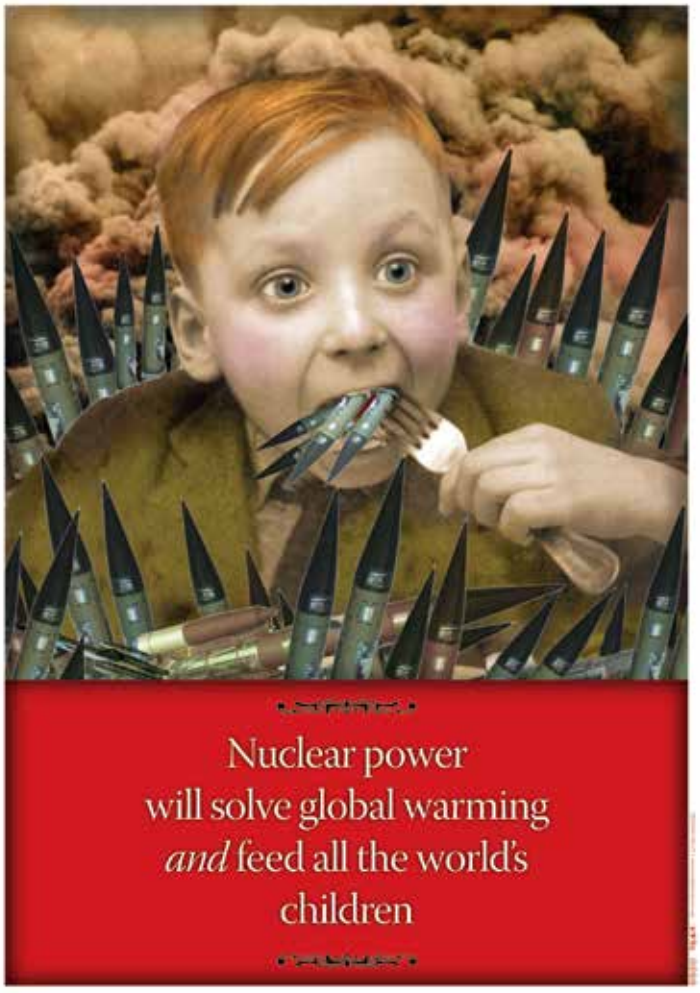
Zeke Hausfather from the Breakthrough Institute (which Shellenberger co-founded in 2007) said that Shellenberger's opinion piece includes a mix of "accurate, misleading, and patently false statements" and that "inaccurately downplaying real climate risks is deeply problematic and counterproductive".[12] Hausfather said the Breakthrough Institute and Shellenberger are "not on friendly terms" and Shellenberger "in no way reflects our views", partly because of disagreements "about the role of nuclear as a climate silver bullet vs. part of a broader portfolio of decarbonization technologies".[23]

Nuclear engineer Katie Mummah said: “Michael Shellenberger is not the only pro-nuclear environmentalist and many of us do not share his views on 1. whether or not climate change is a crisis 2. the value of renewables 3. how to communicate about nuclear energy 4. nuclear weapons.”[24]

James Hansen, a member of the advisory board of Environmental Progress, said: “Well-meaning souls, (including my friend Michael Shellenberger) rightfully concerned about the effect of “gloom-and-doom” talk on young people, say that everything is hunky-dory, climate change impacts are exaggerated (they often are) and climate change is not a serious threat (unfortunately, it is).”[25]

Explaining Shellenberger

Shellenberger has gone full Trump. His facts are alternative. His attacks on environmentalism and renewable energy are as bizarre as Trump’s. His self-promotion is Trumpian – his long opinion piece promoting *Apocalypse Never* was removed because it violated Forbes’ “editorial guidelines around self-promotion”.[22] His apology on behalf of the environment movement for climate alarmism betrays Trump-sized arrogance.[6] His promotion of nuclear weapons proliferation[26] and his downplaying of proliferation risks is “almost Trumpian in its incoherence” as one critic noted.[27]



The media are implicated in the conspiracy theories of both Trump and Shellenberger. “The activists and their media allies censor news articles. But eventually, the public will get to review the evidence and realize that the censors are wrong,” Shellenberger wrote in an opinion piece for the Murdoch press.[28]

Industry funding might – or might not – offer a partial explanation for Shellenberger. An internal Nuclear Energy Institute report in 2017 said that the Institute had “engaged” Shellenberger “to engage with media through interviews and op-eds”[29] The Institute later denied making any payments to Shellenberger but said that it had been a participant and registrant to meetings organized by Environmental Progress – presumably for a fee.[22] Desmog Blog notes that the largest donor to Shellenberger’s failed run for California Governor in 2018 was Frank Batten Jr., who has testified on behalf of The Landmark Foundation promoting nuclear energy projects.[30]

In *Apocalypse Never*, Shellenberger says his previous “heightened anxiety” about climate change reflected “underlying anxiety and unhappiness in my own life that had little to do with climate change or the state of the natural environment.” So perhaps there are psychological explanations for Shellenberger going full Trump?

A Trumpian inability to admit errors seems to be at play (leaving aside his faux apology for his previous climate ‘alarmism’). Australian economist Prof. John Quiggin writes:[31]

“Michael Shellenberger’s “apology essay” is the last gasp of “ecomodernism”. Although ecomodernists make a lot of claims, the only one that is distinctive is that nuclear power is the zero-carbon “baseload” energy source needed to replace coal, and that mainstream environmentalists have wrongly opposed it.

“Historically, there is something to this. It would have been better to keep on building nuclear plants in the 1980s and 1990s than to switch from oil to coal, and it was silly for Germany to shut down nuclear power before coal. But none of that is relevant anymore, at least in the developed world. Solar PV and wind, backed up storage are far cheaper than either nuclear or coal. As a result, there have been very few new coal or nuclear plants constructed in developed countries in recent years. …

“At this point, Shellenberger is faced with the choice between admitting that the mainstream environmentalists were right or explicitly going over to the other side. He has chosen the latter.”

Whatever the motives, Shellenberger’s recent behavior has been “cynical and disingenuous” but effective in gaining media attention according to scientist Ken Rice.[32] “If this wasn’t such a serious topic, it might even be quite funny,” Rice said.

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Shellenberger's nuclear nonsense: economics, waste, radiation, disasters

Author: Jim Green – Nuclear Monitor editor

Michael Shellenberger claims that his book *Apocalypse Never: Why Environmental Alarmism Hurts Us All*[1] is based on the 'best-available science'. But the book's many claims about nuclear issues are based on selective use of expert views, or attributed to anonymous 'experts' or even 'friends', or based on nothing at all.

Economics

"Nuclear has long been one of the cheapest ways to make electricity in the world," Shellenberger states in *Apocalypse Never*. In fact, it is now one of the most expensive. The latest Lazard report on levelized costs of energy shows that nuclear power is considerably more expensive than renewables:[2]

	US$ / MWh
Nuclear	118–192
Wind power	28–54
Solar PV utility scale	32–44
Solar thermal with storage	126–156
Geothermal	69–112

Renewables coupled with storage are cheaper than nuclear. Australia's Commonwealth Scientific and Industrial Research Organisation provides these estimates in a recent report[3] (with the Lazard figure included for comparison):

	Low and high estimates (2020) A$/MWh
Nuclear – SMR (CSIRO)	258–338
Nuclear – Lazard (US$118–192)	169–275
Wind + 2 hrs battery storage	84–107
Wind + 6 hrs pumped hydro storage	92–117
Solar PV + 2 hrs battery storage	88–133
Solar PV + 6 hrs pumped hydro storage	101–151

The "best-available science" refutes claims that nuclear power is expensive, Shellenberger claims in *Apocalypse Never*. If so, the best-available scientists need to update their best-available science to include the recent pattern of disastrous cost overruns. As the pro-nuclear Breakthrough Institute (which Shellenberger co-founded) noted: "Reactors under construction around the world, from Georgia and South Carolina to Britain and France, have struggled with crippling cost overruns and construction delays."[4]

In recent years, the Breakthrough Institute and other pro-nuclear lobby groups have bemoaned nuclear power's "rapidly accelerating crisis", a "crisis that threatens the death of nuclear energy in the West", "the crisis that the nuclear industry is presently facing in developed countries", and noted that "the industry is on life support in the United States and other developed economies".[5,6] Ted Nordhaus from the Breakthrough Institute wonders what if anything can be salvaged from "the ashes of today's dying industry".[7]

Bizarrely, Shellenberger gives a reasonable snapshot of the current status of nuclear power in *Apocalypse Never*, followed by this caveat: "While all of the above is technically accurate, I carefully excluded key facts in order to be misleading …"

Here's a sample of his technically accurate snapshot:[1]

"Every effort to make nuclear plants safer makes them more expensive, according to experts, and higher subsidies from governments are required to make them cost-effective. Those soaring subsidies, combined with the financial cost of accidents like Fukushima, estimated to be between 35 trillion yen and 81 trillion yen ($315 billion to $728 billion) by one private Japanese think tank, make nuclear one of the most expensive ways to generate electricity.

"Meanwhile, from Finland and France to Britain and the United States, nuclear plants are way behind schedule and far over budget. Two new nuclear reactors at Britain's Hinkley Point C were estimated to cost $26 billion but will now cost as much as $29 billion. Expansion of a nuclear plant near Augusta, Georgia, which was supposed to take four years and cost $14 billion for two new reactors, is now expected to take ten years and cost as much as $27.5 billion. All of this makes nuclear too slow and expensive to address climate change, many experts say.

"Nuclear has what energy experts call a "negative learning curve," meaning we get worse at building it the more we do it. Most technologies have a positive learning curve. Take solar panels and wind turbines, for instance. Their costs declined 75 percent and 25 percent, respectively, since 2011. The more we make of them, the better we get at it and the cheaper they become. …

"Today, the developed world is abandoning nuclear. Germany is almost done phasing it out. France has reduced nuclear from 80 percent to 71 percent of its electricity and is committed to reduce it to 50 percent. In the United States, nuclear could decline from 20 percent to 10 percent of its electricity by 2030. Belgium, Spain, South Korea, and Taiwan are all phasing out their nuclear plants."

Shellenberger persists with his belief that nuclear power is cheap and indulges in evidence-free streams of consciousness such as this in *Apocalypse Never:*

"Only nuclear, not solar and wind, can provide abundant, reliable, and inexpensive heat. Thus, only nuclear can affordably create the hydrogen gas and electricity that will provide services such as heating, cooking, and transportation, which are currently provided by fossil fuels. And only nuclear can accommodate the rising energy consumption that will be driven by the need for things like fertilizer production, fish farming, and factory farming – all of which are highly beneficial to both people and the natural environment."

Promoting his own work to prolong the lifespan of aging power reactors, Shellenberger writes in *Apocalypse Never*: "Few things make one feel more immortal than saving the life of a nuclear plant. Maybe that's because nuclear energy itself could be said to be immortal. One thousand years from now, future humans might still be producing nuclear power from the same locations they do so today."

But lobbying for subsidies to keep aging nuclear power plants operating is a tactic born in desperation. Shellenberger himself was desperate in 2017 following Westinghouse's bankruptcy filing: "I'm freaked out, honestly. If we were building nuclear plants, I wouldn't be so worried. But if nuclear is dying, I'm alarmed," he said.[8]

The Breakthrough Institute noted in a 2018 article that "moving from crisis to crisis, with mounting political and economic risk, is not a model for a sustainable industry" and bailouts such as that sought by FirstEnergy in the US amount to "policymakers and industry taking climate goals hostage to compensate for their failure to keep nuclear viable in the long run."[4]

FirstEnergy is now at the center of a corruption scandal concerning the nuclear bailout in Ohio, which gutted the state's renewables and energy efficiency laws while bailing out several coal and nuclear plants.[9] Shakiba Fadaie and M.V. Ramana wrote in the *Bulletin of the Atomic Scientists:*[10]

"The enormous lobbying effort that won the subsidies used dark money–backed organizations that spent millions of dollars to sway voters and politicians. But it didn't stop with the bill being signed into law – the lobbying also thwarted the ability of citizens to put the proposal to a democratic vote through a referendum, including by funding television advertisements that falsely claimed that China was "intertwining themselves financially in our energy infrastructure" and threatening "national security," implying that not going through with the nuclear bailout would somehow lead to Chinese control of Ohio's power grid. As confronting climate change gets in the way of corporate profits, such dirty battles are sure to emerge more often."

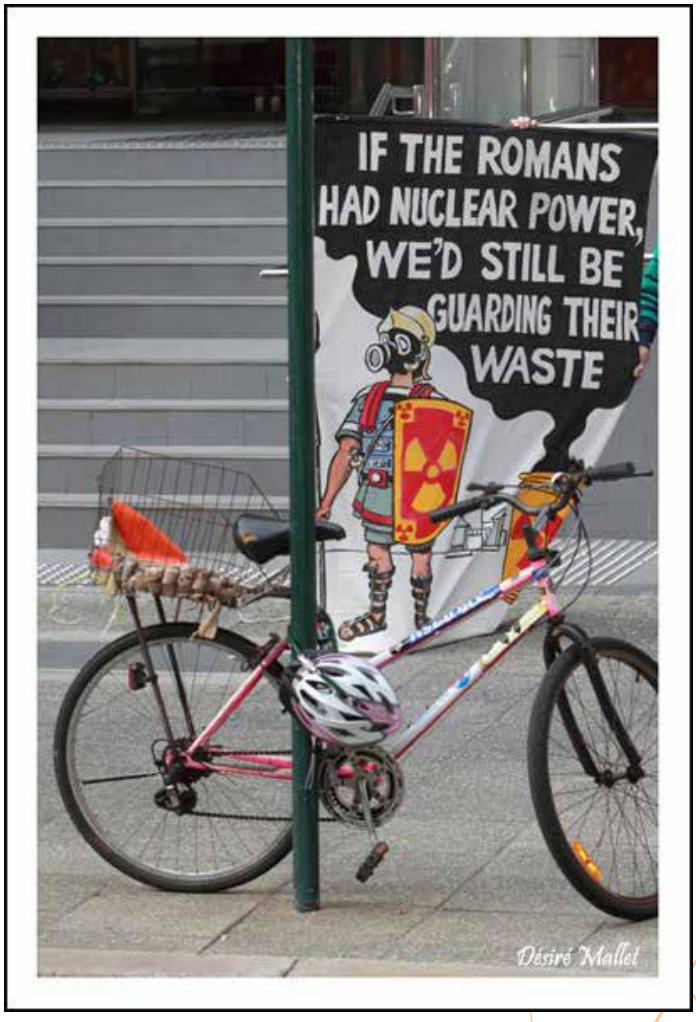
Lobbying for bailouts to keep aging reactors operating is a desperate tactic to save an industry with near-zero growth prospects. The number of reactor construction starts is nothing more than a trickle (an annual average of 4.3 from 2014–19), the global reactor fleet is aging and the average age has passed 30. The International Atomic Energy Agency (IAEA) anticipates the closure of more than one-third of current global nuclear power capacity from 2018–2030 and the closure of 82% of nuclear capacity from 2018–2050.[11] The nuclear / renewables comparison could hardly be more striking: a record 201 gigawatts growth of renewable power generating capacity in 2019[12] compared to a loss of 4.5 gigawatts of nuclear capacity.[13]

Nuclear waste

Shellenberger claims in *Apocalypse Never* that nuclear waste "is the best and safest kind of waste produced from electricity production. It has never hurt anyone and there is no reason to think it ever will."

Inexplicably, he ignores radioactive streams across the nuclear fuel cycle apart from spent nuclear fuel. He asserts that "one of the best features of nuclear waste is that there is so little of it", which ignores, among other things, hundreds of millions of tonnes of radioactive tailings waste at uranium mines.

He falsely claims that nuclear is "the only form of electricity that internalizes its waste product" – an



odd argument even for spent nuclear fuel given that responsibility for managing it will be imposed on future generations for thousands of years to come.

"If an airplane crashed into the canisters of used fuel, the plane would explode and the cement-sealed steel canisters would likely remain intact," Shellenberger states without any evidence, and without any mention of the vulnerabilities of spent fuel stored in pools and the potential release of catastrophic amounts of long-lived radioactivity following accidents or acts of malice.[14] A 2017 article in *Science Magazine* warns that an irradiated (spent) nuclear fuel pool fire at a nuclear power station would be far more damaging than the US Nuclear Regulatory Commission analysis acknowledges, and the Commission's inaction has left many US citizens and the economy vulnerable to undue risk from a fire caused by an earthquake or an act of terrorism.[15]

Spent fuel – and high-level nuclear waste arising from reprocessing – is destined for deep geological disposal. But Shellenberger is silent about the Feb. 2014 chemical explosion that closed the Waste Isolation Pilot Plant (WIPP) in New Mexico for three years.[16] WIPP is the world's only operating deep geological repository, accepting long-lived intermediate-level military waste. An alarming slide in safety and regulatory standards emerged soon after the WIPP repository opened in 2009. A US Department of Energy report blamed the explosion and radiation release on the operator and regulator of WIPP, noting their "failure to fully understand, characterize, and control the radiological hazard ... compounded by degradation of key safety management programs and safety culture."[17]

There are serious discussions about the risks associated with nuclear waste[18-20] – but Shellenberger's book isn't among them. On nuclear waste, as with so many other topics, he offers pop-psychology: "When I talk to people who fear the waste, they often can't articulate why they believe it is dangerous, but it appears to emanate from a conscious or unconscious fear of nuclear weapons."[1]

Radiation and health

Shellenberger falsely claims that the linear no-threshold model is based on "disproven methodology". The mainstream scientific understanding is that there is no threshold below which exposure to ionizing radiation is harmless. The United Nations Scientific Committee on the Effects of Atomic Radiation states that "the current balance of available evidence tends to favour a non-threshold response for the mutational component of radiation-associated cancer induction at low doses and low dose rates."[21]

Scientists are less confident about the linear part of the linear no-threshold model, but nevertheless there is heavy-hitting scientific support – for example the 2006 report of the Committee on the Biological Effects of Ionizing Radiation (BEIR) of the US National Academy of Sciences states that "the risk of cancer proceeds in a linear fashion at lower doses without a threshold and ... the smallest dose has the potential to cause a small increase in risk to humans."[22] The BEIR Committee also notes that a linear risk model may underestimate or overestimate true risks: "The committee recognizes that its risk estimates become more uncertain when applied to very low doses. Departures from a linear model at low doses, however, could either increase or decrease the risk per unit dose."

Shellenberger's group Environmental Progress described its former UK director John Lindberg as an "expert on radiation" when in fact he has no relevant qualifications and is a member of the pseudo-scientific organization 'Scientists for Accurate Radiation Information' which is at war with the linear no-threshold model and promotes fringe claims regarding alleged health benefits from exposure to ionizing radiation.[23] Lindberg has moved on to the World Nuclear Association, while at the time of writing a video of Shellenberger is featured on the 'Scientists for Accurate Radiation Information' website![23]

In *Apocalypse Never*, Shellenberger relies exclusively on the 'expertise' of Gerry Thomas in support of his claims about radiation and health, and the death tolls from the Chernobyl and Fukushima disasters. But Thomas is prone to misleading and irrational statements as discussed by Assoc. Prof. Mark Diesendorf in *Nuclear Monitor* last year.[24]

Chernobyl and Fukushima

There is passing acknowledgement in *Apocalypse Never* of the World Health Organization's (WHO) estimate of 4,000 deaths amongst those people most heavily exposed to ionizing radiation following the Chernobyl disaster. But Shellenberger rejects the estimate on the grounds that the linear no-threshold model is "disproven". He acknowledged around 200 deaths from Chernobyl radiation exposure in a radio interview, attributing that estimate to the WHO and the IAEA.[25] But in fact UN agencies including the WHO and the IAEA were involved in 2005 study which estimated up to 4,000 long-term cancer deaths among the higher-exposed Chernobyl populations, and in a follow-up study in 2006 the WHO estimated an additional 5,000 deaths among populations exposed to lower doses in Belarus, the Russian Federation and Ukraine.[26] Estimates of the Europe-wide death toll are in the tens of thousands.[27]

Nobody will die from radiation exposure from the Fukushima disaster, Shellenberger asserts in *Apocalypse Never*. In fact, the WHO released a report in 2013 which concluded that for people in the most contaminated areas in Fukushima Prefecture, the estimated increased risk for all solid cancers will be around 4% in females exposed as infants; a 6% increased risk of breast cancer for females exposed as infants; a 7% increased risk of leukemia for males exposed as infants; and for thyroid cancer among females exposed as infants, an increased risk of up to 70% (from a 0.75% lifetime risk up to 1.25%).[28] About 5,000 people will die from cancer as a result of radiation exposure from Fukushima fallout according to radiation biologist Dr. Ian Fairlie, basing his calculation on UNSCEAR dose estimates and a linear-no-threshold-derived risk estimate for fatal cancers (10% per Sievert).[29]

Nuclear power's worldwide "known total death toll is just over one hundred", Shellenberger writes in *Apocalypse Never*, a figure which obviously cannot be squared with scientific estimates of the death tolls from Chernobyl, Fukushima and other nuclear disasters.

Fukushima evacuation

Shellenberger complains in *Apocalypse Never* about the "over-evacuation of Fukushima prefecture" following the 3/11 nuclear disaster and the "1,600 (unnecessary) evacuation deaths". Elsewhere, has asserts that the Fukushima evacuation was "entirely unnecessary and indeed counterproductive" and it was the outcome of "fear-mongering".[30] Evacuations were not ordered on the basis of fear-mongering; they were ordered on the basis of multiple fires, hydrogen explosions and presumed meltdowns, and a high degree of uncertainty about the state of the Fukushima nuclear plant.

Shellenberger claims that UNSCEAR concluded in 2013 that the vast majority of the Fukushima evacuation zone was safe, nearly all residents could have returned long ago, and most should never have left.[31] But the UNSCEAR report didn't conclude that the vast majority of the Fukushima evacuation zone is safe or that nearly all residents could have returned long ago, and it didn't state that most evacuees should never have left.[32] The report states: "The actions taken to protect the public significantly reduced the radiation exposures that could have been received. This was particularly the case for settlements within the 20-km evacuation zone and the deliberate evacuation zones, where the protective measures reduced the potential exposures in the first year by up to a factor of 10."

A 2017 Shellenberger article berates the Japanese government for failing to follow "normal protocols" by ordering Fukushima residents to evacuate instead of sheltering in place.[31] He cites a 2015 IAEA report[33] in support of that argument. Misrepresenting his sources is one of Shellenberger's bad habits. Nowhere in the IAEA report is there a proscription against evacuation in response to nuclear accidents. No IAEA report states that sheltering in place should be the "normal protocol" in the event of a nuclear accident – the appropriate response depends entirely on the circumstances.

A 2011 IAEA report points to the impracticality of sheltering in place as a long-term response to elevated radiation levels following nuclear accidents:[34]

"Lesson 12: The use of long term sheltering is not an effective approach and has been abandoned and concepts of 'deliberate evacuation' and 'evacuation-prepared area' were introduced for effective long term countermeasures using guidelines of the ICRP [International Commission on Radiological Protection] and IAEA."

The limit for public radiation exposure in Fukushima fallout zones has been lifted from 1 millisievert/year to 20 mSv/yr. Shellenberger clearly believes that the limit should be raised but he doesn't offer a specific proposal. And he doesn't have to grapple with the trade-offs because he doesn't accept the mainstream scientific understanding of the health risks associated with low-level radiation exposure. Australian public health expert Assoc. Prof. Tilman Ruff gives an indication of the risks associated with the 20 mSv limit:

"To provide a perspective on these risks, for a child born in Fukushima in 2011 who was exposed to a total of 100 mSv of additional radiation in its first five years of life, a level tolerated by current Japanese policy, the additional lifetime risk of cancer would be on the order of one in thirty, probably with a similar additional risk of premature cardiovascular death."[35]

Radiation biologist Dr. Ian Fairlie notes that the issue of evacuation raises an "acute planning dilemma": "if evacuations are carried out (even with good planning) then illnesses and deaths will undoubtedly occur. But if they are not carried out, even more people could die."[36]

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Shellenberger's nuclear nonsense: The myth of the peaceful atom

Author: Jim Green – Nuclear Monitor editor

Nuclear is "the safest way to make reliable electricity", according to Michael Shellenberger in his book *Apocalypse Never: Why Environmental Alarmism Hurts Us All*.[1] It's a claim that could only be defended by trivializing the impacts of nuclear disasters and by ignoring the unique proliferation and security risks associated with nuclear power.

Shellenberger reduces the complexities of nuclear terrorism and security issues[2] to a cartoonish singularity in *Apocalypse Never*, rejecting the idea that terrorists could steal spent fuel from a nuclear power plant and transport it to a reprocessing plant. He falsely claims that only antinuclear activists have attacked nuclear plants and ignores the history of nation-states launching military strikes on nuclear plants. He should – but doesn't – explore scenarios such as multiple simultaneous Chernobyl- or Fukushima-scale catastrophes at nuclear power plants attacked by warring nation-states.

It is on the topic of nuclear weapons that Shellenberger's dangerous ignorance is most evident. He "was always a bit unrestrained in his advocacy of nuclear power, and in speaking of nuclear weapons he surpasses himself" according to Victor Gilinsky and Henry Sokolski, writing in the *Bulletin of the Atomic Scientists* in 2018.[3]

Shellenberger asserts in *Apocalypse Never* that "we are further from global nuclear war now than at any other point in the last seventy-five years since the invention and use of the bomb." But as the Science and Security Board of the *Bulletin of the Atomic Scientists* noted in Jan. 2020, national leaders have ended or undermined several major arms control treaties; US-Russia cooperation on arms control and disarmament is "all but nonexistent"; and there are unresolved, worsening political conflicts regarding nuclear programs in Iran and North Korea.[4] Thus the Board concludes that the world "is sleepwalking its way through a newly unstable nuclear landscape" and "arms control boundaries that have helped prevent nuclear catastrophe for the last half century are being steadily dismantled". The Board warns that "civilization-ending nuclear war – whether started by design, blunder, or simple miscommunication – is a genuine possibility."[4]

Shellenberger acknowledges the extraordinary destructive potential of nuclear weapons in *Apocalypse Never*, noting their potential to destroy "cities and perhaps even civilizations". But he nevertheless has nothing but nice things to say about them. He writes:[5]

"We need to correct our misunderstanding of nuclear energy. It was born from good intentions, not bad ones, nor from some mindless accident of science. Nuclear weapons were created to prevent war and end war, and that is all they have been used for and all they will ever be good for. " Or as he put it in a 2018 article, nuclear weapons "make us peaceful".

His support for nuclear weapons stems partly from his belief in the power and infallibility of deterrence. As one dubious case study in support of that dubious argument, Shellenberger says that many feared nuclear war between India and Pakistan, but deterrence logic has prevented not only nuclear warfare but has for all practical purposes done away with the prospect of any "full scale war" between the two countries. Shellenberger cites one so-called "expert" who claims that nuclear conflict between India and Pakistan would be contained at the "tactical" level, while ignoring experts who have no such confidence.[3]

Shellenberger approvingly quotes Oppenheimer saying that "the atomic bomb is so terrible a weapon that war is now impossible." So nuclear weapons have put an end to warfare for all time … or at least, that would be the case if they were more widespread. Shellenberger said in an interview: "Smart guys … said 'this is going to end war', this is going to allow small countries to defend themselves against big countries. They're obviously right."

We needn't worry about North Korea because it will act like "other nuclear-armed nations", Shellenberger writes in *Apocalypse Never*, as will Iran if it acquires nuclear weapons. International support for the construction of nuclear power reactors in North Korea would – somehow, magically – curtail or end the country's nuclear weapons program, Shellenberger argued in 2017.[6] The following year he argued that we "should be glad that North Korea acquired the bomb".[5]

Shellenberger doesn't explicitly promote the spread of nuclear weapons in *Apocalypse Never*, but he did so in 2018, promoting proliferation by "weak nations" such as North Korea and Iran and labeling anyone who disagrees as "hypocritical, short-sighted, and imperialistic".[5] Only a balance of military power in the Middle East – i.e. further nuclear weapons proliferation – will end the decades-long Middle East nuclear crisis, Shellenberger claimed.[5] And a nuclear-armed Germany would (somehow) stabilize NATO and the security of the Western World.[5]

Globally, nuclear deterrence between large nations has largely been responsible for a 95% decline in deaths from wars and conflicts since 1945, Shellenberger wrote in 2018, demonstrating a slim grasp of the difference between causation and correlation.[7] He attributes that claim to an 'empirical' study which makes no such finding. The study found that when two states possess nuclear weapons, the odds of war drop – but nuclear weapons

and nuclear asymmetry are associated with higher likelihoods of crises, uses of force, and conflicts involving lower-levels of casualties.[8]

Gilinsky and Sokolski wrote in the *Bulletin of the Atomic Scientists*: "That the presence of nuclear weapons has reduced the frequency of war is an arguable proposition. But one only has to consider the experience of the Cuban Missile Crisis to realize it comes at the price of gambling on nuclear war."[3]

Nuclear weapons "make us peaceful"[5] and in any case the idea of humans doing away with them is "fanciful".[1] "We can't get rid of them, even if we wanted to", Shellenberger writes in *Apocalypse Never*, ignoring any number of successful efforts to curb nuclear proliferation, and "trying to do so has contributed to decades of tension and conflict, culminating in the unnecessary and disastrous U.S. and British invasion of Iraq in 2003."

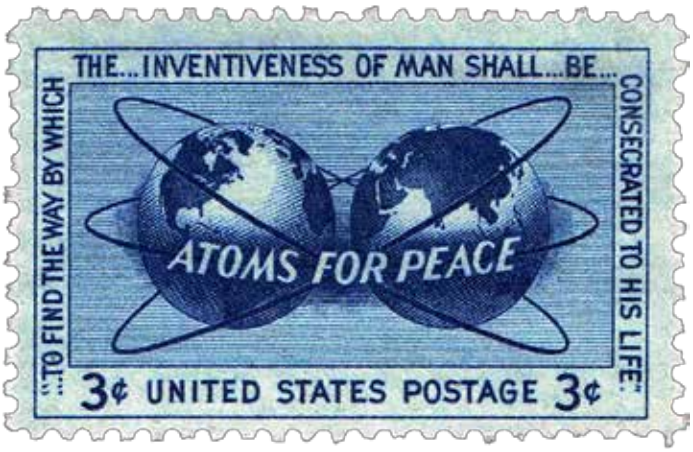
To deal with the "existential angst" of the existence of weapons that can destroy cities and perhaps even civilizations, Shellenberger writes in *Apocalypse Never* that "the continued existence of nuclear weapons should remind us to be happy to be alive" and to remember that we all die!

Nuclear power/weapons connections

Shellenberger says he stands by his 2018 articles which acknowledge strong nuclear power/weapons connections and promote nuclear weapons proliferation.[9] But in fact, he was done a complete U-turn regarding power/weapons connections and there has been no acknowledgement let alone explanation. Having argued pre-2018 that "nuclear energy prevents the spread of nuclear weapons"[10] and that there is an "inverse relationship between energy and weapons"[11], Shellenberger acknowledged in 2018 that "having a weapons option is often the most important factor in a state pursuing peaceful nuclear energy"[12] and that "at least 20 nations sought nuclear power at least in part to give themselves the option of creating a nuclear weapon".[13]

Gaining "weapons latency appears to be the difference-maker" as to whether or not countries pursue nuclear power, Shellenberger argued in 2018, whereas "nations that lack a need for weapons latency often decide not to build nuclear power plants".[13] The weapons latency of nuclear power is not a "bug" but rather it is an "epochal, peace-making feature" that should be promoted.[13] Nuclear power "will continue to spread around the world, largely with national security as a motivation," he claimed in 2018.[13]

But before 2018 had even ended, Shellenberger was at war with himself, arguing that unremarkable IPCC comments regarding the links between nuclear power and weapons were "unsubstantiated fear-mongering".[7] And he said last year that one of the reasons people oppose nuclear power is that "they associate it with the bomb, which is wrong, they are two separate technologies."[14]



In 2018, Shellenberger said that "in seeking to deny the connection between nuclear power and nuclear weapons, the nuclear community today finds itself in the increasingly untenable position of having to deny these real world connections – of motivations and means – between the two.[13]

Now Shellenberger himself is in the untenable position of denying real-world connections that he has written about at some length.

He claims in *Apocalypse Never* that "antinuclear groups continue to deceive and frighten the public about nuclear energy" and they "do so with an eye to triggering fears of nuclear apocalypse." In fact, many nuclear critics have long understood the connections between nuclear power and weapons and have long understood that battles against nuclear power and weapons are two sides of the same coin.

Shellenberger is swept away with the idea that the latent weapons potential of a nuclear power program has "deterrence-related" benefits. Gilinsky and Sokolski wrote in the *Bulletin of the Atomic Scientists*:[3]

"[Shellenberger] asserts that a nuclear power program itself provides a significant level of "deterrence-related" benefits – "a bomb isn't even required." He says that when he thought of this, he almost fell off his chair. Why, he wondered, was this fact "not being promoted as one of nuclear power's many benefits?" One reason is that it's a ridiculous proposal based on half-baked ideas."

The latent weapons potential of civil nuclear programs clearly enthuses some would-be aggressors, as demonstrated by national military attacks on nuclear facilities in Iraq, Iran, Israel, Syria and elsewhere – attacks designed primarily to prevent adversaries acquiring nuclear weapons. Shellenberger asked in a 2018 article whether latency could "also be a threat to peace?", noting Israeli and US threats to take pre-emptive action against Iran.[13] He doesn't offer an answer or explore the issue further.

Attacking nuclear critics

Shellenberger is a "bit unrestrained" in his advocacy of nuclear power, as Gilinsky and Sokolski put it, and still less restrained in his promotion of nuclear weapons.[3] There's no restraint whatsoever in Shellenberger's bizarre attacks on opponents of nuclear power. In *Apocalypse Never*, he argues that "some activists who were originally focused on nuclear weapons disarmament began displacing their anxieties on nuclear reactors instead", and helpfully he offers a definition of the psychological concept of displacement as well as an analogy: "If the boss yells at us, we kick the dog because talking back to the boss is too dangerous."

Antinuclear groups "continue to deceive and frighten the public about nuclear energy" and they "do so with an eye to triggering fears of nuclear apocalypse", according to *Apocalypse Never*.

"Mixing up reactors and bombs" is the "go-to strategy for Malthusian environmentalists", according to *Apocalypse Never.* And once again bending reality beyond breaking point:

"Nuclear energy not only meant infinite fertilizer, freshwater, and food but also zero pollution and a radically reduced environmental footprint. Nuclear energy thus created a serious problem for Malthusians and anyone else who wanted to argue that energy, fertilizer, and food were scarce. And so some Malthusians argued that the problem with nuclear was that it produced too much cheap and abundant energy."

Anti-nuclear climate alarmists are on the warpath attacking "nuclear energy, which offers effectively infinite cheap energy, which they rightly view as a threat to their efforts to control food and energy production."[15] Likewise, he claims that there is no energy scarcity with nuclear, which is a problem for climate alarmists who want "to take control of big sectors of the economy".[16]

In another variation of the argument, power-grabbing 'elites' are at work: "Climate alarmism isn't just about money. It's also about power. Elites have used climate alarmism to justify efforts to control food and energy policies in their home nations and around the world for more than three decades."[17]

Anti-nuclear climate-alarmist elites want to control food and energy production and other 'big sectors of the economy' in their home nations and around the world?

Seriously?

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No market for Australian uranium in India

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In 2011, the Australian Labor Party (ALP) voted to overturn a ban on uranium sales to India.[1] The Civil Nuclear Cooperation Agreement between Australia and India was then signed in 2014. The Australian Parliament subsequently passed a bill permitting its uranium mining companies to supply nuclear material to India.[2] These efforts were supposedly intended to allow Australia to profit from Indian uranium purchases.

At the 2011 ALP national conference, then prime minister Julia Gillard argued that India was planning to generate 40 per cent of its electricity with nuclear energy by 2050.[3] 'Having access to this market is good for Australian jobs', said Gillard during the conference. The Australian Uranium Association projected that 'Australia could expect to sell some 2500 tonnes of uranium annually to India by 2030, generating export sales of AU$300 million' (US$205 million).[4] But nearly a decade later, what is the reality?

Aside from a small shipment of uranium sent to India for testing in 2017, no uranium appears to have been exported to India from Australia.[5] In 2018, India's Ministry of Atomic Energy stated that the country had signed contracts with firms from Kazakhstan, Canada, Russia and France to procure uranium.[6] And in March 2020, India signed a contract with Uzbekistan.[7] There has been no mention of Australia.

A large order for Australian uranium appears unlikely in the future as well. With a net generating capacity of only 6.2 gigawatts (GW), India does not have a large requirement for uranium in the first place.[8] Further, Australian uranium can only be used for reactors under International Atomic Energy Agency (IAEA) safeguards, which attempt to ensure that no materials are used for nuclear weapons. Such reactors amount to less than 2 GW of India's capacity.[9]

India's nuclear fleet will not expand dramatically either. India's Department of Atomic Energy (DAE) has a long history of setting ambitious nuclear power generation targets and failing to meet them.[10] In 1984, the DAE promised a nuclear capacity of 10 GW by 2000. The actual figure in 2000 was 2.7 GW. By then the DAE had set a new target, 20 GW by 2020.[11] Again, today's current capacity (6.2 GW) is nowhere close to this target.

Seven more reactors, with a total capacity of 4.8 GW, are under construction.[12] But five of these reactors have been significantly delayed. Four of them were supposed to be commissioned in 2015 and 2016. But these reactors are now expected to start operating in October 2020, September 2021, March 2022 and March 2023 respectively.

The fifth is India's flagship project, the Prototype Fast Breeder Reactor (PFBR). Construction started in 2004 and the reactor was supposed to start functioning in 2010[13] but is now 'expected to commence production of electricity in October 2022'.[14]

Costs have increased, too. The PFBR's estimate has jumped from Rs 34.9 billion (US$457 million) to Rs 68.4 billion (US$896 million). And the PHWRs will cost around 40–45 per cent more than initially projected.

In contrast, India's renewable energy sector is a different story.[15] Wind and solar power have only recently been introduced to India's energy mix, but both technologies are expanding rapidly while becoming significantly cheaper. Between 2016 and 2019, installed solar capacity increased from 9.6 GW to 35 GW, while wind capacity increased from 28.7 GW to 37.5 GW.[16] In 2019, both wind (63.3 terawatt-hours (TWh)) and solar (46.3 TWh) power contributed more to overall electricity generation in India than nuclear power (45.2 TWh).[17]

India's renewable energy sector is expected to continue growing[18], while nuclear energy will likely remain stagnant. Recently, the Department of Economic Affairs assembled a task force to 'identify technically feasible and financially viable infrastructure projects that can be initiated in fiscals 2020–25'. The task force foresaw renewable capacity increasing from 22 per cent of the total installed electrical capacity in 2019 to 39 per cent by 2025. Conversely, nuclear capacity stays around 2 per cent of installed capacity.

Even the Indian government expects the divergence between the growing renewable energy sector and the stagnant nuclear sector to increase as the rapidly falling cost[19] of solar power makes nuclear power redundant.

Australian policymakers who advocated for exporting uranium to India were betting on the wrong energy source. Perhaps there were ulterior motives, including recognising India as a major power. But good policy cannot be made on the basis of false claims.

Australian uranium companies continue to insist that India is expanding its nuclear power capacity. Energy Resources of Australia Ltd's 2017 annual report claims that 'India has 22 reactors in operation and plans to generate as much as 25 per cent of electricity from nuclear power by 2050'.[20] Paladin[21] and Yellow Cake[22] made similar claims in 2019.

Protest against the Koodankulam nuclear power plant, 2012.

Nuclear power has never constituted more than a few per cent of India's electricity supply. Given current trends, it will never amount to much more. Nuclear reactors are expensive and time-consuming to construct, factors that explain why the share of electricity supplied by nuclear power plants globally has declined continuously, from 17.5 per cent in 1996 to 10.15 per cent in 2018.[23] This global trend must be considered by Australian policymakers as they deal with lobbyists for uranium mining and the push there to build nuclear plants.[24]

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