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Monitored this issue:

Nuclear lobbyist Michael Shellenberger learns to love the bomb, goes down a rabbit hole

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

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In 2015, *Nuclear Monitor* published a detailed critique of the many ways nuclear industry insiders and lobbyists trivialize and deny the connections between nuclear power (and the broader nuclear fuel cycle) and nuclear weapons proliferation.[1]

Since then, the arguments have been turned upside down with prominent industry insiders and lobbyists openly acknowledging power-weapons connections. This remarkable about-turn has clear origins in the crisis facing nuclear power and the perceived need to secure increased subsidies to prevent reactors closing and to build new ones.[2]

One thread of the new sales pitch – one which doesn't fundamentally contradict long-standing denials of power-weapons connections – has been a ratcheting up of the argument that countries with a thriving nuclear export industry, (necessarily) underpinned by a thriving domestic nuclear industry, are best placed to influence which countries can or can't pursue weapons.[3]

Another thread of the new sales pitch – and this really *is* new – is to openly link to nuclear power to weapons, to celebrate the connections and to use them to lobby for greater subsidies for nuclear power.[2] The US Nuclear Energy Institute, for example, tried in mid-2017 to convince politicians in Washington that if the AP1000 reactor construction projects in South Carolina and Georgia weren't completed, it would stunt development of the nation's nuclear weapons complex.[4]

The Nuclear Energy Institute paper wasn't publicly released. But in the second half of 2017, numerous nuclear insiders and lobbyists openly acknowledged power-weapons connections and called for additional subsidies for nuclear power. The most important of these initiatives was a paper by the Energy Futures Initiative (EFI) – a creation of Ernest Moniz, who served as energy secretary under President Barack Obama.[5]

Even the uranium industry has jumped on the bandwagon, with two US companies warning that reliance on foreign sources threatens national security and lodging a petition with the Department of Commerce calling for US utilities to be required to purchase a minimum 25% of their requirements from domestic mines.[6]

Decades of deceit have been thrown overboard with the new sales pitch linking nuclear power and weapons. However there are still some hold-outs.[7] Ted Norhaus, a self-styled 'pro-nuclear environmentalist', argues that to conflate nuclear power with nuclear weapons is "extremely misleading" because they involve different physics, different technologies and different institutions.[8]

Ben Heard – a nuclear lobbyist in Australia whose 'Bright New World' lobby group accepts secret corporate donations[9,10] – attacked the Australian Conservation Foundation for its failure to acknowledge the "obvious distinction" between nuclear power and weapons and for "co-opting disarmament … toward their ideological campaigns against peaceful science and technology".[11]

Heard wrote in December 2017: "Peace is furthered when a nation embraces nuclear power, because it makes that nation empirically less likely to embark on a nuclear weapons program. That is the finding of a 2017 study published in the peer-reviewed journal *International Security*."[11] In fact, that non-statistically significant finding sat alongside a contrary, statistically significant finding in the *International Security* journal article: the annual probability of starting a nuclear weapons program is more than twice as high in countries with an operating power reactor or one under construction.[12]

Until recently, another nuclear lobbyist continuing to deny power-weapons connections was Michael Shellenberger from the 'Environmental Progress' pro-nuclear lobby group in the US. He told an IAEA conference last year that "nuclear energy prevents the spread of nuclear weapons".[13] And he claimed last year that "one of FOE-Greenpeace's biggest lies about nuclear energy is that it leads to weapons" and that there is an "inverse relationship between energy and weapons".[14] He concluded that article by asserting that "nuclear is our only source of energy with a transcendent moral purpose, to lift all humans out of poverty, reverse humankind's negative environmental impact, and guarantee peace."[14]

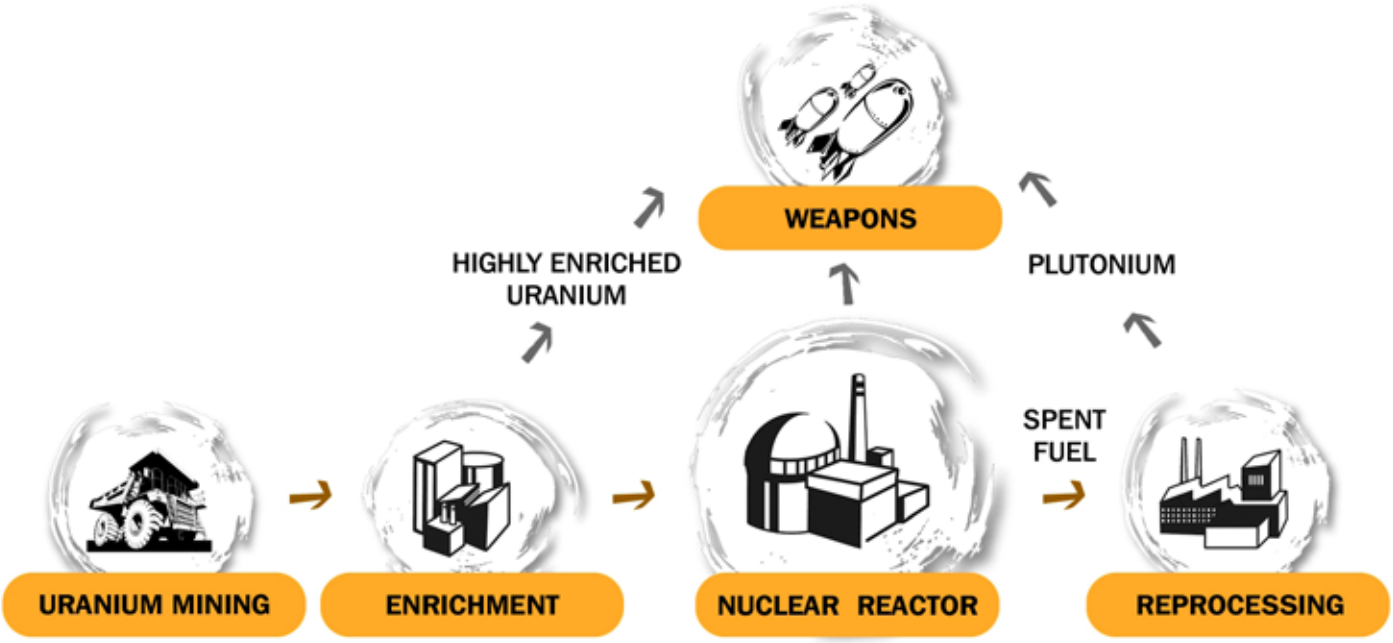
One of Shellenberger's bright ideas was to launch a campaign to garner international support for the construction of nuclear power reactors in North Korea.[15] That would – somehow, magically – curtail or end North Korea's nuclear weapons program. This "atoms for peace" initiative would be, in Shellenberger's words, "one of the best means of creating peace with North Korea".[14] No matter that his "new framework" is much the same as the old 1994 Agreed Framework, which was a complete failure.[16]

Shellenberger's backflip

In two articles published in August, Shellenberger has done a 180-degree backflip on the power-weapons connections.[17,18]

"[N]ational security, having a weapons option, is often the most important factor in a state pursuing peaceful nuclear energy", Shellenberger now believes.[19]

A recent analysis from Environmental Progress finds that of the 26 nations that are building or are committed to build nuclear power plants, 23 have nuclear weapons, had weapons, or have shown interest in acquiring weapons.[20] "While those 23 nations clearly have motives other than



national security for pursuing nuclear energy," Shellenberger writes, "gaining weapons latency appears to be the difference-maker. The flip side also appears true: nations that lack a need for weapons latency often decide not to build nuclear power plants ... Recently, Vietnam and South Africa, neither of which face a significant security threat, decided against building nuclear plants ..."[17]

Here is the break-down of the 26 countries that are building or are committed to build nuclear power plants:[17]

- Thirteen nations had a weapons program, or have shown interest in acquiring a weapon: Argentina, Armenia, Bangladesh, Brazil, Egypt, Iran, Japan, Romania, Saudi Arabia, South Korea, Taiwan, Turkey, UAE.
- Seven nations have weapons (France, US, Britain, China, Russia, India and Pakistan), two had weapons as part of the Soviet Union (Ukraine and Belarus), and one (Slovakia) was part of a nation (Czechoslovakia) that sought a weapon.
- Poland, Hungary, and Finland are the only three nations (of the 26) for which Environmental Progress could find no evidence of "weapons latency" as a motivation.

Shellenberger points to research by Fuhrmann and Tkach which found that 31 nations had the capacity to enrich uranium or reprocess plutonium, and that 71% of them created that capacity to give themselves weapons latency.[21]

Current patterns connecting the pursuit of power and weapons stretch back across the 60 years of civilian nuclear power. Shellenberger notes that "at least 20 nations sought nuclear power at least in part to give themselves the option of creating a nuclear weapon" – Argentina, Australia, Brazil, Egypt, France, Italy, India, Iran, Iraq, Israel, Japan, Libya, Norway, Romania, South Africa, Sweden, Switzerland, Taiwan, West Germany, Yugoslavia.[17]

Nuclear weapons – a force for peace?

So far, so good. The pursuit of nuclear power and weapons are often linked. That's a powerful reason to eschew nuclear power, to strengthen the safeguards system, to tighten export controls, to restrict the spread of enrichment and reprocessing, and so on. But Shellenberger has a very different take on the issues.

Discussing the Fuhrmann and Tkach article (and studiously avoiding a vast body of contrary literature), Shellenberger writes:[17]

"What was the relationship between nuclear latency and military conflict? It was negative. "Nuclear latency appears to provide states with deterrence-related benefits," they [Fuhrmann and Tkach] concluded, "that are distinct from actively pursuing nuclear bombs."

"Why might this be? Arriving at an ultimate cause is difficult if not impossible, the authors note. But one obvious possibility is that the "latent nuclear powers may be able to deter conflict by (implicitly) threatening to 'go nuclear following an attack." ...

"After over 60 years of national security driving nuclear power into the international system, we can now add "preventing war" to the list of nuclear energy's superior characteristics. ...

"As a lifelong peace activist and pro-nuclear environmentalist, I almost fell out of my chair when I discovered the paper by Fuhrmann and Tkach. All that most nations will need to deter military threats is nuclear power – a bomb isn't even required? Why in the world, I wondered, is this fact not being promoted as one of nuclear powers many benefits?

"The answer is that the nuclear industry and scientific community have tried, since Atoms for Peace began 65 years ago, to downplay any connection between the two – and for an understandable reason: they don't want the public to associate nuclear power plants with nuclear war.

"But 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. Worse, in denying the connection between energy and weapons, the nuclear community reinforces the widespread belief

that nuclear weapons have made the world a more dangerous place when the opposite is the case. …

"In the real world, nuclear weapons have only been used to end or prevent war — a remarkable record for the world's most dangerous objects.

"Nuclear energy, without a doubt, is spreading and will continue to spread around the world, largely with national security as a motivation. The question is whether the nuclear industry will, alongside anti-nuclear activists, persist in stigmatizing weapons latency as a nuclear power "bug" rather than tout it as the epochal, peace-making feature it is."

Shellenberger asks why the deterrent effect of nuclear power isn't being promoted as one of its many benefits. A better answer to the one he offers is that the premise is nonsense. Nuclear weapons can have a deterrent effect – in a uniquely dangerous and potentially uniquely counterproductive manner – but any correlation between latent nuclear weapons capabilities and reduced military conflict is just that, correlation not causation.

In a second article, Shellenberger offers the contrarian wisdom that "nuclear weapons make us peaceful".[18] He writes:

"The widespread assumption is that the more nations have nuclear weapons, the more dangerous the world will be. But is that really the case? ... [I]t is impossible not to be struck by these facts:

- *No nation with a nuclear weapon has ever been invaded by another nation.*
- *The number of deaths in battle worldwide [per 100,000 of world population] has declined 95 percent in the 70 years since the invention and spread of nuclear weapons;*
- *The number of Indian and Pakistani civilian and security forces deaths in two disputed territories declined 95 percent after Pakistan's first nuclear weapons test in 1998.…*

"The division of the world into nuclear-armed and unarmed nations has long been arbitrary and unfair. Nuclear-armed nations, except for France, hypocritically punished India for decades with trade sanctions for acquiring a weapon. ...

"[A] world without nuclear weapons would be a world where relatively weak nations – like France and Britain before World War II and North Korea and Iran today – are deprived the only power on Earth capable of preventing a military invasion by a more powerful adversary. Who are we to deny weak nations the nuclear weapons they need for self-defense? The answer should by now be clear: hypocritical, short-sighted, and imperialistic."

So Iran should be encouraged to develop nuclear weapons – or perhaps Iran should be gifted nuclear weapons by an enlightened weapons state. Shellenberger cites long-term nuclear weapons proliferation enthusiast Kenneth Waltz, who claims that the "decades-long Middle East nuclear crisis … will end only when a balance of military power is restored".[18] Dictators Saddam Hussein and Muammar Gaddafi ought to have acquired nuclear weapons, according to Shellenberger, not least because they were killed and their regimes overthrown after they gave up the pursuit of nuclear weapons.[18] Shellenberger cites a German academic who argues that a nuclear-armed Germany "would stabilize NATO and the security of the Western World".[18,22] We "should be glad that North Korea acquired the bomb" according to Shellenberger.[18] And on it goes – his enthusiasm for nuclear weapons proliferation knows no bounds.

What to make of Shellenberger's conversion?

No doubt there will be more acknowledgements of power-weapons connections by nuclear industry insiders and lobbyists. As Shellenberger notes, the nuclear 'community' today finds itself in an increasingly untenable position denying the connections.[17]

What to make of Shellenberger's advocacy of nuclear weapons proliferation? There is a degree of domestic support for nuclear weapons programs in weapons states … but few people support generalized nuclear weapons proliferation and few would swallow Shellenberger's arguments including his call to shred the non-proliferation and disarmament system and to encourage weapons proliferation.

Understanding of the power-weapons connections, combined with opposition to nuclear weapons, is one of the motivations driving opposition to nuclear power. According to Shellenberger, the only two US states forcing the closure of nuclear plants, California and New York, also had the strongest nuclear disarmament movements.[17]

There is some concern that claims that the civil nuclear industry is an important (or even necessary) underpinning of a weapons program will be successfully used to secure additional subsidies for troubled nuclear power programs (e.g. in the US, France and the UK). After all, nuclear insiders and lobbyists wouldn't abandon their decades-long deceit about power-weapons connections if not for the possibility that their new argument will gain traction, among politicians if not the public.

The growing acknowledgement – and public understanding – of power-weapons connections might have consequences for nuclear power newcomer countries such as Saudi Arabia. Assuming that the starting point is opposition to a Saudi nuclear weapons program, heightened sensitivity might constrain nuclear exporters who would otherwise export to Saudi Arabia with minimalist safeguards and no serious attempt to check the regime's weapons ambitions. Or it might not lead to that outcome … as things stand, numerous nuclear exporters are scrambling for a share of the Saudi nuclear power program regardless of proliferation concerns.

More generally, a growing understanding of power-weapons connections might lead to a strengthening of the safeguards system along with other measures to firewall nuclear power from weapons. But again, that's hypothetical and it is at best some way down the track – there is no momentum in that direction.

And another hypothetical arising from the growing awareness about power-weapons connections:

proliferation risks might be (and ought to be) factored in as a significant negative in comparative assessments of power generation options.

'Shellenberger has gone down a rabbit hole'

As for Shellenberger, *Nuclear Monitor* has previously exposed the litany of falsehoods in his writings on nuclear and energy issues.[16] In his most recent articles he exposes himself as an intellectual lightweight prepared to swing from one extreme of a debate to the other if that's what it takes to build the case for additional subsidies for nuclear power.

A dangerous intellectual lightweight. Responding to Shellenberger's more-the-merrier attitude towards nuclear weapons proliferation, pro-nuclear commentator Dan Yurman puts it bluntly: "Here's the problem. The more nations have nuclear weapons, the more dangerous the world will be. Sooner or later some tin pot dictator or religious zealot, is likely to push a button and send us all to eternity."[23]

Shellenberger's about-turn on power-weapons connections provoked a hostile response from Yurman:[23]

"Shellenberger has crossed a red line for the global commercial nuclear industry, which has done everything in its power to avoid having the public conflate nuclear weapons with commercial nuclear energy. Worse, he's given opponents of nuclear energy, like Greenpeace, a ready-made tool to attack the industry. …

"In the end he may have painted himself into a corner. Not only has he alienated some of his supporters on the commercial nuclear side of the house, but he also has energized the nonproliferation establishment, within governments and among NGOs, offering them a rich opportunity promote critical reviews of the risks of expanding nuclear energy as a solution to the challenge of climate change. …

"Shellenberger has gone down a rabbit hole with his two essays promoting the proliferation of nuclear weapons. Given all the great things he has done to promote commercial nuclear energy, it is a perplexing and disturbing development.

"It's ok to be contrarian, but I fear he will pay a price for it with reduced support from some of his current supporters and he will face critical reviews from detractors of these essays. In the end public support and perception of the safety of nuclear energy may be diminished by these essays since they will lead to increased conflating of commercial nuclear energy with nuclear weapons. The fatal attraction of the power of nuclear weapons has lured another victim. It's an ill-fated step backwards."

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‘Almost Trumpian in its incoherence’: Critical responses to Michael Shellenberger’s promotion of nuclear weapons proliferation

Author: Jim Green – Nuclear Monitor editor

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Ironically, one of the most thorough critiques of Michael Shellenberger’s dangerous advocacy of nuclear weapons proliferation[1,2] was written by Environmental Progress attorney Frank Jablonski and published on the Environmental Progress website.[3] Shellenberger is founder and president of Environmental Progress.

Jablonski writes:[3]

“From Shellenberger’s article[2] you would conclude that, for any “weak nation”, or for the “poor or weak” persons within such nations, things are bound to improve with acquisition of nuclear weapons. So, for humanitarian reasons, the imperialistic nations and hypocritical people standing in the way of that acquisition should get out of the way. No. The article’s contentions are falsified by … logical untenability, things it got wrong, and things it left out. While Shellenberger’s willingness to take controversial positions has often been valuable, a “contrarian” view is not always right just because it is contrarian.”

Jablonski draws a parallel with NRA pro-guns propaganda:[3]

“The article seems to presume that if the nuclear non-proliferation framework is eliminated, nuclear capabilities will be quickly equalized through some kind of dystopian Oprah episode in which “YOU get a weapon, YOU get a weapon, EVERYBODY gets a weapon!!!”. The resulting equalization of capabilities will lead to peace, kind of in the vein of the NRA slogan that “an armed (international) society is a polite society”.

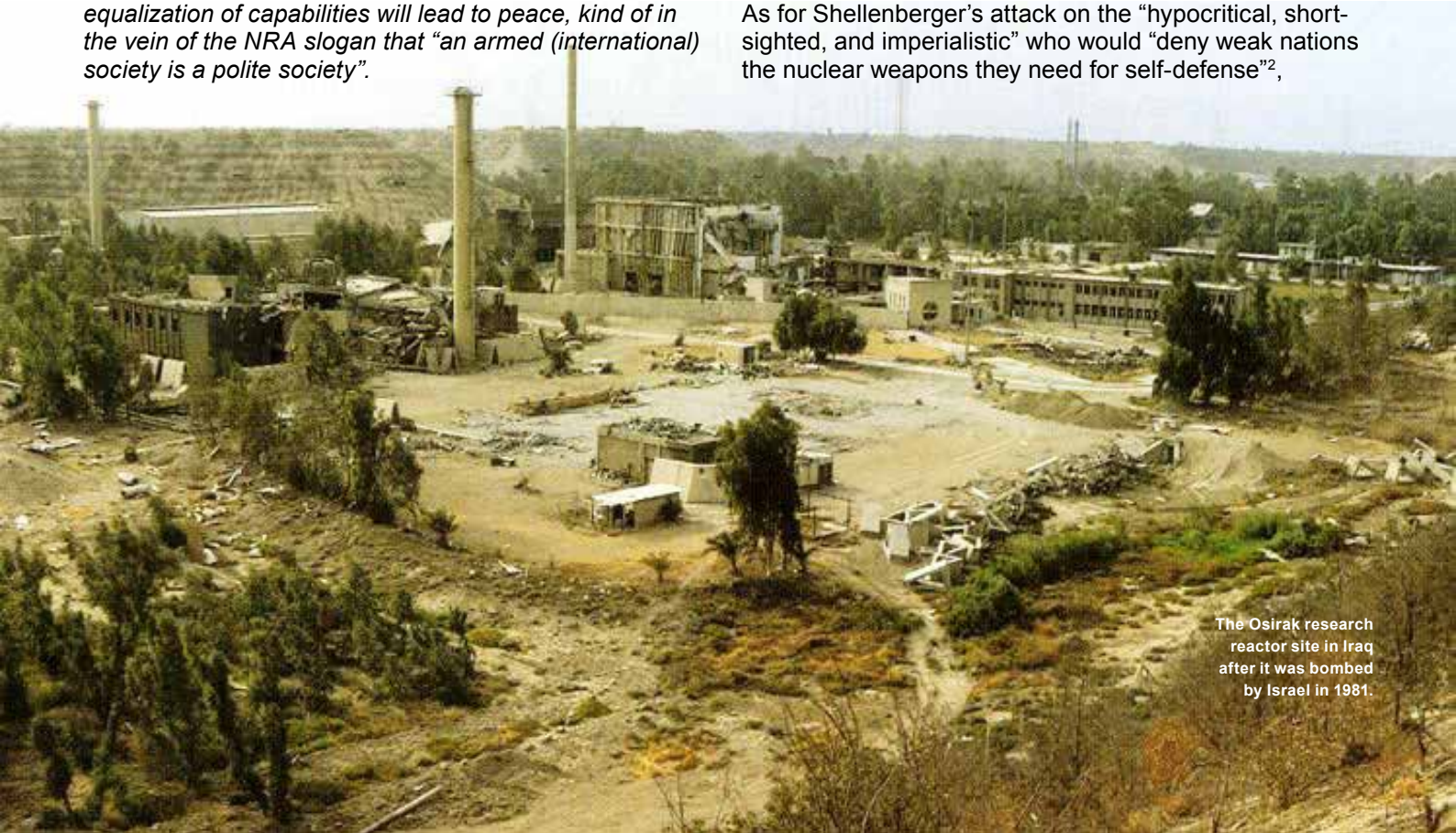
“This is, quite obviously, not how proliferation develops. Allowing ready access to nuclear weapons likely spreads them first to relatively strong nations that are already feeling international pressure, likely because of disturbing human rights records, hegemonic ambitions, or both. It may be hypocritical to try to deny nuclear weapons to autocracies that aspire to them, but these nations themselves can be “imperialist”, i.e., aspiring hegemons seeking to dominate their neighbors.

“By introducing the possibility that a neighboring nation may seek nuclear weapons, making such weapons broadly available disadvantages nations that prefer to spend their resources on development instead of militarization. There are good reasons for nations not to want to be pressured into a nuclear arms race with aspiring hegemons. …

“Forcing the weakest nations to compete for nuclear weapons to keep up with stronger and more aggressive neighbors is a recipe for harming the “poor and weak”, not helping them.”

On deterrence, Jablonski writes: “the fact that deterrence works in some circumstances does not mean that removing barriers to acquisition of nuclear weapons will result in generalized deterrence and stability”.[3]

As for Shellenberger’s attack on the “hypocritical, short-sighted, and imperialistic” who would “deny weak nations the nuclear weapons they need for self-defense”[2],



The Osirak research reactor site in Iraq after it was bombed by Israel in 1981.

Jablonski writes:

"Who are these "hypocritical imperialists" that want to deny nuclear weapons to "weak nations"? I suggest that they include a lot of people who don't want autocrats to get nuclear weapons, who don't want nations forced into regional nuclear arms races, who want nuclear technology directed towards human welfare, and who want no-one, ever again, to die in a nuclear war."[3]

'Almost Trumpian in its incoherence'

Sam Seitz, a student at Georgetown's Walsh School of Foreign Service, takes issue with Shellenberger's claims that no nuclear powers have been invaded ("a pretty misleading statistic" and "wrong"); that battle deaths worldwide have declined by 95% ("fails to prove that nuclear weapons are responsible for this trend … as we are frequently reminded, correlation and causation are not equivalent"); that Indian and Pakistani deaths in two disputed territories declined sharply after Pakistan's first nuclear weapons test in 1998 ("doesn't account for non-nuclear factors like the role of outside mediation and domestic politics"); and that Nazi Germany invaded France because the French lacked a credible deterrent ("makes very little sense and conflates several things … also silly").[4]

Seitz attempts to decipher one of Shellenberger's indecipherable arguments:

"Shellenberger then argues that nuclear weapons moderate state behavior because "History shows that when countries acquire the bomb, they feel increasingly vulnerable." (quote from Waltz) This makes absolutely no sense. Either nukes ensure existential security, preventing great power intervention, or they make countries more vulnerable, but to argue that nukes simultaneously make countries more and less vulnerable is almost Trumpian in its incoherence. And sure, maybe nuclear weapons promote foreign policy moderation, but that isn't the same thing as internal moderation: The Cultural Revolution occurred after China had nuclear weapons, after all."

Seitz points to another problem:

"Shellenberger presumably is only advocating for American acceptance of proliferation. After all, forcing other countries to go along with Washington is the exact kind of interference and American bullying he seems to so despise. But not every country will agree. Israel has struck nascent nuclear programs on several occasions, for example, and the Soviets almost launched an attack on the Chinese nuclear program. So, even if nuclear weapons make conflict less likely, attempting to acquire nuclear weapons actually tends to precipitate conflict as potential adversaries try desperately to stop a proliferator before it is too late. This is, after all, the reason the U.S. and its coalition partners invaded Iraq."

Shellenberger points to the same problem, asking whether latency could "also be a threat to peace?" and noting Israeli and US threats to take pre-emptive action against Iran.[1] He doesn't offer an answer or explore the issue further. He might – but doesn't – explore scenarios such as multiple simultaneous Chernobyl- or Fukushima-scale catastrophes deliberately inflicted by warring nation-states.

Friendly fire

Even those who Shellenberger cites approvingly in support of his arguments differ with him on fundamental points. He describes Vipin Narang as an "up-and-coming star in the field of nuclear peace and security studies", but Narang doesn't share his sanguine view about nuclear weapons security.[5] According to Narang:[5]

"Pakistan may be one or two senior radicalized officers from having a threat to, or breakdown of, command and control. We assume there will be continuity in government, and regular transitions. The trouble is chaos or irregular leadership transitions, and uncertainty about the control of nuclear weapons in the state. Kim Jong Un has signaled that he has sole authority over nuclear weapons. But when he flew Air China to Singapore to meet with Trump, what if there had been rumor the plane had been shot down en route? What is his command and control? What if he feared being shot down and put in place a "dead hand" procedure which means, "If I'm shot down, you fire a nuclear ICBM at New York?" Rumors can go viral and there have been no way for those in Pyongyang to reach Kim, and they may have assumed the worst. These are the kinds of things that scare me."

Asked by Shellenberger if it is the case that the more nuclear weapons states there are, the better, Narang responded:[5]

"Nuclear weapons do deter. I understand why weak nations want them. They do provide deterrence against invasion. They do provide existential protection. The question is are there some states, with certain regime types or civil-military relations, where the risks outweigh the perceived deterrence benefits?

"But states like North Korea, Pakistan, and Egypt have potentially more volatile domestic political situations than, for example Japan or Germany or India. And even India is very opaque about its management and security procedures and the US has been concerned about lax oversight even there – and even the US itself is not immune to the risks of accidents, having had quite a few snafus of its own recently.

"So even in the most stable of states, the risk of accidents is real. Add to that mix the potential for violent domestic upheaval and one has to question whether having nuclear weapons possessed by a state at risk of coup or revolution is a good thing. You start getting into a world where more countries have them, there's simply more systemic risk."

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Social peripheries and the siting of nuclear facilities in South Korea and Japan

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In July 2017, there was an interesting event in South Korea. The government asked a citizens panel to consider whether or not the partially-built Shin Kori 5 and 6 reactors should be completed. Since it was settled to complete the construction, many researchers tried to analyze why people, even local residents who live near the plant, supported the project. This article aims to answer that question.

The paper focuses on the unique siting patterns of nuclear-related facilities in South Korea, and compares it with the situation in Japan. In both nations, most nuclear facilities have concentrated in a few locations including several considered here – Ulju and Gyeongju in Korea, and Futaba and Rokkasho in Japan.

In theoretical perspective, this study started with the concept of 'social peripheralisation', which is suggested by Andrew Blowers and Peter Leroy (1994). They investigated several LULU (Locally Unwanted Land Use) facilities in Europe, and concluded that these types of facilities tend to be located in marginal regions in various aspects. Earlier studies also linked the siting of such facilities to social marginalisation (see Blauner, 1972). Blowers and Leroy focused on the process and characteristics of conflicts, how local regions and members of the community reacted to the siting of each facility, and identified five aspects of peripheralisation: economic marginality; geographic remoteness; environmental degradedness; cultural defensiveness; and political powerlessness.

Ulju: Kori and Shin Kori nuclear complex

Ulju in the south-eastern area of South Korea has three nuclear power plants (Shin Kori-4/5/6). When combined with the adjacent Gijang region (Kori-2/3/4 and Shin Kori-1/2/3), it is one of the largest nuclear complexes in the world.

A noteworthy point in this region is that Ulju accepted three plants because of Gijang. This is explained by then-governor, Jin-gu Park: "*KEPCO plans to build four reactors in Hyoam region in Gijang. As you might know, Hyoam is close to our boundary. Thus, it might be regarded that the specific location is not the matter of issue in the aspect of safety, but when it comes to the compensation, it can bring distinctive differences. Thus, I considered that it seems better to invite the facility to our region on economic grounds.*" (Ulsan Local Council, 1999)

It illustrates that Ulju already shared a certain level of risk from nuclear plants in Gijang, and accepting nuclear plants in Ulju would bring a massive economic benefit. For instance, in its long-term development strategy by Ulju Development Institute (2014) identifies neighboring regions, such as Gijang and Gyeongju, not only as partners but also rivals for development. Considering the above points, it seems that Ulju is highly affected by its faith in economic development and the existing risk of nuclear energy.

At the same time, the government played a crucial role encouraging the acceptance of nuclear power reactors. In South Korea, there are several laws that require the government and utilities to financially support the place that hosts the electricity generating plant. According this rule, Ulju KHNP (Korea Hydro and Nuclear Power) announced the payment – solely for the siting of Shin Kori 3 – of ₩31.5 billion (US$28.0 million) in acquisition tax, ₩2.4 billion (US$2.1 million) in special tax for rural development, and ₩1.4 billion (US$1.24 million) in local education tax to Ulju district (Yonhap News, 2016).

In fact, there was aggressive opposition by people in Ulju when the government tried to build Shin Kori 3 there. However, KHNP completely ignored local opposition. And local politicians also regard the nuclear project as an 'inevitable task' from the perspective of local politics; therefore, even the local government could not easily oppose the plan.

When we returned to the recent situation of Ulju, people formed a tight alliance to protect the Shin Kori reactors from the President's policy to review whether or not construction should be completed. The background to this turn-around is evident in a comment by Lee san-dae, one of the local residents: "*Whilst local people intensively opposed the siting of Shin-Kori 3 and 4 reactors, opposition faded. Over time, it was acknowledged that we cannot make any changes in the case of Shin-Kori 5 and 6 plants, and people decided to cooperate with the siting.*" (Lee, 2017).

Gyeongju: low and intermediate level radioactive waste

Gyeongju lies in the north-east corner of the Korean Peninsula, and is well known as the capital of the Shill dynasty for nearly a century. From this historical background, it is also called the treasure house of historical and cultural assets in Korea. In this sense, the regional economy in Gyeongju relies highly on the tourism industry and related service sector (the tertiary sector accounts for 51% of all employment).

To manage these historical sites, the government set strict regulations about urban development and planning, such as altitude and structure limitation of buildings.

However, these so-called 'Culture belt' regulations have been a stringent obstacle for regional development and urban planning for Gyeongju (Jang, 2005). These circumstances are a cause of deep resentment towards the national government for people in Gyeongju, and resulted in the aspiration for self-reliance and local development (Choi, 2007).

Additionally, as Gyeongju constantly failed to win national projects (for example, a Taekwondo park and racecourse in 2005), they came to argue that this was regional discrimination compared to neighboring regions, such as Busan, Pohang and Ulsan, which are major hubs of industrialization. Put differently, Gyeongju shows similarities to Ulju in its faith for economic development and competition with neighboring regions.

Moreover, Gyeongju has already hosted six nuclear plants (Wolsung 1-4 and Shin Wolsung 1 and 2) since 1983. The plants significantly contributed to the region's growth, not only creating economic supports but also hiring approximately 10% of their workforce in the region. These points seem to have contributed to people's positive perceptions about hosting a repository for low and intermediate level radioactive waste.

Cho (2007), however, criticized the process, describing how peripheral communities tend to lose their identities and set their development strategy into inviting so-called NIMBY and LULU facilities. From this perspective, backward communities reinforce their marginality as a consequence of efforts to overcome their powerlessness through the siting of nuclear-related facilities.

In Gyeongju, the radioactive waste repository has been built and the nuclear industry has become a major channel for regional development rather than tourism and related industries. As an example, Gyeongju and Gyeongsanbuk-do plan to show the city as the core of the nuclear cluster while accumulating further facilities, such as research institutes.

Futaba: Fukushima nuclear reactors

Prior to the Fukushima accident, there were six reactors at the Fukushima Daiichi nuclear power plant and four reactors at Fukushima Daini. Fukushima is said to be the core of *Genpatsu Ginza*, translated as Nuclear Plaza; it was one of the largest nuclear clusters in the world.

The nuclear plant in Fukushima was invited in an unexpected way. A member of the House of Councilors from Fukushima constituency, Kimura tried to utilize Futaba's idle lands for the nuclear energy business, and discussed it with Sato Kiichi (then governor of Fukushima prefecture) and Kigawada Kazutaka, a Fukushima-native then vice-president of TEPCO (Fukushima Minpo, 2011).

Another noteworthy pillar can be regional poverty in the Futaba area. Although local people subsisted on the agriculture and fishery industries, *Dekasegi* (going to other cities for work) was the daily routine for members of the village, especially in the winter (NHK, 2013). The public briefing by TEPCO promoted a local nuclear plant as 'free from Dekasegi'.

At the start of construction, the stimulation of the regional economy seemed enough to give local residents the impression that 'Fukushima is becoming the city'. In fact, according to Three Power Source Development Laws, Okuma town marked significant growth in the 1970s with the benefits from the nuclear facilities. The situation in Futaba town was similar. Fixed asset tax for Futaba town in 1982 reached approximately ¥1.9 billion, which was nearly half the total revenue. In addition, in terms of TEPCO in Futaba town, it created almost one-third of regional employment, including outsourcing firms, according to calculations by Shimizu (2004). Furthermore, the construction industry and service sectors (such as restaurants, cleaning services and barber shops) that targeted workers in the nuclear industry expanded across the region

However, the nuclear-focused regional economy could not last for long. Under the structure of the Three Power Laws, in order to secure tax revenue, the region had to prove their demand, which means they were required to invest more budgets to acquire more taxation. In spite of constant attempts, they could not reduce the pace of collapse of the nuclear-reliant regional economy, especially in Futaba town.

This extremely vulnerable structure of the regional economy drove Futaba town to rely on additional calls for nuclear facilities (Tohoku Politics and Economics, 1997). In September 1991, Futaba local council unanimously passed a bill to invite further nuclear power plants. These were to be the 7th and 8th reactors at Fukushima Daiichi; however, the plan did not materialize due to the disaster. Concerning these phenomena, Sato Eisaku, governor of Fukushima from 1988 to 2006, likened it to 'drug addiction' (Sato, 2011).

Moreover, nuclear energy was not only embedded in the local community, it also restructured the community. Kainuma (2011) argues that local people tend to see minor and individual risks as 'inevitable', and consequently negative opinion cannot be expressed in the society. These mindsets help them live in their hometown with their family and neighbors. In essence, it can be said that local residents rebuilt their lifestyles, and reached a position that self-justified their co-existence with nuclear power facilities. This pattern seems critical to understanding the background of the powerful nuclear regime and myth of nuclear safety in Japan – the myth that was one of the drivers of Fukushima accident.

Consequently, it seems noteworthy that Fukushima invited the nuclear reactors to their community to combat poverty; but it caused the antithetical situation that reinforced addictiveness in the aspects of economic and cultural support.

Rokkasho village: nuclear fuel cycle facilities

Rokkasho village is located in the northeast peninsula, the so-called Shimokita-hantou (Shimokita peninsula) in Aomori prefecture, Japan. This project was triggered by the Mutsu-ogawara plan to build huge petrochemical and steelmaking plants. However, the first and second oil shocks resulted in a complete shift of the government's plans. This was an alarming event, not only for the national government but also for Aomori prefecture because the debts of the existing Mutsu-ogawara partners had risen from ¥82.7 billion to ¥130 billion (US$1.17 billion) since the plan was initiated, due to the non-disposal of land. Arguably, this financial circumstance strongly affected the invitation of the next development scheme – nuclear fuel cycle facilities in the Rokkasho region.

However, the Chernobyl accident aroused people's attention to oppose the project. Thus, the nuclear fuel cycle became a core election issue. Despite aggressive demonstrations, the result was that the pro-nuclear candidate, Kitamura Masaya, who was supported by the utilities and the ruling party, was reappointed as a governor.

At present, Rokkasho village is one of the few regions that promote nuclear power, even after the Fukushima accident. The economic influences of the nuclear facility, particularly financial support and employment, might have encouraged local people to choose a nuclear-friendly candidate (Itoh, 2016). Rokkasho village has been the richest region in Japan. Also in Rokkasho village, nearly 10% of local people work at JNFL.

According to Funabashi (2012), although economic benefits from the nuclear fuel cycle have accelerated local acceptance, there remains local concern and questions about the facility. It has been shown that 61% of people in Rokkasho village said they wished the nuclear fuel cycle could be scaled down if they could ensure employment in alternative ways.

The partially-built Rokkasho nuclear reprocessing plant in the northeast peninsula of Japan.

Whilst people seem to be positive regarding nuclear facilities due to the economic and employment benefits, there is an underlying uncertainty and fear.

Conclusion: toward sustainable nuclear transition

Governments and firms promise large economic incentives to win support for nuclear projects. Marginal communities – hollowed, aged communities and those which already host similar facilities – tend to accept the trade-off between financial support and safety risks. Also, once they accept nuclear facilities, those facilities shape their surrounding region and pro-nuclear sentiment tends to grow as dependence sets in. Thus nuclear facilities in South Korea and Japan are generally found in concentrated clusters. As Andrew Blowers emphasizes, social peripheralisation is not a one-time phenomenon, it constantly exacerbates their marginality.

South Korea and Japan have both pledged to reduce their reliance on nuclear power and the processes of peripheralisation and marginalisation will shape the unfolding energy transition.

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The World Nuclear Industry Status Report 2018

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The 2018 edition of the World Nuclear Industry Status Report has just been released. Here are the 'key insights' from the report:

China Still Dominates Developments

- Nuclear power generation in the world increased by 1% in 2017 due to an 18% increase in China.
- Global nuclear power generation excluding China declined for the third year in a row.
- Four reactors started up in 2017 of which three were in China and one in Pakistan (built by a Chinese company).
- Five units started up in the first half of 2018, of which three were in China – including the world's first EPR and AP1000 – and two in Russia.
- Five construction starts in the world in 2017.
- No start of construction of any commercial reactors in China since December 2016.
- The number of units under construction globally declined for the fifth year in a row, from 68 reactors at the end of 2013 to 50 by mid-2018, of which 16 are in China.

Operational Status and Construction Delays

- The nuclear share of global electricity generation remained roughly stable over the past five years with a long-term declining trend, from 17.5% in 1996 to 10.3% in 2017.
- Seven years after the Fukushima events, Japan had restarted five units by the end of 2017 – generating still only 3.6% of the power in the country in 2017 – and nine by mid-2018.
- As of mid-2018, 32 reactors – including 26 in Japan – are in Long-Term Outage (LTO).
- At least 33 of the 50 units under construction are behind schedule, mostly by several years. China is no exception, at least half of 16 units under construction are delayed. Of the 33 delayed construction projects, 15 have reported *increased* delays over the past year.
- Only a quarter of the 16 units scheduled for startup in 2017 were actually connected to the grid.
- New-build plans have been cancelled including in Jordan, Malaysia and the U.S. or postponed such as in Argentina, Indonesia, Kazakhstan.

Decommissioning Status Report

- As of mid-2018, 115 units are undergoing decommissioning – 70% of the 173 permanently shut-down reactors in the world.
- Only 19 units have been fully decommissioned: 13 in the U.S., five in Germany, and one in Japan. Of these, only 10 have been returned to greenfield sites.

Interdependencies Between Civil and Military Infrastructures

- Nuclear weapon states remain the main proponents of nuclear power programs. A first look into the question whether military interests serve as one of the drivers for plant-life extension and new-build.

Renewables Accelerate Take-Over

- Globally, wind power output grew by 17% in 2017, solar by 35%, nuclear by 1%. Non-hydro renewables generate over 3,000 TWh more power than a decade ago, while nuclear produces less.
- Auctions resulted in record low prices for onshore wind (<US$20/MWh) offshore wind (<US$45/MWh) and solar (<US$25/MWh). This compares with the "strike price" for the Hinkley Point C Project in the U.K. (US$120/MWh).
- Nine of the 31 nuclear countries – Brazil, China, Germany, India, Japan, Mexico, Netherlands, Spain and United Kingdom (U.K.) – generated more electricity in 2017 from non-hydro renewables than from nuclear power.

Mycle Schneider, Antony Froggatt et al., Sept 2018, 'The World Nuclear Industry Status Report 2018', www.worldnuclearreport.org/Nuclear-Power-Strategic-Asset-Liability-or-Increasingly-Irrelevant.html

Energy: Missing from the nuclear Story

Author: Don Fitz

NM865.4748

One of my first memories of watching TV during the early 1950s was ads promoting leaded gasoline for reducing engine knock. Little did I suspect the strange history of that gas. By the beginning of World War I, it became clear that the internal combustion automobile was edging out its rival steam cars and electric cars. Shortly afterwards, Thomas Midgley began researching how to remove the knocking "ping" sound from gasoline-powered cars.

Midgley devoted no fewer than six years of his life searching for a fuel additive that would have a "no-knock" effect. He found that corn alcohol would be too expensive. Benzene would also be effective, but it would be impossible to manufacture enough. Both oxygen and chlorine increased knock. Aniline, selenium oxychloride and tellerium worked, but produced an awful smell. Examining one element after another in a periodic table of the time, he finally found a gasoline additive: tetraethyl lead. Since poisonous effects of lead were well known, the product was labeled "ethyl gasoline."

Multiple states banned sale of ethyl gasoline, prompting a retort from Midgley that car exhaust contained far too little lead to cause concern. A vice-president of a new gas company proclaimed that leaded motor fuel was a "gift of God" as Midgley told his partner that they could make 3¢ from each gallon of leaded gasoline in the 20% of the market they could corner. During the next few decades, leaded gasoline caused immeasurable damage to human organ systems as well as causing violent behavior from neurological impairment.

This is the most dramatic story from Richard Rhodes' (2018) *Energy: A Human History*.[1] Much of *Energy* is a hodgepodge of personality sketches of those having a role in scientific discoveries. Some of the anecdotes are fascinating. When the power of steam was being harnessed to move people and things, a contest determined that a steam locomotive attached to the object it was pulling was more efficient than the then popular method of having a stationary engine pull freight uphill with a rope.

Other accounts illustrate how technological changes affected workers. James Watt used nitrous oxide to rid natural gas of its smoke and smell so it could be employed for night-time lighting. Mill owners then lengthened the working day to 14 hours.

Nuclear power

The shock of the book comes after the author completes 18 of his 20 chapters. As Rhodes delves into the most recent of technologies, nuclear power, the reader finds Rachel Carson, Ralph Nader, and Helen Caldicott being compared to misanthropes such as Thomas Malthus, Paul Ehrlich and followers of Adolf Hitler. This bizarre connection is based on the writings of one obscure author who predated Carson with a description of destruction caused by the over-reproduction of "undesirable people."

Rhodes claims that the environmental movement unknowingly brought "anti-humanist" ideology into its visions of a simpler world. By advocating a society less dependent on complex technology, environmentalists are ostensibly condemning untold millions of impoverished humans to disease and starvation.

The author insists that only nuclear power can save humanity from energy poverty and, thus, rejection of nuclear power is elitist. What about nuclear radiation poisoning, which is critical to nuclear dangers? Rhodes presents a case which may well become the next generation of pro-nuclear apologies. Reviewing theories of 1926, he accuses Herman Muller of committing the original sin of radiation theory after his discovery that low doses of radiation caused genetic mutation in fruit flies. Muller developed the critically important "linear no-threshold" (LNT) model which postulates a "linear" relationship between the quantity of radiation received and the likelihood of cell damage, or, that there is no dose of radiation so small that it is without negative effects.

Rhodes' attempts to discredit Muller have three disturbing characteristics. First, he bases his arguments on character attacks against scientists and environmentalists. Next, he minimizes or ignores large bodies of data.

Third, his arguments lack internal consistency as he repeatedly contradicts information from different parts of the book. For example, on p. 324 he claims nuclear power is "carbon-free energy" but on p. 332 says nuclear power creates greenhouse gases during "construction, mining, fuel-processing, maintenance, and decommissioning."

Rhodes borrows his denunciations of Muller from an article by Edward Calabrese, who brags to have unearthed evidence that Muller suppressed research in 1946.[2] During his Nobel Prize acceptance speech, Muller did not acknowledge that he had received a paper that Calabrese thinks contradicted the LNT theory. Calabrese' charge, repeated by Rhodes, is absurd, both because it is ridiculous to think that a Nobel Prize speech would be changed due to one unreplicated finding and because Muller was later instrumental in ensuring the publication of that paper.

It is currently Calabrese, rather than Muller, who is discredited, largely due to his increasingly weird assertions that acceptance of the LNT theory was due to "falsifying and fabricating the research record."[3] Calabrese's objectivity is also called into question by his funding from the nuclear industry and companies such as ExxonMobil, Dow Chemical, and General Electric.[4]

Calabrese's hostility could also be due to the near-universal rejection of his "hormesis" theory that small levels of radiation benefit human health. In 2006, Calabrese made arguments for hormesis to the international Committee on Biological Effects of Ionizing Radiation which rejected them in favor of the LNT model.[5] The LNT model is accepted by a long list of agencies and health organizations.

Many researchers have documented effects of low level radiation (LLR) from the various stages of nuclear power production, background radiation, X-rays and CT scans.[6] Since Muller's first experiments on fruit flies, other studies show these insects being susceptible to radiation levels 50 times lower than found then. As fruit fly research faded away, by the 1970s it was replicated with mice.[7]

Recent research on over 110,000 workers cleaning up after the Chernobyl disaster found significant leukemia increases, even at low doses.[8] Another study of 300,000 nuclear workers in the US, UK and France also showed leukemia increases with extremely low radiation exposure.[9] Parallel investigations in the UK, France, Switzerland and Germany demonstrated 30% to 40% increases of childhood leukemia for those living close to nuclear power plants.[10] An estimated 20% of childhood leukemia in Great Britain is due to background radiation.[11]

Children are particularly susceptible

Children are particularly susceptible to radiation damage because their tissue is growing rapidly.[12] Chronic exposure to radiation is also linked to multiple myeloma, lung cancer, thyroid cancer, skin cancer, and cancer of the breast and stomach.[12]

The many agencies and scientific societies scrutinizing these and vastly more studies are well aware that accepting Rhodes' belief that LLR causes no harm or Calabrese's belief that it is good for you could be very bad for humanity and particularly disastrous for children and nuclear industry workers. It could lead to the elimination of regulations that many argue are already too weak and irregularly enforced. One point rarely addressed is that each study tends to focus on a single source of radiation. Relaxing rules could result in increased poisoning from multiple sources.

This brings up the "Precautionary Principle."[13] It says that if there is doubt about the safety of a substance, the burden of proof that it is safe lies with those who advocate it, rather than burdening those who question it with the responsibility to prove its harm. In other words, "Better safe than sorry." The phrase "Precautionary Principle" is not even included in the index of *Energy*, much less discussed. Rhodes' approach suggests a "Throw-caution-to-the-wind Principle."

Rhodes glibly dismisses Three Mile Island, Chernobyl and Fukushima as accidents that need not have happened had people been more careful. In other words, if humans did not behave as humans, there would be no nuclear disasters.

The author is either ignorant of the Price-Anderson Act of 1957 or deliberately chose to sidestep it.[14] That legislation was passed to encourage private companies to build nuclear power plants by limiting total liability. Many currently worry that a plant near them might melt down, causing damage far into the billions, with the company not having to fully compensate its victims. If Rhodes truly believed his own claims regarding the safety of nuclear plants, he would advocate the repeal of Price-Anderson as unnecessary. "Price-Anderson" also does not appear the book's index.

Nuclear waste

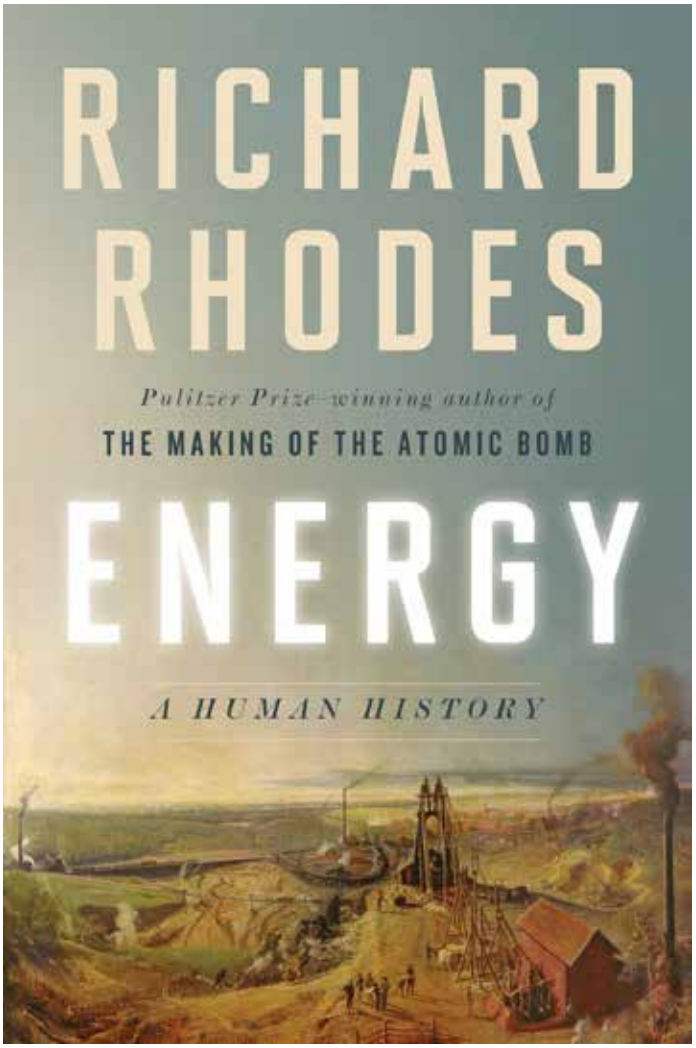
Rhodes belittles concerns regarding nuclear waste, proposing to bury it for 1000 years and let our descendants cope with it. Rational people do not want to encumber their grandchildren with the legacy of leukemia. Again, the author forgets what he wrote in a previous chapter, that the half life of U238 is 4.5 billion years. Most people who made it through middle school realize that this time periods exceeds 1000 years.

Rhodes seems unaware that some types of radwaste can actually become more radioactive with the passage of time, due to the production of daughter atoms with short half lives. Radioactivity can initially increase for thousands of years before activity declines – the dangerous interval can persist much longer than the lapse between the building of Egypt's pyramids and today.

Nor does he seem aware that every nuclear plant must discharge enormous quantities of hot water into an adjacent river or ocean, whose aquatic life is seriously harmed. Nor does he recognize that earth itself is unstable, subject to earthquakes, floods and other calamities, which is a problematic issue for St. Louis dumps that house some of the original wastes from the Manhattan Project. That waste, and waste from a conventional dump which is now smoldering, are inching their way towards each other, which is a burning issue for those living nearby.

Many, many people for many different reasons and living in different times (including the future) do and will take issue with the irresponsible claim that nuclear waste is not dangerous.

It never occurs to Rhodes to contrast the potential horror from someone dropping a bomb on a nuclear power plant to bombing a solar panel or wind installation. Worse, he advocates global proliferation of nuclear power to states vastly less capable of protecting themselves than are the current nuclear powers. Rhodes seems to forget what he wrote in earlier chapters directly linking the Atoms for Peace program of the Eisenhower era to the expansion of nuclear weapons. Nor does he remember his earlier discussion of the need to use a form of uranium fuel at that time which would "reduce the risk of nuclear proliferation."



The difference between Rhodes' early warning against nuclear proliferation and his ringing endorsement of the same in the last two chapters is just one of the ways he contradicts himself. More serious is the contrast in tone, style and conceptualization in the two portions of the book. In the major portion of his work, Rhodes repeatedly describes government agencies' covering up evidence that threatens corporate profits. But in the final portions of the book, government agencies are recast as an interlocking conspiracy to block the nuclear industry from completing its humanitarian goal of providing cheap, clean energy to the world's poor.

More subtle is the way Rhodes hints at energy conservation before ditching the idea in his conclusion. He describes the way that James Watt improved the steam engine by moving the condensation process in order to save energy. Later, he seems about to expand the idea of conserving energy when he notes that many "began to question if growth was good."

This question would challenge the corporate assumption that a quality life comes from possessing an increasing number of objects and propose that energy abundance best be resolved by using energy more efficiently to produce goods (including housing) that endure. Rhodes never follows this dream and, instead, concludes his book by swallowing the "Happiness = More Stuff" model hook, line and sinker.

Failing to explore the potential of conserving energy, Rhodes accepts that increasing energy can only be provided with nuclear power and follows in the footsteps, not only of Edward Calabrese but also of those he criticizes. Like Thomas Midgley's portrayal of "fanatical health cranks," he describes icons of the environmental movement as "extremists." Mimicking Calabrese' characterization of consensus on the LNT radiation theory as "not real but faked," he describes the "disingenuousness" of antinuclear activists. Rather than pointing to a solution for climate change, his radiation denial mirrors Donald Trump's climate denial in its derogation of scientific research and its personality attacks.

The great environmental challenge of our time it to understand that the many sources of biodestruction are all interconnected and must be confronted simultaneously, rather than disparaging one danger to focus on another. Addressing species extinction could not move forward by ridiculing concern with toxic pollution. The extreme threat of climate change will not move closer to resolution by trivializing the menace of nuclear power. Rhodes' book on *Energy* epitomizes what environmentalists should avoid – it does not chart the path that humanity should tread.

Don Fitz is on the Editorial Board of Green Social Thought (http://greensocialthought.org), where this article first appeared. He was the 2016 candidate of the Missouri Green Party for Governor. His articles on politics and the environment have appeared in Monthly Review, Z Magazine, and Green Social Thought, as well as several online publications.

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