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Editorial

Dear readers of the WISE/NIRS Nuclear Monitor,

This issue of the *Nuclear Monitor* includes a detailed dissection of the 'myth of the peaceful atom' − the distortions and lies peddled by nuclear proponents to trivialize the links between 'peaceful' nuclear programs and weapons proliferation. In this issue we also look at the enormous opposition to plans to build a radioactive waste repository near Lake Huron in Canada.

Feel free to contact us if you have feedback on this issue of the *Monitor*, or if there are topics you would like to see covered in future issues.

Regards from the editorial team.

Email: monitor@wiseinternational.org

Monitored this issue:

Canada: Widespread opposition to proposed nuclear dump

NM804.4472 A proposal by Ontario Power Generation (OPG) to build a deep geological repository near the Bruce nuclear power plant has been endorsed by a federal Joint Review Panel Report. Opponents have 120 days to file further comment, after which the Environment Minister could authorize the panel to issue a licence to prepare the site for the repository.[1]

OPG plans to bury as much as 200,000 cubic metres of waste within a thick layer of limestone located 680 metres below ground, barely a kilometre from the shores of Lake Huron. The repository would take waste from the Bruce, Pickering, and Darlington nuclear plants.[1]

The plan has met with fierce opposition from Traditional Owners. Grand Council Chief Patrick Madahbee from the Anishinabek Nation said: "The uncertainties and risks are too great for the Anishinabek Nation and Ontario citizens to consider. The Anishinabek Nation passed a resolution, and we have informed governments before, that 'the Anishinabek Nation will stand united and oppose any deep geological nuclear waste repositories within the Anishinabek Nation territory'."[1,2]

Saugeen Objiway Nation (SON) Chief Vernon Roote said: "If something were to happen with the disposal or the leakage of nuclear waste I wouldn't want to be drinking the water downstream. That means the balance of Lake Huron, Lake Erie, Lake Ontario and also anyone drinking from those lakes, even into the US."[1,2]

"In our community that I represent ... there are no members that are agreeable to the burial at the site at this time," Roote said.[3]

The site is in the traditional territory of the SON. OPG says approval by the SON is necessary for the project to proceed. “As we have stated in the past and we will state again, we will not build this project without SON support,” OPG spokesperson Neal Kelly said.[3]

There is broad public and political opposition on the Canadian and US sides of Lake Huron. Bipartisan resolutions opposing the proposed repository have been introduced in the US House and Senate.[4]

One hundred and fifty-five Native American First Nations, states, counties, cities, towns, and villages − including Michigan, Chicago, Toledo, and Toronto − have passed resolutions opposing the repository, representing 21 million people.[5]

After Chicago City Council unanimously passed a resolution opposing the repository in January, Chicago Mayor Rahm Emanuel said: “The Great Lakes hold 84 percent of North America’s fresh water and Chicago’s position as the paramount Great Lakes city makes OPG’s proposed nuclear waste repository a threat both to public health and our environment.”[6]

The independence of the Canadian Nuclear Safety Commission has been called into question, and the conservative Canadian government has seriously weakened environmental protection laws in recent years.[7,8]

More information:
www.stopthegreatlakesnucleardump.com

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The myth of the peaceful atom

Author: *Jim Green − Nuclear Monitor editor*

NM804.4473 The greatest risks associated with the nuclear fuel cycle are weapons proliferation and related risks such as military strikes on nuclear plants. The nuclear industry and its supporters have developed an elaborate set of tactics and myths to trivialize the proliferation risks.

1. Ignore the proliferation problem.

Often, nuclear proponents simply ignore the proliferation problem. For example, academics Barry Brook and Corey Bradshaw, writing in the *Conservation Biology* journal last year, rank power sources according to seven criteria: greenhouse emissions, cost, dispatchability, land use, safety, solid waste, and radiotoxic waste.[1] Nuclear weapons proliferation is excluded from the analysis.

2. Define the problem out of existence.

Academic Andrew O’Neil states: “There is simply no historical evidence to support the proposition that civilian nuclear reactor programs fuel weapons proliferation. ... All nuclear weapons states acquired their arsenals through purpose-built military facilities, not as a by-product of civilian reactors.”[2]

Numerous examples illustrating the fallacy of O’Neil’s claims are listed below. Suffice it here to note one example:

- India’s first nuclear weapon test used plutonium produced in the CIRUS research reactor;
- the plutonium produced in CIRUS was ostensibly separated for India’s fast breeder nuclear power program[3]; and
- India refuses to place numerous reactors under International Atomic Energy Agency (IAEA) safeguards and there can be only one explanation: India uses (or plans to use) those reactors to produce materials for nuclear weapons.

O’Neil reduces the debate to a *reductio ad absurdum:* all facilities and materials used in military programs are, by definition, military facilities and materials; and anyone suggesting otherwise is, by definition, indulging in anti-nuclear scuttlebutt. Q.E.D.

1. B. Brook, and C. Bradshaw, 2014, ‘Key role for nuclear energy in global biodiversity conservation’, Conservation Biology, http://dx.doi.org/10.1111/cobi.12433
2. Andrew O’Neil, 18 Sep 2010, ‘Nuclear power plants are not bomb factories’, The Australian, www.theaustralian.com.au/news/opinion/nuclear-power-plants-are-not-bomb-factories/story-e6frg6zo-1225925594625
3. International Panel on Fissile Materials, 2010, ‘Fast Breeder Reactor Programs: History and Status’, www.ipfmlibrary.org/rr08.pdf

3. Trivialize the proliferation problem.

According to Ian Hore-Lacy from the World Nuclear Association: "Happily, proliferation is only a fraction of what had been feared when the NPT was set up ..."[4] The 'nuclearradiophobia' blog states that "37 countries that have the infrastructure and capability to build nuclear weapons if they wanted" but "only nine of these countries have nuclear weapons".[5] There are a "mere nine nuclear weapons states" according to Andrew O'Neil.[6]

However proliferation is a huge problem. The 16,000 (or so) weapons held by weapons states have the potential to kill billions of people. Moreover, even a limited exchange of some dozens of weapons could cause catastrophic climate change.[7] Academic Alan Robock wrote in the *Bulletin of the Atomic Scientists:* "As recent work ... has shown, we now understand that the atmospheric effects of a nuclear war would last for at least a decade − more than proving the nuclear winter theory of the 1980s correct. By our calculations, a regional nuclear war between India and Pakistan using less than 0.3% of the current global arsenal would produce climate change unprecedented in recorded human history and global ozone depletion equal in size to the current hole in the ozone, only spread out globally."[8]

The 'modernization' programs of the nuclear weapons states pose major risks (and opportunity costs) and weaken the disarmament/non-proliferation regime.[9]

The number of nuclear weapons-armed states has increased from five to nine since the Nuclear Non-Proliferation Treaty (NPT) was established. The eroding disarmament/non-proliferation regime coupled with (slowly) expanding nuclear capacity (from civil nuclear programs) creates the potential for significant horizontal proliferation. The UN Secretary-General's High Level Panel on Threats, Challenges and Change noted in 2004: "We are approaching a point at which the erosion of the non-proliferation regime could become irreversible and result in a cascade of proliferation."[10]

Nuclear advocate Geoff Russell states that we have been 100% successful at preventing further use of nuclear weapons since World War II and that a "rational person would conclude that preventing nuclear wars and nuclear weapons proliferation is actually pretty easy, otherwise we wouldn't have been so good at it." He further notes that "ladders are more dangerous than nuclear electricity plants, and cars are more dangerous than ladders."[11]

So perhaps ladders and cars should be classified as Weapons of Mass Destruction? Nuclear weapons are unique in their destructive potential − even more destructive than ladders. As former US Defense Secretary Robert MacNamara said: "In conventional war, mistakes cost lives, sometimes thousands of lives. However, if mistakes were to affect decisions relating to the use of nuclear forces, there would be no learning curve. They would result in the destruction of nations."[12]

Russell states: "The proliferation argument isn't actually an argument at all. It's just a trigger word, brilliantly branded to evoke fear and trump rational discussion." One of the rabidly anti-nuclear organisations evoking fear and trumping rational discussion is the US State Department, which noted in a 2008 report that the "rise in nuclear power worldwide … inevitably increases the risks of proliferation".[13] And the anti-nuclear ideologues at the US National Intelligence Council argued in a 2008 report that the "spread of nuclear technologies and expertise is generating concerns about the potential emergence of new nuclear weapon states and the acquisition of nuclear materials by terrorist groups."[14]

An honorary mention for trivializing nuclear weapons goes to French diplomat Jacques Le Blanc, who said, when justifying weapons tests in the Pacific in 1995: "I do not like this word bomb. It is not a bomb; it is a device which is exploding."[15]

And an honorary mention goes to the Indian government, which insisted that its 1974 'Smiling Buddha' bomb test was a 'peaceful nuclear explosive'.

4. Pay lip service to proliferation problems.

Often nuclear proponents pay lip service to the problems of proliferation and the contribution of civil programs to proliferation risks.

For example, US President Obama cautioned at the 2012 Nuclear Security Summit in Seoul: "We simply can't go on accumulating huge amounts of the very

4. Ian Hore-Lacy, 2000, "The Future of Nuclear Energy", paper presented at the Royal College of Physicians Conference, Adelaide, 4 May 2000, available from jim.green@foe.org.au
5. 'Nuclear Proliferation', http://nuclearradiophobia.blogspot.com.au/p/nuclear-proliferation.html
6. Andrew O'Neil, 18 Sep 2010, 'Nuclear power plants are not bomb factories', The Australian, www.theaustralian.com.au/news/opinion/nuclear-power-plants-are-not-bomb-factories/story-e6frg6zo-1225925594625
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10. UN High-Level Panel on Threats, Challenges and Change, 30 Nov 2004, 'A more secure world: Our shared responsibility. Report to the Secretary-General', p.39, www.un.org/en/peacebuilding/pdf/historical/hlp_more_secure_world.pdf
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13. Quoted in Sue Wareham, 6 Aug 2009, 'The terror of Hiroshima', www.onlineopinion.com.au/view.asp?article=9269&page=0
14. US National Intelligence Council, 2008, "Global Trends 2025 – a Transformed World", http://web.archive.org/web/20081126005323/http://www.dni.gov/nic/PDF_2025/2025_Global_Trends_Final_Report.pdf
15. 1 Aug 2004, New Internationalist, http://newint.org/columns/speechmarks/2004/08/01/jacques-le-blanc/

material, like separated plutonium, that we're trying to keep away from terrorists."[16]

So what's being done about the problem of growing stockpiles of separated plutonium? Nothing. All that would need to be done to address the problem of growing stockpiles of separated/unirradiated plutonium would be to slow or suspend reprocessing until the stockpile is drawn down.

The US could (but doesn't) take concrete steps to curb the separation and stockpiling of plutonium − it has the authority to disallow separation and stockpiling of US-obligated plutonium, i.e. plutonium produced from nuclear materials originally mined or processed in the US.

5. Warped priorities.

The April 2010 Nuclear Security Summit in Washington issued a communiqué expressing the resolve of the 47 participating nations to strengthen nuclear security and thus reduce the risk of nuclear terrorism. But there's a caveat in the communiqué. It calls on nations to "support the implementation of strong nuclear security practices that will not infringe upon the rights of States to develop and utilize nuclear energy for peaceful purposes ..."[17]

The Nuclear Security Summit got it the wrong way around: surely preventing nuclear terrorism comes first and peaceful nuclear development is a subordinate right − assuming it's a right at all.

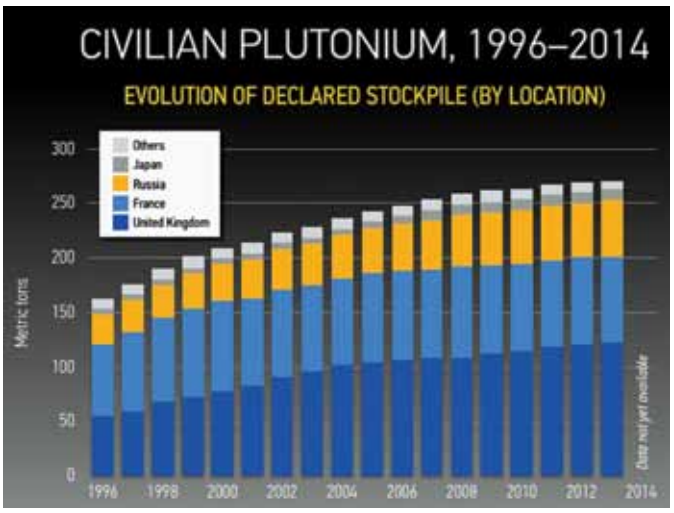
The NPT has a similar caveat: "Nothing in this Treaty shall be interpreted as affecting the inalienable right of all the Parties to the Treaty to develop research, production and use of nuclear energy for peaceful purposes without discrimination ..."[18]

Current priorities need to be reversed. Victor Gilinsky, a former member of the US Nuclear Regulatory Commission, states: "Security should come first − not as an afterthought. We should support as much nuclear power as is consistent with international security; not as much security as the spread of nuclear power will allow."[19]

6. Fissile material is scarce?

Academic nincompoops Haydon Manning and Andrew O'Neil state that "the core ingredients of weapons-grade fissile material (i.e. highly enriched uranium and plutonium) are scarce internationally ..."[20]

A May 2015 report written by Zia Mian and Alexander Glaser for the International Panel on Fissile Materials provides details on stockpiles of fissile materials as of the end of 2013:



Stockpiles of separated/uniraradiated plutonium. *Source: International Panel on Fissile Materials, http://fissilematerials.org/library/ipfm15.pdf*

- Highly enriched uranium (HEU): 1,345 tons (936 tons military; 290 tons naval; 57 tons 'excess'; 61 tons civilian) − enough for 89,700 weapons (assuming 15 kg HEU/weapon).
- Plutonium: 498 tons (142 tons military; 89 tons 'excess'; 267 tons civilian) − enough for 129,700 weapons (assuming 3 kg of weapon grade plutonium or 5 kg of reactor grade plutonium per weapon).[21]

Mian and Glaser state that the global stockpile of fissile material contains more than 200,000 weapon-equivalents (219,400 using the above figures). The civilian stockpiles contain 57,070 weapons-equivalents: 61 tons of highly enriched uranium (4,070 weapons), and 267 tons of (separated) plutonium (53,000 weapons).

The figures are greater if plutonium in spent fuel is included. A 2005 report by the Institute for Science and International Security found that nuclear stockpiles contained over 300,000 weapon-equivalents:

- 1,830 tonnes of plutonium in 35 countries at the end of 2003, enough to make 225,000 nuclear bombs (assuming 8 kg/weapon), with civil plutonium stockpiles increasing by 70 tonnes per year. The figure for power and research reactor programs was 1,570 tonnes or 196,250 weapon-equivalents.
- 1,900 tonnes highly enriched uranium in more than 50 countries, enough for over 75,000 weapons (assuming 25 kg/weapon).
- more than 140 tonnes of neptunium-237 and americium in 32 countries, enough for 5,000 weapons.[22]

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21. Zia Mian and Alexander Glaser, 2015, 'Global Fissile Material Report 2015: Nuclear Weapon and Fissile Material Stockpiles and Production', International Panel on Fissile Materials, http://fissilematerials.org/library/ipfm15.pdf
22. Institute for Science and International Security, 1 Jan 2005, 'Global Stocks of Nuclear Explosive Material – End 2003 (Updated 2005)', Chapters I and II, http://isis-online.org/isis-reports/detail/global-stocks-of-nuclear-explosive-materials/17
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7. Nuclear power is not a proliferation problem?

Academic 'Research Fellow' Martin Boland states: "Historically, if a country wants to produce a nuclear bomb, they build reactors especially for the job of making plutonium, and ignore civilian power stations."[23]

John Carlson, former head of the Australian Safeguards and Non-proliferation Office, states: "I have pointed out on numerous occasions that nuclear power as such is not a proliferation problem – rather the problem is with the spread of enrichment and reprocessing technologies ..."[24]

Such arguments are false and disingenuous, for several reasons.

- Firstly, power reactors have been used directly in weapons programs:
- India refuses to place numerous power reactors under safeguards[25] and presumably uses (or plans to use) them for weapons production.
- The US has long used a power reactor to produce tritium for use in nuclear weapons.[26] And proponents of a 'Safe Modular Underground Reactor' proposed for South Carolina were kindly offering the reactor to produce tritium for weapons.[27]
- The 1962 test of sub-weapon-grade plutonium by the US may have used plutonium from a power reactor.
- The US operated at least one dual-use reactor (the Hanford 'N' reactor) to generate power and to produce plutonium for weapons.[28]
- Russia operated dual-use reactors to generate power and to produce plutonium for weapons.[29]
- Magnox reactors in the UK were used to generate power and to produce plutonium for weapons.[30]
- In France, the military and civilian uses of nuclear energy are "intimately linked".[31] France used the Phénix fast neutron power reactor to produce plutonium for weapons[32] and possibly other power reactors for the same purpose.
- North Korea has tested weapons using plutonium produced in its 'Experimental Power Reactor'.

The Watts Bar I power reactor has been used to produce tritium for the US nuclear weapons program.

- Pakistan may be using power reactor/s in support of its nuclear weapons program.

Secondly, separating enrichment and reprocessing on the one hand, and reactors on the other, misses the point that the purpose of enrichment is to produce fuel for reactors, and reactors are the only source of materials for reprocessing plants. Nuclear power programs provide cover and legitimacy for the acquisition of enrichment and reprocessing technology.

Similarly, one of the main justifications for the development of research and training reactors is, as the name suggests, research and training towards the development of nuclear power. Research reactors have been the plutonium source for weapons in India and Israel. Small amounts of plutonium have been produced in research reactors then separated from irradiated materials in a number of countries suspected of or known to be interested in the development of a nuclear weapons capability − including Iraq, Iran, South Korea, North Korea, Taiwan, Yugoslavia, and possibly Romania.[33] There is little pretence that Pakistan's unsafeguarded Khushab reactors are anything other than military reactors, but the 50 MWt Khushab reactor has been described as a 'multipurpose' reactor.[34]

23. Martin Boland, 30 Dec 2013, 'Debunking myths on nuclear power (it's not for making bombs)', http://theconversation.com/debunking-myths-on-nuclear-power-its-not-for-making-bombs-20013
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27. Thomas Clements, 2012, 'Documents Reveal Time-line and Plans for "Small Modular Reactors" (SMRs) at the Savannah River Site (SRS) Unrealistic and Promise no Funding', http://aikenleader.villagesoup.com/p/documents-reveal-time-line-and-plans-for-small-modular-reactors-smrs-at-the-savannah-river-site-sr/840884
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29. Mark A. Prelas and Michael Peck, 12 Jan 2005, 'Nonproliferation Issues For Weapons of Mass Destruction', CRC Press, pp.88-89, https://books.google.com.au/books?id=QmmZoVTyAKwC https://books.google.com.au/books?id=QmmZoVTyAKwC&pg=PA88&lpg=PA89
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34. World Nuclear Association, 'Nuclear Power in Pakistan', Updated April 2015, www.world-nuclear.org/info/Country-Profiles/Countries-O-S/Pakistan/

Nuclear power programs can facilitate weapons programs even if power reactors are not actually built. Iraq provides a clear illustration of this point. While Iraq's nuclear research program provided much cover for the weapons program from the 1970s until 1991, stated interest in developing nuclear power was also significant. Iraq pursued a 'shop till you drop' program of acquiring dual-use technology, with much of the shopping done openly and justified by nuclear power ambitions.[35]

According to Khidhir Hamza, a senior nuclear scientist involved in Iraq's weapons program: "Acquiring nuclear technology within the IAEA safeguards system was the first step in establishing the infrastructure necessary to develop nuclear weapons. In 1973, we decided to acquire a 40-megawatt research reactor, a fuel manufacturing plant, and nuclear fuel reprocessing facilities, all under cover of acquiring the expertise needed to eventually build and operate nuclear power plants and produce and recycle nuclear fuel. Our hidden agenda was to clandestinely develop the expertise and infrastructure needed to produce weapon-grade plutonium."[36]

In addition to material contributions for weapons programs, civil nuclear programs can provide the necessary expertise. Ian Jackson discusses the overlap: "The physics of nuclear weapons is really a specialized sub-set of general nuclear physics, and there are many theoretical overlaps between reactor and weapon design. ... Indeed, when I myself changed career from working at Britain's civilian Atomic Energy Research Establishment (Harwell) to inspecting the military AWE Aldermaston nearly a decade later, I was surprised at the technical similarity of energy and bomb research. The career transition was relatively straightforward, perhaps signalling the intellectual difficulty of separating nuclear energy technology from that of nuclear weapons."[37]

Civil nuclear programs can provide political impetus for weapons programs. In Australia, for example, the most influential proponent of the push for nuclear weapons in the 1960s was Philip Baxter, head of the Australian Atomic Energy Commission.[38]

Alternatively, the military can co-opt civil nuclear programs. Academic Saleem Ali discusses the case of Pakistan: "Nuclear capability seems to have a seductive appeal towards weaponization in countries that exist in conflict zones. Aspiring nuclear power states should consider this danger of the military co-opting any nuclear agenda, as happened in Pakistan despite the pioneering work of well-intentioned scientists and nuclear energy advocates like Salam."[29]

8. In some weapons states, nuclear power is insignificant or non-existent.

John Carlson, then head of the Australian Safeguards and Non-Proliferation Office, claimed that "... in some of the countries having nuclear weapons, nuclear power remains insignificant or non-existent."[40]

This attempt to absolve nuclear power from proliferation problems ignores the direct use of power reactors to produce material for weapons, and the use of power programs to justify development of other facilities used in weapons programs (enrichment and reprocessing plants, and research and training reactors).

Of the 10 states that have produced nuclear weapons, eight have power reactors and North Korea has an 'Experimental Power Reactor'. The nine current weapons states account for 59% of the world's 'operable' reactors as of May 2015 (257/437).[41]

9. Weapons first, power later.

Academic 'Research Fellow' Martin Boland claims that "no country has developed indigenous nuclear weapons after deploying civilian nuclear power stations.[42] Likewise, John Carlson says: "If we look to the history of nuclear weapons development, we can see that those countries with nuclear weapons developed them before they developed nuclear power programs."[43]

Those claims are partly true, partly false and partly misleading. In some cases, reactors preceded weapons. India had three power reactors operating before its 1974 weapons test.[44] Pakistan had one power reactor operating before it developed weapons.[45] North Korea's 'Experimental Power Reactor' preceded its weapons program − and has been used to produce plutonium for weapons.

In some other countries, weapons programs did indeed predate the development of nuclear power − but power programs have still contributed to weapons production. Examples include the operation of dual-use power/plutonium reactors in the UK, US, France and Russia (see #7 above).

35. David Albright and Mark Hibbs, April 1992, 'Iraq's shop-yill-you-drop nuclear program', Bulletin of the Atomic Scientists, Vol. 48, No. 3, www.iraqwatch.org/perspectives/bas-iraqshop-nuke-4-92.htm
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10. Weapons proliferation is a problem with or without nuclear power.

Academics Brook and Bradshaw state: "Nuclear weapons proliferation is a complex political issue, with or without commercial nuclear power plants ..."[46]

True, but civil nuclear programs are a significant part of the proliferation. Five of the 10 states that have built weapons did so with significant technical and material input and/or political cover from civil programs (or ostensibly civil programs) − South Africa, Pakistan, India, Israel and North Korea.

The use of civil nuclear facilities and materials for weapons research or weapons programs has been commonplace. It has occurred in the following countries: Algeria, Argentina, Australia, Brazil, Egypt, France, India, Iran, Iraq, Israel, Libya, North Korea, Norway, Pakistan, Poland, Romania, Russia, South Africa, South Korea, Sweden, Switzerland, Syria, Taiwan, UK, US, and Yugoslavia.[47]

Overall, civil nuclear facilities and materials have been used for weapons R&D in over one-third of all the countries with a nuclear industry of any significance, i.e. with power and/or research reactors. The Institute for Science and International Security collates information on nuclear programs and concludes that about 30 countries have sought nuclear weapons and 10 succeeded – a similar strike rate of one-in-three.[48]

Former IAEA Director-General Mohamed El Baradei noted: "If a country with a full nuclear fuel cycle decides to break away from its non-proliferation commitments, a nuclear weapon could be only months away. In such cases, we are only as secure as the outbreak of the next major crisis. In today's environment, this margin of security is simply untenable."[49]

11. Climate change is more important than nuclear weapons proliferation?

Even if we accept the proposition that climate change is a graver threat than nuclear weapons proliferation, that's hardly an argument for ignoring weapons proliferation. In any case, both problems are profound. And the problems are linked because of the potential for nuclear warfare to cause catastrophic climate change (see #3 above).

Academic Mark Diesendorf states: "On top of the perennial challenges of global poverty and injustice, the two biggest threats facing human civilisation in the 21st century are climate change and nuclear war. It would be absurd to respond to one by increasing the risks of the other. Yet that is what nuclear power does."[50]

Likewise, former US Vice President Al Gore said: "For eight years in the White House, every weapons-proliferation problem we dealt with was connected to a civilian reactor program. And if we ever got to the point where we wanted to use nuclear reactors to back out a lot of coal ... then we'd have to put them in so many places we'd run that proliferation risk right off the reasonability scale."[51]

A 2010 editorial in the *Bulletin of the Atomic Scientists* noted: "As we see it, however, the world is not now safe for a rapid global expansion of nuclear energy. Such an expansion carries with it a high risk of misusing uranium enrichment plants and separated plutonium to create bombs. The use of nuclear devices is still a very dangerous possibility in a world where Russian and U.S. ballistic missiles are on hair trigger and long-standing conflicts between countries and among peoples too often escalate into military actions. As two of our board members have pointed out, 'Nuclear war is a terrible trade for slowing the pace of climate change.'"[52]

12. Nuclear capable countries account for a large majority of greenhouse emissions.

Academics Brook and Bradshaw state that countries with nuclear power reactors account 80% of global greenhouse gas emissions, and the figure rises to over 90% including those nations that are actively planning nuclear deployment or already have research reactors. They conclude: "As a consequence, displacement of fossil fuels by an expanding nuclear-energy sector would not lead to a large increase in the number of countries with access to nuclear resources and expertise."[53]

Likewise, Geoff Russell argues: "Over 90 percent of the world's carbon dioxide emissions come from countries which already have nuclear reactors. So these are the countries where the most reactors are needed. How is having more reactors, particularly electricity reactors, going to make any of these countries more likely to build nuclear weapons? It isn't."[54]

The premise is correct − countries operating reactors account for a large majority of greenhouse emissions. But even by the most expansive estimate − Brook's[55] − less than one-third of all countries have some sort of weapons capability (they possess weapons, are allied to a weapons state, or they operate power and/or research reactors). So Brook and Bradshaw's conclusion − that nuclear power expansion "would not lead to a large increase in the number of countries with access to nuclear resources and expertise" − is nonsense.

46. B. Brook, and C. Bradshaw, 2014, 'Key role for nuclear energy in global biodiversity conservation', Conservation Biology, http://dx.doi.org/10.1111/cobi.12433

47. Friends of the Earth, Australia, 'Case Studies: Civil Nuclear Programs and Weapons Proliferation', http://foe.org.au/sites/default/files/CivMil-CaseStudies2010.doc

48. Institute for Science and International Security, 'Nuclear Weapons Programs Worldwide: An Historical Overview', accessed 26 May 2015, http://isis-online.org/nuclear-weapons-programs/

49. Mohamed El Baradei, 6 Dec 2005, 'Reflections on Nuclear Challenges Today', www.iaea.org/newscenter/statements/reflections-nuclear-challenges-today

50. Mark Diesendorf, 14 Oct 2009, 'Need energy? Forget nuclear and go natural', www.theage.com.au/opinion/society-and-culture/need-energy-forget-nuclear-and-go-natural-20091014-gvzo.html)

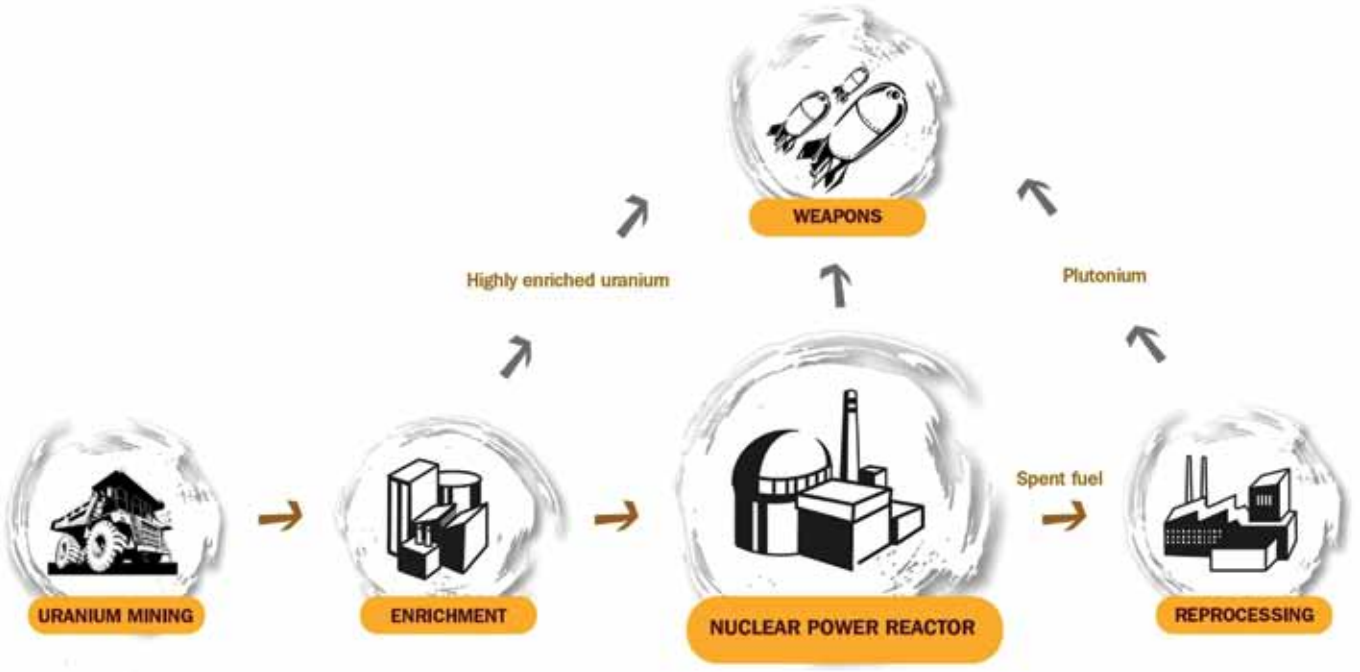
51. Quoted in David Roberts, 9 May 2006, 'An interview with accidental movie star Al Gore', http://grist.org/article/roberts2/

52. Editorial − Bulletin of the Atomic Scientists, 14 Jan 2010, 'It is 6 minutes to midnight', http://thebulletin.org/press-release/it-6-minutes-midnight

53. B. Brook, and C. Bradshaw, 2014, 'Key role for nuclear energy in global biodiversity conservation', Conservation Biology, http://dx.doi.org/10.1111/cobi.12433

54. Geoff Russell, 2014, 'GreenJacked! The misdirection of environmental action on climate change', chapter 14, ISBN: 9-780980-656114

55. Barry Brook, 6 Nov 2009, 'Carbon emissions and nuclear capable countries', http://bravenewclimate.com/2009/11/06/carbon-emissions-nuclear-capable-countries/



There is another thread to the Brook/Bradshaw argument. It is true that the expansion of nuclear power in countries which already operate reactors is of little of no proliferation significance. It is of still less significance in countries with both nuclear power and weapons. Incremental growth of nuclear power in the US, for example, is of no proliferation significance. That said, US civil nuclear policies can (and do) have profound proliferation significance. The US-led push to allow nuclear trade with India has dealt a cruel blow to the global non-proliferation and disarmament architecture and to the NPT in particular. And the US government's willingness to conclude bilateral nuclear trade agreements without prohibitions on the development of enrichment and reprocessing is problematic (and conversely, the agreement with the United Arab Emirates, which does prohibit enrichment and reprocessing in the UAE, is helpful).

13. The weapons genie is out of the bottle.

Some nuclear advocates claim that the weapons 'genie is out of the bottle' and that we therefore need not concern ourselves about the proliferation risks associated with an expansion of nuclear power.[56]

However, of the world's 194 countries, 10 have produced weapons − just under 5%.

About 45 countries (about one-quarter of all nations) have the capacity to produce significant quantities of fissile material for nuclear weapons − they have power reactors, medium- to large-sized research reactors, enrichment and/or reprocessing technology.

The weapons genie is only part way out of the bottle. And a large majority of the countries that have the capacity to produce significant quantities of fissile material have that capacity from their civil programs − so the 'genie' argument is circular and disingenuous.

14. Reactor grade plutonium can't be used for weapons?

Some nuclear advocates claim that the 'reactor grade' plutonium routinely produced in power reactors cannot be used in weapons. For example Barry Brook claims that "plutonium that comes out of reactors ... is contaminated with different isotopes of plutonium which means that even if you had all of the facilities available to you that the Manhattan bomb designers had, you still wouldn't be able to use it to create a nuclear bomb."[57]

In fact, the 'reactor grade' plutonium produced during routine operation of a power reactor is not ideal for weapons, but can be used nonetheless.[58]

The US government has acknowledged that a successful test using reactor grade plutonium was carried out at the Nevada Test Site in 1962. The exact isotopic composition of the plutonium used in the 1962 test remains classified. It has been suggested that because of changing classification systems, the plutonium may have been fuel grade plutonium using current classifications; in any case it was certainly sub-weapon grade.

India Today reported that one or more of the 1998 tests in India used reactor grade plutonium[59] and the UK and North Korea may have tested bombs using reactor grade or fuel grade plutonium.[60]

The problem is exacerbated by the separation and stockpiling of plutonium produced in power reactors, such that it can be used directly in weapons. Stockpiles of separated civil plutonium amounted to 267 tons as of the end of 2013.[61]

56. Barry Brook, 6 Nov 2009, 'Carbon emissions and nuclear capable countries', http://bravenewclimate.com/2009/11/06/carbon-emissions-nuclear-capable-countries/
57. ABC, 17 May 2010, 'Does Being Green mean Going Nuclear?', www.abc.net.au/rn/counterpoint/stories/2010/2901393.htm
58. 'Can 'reactor grade' plutonium be used in nuclear weapons?', 6 June 2014, Nuclear Monitor #787, www.wiseinternational.org/node/4247
59. Anon., October 10, 1998, "The H-Bomb", India Today.
60. Jackson, Ian, 2009, 'Nuclear energy and proliferation risks: myths and realities in the Persian Gulf', International Affairs 85:6, pp.1157–1172, www.chathamhouse.org/publications/ia/archive/view/163055 or http://onlinelibrary.wiley.com/doi/10.1111/j.1468-2346.2009.00855.x/full (available on request to jim.green@foe.org.au)
61. Zia Mian and Alexander Glaser, 2015, 'Global Fissile Material Report 2015: Nuclear Weapon and Fissile Material Stockpiles and Production', International Panel on Fissile Materials, http://fissilematerials.org/library/ipfm15.pdf

Moreover it is possible to operate power reactors on a short cycle to produce weapon grade plutonium. A typical reactor (1,000 MWe) could produce around 200 kg of weapon grade plutonium annually − enough for 50 weapons.[62]

15. Specious parallels with other dual-use materials.

Nuclear proponents sometimes downplay the significance of the dual-use capabilities of nuclear facilities and materials by noting the dual-use capabilities of many non-nuclear materials. For example, steel has a myriad of military and civil uses, and planes can be used as missiles.

Such arguments overlook the problem that nuclear weapons are unique in their destructive potential.

Such arguments ignore the fact that there are typically a myriad of pathways to the production of conventional, chemical and biological weapons, whereas for nuclear weapons the are just a couple of fundamental choices − pursuit of highly-enriched uranium and/or plutonium, and the choice between a dedicated (sometimes secret) weapons program or the pursuit of weapons under cover of a peaceful program.

There is also a 'straw man' character to the arguments. Banning steel because of its military uses would be impossible, it would result in nothing more than the substitution of other metals (or materials) to replace steel, and overall it would do far more harm than good. Banning planes because of their potential use as missiles would be just as silly.

Another 'straw man' element to the argument is the assumption that nuclear power must either be supported or banned. That assumption ignores the potential to reduce proliferation risks in a myriad of ways (see #16 below).

16. Determined proliferators can't be stopped ... so there's no point trying.

Nuclear weapons proliferation can be stopped or curbed by the following means (among others):

- Bilateral (e.g. Argentina-Brazil), multilateral (e.g. weapons free zones) and international agreements (e.g. the NPT).
- The detection of a weapons program (by the IAEA or others) followed by action to stop the program.
- Preventing the spread of 'sensitive nuclear technologies' (enrichment and reprocessing) and tightening control of existing enrichment and reprocessing plants.
- Replacing highly enriched uranium fuel or targets with low-enriched uranium in research reactors.
- Technology choices (e.g. preventing or prohibiting the development of laser enrichment technology).
- Security assurances.
- Unilateral pressure (e.g. the US has pressured a number of countries to stop their pursuit of a weapons capability, e.g. Taiwan and South Korea).

Weapons proliferation can also be reversed:

- South Africa dismantled its nuclear weapons.
- Three ex-Soviet states gave up their weapons in the aftermath of the collapse of the Soviet Union − Belarus, Kazakhstan, and Ukraine.
- Many countries have gone some way down the path towards developing a nuclear weapons capability but have abandoned those efforts.[63]

17. Strict safeguards prevent the misuse of the peaceful atom?

Ian Hore-Lacy from the World Nuclear Association states: "The international safeguards regime is perhaps the main success story of UN Agencies ..."[64]

But there are countless problems with the safeguards system.[65] In articles and speeches during his tenure as IAEA Director General from 1997− 2009, Dr. Mohamed El Baradei said that the Agency's basic rights of inspection are "fairly limited", that the safeguards system suffers from "vulnerabilities" and "clearly needs reinforcement", that efforts to improve the system have been "half-hearted", and that the safeguards system operates on a "shoestring budget ... comparable to that of a local police department".

Nuclear advocates sometimes imagine that a robust safeguards system exists and conflate their imagination with reality. Brook and Bradshaw claim that nuclear weapons proliferation "is under strong international oversight".[66] Strangely, they cite a book by Tom Blees in support of that statement.[67] But Blees doesn't argue that the nuclear industry *is* subject to strong international oversight − he argues that "fissile material *should* all be subject to rigorous international oversight" (emphasis added).[68] He argues for the establishment of an international strike force on full standby to attend promptly to attempts to misuse or divert nuclear materials, and he argues for radical social engineering to accommodate nuclear power including international control and a ban on private sector involvement in the nuclear fuel cycle.[69]

62. Victor Gilinsky with Marvin Miller and Harmon Hubbard, 22 Oct 2004, 'A Fresh Examination of the Proliferation Dangers of Light Water Reactors', www.npolicy.org/article.php?aid=172
    See also Zia Mian and M. V. Ramana, Jan/Feb 2006, 'Wrong Ends, Means, and Needs: Behind the U.S. Nuclear Deal With India', Arms Control Today, www.armscontrol.org/act/2006_01-02/JANFEB-IndiaFeature
63. Friends of the Earth, Australia, 'Case Studies: Civil Nuclear Programs and Weapons Proliferation', http://foe.org.au/sites/default/files/CivMil-CaseStudies2010.doc
64. Ian Hore-Lacy, 2000, "The Future of Nuclear Energy", paper presented at the Royal College of Physicians Conference, Adelaide, 4 May 2000, available from jim.green@foe.org.au
65. For information on safeguards see the papers listed at www.foe.org.au/anti-nuclear/links#safeguards
66. B. Brook, and C. Bradshaw, 2014, 'Key role for nuclear energy in global biodiversity conservation', Conservation Biology, http://dx.doi.org/10.1111/cobi.12433
67. Tom Blees, 'Prescription for the Planet', http://prescriptionfortheplanet.com/
68. http://bravenewclimate.com/2009/02/21/response-to-an-integral-fast-reactor-ifr-critique/
69. Tom Blees, 'Prescription for the Planet', http://prescriptionfortheplanet.com/

Imagining a rigorous safeguards system and radical social engineering is one thing; bringing it into existence is quite another.

Problems with safeguards include:

- Chronic under-resourcing. El Baradei told the IAEA Board of Governors in 2009: "I would be misleading world public opinion to create an impression that we are doing what we are supposed to do, when we know that we don't have the money to do it."[70]
- Issues relating to national sovereignty and commercial confidentiality adversely impact on safeguards.
- the inevitability of accounting discrepancies.
- Incorrect/outdated assumptions about the amount of fissile material required to build a weapon.
- The fact that, the IAEA has no mandate to prevent the misuse of civil nuclear facilities and materials − at best it can detect misuse/diversion and handball the problem to the UN Security Council. As the IAEA states: "It is clear that no international safeguards system can physically prevent diversion or the setting up of an undeclared or clandestine nuclear programme."[71]
- The resolution of suspected misuse/diversion is secretive and protracted, and double-standards are evident in responses to suspected breaches;
- Countries that have breached their safeguards obligations can simply withdraw from the NPT and pursue a weapons program, as North Korea has done;
- Safeguards are shrouded in secrecy − for example the IAEA used to publish aggregate data on the number of inspections in India, Israel and Pakistan, but even that nearly worthless information is no longer publicly available.

A very different take on the argument comes from Manning and O'Neil.[72] They argue that the NPT is in "terminal decline" and isn't worth preserving. That argument is used to justify further weakening the NPT by opening up nuclear trade with India, a weapons state outside the NPT.

So the safeguards / non-proliferation regime is robust and we should therefore support nuclear power; or the regime is bust and we should therefore support nuclear power. Take your pick.

18. New reactors types are proliferation-proof?

Advocates of every conceivable type of reactor claim that their preferred reactor type is proliferation-proof or proliferation-resistant.

For example, a thorium enthusiast claims that thorium is "thoroughly useless for making nuclear weapons."[73] But the proliferation risks associated with thorium fuel cycles can be as bad as − or worse than − the risks associated with conventional uranium reactor technology.[74]

An enthusiast of integral fast reactors (IFR) claims they "cannot be used to generate weapons-grade material."[75] But IFRs can be used to produce plutonium for weapons.[76] Dr George Stanford, who worked on an IFR R&D program in the US, notes that proliferators "could do [with IFRs] what they could do with any other reactor − operate it on a special cycle to produce good quality weapons material."[77]

Nuclear advocates frequently make statements which are true, but misleading. For example, thorium itself is not a proliferation risk, but the uranium-233 that is produced when thorium is irradiated can be (and has been) used in weapons. And strictly speaking, it is true that IFRs "cannot be used to generate weapons-grade material" − because IFRs don't exist. And neither new or old reactor types can produce weapon grade plutonium or weapons-useable plutonium in the sense that plutonium cannot be used in weapons until it is separated from materials irradiated in a reactor, by reprocessing.

Fusion illustrates how difficult it is to disentangle the peaceful atom from its siamese twin, the military atom. Fusion has yet to generate a single Watt of useful electricity but it has already contributed to proliferation problems. According to Khidhir Hamza, a senior nuclear scientist involved in Iraq's weapons program in the 1980s: "Iraq took full advantage of the IAEA's recommendation in the mid 1980s to start a plasma physics program for "peaceful" fusion research. We thought that buying a plasma focus device ... would provide an excellent cover for buying and learning about fast electronics technology, which could be used to trigger atomic bombs."[78]

All existing and proposed reactor types and nuclear fuel cycles pose proliferation risks. The UK Royal Society notes: "There is no proliferation proof nuclear fuel cycle. The dual use risk of nuclear materials and technology and in civil and military applications cannot be eliminated."[79]

70. Mohamed El Baradei, 16 June 2009, 'Director General's Intervention on Budget at IAEA Board of Governors', www.iaea.org/newscenter/statements/director-generals-intervention-budget-iaea-board-governors
71. IAEA, 1993, Against the Spread of Nuclear Weapons: IAEA Safeguards in the 1990s.
72. Haydon Manning and Andrew O'Neil, 26 May 2006, 'Smart moves', www.onlineopinion.com.au/view.asp?article=4504
73. Tim Dean, 16 March 2011, 'The greener nuclear alternative', www.abc.net.au/unleashed/45178.html
74. 'Thor-bores and uro-sceptics: thorium's friendly fire', Nuclear Monitor #801, 9 April 2015, www.wiseinternational.org/nuclear-monitors or www.foe.org.au/anti-nuclear/issues/nfc/power-weapons/thorium
75. Barry Brook, 9 June 2009, 'An inconvenient solution', The Australian, http://bravenewclimate.com/2009/06/11/an-inconvenient-solution/
76. Friends of the Earth, Australia, 'Nuclear Weapons and 'Generation 4' Reactors', www.foe.org.au/anti-nuclear/issues/nfc/power-weapons/g4nw
77. George Stanford, 18 Sep 2010, 'IFR FaD 7 – Q&A on Integral Fast Reactors', http://bravenewclimate.com/2010/09/18/ifr-fad-7/
78. Khidhir Hamza, Sep/Oct 1998, 'Inside Saddam's Secret Nuclear Program', Bulletin of the Atomic Scientists, Vol. 54, No. 5, www.iraqwatch.org/perspectives/bas-hamza-iraqnuke-10-98.htm
79. UK Royal Society, 13 Oct 2011, 'Fuel cycle stewardship in a nuclear renaissance', http://royalsociety.org/policy/projects/nuclear-non-proliferation/report
80. John Carlson, 2009, 'Introduction to the Concept of Proliferation Resistance', www.foe.org.au/sites/default/files/Carlson%20ASNO%20ICNND%20Prolif%20Resistance.doc

Likewise, John Carlson, former Director-General of the Australian Safeguards and Non-Proliferation Office, notes that "no presently known nuclear fuel cycle is completely proliferation proof".[80]

Proponents of new reactor types claim that proliferation-resistance is an important driver of technological innovation. There is no evidence to support the claim. Moreover, precious few nuclear industry insiders or nuclear advocates show the slightest concern about proliferation problems such as growing stockpiles of separated civil plutonium, or the inadequate safeguards system, or the troubling implications of opening up civil nuclear trade with non-NPT states such as India.

Climate scientist James Hansen states: "Nuclear reactors can also be made more resistant to weapons proliferation than today's reactors."[81] But *are* new reactors being made more resistant to weapons proliferation than today's reactors? In a word: No.

Hansen claims that "modern nuclear technology can reduce proliferation risks and solve the waste disposal problem by burning current waste and using fuel more efficiently."[82] That's absolutely true. And it's equally true that modern (Generation IV) technology could worsen proliferation problems. For example, India plans to produce weapons-grade plutonium in fast breeder reactors for use as driver fuel in thorium reactors.[83]

Compared to conventional uranium reactors, India's plan is far worse on both proliferation and security grounds.

In a 2013 article, Pushker Kharecha and James Hansen wave away the proliferation problem with the assertion that they have "discussed it in some detail elsewhere".[84] But the paper they cite[85] barely touches upon the proliferation problem and what it does say is mostly rubbish:

- It falsely claim that thorium-based fuel cycles are "inherently proliferation-resistant".
- It claims that integral fast reactors "could be inherently free from the risk of proliferation". At best, integral fast reactors could reduce proliferation risks; they could never be "inherently free" from proliferation risks.
- And it states that if "designed properly", breeder reactors would generate "nothing suitable for weapons". India's Prototype Fast Breeder Reactor will be the next fast neutron reactor to begin operation (scheduled for September 2015). It will be ideal for producing weapon grade plutonium for India's weapons program, and it will likely be used for that purpose since India is refusing to place it under safeguards.[86]

Hansen and his colleagues argue that "modern nuclear technology can reduce proliferation risks".[87] India's Prototype Fast Breeder Reactor is modern − but it will exacerbate, not reduce, proliferation risks.

81. James Hansen, 7 June 2014, 'Scientists can help in planet's carbon cut', http://usa.chinadaily.com.cn/opinion/2014-06/07/content_17570035.htm
82. 3 Nov 2013, 'Top climate change scientists' letter to policy influencers', http://edition.cnn.com/2013/11/03/world/nuclear-energy-climate-change-scientists-letter/index.html
83. John Carlson, 2014, submission to Joint Standing Committee on Treaties, Parliament of Australia, www.aph.gov.au/DocumentStore.ashx?id=79a1a29e-5691-4299-8923-06e633780d4b&subId=301365
84. Pushker Kharecha and James Hansen, March 2013, 'Prevented Mortality and Greenhouse Gas Emissions from Historical and Projected Nuclear Power', Environment, Science and Technology, http://pubs.acs.org/doi/abs/10.1021/es3051197
85. P. Kharecha et al., 2010, 'Options for near-term phaseout of CO2 emissions from coal use in the United States', Environmental Science & Technology, 44, 4050-4062, http://pubs.acs.org/doi/abs/10.1021/es903884a
86. John Carlson, 2015, first supplementary submission to Joint Standing Committee on Treaties, Parliament of Australia, www.aph.gov.au/DocumentStore.ashx?id=cd70cb45-f71e-4d95-a2f5-dab0f986c0a3&subId=301365
87. K. Caldeira, K. Emanuel, J. Hansen, and T. Wigley, 3 Nov 2013, 'Top climate change scientists' letter to policy influencers', http://edition.cnn.com/2013/11/03/world/nuclear-energy-climate-change-scientists-letter/index.html

WISE/NIRS Nuclear Monitor

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The Nuclear Information & Resource Service (NIRS) was set up in the same year and is based in Washington D.C., US.

WISE and NIRS joined forces in the year 2000, creating a worldwide network of information and resource centers for citizens and environmental organizations concerned about nuclear power, radioactive waste, proliferation, uranium, and sustainable energy issues.

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