

Energy ~ Climate ~ Security

The New Nuclear Deal with India and the Global Nuclear Energy Partnership are Not a Solution to Nuclear Weapons Proliferation;
Expanding Nuclear Power is Not a Solution to the Climate Crisis

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These two strands – the attempt to expand nuclear energy as a misguided means to limit the spread of nuclear weapons – and the promotion of nuclear energy as a misguided solution to the climate crisis – constitute enormous potential for compounding two androgenic disasters. The Middle Powers Initiative’s goals and real opportunities for the New Agenda Coalition States to participate in pivotal decisions create options to avert deepening of these interwoven crises.

As the world reeled in the wake of the atomic destruction of Hiroshima and Nagasaki, it is understandable that many people innocently embraced the idea that splitting atoms could be a good thing. Atoms for Peace spoke to a generation that needed to address their collective conscience and anxiety. Unfortunately atoms that are split are *not* peaceful: all industrial-scale fission results in massive new radioactivity with the capacity to do harm at both high levels (causing tissue and organ damage) and low levels (causing cellular damage, often to DNA resulting in mutations that cause cancer, sterility, birth defects and a host of other complications¹). Splitting uranium atoms for energy results in the production of plutonium; this plutonium can be (and has been) used to make nuclear weapons. Even in medicine, it is the destructive force of radiation that is harnessed to attack disease or to penetrate tissue.

Radioactive atoms are not peaceful!

Promoting the splitting of atoms at an industrial scale (as required for electric power production) in an effort to limit the splitting of atoms for war, worldwide has clearly been one of the largest miscalculations in human history. While the Nuclear Nonproliferation Treaty remains one of the most hopeful products of the 20th Century – nonetheless it is flawed in its construct that nuclear power should be promoted in lieu of nuclear weapons development. One nation after another has claimed its so-called “inalienable right” to nuclear energy and then diverted materials and technologies from these so-called Peaceful Atoms programs, for weapons.

Unfortunately, instead of correcting this folly by working for international abolition of industrial-level fission *of all kinds*, the Bush administration is promoting a massive re-investment in this failed scheme – both with a planned return to industrial-scale nuclear weapons production via the development of “Bombplex 2030,”² and also, the revival of the failed global nuclear energy program supported –unfortunately (but with no surprise) -- by the UN’s International Atomic Energy Agency.³

This comes, as once again, the world is **reeling** – we are facing an androgenic global climate crisis which is brewing faster than most ever imagined.⁴ Splitting atoms is yet again, erroneously promoted as the “solution.” Building more nuclear power reactors is not only a false solution to the climate crisis as will be discussed here – investment in a false solution – particularly one as expensive as nuclear -- is actually a *barrier* to arriving successfully at an effective strategy to

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stabilize climate change, and limit the impacts of this real climate crisis. Taking these issues one at a time:

Nuclear Energy as the (False) Solution to Nuclear Proliferation: US / India Nuclear Deal

The Bush administration has been a promoter of nuclear energy since their arrival in office; however this activity intensified in 2005 when their new Energy Policy Act was passed by the US Congress and signed into law. This legislation gives enormous direct taxpayer subsidy (about \$14 billion dollars – currently being greatly enlarged with potentially *unlimited* loan guarantees⁵) to new nuclear reactor development in the USA⁶ where nuclear expansion had been effectively dormant for three decades.⁷ Bush quickly extended this domestic initiative to the international arena when he and the US nuclear agencies began pursuing a new nuclear deal with India.

In broad outline, India would agree to “separate” their civilian (energy) and military (weapons) nuclear programs and adopt some international protocols and inspections for the civil portion of their nuclear operations.⁸ These changes would be in exchange for receiving a supply of nuclear fuel from the US, as well as US cooperation on new reactors – including plutonium breeders. The agreement would mandate a much higher rate of plutonium separation (reprocessing) in India than is currently happening⁹ -- offering the potential for increased nuclear weapons production -- squashing all claims that this accord is designed to reduce nuclear weapons.

This Nuclear New Deal with India raises additional questions since it establishes the precedent of a “special treatment” for India while other countries – most notably Iran and North Korea – are excluded from similar terms.¹⁰ A recent interview with a representative from South Korea highlights that nation’s discomfort with the deal, due to their significant quest for a non-nuclear (weapons) Korean Peninsula.¹¹

This new game plan initiated by the Bush Administration effectively replaces the principle of equal protection under the law (including treaties) with cronyism and favoritism. Favoritism, even dressed up as “cooperation among democracies”¹² is, ultimately, a thin veil over unilateral power and control as the basis of “order,” rather than multi-lateral cooperation of sovereign nations forming treaties and international laws.

The Middle Powers Initiative¹³ and the New Agenda Coalition¹⁴ have the opportunity to help preserve and promote the Rule of Law in the Nuclear Age by working to stop the nuclear deal between the USA and India.

This planned cooperation and nuclear commerce between the USA and India is a clear violation of the responsibilities of the USA as a signatory of the Nuclear Non-Proliferation Treaty (NPT). While certainly not the **only** situation or *way* in which the USA does not uphold its responsibilities under the NPT, the US pursuit of India for this new nuclear deal is one of the most flagrant violations of the NPT.¹⁵ This Bush initiative is contrary to decades of US policy – on multiple levels – particularly US policy against reprocessing nuclear waste for plutonium extraction – that ban was explicitly adopted in response to India’s entry into the “nuclear weapons club.” India’s first nuclear weapon came from the diversion of plutonium from its energy / research sector.¹⁶ India has not signed the NPT, and is therefore, under the terms of the Treaty, officially “off-limits” for nuclear commerce with nations that **have** signed the Treaty— including the USA. Clearly the terms of the NPT are not only being bent; they are being broken.

As recently reported, the deal between India and the USA has hit resistance within India – and may even result in early elections.¹⁷ At issue are pivotal minority party concerns about whether

India's internal and foreign policies maybe influenced or controlled by the US under the deal.¹⁸ This prospective self-determination is a mixed, nonetheless hopeful sign. It does not speak however to the real goals of nuclear disarmament – the true goal of the NPT -- since these factions are worried about India's nuclear weapons autonomy.

The sovereignty of nations and the principles of voluntary cooperation among sovereign nations under treaties such as the NPT are fundamental to civilized order in the world. In our view, even though the core of the NPT contains flaws (the inalienable right to a world free from industrial-scale fission of all kinds should be emphasized) it is, nonetheless, an enormously important first-step towards cooperation and sanity in the Nuclear Age. The NPT should not be abandoned or ignored, but instead updated and revised to reflect today's greater comprehension and appreciation of the depth of the nuclear dilemma. Dissolving the Treaty or allowing it to be "selectively applied" does not bode well for the overall goals of preserving a viable future for the human race. Action is warranted!

In addition to the possibility that India will scuttle the deal itself, the US--India deal must also be approved (again) by the US Congress and also the 45-member Nuclear Suppliers Group.¹⁹ Significantly, a number of the New Agenda Coalition member states (Brazil, Ireland, New Zealand South Africa and Sweden) are also participants in the Nuclear Suppliers Group. ***This means that many New Agenda Coalition States have a role in the approval (or not) of the US-India nuclear deal and could exert their leverage towards the goal of nuclear abolition.***

Global Nuclear Energy Partnership

The proposed US / India agreement has also inspired a broader US nuclear initiative -- the Global Nuclear Energy Partnership²⁰ (GNEP) – though India is not yet an official GNEP participant²¹. GNEP is a formula for expanding global nuclear development based on a new plan wherein nations that already have nuclear fuel production capacity (specifically nuclear enrichment) would become suppliers of nuclear fuel to an ever-expanding number of client states who would agree to forgo nuclear fuel production. Sympathizers describe this as a commercial counterpart to the NPT²² – completely ignoring the fact that the GNEP concept was born in the US abrogation of that treaty.

Less prominently discussed but implicit in GNEP is the corollary that nations / entities that supply nuclear fuel would take it back once it is irradiated. This high-level radioactive waste (NRC uses this term for irradiated fuel and we prefer it to the industry's "spent" fuel) is laced with plutonium.²³ In general the high-level waste from making nuclear electricity contains about 1% plutonium-239 (while not "weapon grade," it is weapons-usable).²⁴ Simply considering the global transportation of this deadly material (with surface radiation capable of delivering a lethal dose in less than 30 seconds) invokes a new slogan: Stop Global Mobile Chernobyl!²⁵

Unfortunately GNEP is plowing ahead – going from 5 participating nations to 16 at a Vienna meeting on Sept 16, 2007.²⁶ It is salutary to note that none of the New Agenda Coalition member states are in the growing GNEP group (see notes # 14 and 19).

Embedded in **both** the US / India deal, and the Global Nuclear Energy Partnership is the justification that nuclear power infrastructure must be expanded worldwide **because of** the global climate crisis. This is a false construct; **nuclear energy is NOT a solution to the climate crisis.** Nonetheless, Bush and Cheney are promoting nuclear power as a key remedy to climate change, and concomitantly listing climate as a key reason for the world to re-invest in this failed energy technology. Nuclear energy *is* failed -- it is only the considerable liability of CO2 production that creates any kind of an "economy" in which investment of either public or private funds in new

nuclear infrastructure would be considered in the USA, at all – *but nuclear should be rejected as a climate “fix” since a technology that cannot compete with other options should not be the preferred strategy in the face of crisis.*²⁷

Nuclear Power Will Not, and Cannot Solve the Climate Crisis²⁸

There are multiple issues that must be considered when engaging with the issue of nuclear power. Expanding the nuclear power infrastructure worldwide will not be an effective response to the climate crisis precisely because nuclear energy is known not to be viable in non-monopoly free markets – it cannot compete. It has been three decades since any energy corporation in the United States ordered a nuclear power reactor that was not subsequently canceled. Indeed, the current rush for new reactor applications is **only** because of massive subsidies that have been signed into law under the Bush administration. Few energy corporations located in states where energy is no longer fully regulated by the state and where there are no longer monopolies of production, distribution and sale are considering participation in this nuclear welfare due, no doubt, to the fact that without such monopolies consumers are no longer hostage to the higher electric power prices that new nuclear investment will bring.²⁹ Wall Street analysts also noted early in this attempt at nuclear revival that trying nuclear in anything but a fully regulated market would be more than risky.³⁰

The good news is that nuclear is not only expensive when compared to burning coal (which must be phased out to reduce carbon emissions) – it is significantly more expensive than truly green, sustainable energy options as well. **A dollar invested in new wind generation infrastructure returns two to three times more electricity than a dollar invested in new nuclear power infrastructure will.**³¹ By comparison, **a dollar invested in energy efficiency – including technologies like cogeneration that prevent the loss of potential energy from industrial systems – will yield 7 – 10 times more avoided-energy-use (and therefore need for generation) than the dollar invested in new nuclear power generating infrastructure.**³² For some years now, wind has been the fastest-growing new electric power generating capacity³³ – and for honest market-based reasons! Energy efficiency is finally making a foothold as mega-corps such as DuPont Chemical are making investments that not only cut their energy consumption, but are immediately *profitable, due to the averted cost of energy not used.*³⁴

Please note that US spot-market prices quoted today for “the price of nuclear power” **do not** adequately represent the cost of new nuclear generating capacity. This is because today’s reactors were built with funds that in many cases were never paid off – during the 1980’s and 1990’s reactors sold for a dime on the dollar – the large conglomerates that emerged have trimmed expenses in ways that likely will not be sustainable over time; let alone all the true costs that are never included, such as impacts on health and the true long-term waste costs.

So when it comes to the climate crisis, the fact that nuclear energy **cannot** compete is a crucial piece of information – for the same level of investment (of either commercial or public funds) – one gets 3 – 10 times more reduction in greenhouse gas emissions from non-nuclear energy infrastructure and programs compared to building new nuclear power reactors. Since the overall level of investment in nuclear power that would be required to take a sizable bite out of global greenhouse emissions is on the order of 1500 new power plants³⁵ – each projected to cost somewhere between \$2 and \$6 billion for **each unit**³⁶ this is an astronomical amount of money – running in the many trillions dollars. What about *trillions* spent on wind and wave energy? – The numbers say we would get more energy (turn off more coal plants) than spending it on nukes – without the health and security risks!

The climate crisis is real – and rapid action is required. News from this past week confirms that changes in Earth’s systems are, unfortunately, progressing far more rapidly than previously thought. A scientist interviewed on the radio Friday warned that we have no time to delay.³⁷ We cannot afford to invest limited resources for dealing with this crisis in a technology that does not give a good rate of return on the money invested! New nuclear generating capacity is like a black hole when it comes to addressing this crisis. For those seeking real reduction in greenhouse gas emissions from the US “energy pig” energy efficiency is the number one option – with wind, appropriate hydro and solar all more preferable than investment in new nuclear power.

In a detailed consideration of a revival of nuclear energy, many “conventional” concerns are worthy of consideration – including:

1. Radiological concerns:

- routine radioactive emissions by air³⁸, water and solid wastes³⁹ (nuclear power is not clean; not healthy; not “Green”)
- potential for catastrophic accidents⁴⁰ (not safe; not secure; not healthy)
- radioactive waste production that contains the vast majority of global source term⁴¹ (not secure; not clean; not safe) including the biggest reservoir of plutonium – a burden for 11,000 human generations

2. Danger of nuclear weapons proliferation:

- “front-end” uranium enrichment can produce both low-enriched reactor fuel or highly enriched nuclear weapons production material
- “back-end” separation of plutonium via reprocessing from waste that is an automatic by-product of electric power production from uranium fuel
- even greater potential for nuclear weapons proliferation if plutonium fuel (including MOX) is further commercialized

These concerns are intrinsic reasons why nuclear energy has failed, and worthy of extensive study. The reader is directed to the extensive discussion of these concerns, specifically in the context of the climate crisis, in recently published works:

Dr. Helen Caldicott, “**Nuclear Power is Not the Answer**” New Press, 2007.

Dr. Brice Smith: “**Insurmountable Risks: The Dangers of Using Nuclear Power to Combat Global Climate Change**” IEER Press and RDR Books, 2006.

Two other nuclear technology issues receive less attention, but are perhaps even more potent reasons why nuclear energy CANNOT fix the climate problem:

- *Nuclear, more than any other energy source, is vulnerable to turbulent weather*
- *Nuclear reactors do not work in warming water*⁴²

Nuclear is Vulnerable to Climate Impacts

Extreme weather often causes loss of electric power, which in turn, causes nuclear power reactors to go off-line automatically (also called a “scram”). Reactors go off-line because they – all of them – depend on energy from the grid to operate. Since the core of a reactor continues to generate heat for *years* (even “off-line”) it is vital that emergency cooling equipment be operable around the clock. As is sensible, every reactor site is equipped with back-up power, most often in the form of (two) diesel generators. Unfortunately these generators, in part because of intermittent use, are not terribly reliable.⁴³ When both the grid and the back-up power fail, the site is said to be in “station blackout.” According to the US Nuclear Regulatory Commission, station blackout contributes a full one-half of the total risk of a major reactor accident at US nuclear power stations.⁴⁴

Recent years have seen an escalation in all kinds of extreme weather: intense heat, drought, blizzards, tornados, and perhaps most compelling – hurricanes and cyclones. All of these conditions may contribute to electric grid failures. The loss of grid power will not necessarily trigger a nuclear crisis, but it elevates the risk. As overall incidence of grid blackout increases, so will the over all risk for nuclear power accidents. Nuclear energy is an enormous liability in these turbulent times.

Nuclear Power Does Not Work in Hot Water

The heat waves of 2003 were a turning point: the frequency and also the duration of periods of elevated temperatures in the rivers, lakes and even oceans, used for cooling nuclear power reactors have been increasing each summer ever since. With this have come reports of nuclear power reactors being forced to low power or off-line until the water temperatures dropped. In 2004 a number of nuclear reactors in France were impacted⁴⁵ not because of nuclear safety issues – but because of the basic design of a nuclear reactor.

Essentially an expensive, dangerous “tea pot,” a nuclear power reactor harvests the heat from splitting atoms to make steam, to turn a turbine – essentially 19th century stationary steam technology with an atomic “fire.” The closed-loop steam system relies on the heat differential between the temperature of the steam, and the temperature of a condenser, to turn the steam back into liquid, in order to repeat the process. When the water used to cool the condenser gets too warm, this temperature differential is lost; the steam no longer condenses back to liquid. When river and lake water gets too hot, electric power cannot be generated.⁴⁶ As temperatures rise, nuclear power will be less and less qualified as a means to even **try** to generate electric power.

To sum up, no one has said it better than my friend David Lochbaum: "We're going to have to solve the climate-change problem if we're going to have nuclear power, not the other way around." David is a nuclear engineer with the Union of Concerned Scientists; his comment was reported in the May 20, 2007 International Herald Tribune.

Nuclear power will never solve any crisis – nuclear energy **is** a crisis. The following references are offered to support your understanding of this situation.

¹ For basic information on ionizing radiation see Nuclear Information and Resource Service fact sheets posted at: <http://www.nirs.org/radiation/radiationhome.htm> . Milestone work on radiation health effects was done by the late Dr. John Gofman who's many works are available via: <http://www.ratical.org/radiation/CNR/CNRtitles.html>

² See <http://www.ananuclear.org> for info on “Complex 2030” aka “Bomplex 2030” – the update and restoration of full industrial-scale nuclear weapons production in the USA – lost in 1989 when Rocky Flats plutonium pit factory was closed due to environmental crimes (see: <http://www.nukewatch.com/Quarterly/20033fall/20033fallpage10.pdf>)

³ See IAEA —their logo says “Atoms For Peace” website: <http://www.iaea.org/NewsCenter/News/2007/gnep.html>

⁴ Climate crisis immediate see for instance: National Public Radio, All Things Considered, September 21, 2007: “Chilling News on North Pole Sea Ice” -- Final data on the shrinking North Pole ice cap confirms that the amount of ice there is the lowest yet recorded, with even less ice than had been reported in August. Mark Serreze, senior research scientist at the National Snow and Ice Data Center at the University of Colorado, tells Melissa Block what the figures might imply. <http://www.npr.org/templates/story/story.php?storyId=14599253> – the segment stated that data is showing that changes due to climate change are coming very much faster than any of the scientific models had previously predicted. Serreze used the words “a death spiral” to describe the “implications” of these findings.

⁵ For a description of this pending legislation, see Public Citizen's press release posted at: <http://www.citizen.org/pressroom/release.cfm?ID=2488>

⁶ See Olson, Mary, 2005. “Nuclear Power the Next Degeneration: Provisions of the Energy Policy Act of 2005.” Posted at: http://www.nirs.org/factsheets/nuclear_degeneration.pdf

⁷ A classic on nuclear energy in the US is: Caldicott, Helen, 1994. “Nuclear Madness.” W.W. Norton, NY.

⁸ See editorial “Nuclear India” in the Washington Post, March 3, 2006 posted at: <http://www.washingtonpost.com/wp-dyn/content/article/2006/03/02/AR2006030201682.html>

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- ⁹ Mian, Zia, et al, July 11, 2006 (draft) Fissile Materials in South Asia and the Implications of the US – India Nuclear Deal. Posted at: http://www.armscontrol.org/pdf/20060711_IPFM-DraftReport-US-India-Deal.pdf . See also: Perkovich, George, Carnegie Endowment for Peace, September 2005. “Faulty Promises: The US – India Nuclear Deal.” Posted at: <http://www.carnegieendowment.org/files/PO21.Perkovich.pdf>
- ¹⁰ See Henry Sokoloski, 2006. “Unconditionally Bad: The Indian Nuclear Deal Trades Away Our Credibility with North Korea and Iran.” Posted at: <http://www.npec-web.org/Frameset.asp?PageType=Single&PDFFile=20060626-Sokolski-NRO-UnconditionallyBad&PDFFolder=OpEds>
- ¹¹ An interview Suryanarayana, P. S. (Republic of Korea) in The Hindu, September 22, 2007. “No Reservation Over Nuclear Deal.” Posted at: <http://www.hindu.com/2007/09/22/stories/2007092255441300.htm>
- ¹² See the White House Press Release of July 2005 on the US – India Nuclear Cooperation: <http://www.whitehouse.gov/news/releases/2005/07/20050718-6.html>
- ¹³ See: <http://www.middlepowers.org/index.html>
- ¹⁴ From: <http://www.middlepowers.org/delegations.html> “...the New Agenda Coalition (Brazil, Egypt, Ireland, Mexico, New Zealand, South Africa and Sweden) a coalition which has formally positioned itself as a leading voice for nuclear weapons elimination.”
- ¹⁵ See US Council on Foreign Relations analysis on the US – India deal posted at: http://www.cfr.org/publication/9663/usindia_nuclear_deal.html
- ¹⁶ See: Congressional Research Service, Sharon Squassoni, December 22, 2006. “India’s Separation Plans: Issues and Views.” Posted at <http://www.fas.org/spp/crs/nuke/RL33292.pdf>
- ¹⁷ See Reuters, Y.P. Rajesh September 23, 2007. “Fresh Crisis Brews Over US-India Nuclear Deal.” Posted at: http://today.reuters.com/news/articlenews.aspx?type=worldNews&storyid=2007-09-23T063935Z_01_DEL147464_RTRUKOC_0_US-INDIA-NUCLEAR.xml
- ¹⁸ Rama Lakshmi, the Washington Post, September 21, 2007. “US Questions India-Iran Ties.” Posted at: http://www.boston.com/news/world/asia/articles/2007/09/21/us_questions_india_iran_ties/
- ¹⁹ For information on the Nuclear Suppliers Group see: <http://www.nuclearsuppliersgroup.org/> The current Participating Governments are: ARGENTINA, AUSTRALIA, AUSTRIA, BELARUS, BELGIUM, BRAZIL, BULGARIA, CANADA, CHINA, CROATIA, CYPRUS, CZECH REPUBLIC, DENMARK, ESTONIA, FINLAND, FRANCE, GERMANY, GREECE, HUNGARY, IRELAND, ITALY, JAPAN, KAZAKHSTAN, REPUBLIC OF KOREA, LATVIA, LITHUANIA, LUXEMBOURG, MALTA, NETHERLANDS, NEW ZEALAND, NORWAY, POLAND, PORTUGAL, ROMANIA, RUSSIAN FEDERATION, SLOVAKIA, SLOVENIA, SOUTH AFRICA, SPAIN, SWEDEN, SWITZERLAND, TURKEY, UKRAINE, UNITED KINGDOM, and UNITED STATES
- ²⁰ See Dr. Edwin Lyman, 2006. “Global Nuclear Energy Partnership: Will It Advance Nonproliferation, or Undermine It?” posted at: <http://www.npec-web.org/Frameset.asp?PageType=Single&PDFFile=20060700-Lyman-GNEP&PDFFolder=Essays>
- ²¹ From: www.gnep.energy.gov Sept 16, 2007 – “16 nations today agreed to increase international nuclear energy cooperation through the Global Nuclear Energy Partnership (GNEP). China, France, Japan, Russia and the United States, who are original GNEP partners, as well as Australia, Bulgaria, Ghana, Hungary, Jordan, Kazakhstan, Lithuania, Poland, Romania, Slovenia, and Ukraine signed a “Statement of Principles”, which addresses the prospects of expanding the peaceful uses of nuclear energy, including enhanced safeguards, international fuel service frameworks, and advanced technologies.”
- ²² The Royal Society, September, 2007. “Strategy Options for UK’s Separated Plutonium” page 7 (as numbered in document). Posted at: <http://www.royalsoc.ac.uk/displaypagedoc.asp?id=27169>
- ²³ Space does not permit a discussion of reprocessing – suffice it to say, it greatly expands the volume of waste, making it far more difficult to contain, while doing nothing to reduce total radioactivity. It is not a “solution.”
- ²⁴ Institute for Energy and Environmental Research (IEER) Fact Sheet on the Physical, Nuclear and Chemical Properties of Plutonium posted at: <http://www.ieer.org/fctsheets/pu-props.html>
- ²⁵ NIRS coined the slogan “Stop Mobile Chernobyl” in 1994 when the nuclear utilities were pushing to send the irradiated fuel they had produced to a “temporary” storage site either in Nevada or on an Indian Reservation. For a wealth of information on what the shipping campaign from US reactors to Nevada would entail, visit: <http://www.nirs.org/radwaste/hlwtransport/mobilechernobyl.htm>
- ²⁶ Secretary Bodman’s speech from the Vienna Global Nuclear Energy Partnership meeting is posted at: <http://www.gnep.energy.gov/gnepPRs/gnepPR091607.html>
- ²⁷ The classic analysis by Amory Lovins “Nuclear Power: Economics and Climate-Protection Potential” posted at: http://www.rmi.org/images/PDFs/Energy/E05-08_NukePwrEcon.pdf
- ²⁸ For more NIRS documents on nuclear energy and climate, see: <http://www.nirs.org/climate/climate.htm>
- ²⁹ Olson, Mary “We Don’t Need New Nukes” <http://www.nirs.org/southeast/wedontneednewnukes.pdf>

³⁰ Bradford, Peter and David Schlissel 2007. “Why A Future For the Nuclear Power Industry is RISKY” posted at: <http://www.cleanenergy.org/resources/reports/WhyNewNukesAreRiskyFACTSHEET.pdf>

³¹ See a variety of sources including: Greenpeace France “Wind Vs Nuclear 2003” posted at: <http://www.greenpeace.org/raw/content/international/press/reports/wind-vs-nuclear-2003.pdf>, Amory Lovins as cited in note above and also IEER’s interesting comparison of wind and plutonium (MOX) fuel for Japan posted at: <http://www.ieer.org/reports/wind/index.html>

³² See Lovins, Amory as cited in note 24.

³³ See for instance, US State Department press release in 2005:

<http://usinfo.state.gov/xarchives/display.html?p=washfile-english&y=2005&m=April&x=20050422130541lcniellep0.9051172>

³⁴ See 2005 press release of Alliance to Save Energy: <http://www.ase.org/content/news/detail/2249> and also Amory Lovins, “More Profit With Less Carbon,” Scientific American: September 2005.

³⁵ J. Deutsch and E. Moniz (co-chairs), The Future of Nuclear Power, MIT, 2003. <http://web.mit.edu/nuclearpower/>

³⁶ In recent years the media has reported that a nuclear power reactor can be built for \$2 billion – however all current construction is running much higher than that –and the last reactors in the US to go on line weighed in at 4 – 5 billion dollars per unit. See also: <http://www.nirs.org/factsheets/quickeconfact1206.pdf>

³⁷ See for instance: National Public Radio, All Things Considered, September 21, 2007: “Chilling News on North Pole Sea Ice” -- Final data on the shrinking North Pole ice cap confirms that the amount of ice there is the lowest yet recorded, with even less ice than had been reported in August. Mark Serreze, senior research scientist at the National Snow and Ice Data Center at the University of Colorado, tells Melissa Block what the figures might imply.

<http://www.npr.org/templates/story/story.php?storyId=14599253> – the segment stated that data is showing that changes due to climate change are coming very much faster than any of the scientific models had previously predicted. Serreze used the words “a death spiral” to describe the “implications” of these findings.

³⁸ Drey, Kay “Hidden Radioactive Releases from Nuclear Power Plants in the United States” posted at:

http://www.nirs.org/factsheets/drey_usa_pamphlet.pdf Note: region-specific pamphlets are in the same directory.

³⁹ For a wealth of information on radioactive waste see: <http://www.nirs.org/factsheets/fctsht.htm>

⁴⁰ For a compendium of information on the 1986 Chernobyl nuclear power plant disaster and updated reports as of the 20 year mark: <http://www.nirs.org/c20/c20us.htm>

⁴¹ Source term is the kind of radioactivity and the duration of its hazard.

⁴² A current, very telling editorial about the connection of electric power and water, “Water Power,” September 24, 2007 Raleigh (North Carolina) “News and Observer” posted at:

<http://www.newsobserver.com/opinion/editorials/story/714061.html>, here is a selection of news reports of nuclear power reactors being taken off-line due to elevated temperatures of the cooling water supplies:

May 20, 2007 “Climate Change Puts Nuclear Energy in Hot Water” International Herald Tribune,

<http://iht.com/articles/2007/05/20/business/nuke.php?page=2>

June 8, 2007 “Court Blocks Yankee’s Warm Water Discharge” Rutland Herald (VT)

<http://www.rutlandherald.com/apps/pbcs.dll/article?AID=/20070608/NEWS04/706080387>

July 31, 2007 “US Heat Wave...” Bloomberg.com

<http://www.bloomberg.com/apps/news?pid=20601087&sid=aNtzVaLCaNc8&refer=home>

August 17, 2007 “TVA Reactor Shut Down: Cooling Water Drawn From River Too Hot” reported on WAFF48

News <http://www.waff.com/global/story.asp?s=6944527> and “Heat Wave Ignites Problems in ET” Knoxnews

<http://www.knoxnews.com/news/2007/aug/18/heat-wave-ignites-problems-in-et/>

August 23, 2007 “Rising Temperatures Undermine Nuclear Power’s Promise” Union of Concerned Scientists

<http://www.nirs.org/climate/background/ucsrisingtemps82307.pdf>

July 30, 2006 “Heat Wave Shuts Down Nuclear Power Plants” The Observer (London)

<http://observer.guardian.co.uk/world/story/0,,1833620,00.html>

July 27, 2006 “Heat Wave Shows Limits of Nuclear Energy” IPS <http://www.ipsnews.net/news.asp?idnews=34121>

August 10, 2006 “Hot Temps Chill Nuclear Power’s Appeal” Christian Science Monitor, posted at

<http://www.cbsnews.com/stories/2006/08/10/tech/main1881980.shtml>

⁴³ Summary of findings given in: <http://www.nirs.org/reactorwatch/mox/nirmscguirecatawbacontentions.htm>

⁴⁴ U.S. Nuclear Regulatory Commission, “Severe Accident Risks: An Assessment for Five U.S. Nuclear Power Plants,” NUREG-1150, 1990.

⁴⁵ For a review of French reactors off line due to heat listen to NPR’s Morning Edition August 21, 2007:

<http://www.npr.org/templates/story/story.php?storyId=13818689>

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