

Avoiding Apocalypse: Congress Should Ban Nuclear Power.

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Thesis:

For almost as long as fission-produced nuclear power has existed as a viable energy source, there has been unending debate over whether or not, or to what extent, it should be used as a source of energy. Many see nuclear power as an efficient source of energy that is dependable, cost efficient and clean. That view fails to appreciate the true costs of nuclear power. The risks presented by nuclear power to human health and the environment are unparalleled. Nuclear power is not clean or safe when one considers the byproducts that come of its production or the potential ramifications of a nuclear accident. Nuclear power is also unnecessary to fulfill this nation's energy needs. There are alternative sources of power, such as wind power or hydroelectric power, that should be used to a fuller extent in generating the nation's electricity.

Congress should 1) ban production, in the United States, of nuclear material for use in fission power plants, 2) prohibit the building of any new nuclear plant, and 3) phase out currently operating nuclear plants. If, at some point, a method is developed for producing fuels or processes that would eliminate instability and radioactive waste, then nuclear power might be acceptable. But so long as the only reliable method of producing nuclear power is through fission, which is unstable and produces radioactive waste, we should not place its convenience before the risks posed to health or environment.

I. An Introduction to Nuclear Power in the United States.

A. The progression of nuclear power.

The use of nuclear fission as a power source in the United States has expanded greatly from its beginnings in the 1940s, and it doesn't seem that it will be declining anytime soon, at least not without a solid push in that direction. In 1946, Congress created the Atomic Energy

Commission (AEC) with the Atomic Energy Act of 1946.¹ The AEC then authorized the construction of the first nuclear power reactor: “Experimental Breeder Reactor I.”² Electricity was first intentionally generated from a nuclear power source in December of 1951, from this reactor in Idaho.³ In the 1950s, nuclear power reactors used ordinary water to cool the reactor cores during chain reaction.⁴ The Atomic Energy Act of 1954 allowed further civilian access to nuclear technology.⁵

In July of 1955, Arco, Idaho’s experimental BORAX III was the first plant to power a town (albeit only of 1,000).⁶ The first commercially operated nuclear power plant was in Shippingport, Pennsylvania, and it became fully functional in 1957.⁷ After the plant in Shippingport went online, private industry became much more involved in nuclear power development.⁸ The Sodium Reactor Experiment in Santa Susana, California became the first civilian operated nuclear power reactor to generate electricity, in July of 1957.⁹ In 1959, the first entirely “private” nuclear power plant in the United States, “Dresden-1” in Illinois had a self-sustaining reaction.¹⁰

In the 1960s, nuclear power took off as a conventional source of electricity in the United States.¹¹ In 1964, the Private Ownership of Special Nuclear Materials Act allowed plant operators to privately own the nuclear material used to fuel their power plants, where those

¹ U.S. N.R.C., *History*, <http://www.nrc.gov/about-nrc/history.html> (last updated May 11, 2011); *see* 42 U.S.C. § 2011 et seq. (1946)(amended by 1954 Act).

² U.S. D.O.E., *The History of Nuclear Energy*, 8 (1994), <http://www.ne.doe.gov/pdfFiles/History.pdf>.

³ *Id.*

⁴ *Id.*

⁵ *Id.*, at 14; *see* 42 U.S.C. § 2011 et seq. (1954)(amended by 1974 Act).

⁶ U.S. D.O.E., *supra*, note 2, at 14.

⁷ *Id.*, at 8.

⁸ *Id.*

⁹ *Id.*, at 14.

¹⁰ *Id.*, at 15.

¹¹ *Id.*, at 9.

materials were previously under exclusive government control.¹² By 1971, there were twenty-two fully functional nuclear power plants in the United States, accounting for just over two percent of the nation's electric power.¹³ The industry ordered forty-one nuclear power plants in 1973 alone, which is a single-year record.¹⁴

Also in 1974, Congress dissolved the AEC and split its authority between the Energy Research and Development Administration (ERDA) and the Nuclear Regulatory Commission (NRC), – a response to public concern about the floundering AEC.¹⁵ In 1977, President Carter announced an intention to indefinitely defer plans for reprocessing (extracting reusable isotopes from) spent nuclear fuel.^{16,17} Later in the same year, the Department of Energy Organization Act transferred ERDA's functions to the newly created Department of Energy (DOE).¹⁸ By 1979, there were seventy-two licensed nuclear reactors in the United States, accounting for about twelve percent of the nation's commercial electricity.¹⁹

The worst reactor incident in United States history so far also occurred in 1979.²⁰ Near Harrisburg, Pennsylvania, one of the reactor cores at the Three Mile Island nuclear power plant partially melted down from a lack of coolant – a result of a combination of human and mechanical error.²¹ Luckily, there were no fatalities or major health risks.²² The incident awakened public concern for the risks of nuclear power and it spurred stricter safety regulations

¹² *Id.*, at 16; *see* 42 U.S.C. § 2012 et seq. (1964).

¹³ U.S. D.O.E., *supra*, note 2, at 17.

¹⁴ *Id.*

¹⁵ *Id.*; 42 USCA §§ 5817, 5841 (1974); *see also* U.S. N.R.C., *supra*, note 1.

¹⁶ U.S. D.O.E., *supra*, note 2, at 17.

¹⁷ *See* U.S. N.R.C., *Waste Incidental to Reprocessing*, <http://www.nrc.gov/waste/incidental-waste.html> (last updated Mar. 12, 2011).

¹⁸ U.S. D.O.E., *supra*, note 2, at 18; 42 U.S.C.A. § 7151 (1977).

¹⁹ U.S. D.O.E., *supra*, note 2, at 18.

²⁰ *Id.*

²¹ *Id.*

²² *Id.*

and inspection procedures.²³ Moving into the 80s, for the first time, there was significant concern for environmental issues related to nuclear power, involving plant safety and waste disposal.²⁴

In 1983, the Nuclear Waste Policy Act (NWPA) created a program, funded by fees from radioactive waste owners and producers, for the purpose of finding a site for a permanent high-level waste repository.²⁵ By that year, nuclear power accounted for more electricity production than natural gas generators.²⁶ By 1984, there were eighty-three functioning nuclear power plants – accounting for about fourteen percent of the nation’s electric power – which placed nuclear power as the second largest source of electric power, behind coal and ahead of hydroelectricity.²⁷

In 1987, Congress amended the NWPA, directing the DOE to investigate the viability of Yucca Mountain, Nevada, as a site for a national repository for high-level radioactive waste.²⁸ The site has yet to become operational.²⁹ By the close of the 1980s, there were 109 nuclear plants and they accounted for about twenty-two percent of the nation’s electric energy.³⁰ Today, there are 104 licensed nuclear power reactors in the United States, accounting for about twenty percent of our electricity.³¹ There are not any permanent facilities for storing high-level radioactive waste.³² Waste is currently stored on-site at nuclear power plants, whether in cold-water pools or dry casks.³³ There are also temporary storage facilities in the following locations:

²³ *Id.*

²⁴ *Id.*, at 9.

²⁵ *Id.*, at 18-19; 42 U.S.C. § 10101 et seq. (1983).

²⁶ U.S. D.O.E., *supra*, note 2, at 19.

²⁷ *Id.*

²⁸ *Id.*, at 19; 42 U.S.C. § 10131 et seq. (1987).

²⁹ U.S. N.R.C., *Backgrounder on Radioactive Waste*, <http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/radwaste.html> (last updated Feb. 4, 2011).

³⁰ U.S. D.O.E., *supra*, note 2, at 19.

³¹ U.S. N.R.C., *Power Reactors*, <http://www.nrc.gov/reactors/power.html> (last updated Mar. 12, 2011).

³² U.S. N.R.C., *supra*, note 29.

³³ *Id.*

West Valley, New York; Morris, Illinois; and the Idaho National Engineering and Environmental Laboratory in Idaho Falls, Idaho.³⁴

B. Properties and health risks of primary isotopes used for nuclear power.

One cannot meaningfully talk about why nuclear fission should be banned without first discussing the dangers associated with the isotopes that are used for fuel, as well as their byproducts. The two elements which United States power plants currently use in nuclear fission reactions for commercial nuclear power are Uranium and Thorium.³⁵ Most commonly, power reactors use Uranium, as Thorium is less efficient.³⁶ The isotope of Uranium that power reactors use is U-235.³⁷ U-235 is not that common in nature; it comprises less than one percent of the total naturally occurring Uranium.³⁸

U-235 is far more radioactive than U-238 – the most common Uranium isotope – and has a significantly shorter half-life.³⁹ In order to get the most productivity out of Uranium, it is “enriched;” Uranium processors separate out the isotopes within naturally occurring Uranium in order to concentrate the more radioactive U-235.⁴⁰ Also, U-238 can capture neutrons in the reaction chamber and become (through decay) Plutonium (Pu-239), which produces about a third of the energy in Uranium reactors.⁴¹ Pu-239, in turn, decays directly into U-235.⁴² Between

³⁴ *Id.*; Idaho National Laboratory, *Home* (2011), <https://inlportal.inl.gov/portal/server.pt/community/home/255>.

³⁵ U.S. N.R.C., *Source Material*, <http://www.nrc.gov/materials/srcmaterial.html> (last updated Mar. 31, 2011).

³⁶ See World Nuclear Association, *Thorium*, <http://www.world-nuclear.org/info/inf62.html> (last updated Nov. 11, 2011).

³⁷ U.S. E.P.A., *Radiation Protection: Uranium*, <http://www.epa.gov/rpdweb00/radionuclides/uranium.html> (last updated July 8, 2011).

³⁸ *Id.*

³⁹ *Id.*

⁴⁰ *Id.*

⁴¹ World Nuclear Association, *What is uranium? How does it work?*, <http://www.world-nuclear.org/education/uran.htm> (last updated Feb. 2011).

⁴² U.S. E.P.A., *Radiation Protection: Plutonium*, <http://www.epa.gov/radiation/radionuclides/plutonium.html> (last updated July 8, 2011).

them, Uranium and Plutonium release a number of other radioactive elements including Radium, Radon, and others.⁴³

U-235, the more radioactive of the two Uranium isotopes discussed above, has a half-life of 700,000 years.⁴⁴ Uranium enters the body through inhalation, swallowing (most common) or, in rare circumstances, through breaks in the skin.⁴⁵ While the body tends to pass most Uranium under normal conditions – either through digestion or via the kidneys – some may wind up deposited in bones.⁴⁶ The most prevalent health issue from Uranium exposure is an increased risk for cancer but, given enough exposure over time, it can cause internal irradiation or chemical toxicity.⁴⁷

Pu-239 has a half life of 24,100 years.⁴⁸ It enters the body in much the same way as Uranium and, like Uranium, the body usually passes most of it out.⁴⁹ However, if Plutonium is absorbed it tends to move through the bloodstream into bones and internal organs, where it irradiates those organs for decades.⁵⁰ Plutonium also presents an increased risk when inhaled.⁵¹ Different isotopes of Thorium have a wide range of half-lives, from days to billions of years.⁵² Thorium presents many of the same health risks common to Uranium and Plutonium but there is some evidence that, unlike Uranium and Plutonium, the body may also absorb Thorium through the skin.⁵³

⁴³ See U.S. E.P.A., *supra*, note 37.

⁴⁴ *Id.*

⁴⁵ *Id.*

⁴⁶ *Id.*

⁴⁷ *Id.*

⁴⁸ U.S. E.P.A., *supra*, note 42.

⁴⁹ *Id.*

⁵⁰ *Id.*

⁵¹ *Id.*

⁵² U.S. E.P.A., *Radiation Protection: Thorium*, <http://www.epa.gov/rpdweb00/radionuclides/thorium.html> (last updated July 8, 2011).

⁵³ *Id.*

II. Chernobyl & Fukushima: The Potential Impact of a Nuclear Plant Disaster.

The potential impact of a nuclear plant disaster can be quite grave. Not only can a disaster be grave, but its full effect can take decades to discover. In fact, the full effect may never be discoverable for a number of reasons, not least of which are the dispersal of released materials and the passage of time. Consider the following examples of Chernobyl and Fukushima, the two most pronounced disasters to date.

A. Chernobyl

In April of 1986, reactor 4 at the Chernobyl power plant in Ukraine suffered explosions and released large amounts of radiation into the atmosphere.⁵⁴ There is some consensus that both design flaws and human error were responsible for the accident and the extent of its fallout.⁵⁵ About 600,000 clean-up workers, or "liquidators," from the Soviet army, plant staff, and local emergency workers ultimately cleaned up the radioactive debris and conducted mitigation activities to stem the spread of radiation from the plant.⁵⁶ Between 1986 and 1987, about 240,000 liquidators received high radiation doses while working within around 48 miles of the reactor.⁵⁷ Between 1986 and 2006, various authorities or groups evacuated 346,000 people from the area around Chernobyl.⁵⁸ Another 270,000 people still live in "Strictly Controlled Zones" around the area.⁵⁹ The liquidators, the 116,000 immediate evacuees, and those continuing to live in "Strictly Controlled Zones" have received radiation doses well above the normal background radiation for the area.⁶⁰

⁵⁴ World Health Organization, *Health effects of the Chernobyl accident: an overview* (April, 2006), <http://www.who.int/mediacentre/factsheets/fs303/en/index.html>.

⁵⁵ World Nuclear Association, *Chernobyl Accident 1986*, <http://www.world-nuclear.org/info/chernobyl/inf07.html> (last updated Sept. 2011).

⁵⁶ World Health Organization, *supra*, note 54.

⁵⁷ *Id.*

⁵⁸ *Id.*

⁵⁹ *Id.*

⁶⁰ *Id.*

Of the highly exposed liquidators, 134 developed acute radiation sickness, and 28 of them died in 1986.⁶¹ Since then, other liquidators have died but there isn't conclusive evidence that their deaths are linked to exposure from Chernobyl.⁶² It wouldn't take much to infer a connection, though. Radioactive Iodine which leaked from the reactor into the atmosphere has also been linked to a highly increased rate of thyroid cancer, especially among people who were young at the time of the incident.⁶³ It is believed that the Iodine found its way into cows' milk from settling on grazing land, and that the children were subsequently exposed through drinking the milk.⁶⁴ The increased rates for thyroid cancer are expected to continue, but it's unclear exactly to what extent.⁶⁵ Evidence also suggests that rates for leukemia among highly exposed liquidators may be double the normal rate, but the extent to which this phenomenon translates to other exposed classes – like the residents – is still unknown.⁶⁶ Although some studies suggest an overall increase in non-thyroid cancers for all highly exposed classes, a number of extrinsic factors make it very difficult to predict or measure increases in cancer rates, especially over the amount of time that cancer can take to materialize.⁶⁷

In addition to the health effects on liquidators and residents, there have been various environmental concerns stemming from the Chernobyl Disaster – some of them well beyond the immediate geographical area. In 2001, the International Atomic Energy Agency released a technical document which presented the findings of several studies of the environmental impact of the Chernobyl Disaster.⁶⁸ That document shows extensive contamination of agricultural land, produce and derivatives such as dairy products as well as of forests and forage not only in

⁶¹ *Id.*

⁶² *Id.*

⁶³ *Id.*

⁶⁴ *Id.*

⁶⁵ *Id.*

⁶⁶ *Id.*

⁶⁷ *See Id.*

⁶⁸ I.A.E.A., *IAEA-TECDOC-1240* (Aug. 2001), http://www-pub.iaea.org/MTCD/publications/PDF/te_1240_prn.pdf.

Ukraine, but in Belarus and Russia as well.⁶⁹ The document also states that some species of both flora and fauna suffered reproductive, cellular and molecular mutation as a result of radiation exposure.⁷⁰ In another report by the Norwegian Radiation Protection Authority (“NRPA”), data showed that fallout from Chernobyl affected cows, sheep and reindeer in Norway as a result of Cesium-contaminated forage and pastures.⁷¹ According to that report, radiation contamination continued to be a problem in Norway, twenty years after the disaster.⁷² Research continues to the present day in many European states in an effort to better understand the full impact of the Chernobyl disaster.

B. Fukushima

On March 11, 2011, a 9.0 magnitude earthquake struck Eastern Japan.⁷³ The earthquake created a roughly forty-nine foot tidal wave that knocked out the backup power and cooling systems for three reactors at the Fukushima Daiichi power plant.⁷⁴ The cores in those reactors melted down over the next three days, leading to the world’s worst nuclear disaster since Chernobyl.⁷⁵ The evacuation zone around the plant is currently an area roughly the size of New York City.⁷⁶ The Hydrogen explosions at the plant released an as-yet-uncertain amount of Cesium and Iodine into the atmosphere; initial figures had the amount of Cesium at around 15,000 TBq but a new study suggests that the amount might be more like 35,800 TBq.⁷⁷ If one

⁶⁹ *Id.*, at 103-5, 106-7.

⁷⁰ *Id.* at 108-109.

⁷¹ Norwegian Radiation Protection Authority, *NRPA Bulletin 19-06*, 1,2 (Nov. 10, 2006), <http://www.nrpa.no/dav/8261e12842.pdf>.

⁷² *Id.*, at 1.

⁷³ World Nuclear Association, *Fukushima Accident 2011*, http://www.world-nuclear.org/info/fukushima_accident_inf129.html (last updated Nov. 22, 2011).

⁷⁴ *Id.*

⁷⁵ *Id.*

⁷⁶ Joe Burgess et al, *Conditions at Fukushima Plant Improve, but Return Home Will Take Years*, N.Y. TIMES.COM (Dec. 6, 2011), <http://www.nytimes.com/interactive/2011/12/06/world/asia/Conditions-at-Fukushima-Plant-Improve-But-Return-Home-Will-Take-Years.html>.

⁷⁷ Tsuyoshi Inajima, *Fukushima Plant May Have Emitted Double Radiation Than Estimated*, BLOOMBERG.COM (Oct. 27, 2011, 4:20 AM), <http://www.bloomberg.com/news/2011-10-27/fukushima-plant-may-have-emitted-double->

credits the latter figure, it would mean that the immediate airborne fallout from Fukushima was about forty-two percent that of Chernobyl.⁷⁸ Most of this fallout was carried into the North Pacific by wind currents.⁷⁹ Contaminated water that leaked from the reactors during the crisis continues to present a difficult challenge with containment, as roughly 90,000 cubic meters has yet to be treated as of Nov. 22.⁸⁰ In fact, according to recent reports, some of that radioactive waste water spilled out into the Pacific.⁸¹

After a couple weeks, the meltdown had stopped and the reactors were stable.⁸² By October, the temperature in the reactors was below 80°C, cooled by fresh water from the treatment plant, but an official cold-shutdown has yet to occur.⁸³ Japanese officials hope to achieve cold-shutdown by the end of the year, but it could take thirty years to fully decommission the plant.⁸⁴ And while, as stated above, notification of leaks are still coming in as late as of this writing, it will surely be some time before the figures are anything close to complete regarding the total amount of fallout from this incident.

IV. Indian Point: A Case Study in Insanity.

One might look at the Chernobyl and Fukushima disasters and say “but those involved faulty design, human error, or a large scale natural disaster.” One might think “surely, that couldn’t happen here in the States.” If that is the case, the following example of the Indian Point nuclear power plant should be of particular interest.

radiation-than-estimated.html; A. Stohl et al, *Xenon-133 and caesium-137 releases into the atmosphere from the Fukushima Dai-ichi nuclear power plant*, 11 A.C.P.D. 28319, 28327-8, 28342-3 (2011), available at <http://www.atmos-chem-phys-discuss.net/11/28319/2011/acpd-11-28319-2011.pdf>.

⁷⁸ Inajima, *supra*, note 77.

⁷⁹ *Id.*

⁸⁰ World Nuclear Association, *supra*, note 73.

⁸¹ American Free Press, *Fukushima radioactive water leaked to Pacific: TEPCO*, TERRA DAILY (Dec. 6, 2011), http://www.terradaily.com/reports/Fukushima_radioactive_water_leaked_to_Pacific_TEPCO_999.html.

⁸² World Nuclear Association, *supra*, note 73.

⁸³ *Id.*

⁸⁴ Burgess, *supra*, note 76.

The Indian Point nuclear power plant is located twenty-four miles north of New York City.⁸⁵ It has two operating reactors: Unit 2 and Unit 3.⁸⁶ Unit 2 has been licensed to operate since 1973, and Unit 3 has been licensed to operate since 1975.⁸⁷ The licenses for these reactors are set to expire in 2013 and 2015, respectively.⁸⁸ The major risk with the Indian Point plant is that the Unit 3 reactor sits on a fault line.⁸⁹ Governor Cuomo (New York) has suggested that the plant is the most susceptible plant in the United States in the event of an earthquake.⁹⁰ Gov. Cuomo also stated “This plant in this proximity to the city was never a good risk” and he has called the plant a "catastrophe waiting to happen."⁹¹

Not only does Indian Point’s Unit 3 sit on a fault line, but the plant has suffered numerous problems over the years, including – among other things – radiation leaks.⁹² After the Fukushima disaster this year, a lot of press was directed at the nuclear situation here in the United States. One press report that came out shortly after the Fukushima incident detailed a radiation leak at Indian Point which has been ongoing since 1993.⁹³ The leak is in a steel liner that is meant to protect against radiation leaks in the event of an earthquake.⁹⁴ This bears repeating The steel liner *that is supposed to protect against radiation leaks in the event of an earthquake* at Indian Point (where a reactor sits on a fault line) has been leaking radiation

⁸⁵ U.S. N.R.C., *Indian Point Nuclear Generating Unit 2*, <http://www.nrc.gov/info-finder/reactor/ip2.html> (last updated Nov. 10, 2011) [hereinafter *Indian Point 2*]; U.S. N.R.C., *Indian Point Nuclear Generating Unit 3*, <http://www.nrc.gov/info-finder/reactor/ip3.html> (last updated Nov. 10, 2011) [hereinafter *Indian Point 3*].

⁸⁶ U.S. N.R.C., *Operating Nuclear Power Reactors*, <http://www.nrc.gov/info-finder/reactor/> (last updated May 19, 2011).

⁸⁷ *Indian Point 2*, *supra*, note 85; *Indian Point 3*, *supra*, note 85.

⁸⁸ *Indian Point 2*, *supra*, note 85; *Indian Point 3*, *supra*, note 85.

⁸⁹ Joe Coscarelli, *Indian Point Nuclear Power Plant Should Close, Says Governor Cuomo*, THE VILLAGE VOICE BLOGS (Mar. 17 2011, 9:47 AM), http://blogs.villagevoice.com/runninscared/2011/03/indian_point_nuclear_plant_cuomo.php.

⁹⁰ *Id.*

⁹¹ *Id.*

⁹² *Id.*

⁹³ David Lochbaum, *The NRC and Nuclear Power Plant Safety in 2010*, 4 (Mar. 17, 2011), available at http://www.ucsusa.org/assets/documents/nuclear_power/nrc-2010-report-briefing.pdf.

⁹⁴ *Id.*

since 1993. The kicker? According to this report, the NRC *knew* about the leak and did not act to fix the problem.⁹⁵ These sorts of things are not unique to Indian Point, either. According to a recent article, a nuclear weapons research and production facility in New Mexico has come under scrutiny – in part because it too sits on a fault line.⁹⁶

V. West Valley & Yucca Mountain: Problems with the Storage of Waste

The potential for a nuclear disaster is not the only issue involved with the production of nuclear energy. There are also issues with containment and disposal of nuclear waste. As noted above, there is currently no long-term storage facility for high-level radioactive waste.⁹⁷ Instead, waste is stored on-site at plants or in one of the three temporary storage sites mentioned above.⁹⁸ Not only are there issues related to this country's limited number of disposal sites, but there are also issues with how adequate the containment of that waste is at those sites. Meanwhile, as long as this country continues to produce nuclear power, it continues to produce nuclear waste.

A. West Valley waste storage facility.

One of the nation's three current off-site waste storage facilities for nuclear waste is at West Valley, New York.⁹⁹ West Valley is located about halfway between Buffalo and my hometown, Olean, New York (near the PA border). A few general observations about the land in that area will help understand what is to follow. First, the area around the site contains a high volume of creeks and streams. Second, the water table in parts of the land on which the site sits is high.¹⁰⁰ And third, much of the land is permeable and soft, being made largely of clay.¹⁰¹

⁹⁵ *Id.*

⁹⁶ Jeri Clausing, Questions swirl around \$6 billion nuclear lab, RECORDONLINE.COM (Dec 4, 2011, 2:07 PM), http://hosted.ap.org/dynamic/stories/U/US_NUKE_LAB?SITE=NYMID&SECTION=HOME&TEMPLATE=DEFAULT.

⁹⁷ U.S. N.R.C., *supra*, note 29.

⁹⁸ *Id.*

⁹⁹ *Id.*

¹⁰⁰ N.Y. D.E.C., *West Valley History and Future*, 4 (April, 2008), available at http://www.dec.ny.gov/docs/materials_minerals_pdf/westvalley2008.pdf.

The site started in the 1960s as a waste reprocessing and storage facility.¹⁰² From 1966 to 1972, it was home to the only waste reprocessing plant in the country.¹⁰³ Workers would extract unused Uranium, Plutonium, and Thorium from spent reactor cores, to be reused later.¹⁰⁴ The site was poorly managed, however, and significant amounts of radioactive waste polluted the groundwater on and around the site.¹⁰⁵ Stack upon stack of barrels and boxed containers of radioactive waste were haphazardly piled into storage trenches on the site.¹⁰⁶ In 1975, groundwater seeped into one of the storage trenches, mixed with waste, and caused the trench to overflow with radioactive water.¹⁰⁷ The company that ran the site at the time, NFS, Inc., pumped out the contaminated water and treated it to reduce (*reduce*, not eliminate) contamination before releasing it into nearby streams, such as Cattaraugus Creek.¹⁰⁸ Cattaraugus Creek, for those unfamiliar with the area, flows almost directly west to Lake Erie. According to one source, millions of gallons were pumped out.¹⁰⁹

Shortly after that debacle, NFS, Inc. abandoned the site rather than bring it within then-new safety requirements – leaving New York to foot the bill.¹¹⁰ Several areas around the site are contaminated with a slurry of radioactive materials known to cause not only cancers but DNA damage and other problems.¹¹¹ In 1980, Congress enacted the West Valley Demonstration Project Act, which required the DOE to solidify the high-level liquid waste, decontaminate the

¹⁰¹ *See Id.*

¹⁰² *Id.*, at 1.

¹⁰³ *Id.*, at 2.

¹⁰⁴ *Id.*, Introduction.

¹⁰⁵ *Id.*, at 1-3.

¹⁰⁶ *See Id.*, at 4-5 (see photos).

¹⁰⁷ *See Id.*, at 2.

¹⁰⁸ *Id.*; The Coalition on West Valley Nuclear Wastes (“CWVNW”), Dig It Up, *Home*, <http://www.digitup.org/history.html> (last visited on Nov. 14, 2011).

¹⁰⁹ CWVNW, *supra*, note 107.

¹¹⁰ N.Y. D.E.C., *supra*, note 100, at 2.

¹¹¹ *Id.*, at 3.

site, and decommission it, as well as to cover ninety percent of the cleanup costs.¹¹² To date, only one of these tasks has been accomplished; the high-level liquid waste has largely been solidified into glass rods (vitrified).¹¹³

In 1993, inspectors found a plume of highly radioactive groundwater flowing from under the main reprocessing building.¹¹⁴ The plume is believed to have resulted from a burst pipe in the reprocessing plant that leaked for twenty years before anyone noticed it.¹¹⁵ The Strontium-laden water is still spreading through the upper layer of soil.¹¹⁶ The water in the plume contains many times the EPA's drinking water standards for Strontium; in fact, the area around the main reprocessing building (as of 2008) was 20,000 times the allowable amount of Strontium.¹¹⁷ There was recently a large scale cleanup effort on the site – in which hundreds of workers attempted to decontaminate buildings and equipment and installed an underground wall of volcanic rock for the purpose of stopping the spread of the radioactive plume.¹¹⁸ Some have hailed the containment wall as “an innovative way to protect the public.”¹¹⁹ However, there are some sections of the wall which are certain to stop functioning within thirty years.¹²⁰

The site has already cost taxpayers billions, and it may take unknown decades for it to actually be decommissioned.¹²¹ Even then, some of the waste on the site may remain there indefinitely.¹²² The New York Department of Environmental Conservation has estimated that significant progress toward decontaminating and decommissioning the site would require a

¹¹² *Id.*, at 2.

¹¹³ *Id.*

¹¹⁴ *Id.*, at 2.

¹¹⁵ Daniel Robison, *Nuclear Waste Cleanup At N.Y. Site Nears Completion*, Transcript, NPR (Dec. 27, 2010), <http://www.npr.org/2010/12/27/132369252/Nuclear-Waste-Cleanup-At-N-Y-Site-Nears-Completion>.

¹¹⁶ N.Y. D.E.C., *supra*, note 100, at 3.

¹¹⁷ *Id.*, at 4.

¹¹⁸ Robison, *supra*, note 115.

¹¹⁹ *Id.*

¹²⁰ *Id.*

¹²¹ *Id.*

¹²² *Id.*

minimum of about \$950,000,000, spread out over ten years or so.¹²³ In this economy, that doesn't seem very likely to happen anytime soon.

B. Yucca Mountain

As discussed above, Yucca Mountain is the only site chosen pursuant to the NWPA for a permanent disposal site for high-level radioactive waste.¹²⁴ The proposed site was vehemently opposed by both Brian Sandoval, Governor of Nevada, and Senator Harry Reid of Nevada, among others.¹²⁵ Activities toward establishing a waste repository on the site have ultimately ceased due to federal budget cuts.¹²⁶ And on September 30 of this year, the NRC suspended proceedings regarding the DOE's ability or inability to withdraw its application for a permit to begin operations on the site – effectively closing the issue for the foreseeable future.¹²⁷ So, even though there are problems with waste disposal such as those described above in West Valley, there is still nowhere in this country to permanently store that waste. For the record, I'm not in any way promoting Yucca Mountain as a solution to this problem – merely using its example to illustrate that there currently is no solution.

V. Overview & Criticisms of the Current Federal Regulatory System.

Currently, the NRC is the primary regulatory agency for issues related to nuclear power in the United States.¹²⁸ Other agencies and offices involved with the regulation of various specific activities related to nuclear power include (but may not be limited to) the DOE, EPA,

¹²³ N.Y. D.E.C., *supra*, note 100, Introduction.

¹²⁴ X, *supra*, note 28.

¹²⁵ Mary-Sarah Kinner, *Sandoval Statement On Judicial Order From The Yucca Mountain Licensing Board* (Dec. 15, 2010), <http://gov.nv.gov/news/item/4294971834/>; Harry Reid, *Yucca Mountain*, <http://reid.senate.gov/issues/yucca.cfm> (last visited on Dec. 11, 2011).

¹²⁶ Keith Johnson, *Nuclear Waste: Yucca Mountain's Scrapped, So What Now?*, ENVIRONMENTAL CAPITAL (Feb. 26, 2009, 3:32 PM), <http://blogs.wsj.com/environmentalcapital/2009/02/26/nuclear-waste-yucca-mountains-scrapped-so-what-now/>.

¹²⁷ U.S. N.R.C., *High-Level Waste Disposal*, (Sept. 30, 2011), <http://www.nrc.gov/waste/hlw-disposal.html>.

¹²⁸ See U.S. N.R.C., *History*, <http://www.nrc.gov/about-nrc/history.html> (last updated May 11, 2011).

Department of Transportation and the Department of the Interior.¹²⁹ The NRC's regulations regarding nuclear power are codified in 10 C.F.R.¹³⁰ Some key provisions cover licensing and relicensing of power plants,¹³¹ disposal and storage of waste,¹³² and safety and security of nuclear power plants.¹³³

There have, over the years, been a wide array of complaints regarding both the efficacy of the regulations and the NRC's commitment (or lack thereof) to enforcing them. One major complaint, in so many terms, is that the process of relicensing reactors that have outlived their original licenses is a farce.¹³⁴ In a recent Associated Press report, the NRC and the nuclear power industry came under fire for doubling back on the long-standing notion that nuclear power reactors were only supposed to operate for a maximum of forty years.¹³⁵ According to that article, that forty year limit on the life of nuclear power reactors was "unequivocal . . ." ¹³⁶ The article refers to the current relicensing process as resembling "nothing more than an elaborate rubber stamp,"¹³⁷ and states that, often, the NRC's licensing paperwork looks like a carbon copy of industry applications for relicensing.¹³⁸ The article also asserts that the NRC has yet to decline a single application for relicensing.¹³⁹

Another common argument is that safety protocols for nuclear power plants are inadequate to deal with an event like that in Fukushima.¹⁴⁰ Current regulations and policies

¹²⁹ U.S. N.R.C., *supra*, note 29.

¹³⁰ 10 C.F.R., chapter 1 (2011).

¹³¹ 10 C.F.R., parts 51, 52, 54, 55 (2011).

¹³² 10 C.F.R., parts 60-63 (2011).

¹³³ 10 C.F.R., parts 20, 21, 25, 73, 100 (2011).

¹³⁴ Jeff Donn, *NRC, Nuclear Industry Rewrite History*, HUFFINGTONPOST.COM (June 28, 2011), http://www.huffingtonpost.com/2011/06/28/nrc-nuclear-industry-ap-investigation_n_885862.html.

¹³⁵ *Id.*

¹³⁶ *Id.*

¹³⁷ *Id.*

¹³⁸ *Id.*

¹³⁹ *Id.*

¹⁴⁰ See, e.g., Peter Behr, *U.S. Nuclear Regulations Inadequate to Cope with Incident Like Fukushima*, SCIENTIFIC AMERICAN (June 16, 2011), <http://www.scientificamerican.com/article.cfm?id=us-nuclear-regulations-fukushima->

regarding unexpected natural disasters of that sort are based on unrealistic assumptions about the length of time that plants may be blacked out in the event of a power failure.¹⁴¹ Charlie Miller, the head of a recent task force formed to evaluate current regulations in this area, stated that risk studies had never analyzed the risk of simultaneous loss of both grid and backup generator power.¹⁴²

Yet another issue is the arguably lax enforcement of existing regulations by the NRC. According to one report, the NRC has investigated and discovered twenty-four failures to report faulty equipment and, in the last eight years, has not penalized any plant operators for failure to report these types of risks.¹⁴³ The same article also mentioned the continued leak at Indian Point (mentioned above), along with several other lapses in enforcement.¹⁴⁴ The article also discusses the issue of “capture” and the notion that the NRC, working so closely with the nuclear power industry, often acts more in the interest of the industry than that of the general public.¹⁴⁵

VII. Conclusion

In light of all of this, this country can no longer support nuclear power – at least so long as no-one has yet discovered a truly safe and clean means of producing it. Proponents of nuclear fission might argue that it is more efficient and cost effective than other means of energy production. Some might argue that the likelihood of a nuclear disaster is actually quite low and that we, as a nation, shouldn’t overreact every time there is a disaster elsewhere. On their face, these are reasonable enough arguments. I am willing to concede that the production cost of a

like-incident; Matthew L. Wald, *Nuclear Plant Safety Rules Inadequate, Group Says*, N.Y. TIMES.COM (June 15, 2011), <http://www.nytimes.com/2011/06/16/business/energy-environment/16nrc.html>.

¹⁴¹ Wald, *supra*, note 140.

¹⁴² *Id.*

¹⁴³ Daniel Kaufmann, Veronika Penciakova, *Preventing Nuclear Meltdown: Assessing Regulatory Failure in Japan and the United States*, Brookings Institution (Apr. 1, 2011),

http://www.brookings.edu/opinions/2011/0401_nuclear_meltdown_kaufmann.aspx.

¹⁴⁴ *Id.*

¹⁴⁵ *Id.*

megawatt of electricity *might* be lower with nuclear fission than, say, natural gas or coal. And of 104 operating reactors in this country, only one (Three Mile Island) has had a significant nuclear accident so far, and there were apparently no major risks presented in that incident. So yes, the probability of a major incident like Chernobyl or Fukushima occurring is fairly low.

However, one cannot fail to consider the incidental costs to nuclear power when considering its cost effectiveness. The cleanup activities at West Valley alone have cost billions of dollars and will likely cost billions more to actually finish. And that doesn't even account for any potential costs resulting from the potential contamination of the local farmland or, God forbid, the entire Lake Erie watershed. Remember, too, that this is only one facility; there are 106 more, when you include power plants (where waste is stored on-site). That has to put some kind of dent in the overall cost effectiveness of nuclear power.

One also cannot simply look to the likelihood of a major nuclear accident in simple percentages to determine whether or not the potential economic benefits are outweighed by the health and environmental risks. This is not the same as evaluating the probability of getting into a car accident, your plane going down, or getting cancer. The risk assessment for nuclear power has to consider the potential magnitude and extent of the possible negative effects of an accident. In my opinion, most people tend to oversimplify things by strictly looking at the likelihood of an abstract, generic "accident" occurring but fail to calculate what is meant by "accident" in the context of nuclear power. This is not a situation in which there has to be a high likelihood of multiple accidents before one has cause to re-evaluate the decision to continue one's course of activity. The potential health and environmental risks inherent in a major nuclear disaster are such that even a low probability for *one* disaster should give a person pause.

Never mind Chernobyl, for the moment; the effects of an accident with even the limited initial damage of Fukushima's early reports, if it happened at a plant like Indian Point, would be devastating beyond anyone's wildest dreams. That plant is situated in one of the most highly populated, if not the single most highly populated, areas of the country. A major nuclear disaster like the one in Fukushima there could potentially make New York City or Albany uninhabitable for thousands of years. If an event on the scale of Chernobyl was to happen, the area of effect might include Syracuse, Rochester, and Burlington, Vermont as well. And, depending on where the wind was blowing there is at least a reasonable potential for large quantities of radiation to wind up in Buffalo (NY), Rochester (NY), Philadelphia (PA), Pittsburgh (PA), or most of New England – including Boston, Massachusetts. This is not to mention, of course, the potential contamination of Lake Ontario, The St. Lawrence River, the Hudson River, the Atlantic Ocean and some of the most beautiful country North America has to offer. It is exactly this potential for truly apocalyptic results that renders a simple evaluation of probabilities inadequate to address the risks.

Even without a nuclear disaster, there are still the issues of waste storage and containment. When one considers what happened at West Valley, it's really hard to make a straight-faced argument that there isn't a major problem with this country's ability or inability to adequately manage its nuclear waste. West Valley is polluted on a scale that should make any decent human being shudder – especially one who lives anywhere near the area. And to make matters worse, there isn't anywhere to move the waste to – the United States doesn't have a permanent storage facility and there are only two other temporary ones. One could say, reasonably, that the above argument regarding a nuclear disaster is largely hypothetical, and I can't argue that point. However, the issues presented by the waste – as demonstrated by the

discussion of West Valley – is not hypothetical. These are real problems and they're ongoing, *now*. And at this point in time there is *no solution* in place. Meanwhile, the problem continues to grow as long as this country continues to generate nuclear waste.

From the above, I am convinced that this nation needs to eliminate nuclear fission from its energy sources. My suggestion is that the most efficient means is via Congressional ban. Congress should pass a law that does the following three things: 1) limit the United States' production of radioactive materials to those necessary for much smaller-scale purposes such as medical radiology, etc., 2) prohibit the building of any new nuclear power plant, and 3) devise a plan/schedule for decommissioning existing nuclear power plants. Of course, it would be useful if the same law or another one set up a viable plan for dealing with waste, but it should be a priority to cease their production by abolishing nuclear power.

Of course, there are economic issues related to the decrease in supply of energy (which is a valid concern), but this country cannot afford to do nothing about the nuclear problem. There are a number of things which could be done to mitigate the negative economic impact of losing nuclear power. Such things include (but may not be limited to): increased investment in alternative and sustainable energy, such as solar, wind, hydro, etc. and conservation of energy (use more sunlight and less light bulbs, read a book instead of watching a movie once in a while, etc). It likely won't be easy at first, but few worthwhile things are. This country simply cannot afford to continue playing the odds against a nuclear catastrophe, and it cannot afford to keep compounding the waste issue. These problems are not going away on their own, and viable solutions don't seem to be on the horizon. I, for one, am not content to sit by and see how far this problem can progress before this country reaches a point at which it cannot fix the problem or it's simply too late.