



NUCLEAR POWER AND INDIAN POINT

**What the industry and NRC
do not tell you.**

Written and Presented by: Gary Shaw
Member of the Leadership Council of the
Indian Point Safe Energy Coalition (IPSEC)
Sponsored by Sierra Club – NYC Group

Seafarers and International House
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Introduction

- The Nuclear Industry is like the night club magician who uses sleight of hand tricks so the audience looks in one place while the magic is being accomplished somewhere else.
- The Nuclear Industry tries to get us to focus only on the narrow slice of the process that occurs when the enriched uranium fuel is used in the reactor to create a nuclear chain reaction to boil water so steam will turn turbines “without producing carbon dioxide” in that part of the process.
- The reality is that nuclear power is damaging to the earth, polluting, harmful and deadly from the very start, which is uranium mining, through the never ending problem of storing and isolating radioactive waste that will be harmful and potentially deadly for millennia.

A Quick Note on the NRC

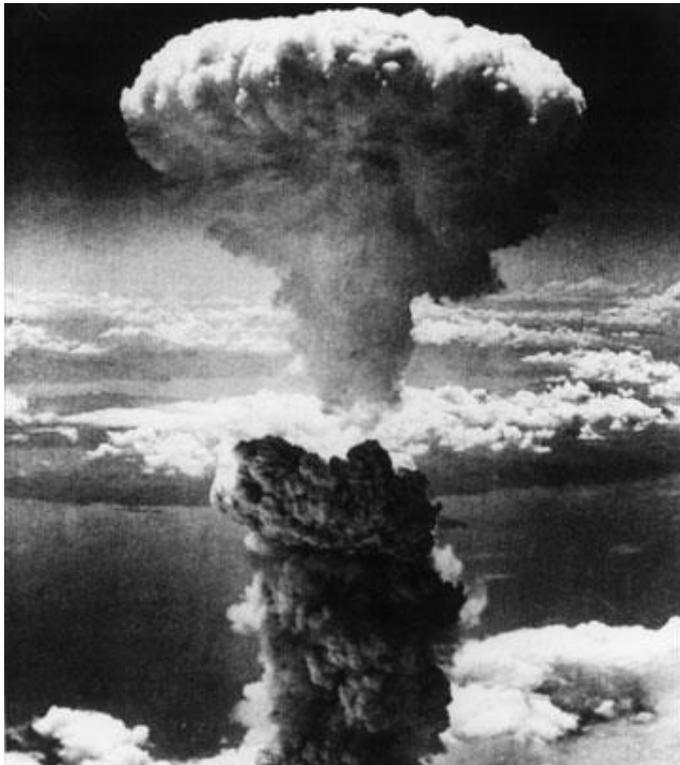
(Nuclear Regulatory Commission)

- **The Nuclear Regulatory Commission operates under a structural conflict of interest.**
 - 90% of the agency's budget comes from industry fees
 - If a nuclear plants closes, the NRC has fewer positions to fill, so personnel cuts are possible.
- When the industry began, nuclear plants in the US were issued operating licenses for 40 years.
 - That is the life span to which the plants were designed and constructed
- The NRC has **never rejected** a relicensing application that was submitted without errors or omissions.

The Beginning of the Nuclear Age

For most of the world, this was the first introduction to nuclear power.

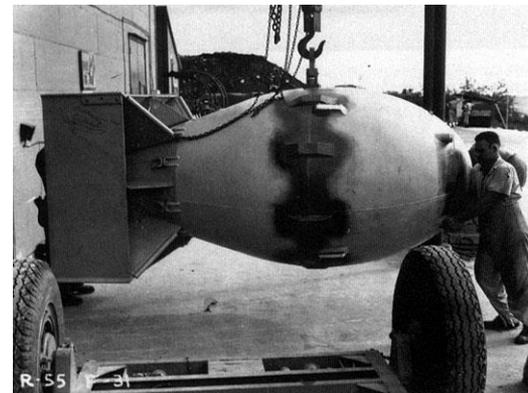
Hiroshima – August 6, 1945



Little Boy – August 6, 1945



Fat Man – August 9, 1945



Where did we go from there?



On December 8, 1953, President Dwight D. Eisenhower delivered the “Atoms for Peace” speech to the United Nations: He said:

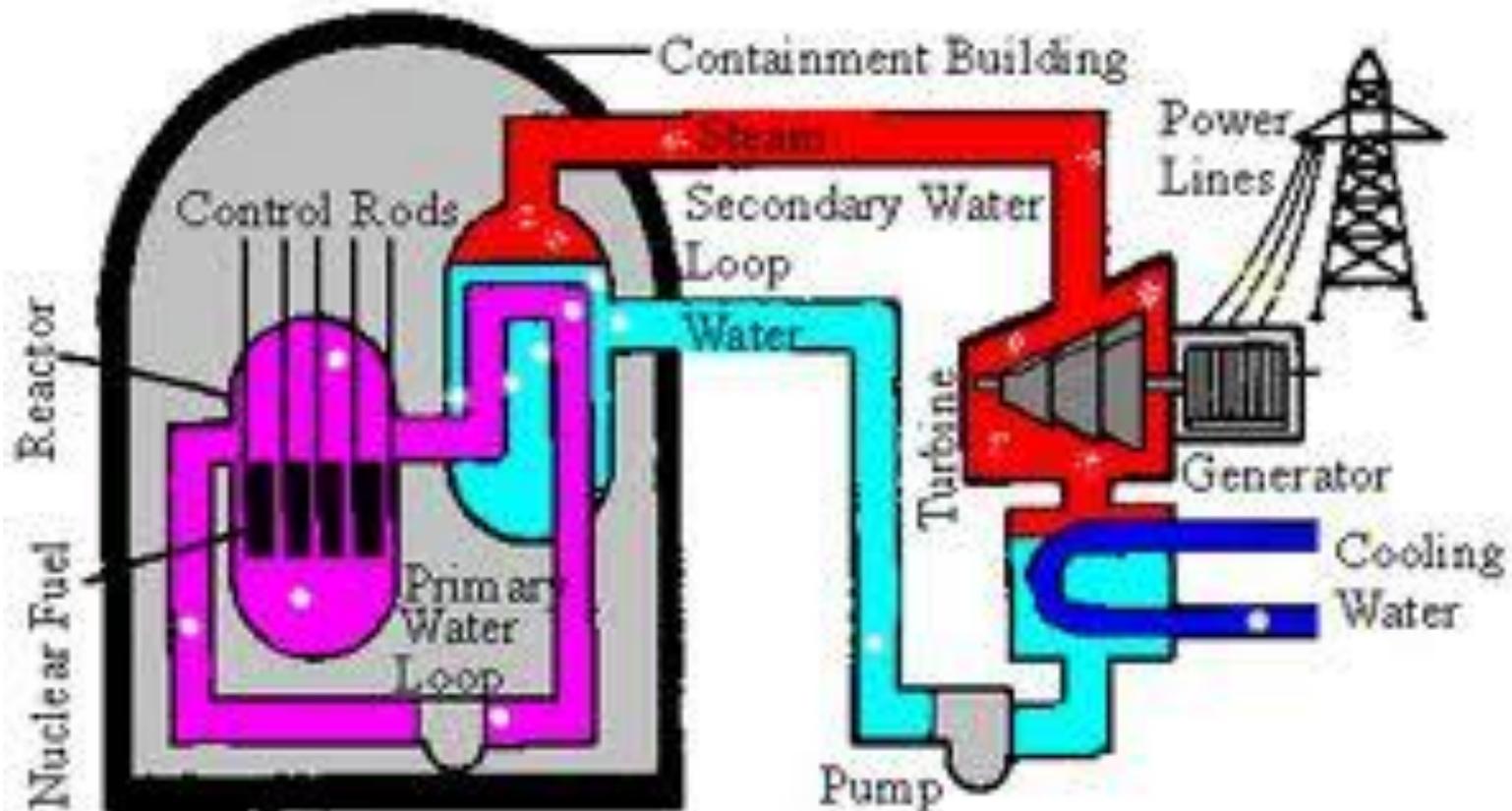
- On July 16th, 1945, the United States set off the world’s first atomic explosion.
- The development has been such that **atomic weapons have virtually achieved conventional status within our armed services.** If at one time the United States possessed what might have been called a monopoly of atomic power, **that monopoly ceased to exist several years ago. ... the knowledge now possessed by several nations will eventually be shared by others, possibly all others.**
- The United States knows that **if the fearful trend of atomic military build-up can be reversed, this greatest of destructive forces can be developed into a great boon, for the benefit of all mankind.**

The US continued development of nuclear weapons as did other countries.

When any country, such as Iran, develops nuclear technology which they say is for energy production, we fear that they are making nuclear weapons.

How does a nuclear power plant work?

- The most common nuclear power plant design is a Pressurized Water Reactor (PWR)



The Nuclear Fuel Cycle – Uranium Extraction

Just like bombs, Nuclear Power starts with Uranium extraction.

- Historically, uranium mining has been predominantly done on Indigenous people's land.
 - From 1944 to 1986, **nearly four million tons of uranium ore were extracted from Navajo lands** ...Many Navajo people worked the mines, **often living and raising families in close proximity to the mines and mills.**
 - Today the mines are closed, but a **legacy of uranium contamination remains**, including **abandoned uranium mines** ...as well as **homes and drinking water sources with elevated levels of radiation**. Potential health effects include **lung cancer from inhalation of radioactive particles**, as well as **bone cancer and impaired kidney function from exposure to radionuclides in drinking water.**

The Nuclear Fuel Cycle – Uranium Extraction

There are more than 10,000 abandoned uranium mines (AUMs) in 15 western states.¹

The true number, location, existing hazard, and off-site migration potential for toxic and radioactive materials from these sites have not yet been adequately determined.

75% of AUMs are located on federal and tribal lands.

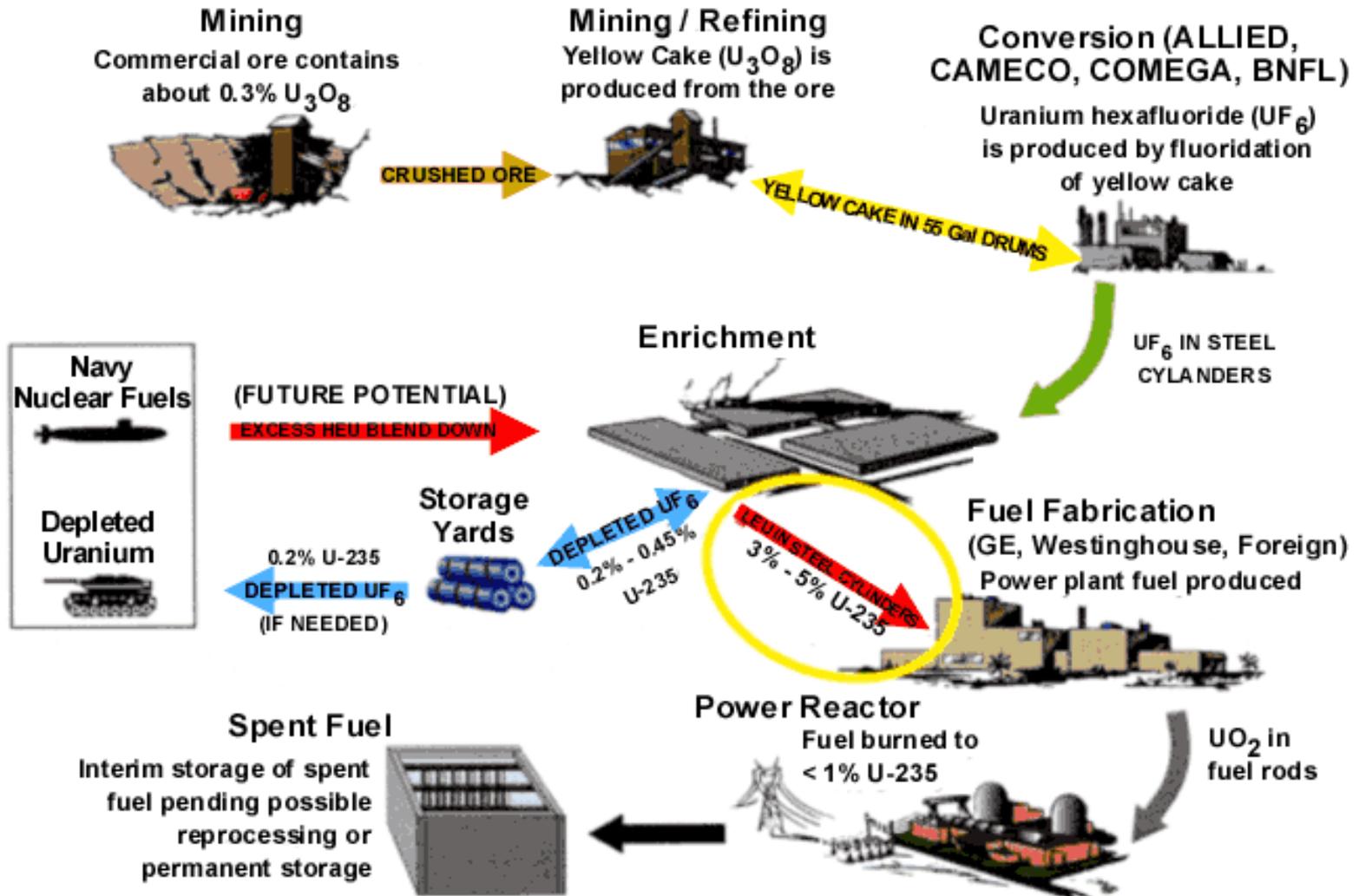
Most of those locations are found in Colorado, Utah, New Mexico, Arizona, and Wyoming.¹

There are 3,272 abandoned uranium mines and prospects located in just five states; Montana, Wyoming, North Dakota, South Dakota, and Colorado. 169 AUMs are located 40 miles southwest of Mount Rushmore in the Black Hills.³ More than 1,200 AUMs have been documented on Navajo Reservation.⁴

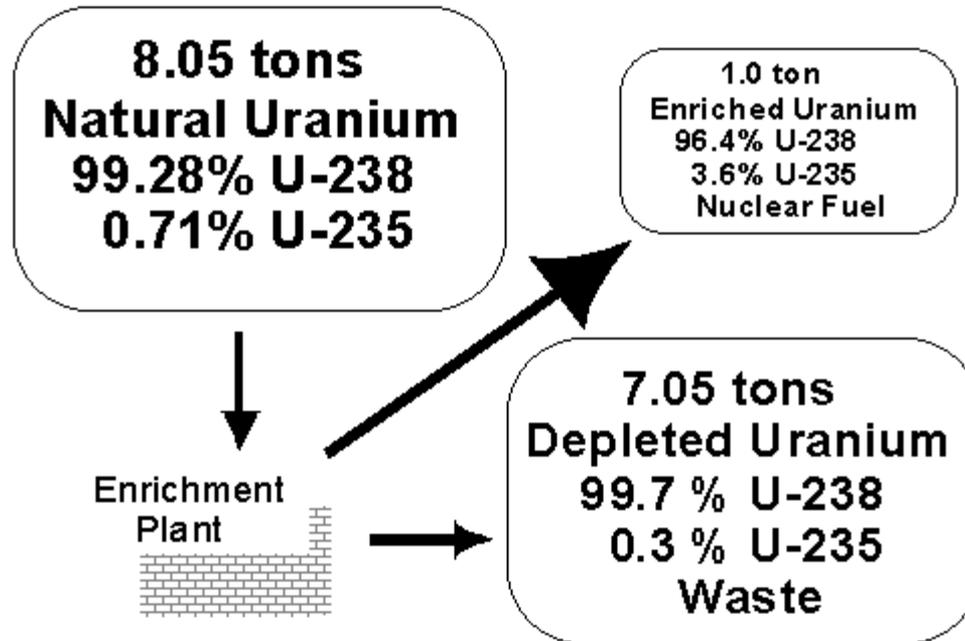


Tiokasin Ghosthorse who hosts and produces “First Voices Indigenous Radio” on WBAI Radio (99.5-FM), is Lakota and grew up in South Dakota. He has spoken that some of his high school classmates worked at the uranium mines, became ill and have passed.

The Nuclear Fuel Cycle



The Nuclear Fuel Cycle – Depleted Uranium



Depleted Uranium is extremely dense and is used for armor piercing shells or bullets.

These munitions are also incendiary so they turn into dust that gets inhaled or ingested when it settles on crops or drinking water sources .

This type of weapon is linked to horrible illnesses and birth defects

The Nuclear Fuel Cycle – Depleted Uranium

- **Depleted uranium weapons were used extensively in the 1991 Desert Storm invasion of Iraq.**
- In 2001 the Annals of Epidemiology reported the results of a study of 30,000 veterans – ½ were Gulf War Veterans and ½ were Control Veterans
 - Gulf War fathers were almost twice as likely as Control fathers to have babies with birth defects
 - Gulf War mothers were almost three times as likely as Control mothers to have babies with birth defects.
- The use of depleted uranium munitions has continued in both Afghanistan and Iraq.

WARNING: THE NEXT SLIDE WILL SHOW SOME REALLY GRUESOME PICTURES OF CHILDREN WITH BIRTH DEFECTS FROM FULLUJAH, IRAQ

The Nuclear Fuel Cycle – Depleted Uranium

In September this year (2009), say campaigners, 170 children were born at Fallujah General Hospital, 24 per cent of whom died within seven days. Three-quarters of these exhibited deformities, including “children born with two heads, no heads, a single eye in their foreheads, or missing limbs”. The comparable data for August 2002 – before the invasion – records 530 births, of whom six died and only one of whom was deformed.*



* <http://www.independent.co.uk/news/world/middle-east/toxic-munitions-may-be-cause-of-baby-deaths-and-deformities-in-fallujah-5506956.html>

The Nuclear Fuel Cycle – High Level Radioactive Waste Storage

The most significant high-level waste from a nuclear reactor is the used nuclear fuel left after it has spent about three years in the reactor generating heat for electricity.

Spent Fuel Pool



	By Volume	By Radioactive Content
High Level Waste	3%	95%
Intermediate Level Waste	7%	4%
Low Level Waste	90%	1%

The Nuclear Fuel Cycle – High Level Radioactive Waste Storage

Spent Fuel Pool

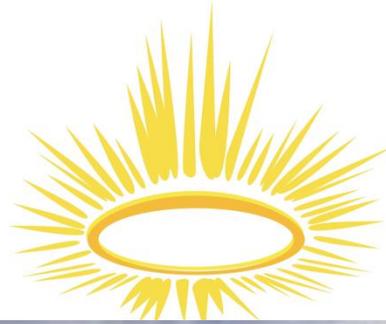


Storage and disposal of used fuel and other HLW

There are about 270,000 tons of used fuel in storage, much of it at reactor sites. About 90% of this is in storage ponds, the balance in dry cask storage. Much of the world's used fuel is stored thus, and some of it has been there for decades.

The Nuclear Fuel Cycle

- **Some nuclear supporters claim that nuclear energy is greenhouse gas free. That is a false claim.**



The Nuclear Fuel Cycle

Nuclear power has a noteworthy carbon footprint.

At the front end of nuclear power, carbon energy is used:

- for uranium **mining, milling, processing, conversion, and enrichment**, as well as for **transportation** and the **heavy construction of nuclear plants**

At the back end, there is the task of dealing with Spent Fuel:

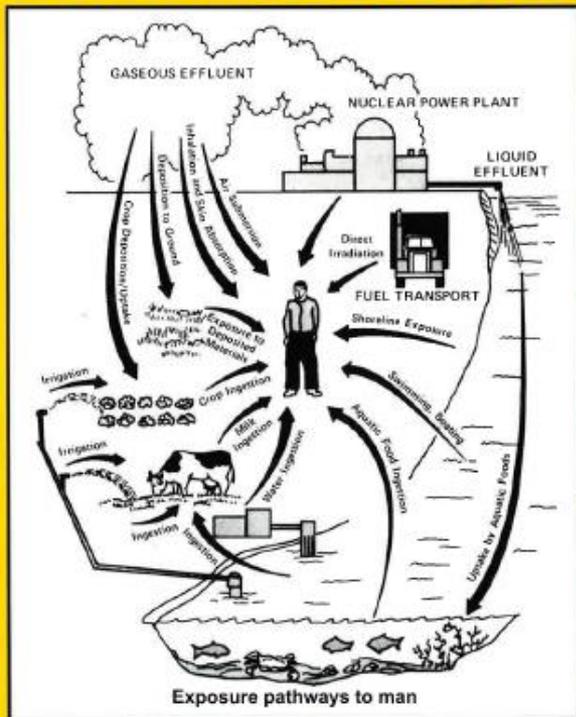
- **isolation of highly radioactive nuclear waste for millennia—a task which science has so far not been able to address.**

Large amounts of water are also used, first in mining and then in cooling the reactors.

- **Uranium mine and mill cleanup demands large amounts of fossil fuel.**
- Each year **2,000 metric tons of high-level** radioactive waste and **twelve million cubic-feet of low-level** radioactive waste are generated **in the U.S. alone.**
- **None of this will magically disappear.** Vast amounts of **energy will be needed to isolate these dangerous wastes** for generations to come.

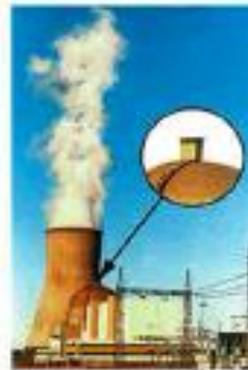
It Does Not Take an Accident to Harm People and the Environment

ROUTINE RADIOACTIVE RELEASES FROM U.S. NUCLEAR POWER PLANTS



↑ A DIAGRAM PUBLISHED IN 1977 BY THE U.S. NUCLEAR REGULATORY COMMISSION

PLANNED RELEASES from Nuclear Plants into Air, Water, and Soil



The vent on top of the Reactor Building at the Callaway 1000-megawatt pressurized water reactor.

IT DOES NOT TAKE AN ACCIDENT

Water discharge area at the Palisades nuclear power plant on Lake Michigan. Note the flow from four big ejection outlets.



Furthermore, if constituents of these high-level wastes were to get into ground water or rivers, they could enter into food chains. Although the dose produced through this indirect exposure is much smaller than a direct exposure dose, there is a greater potential for a larger population to be exposed. * *The National Academy of Sciences issued a report that said that there is no level of exposure to ionizing radiation that can be considered harmless.*

* <http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/radwaste.html>

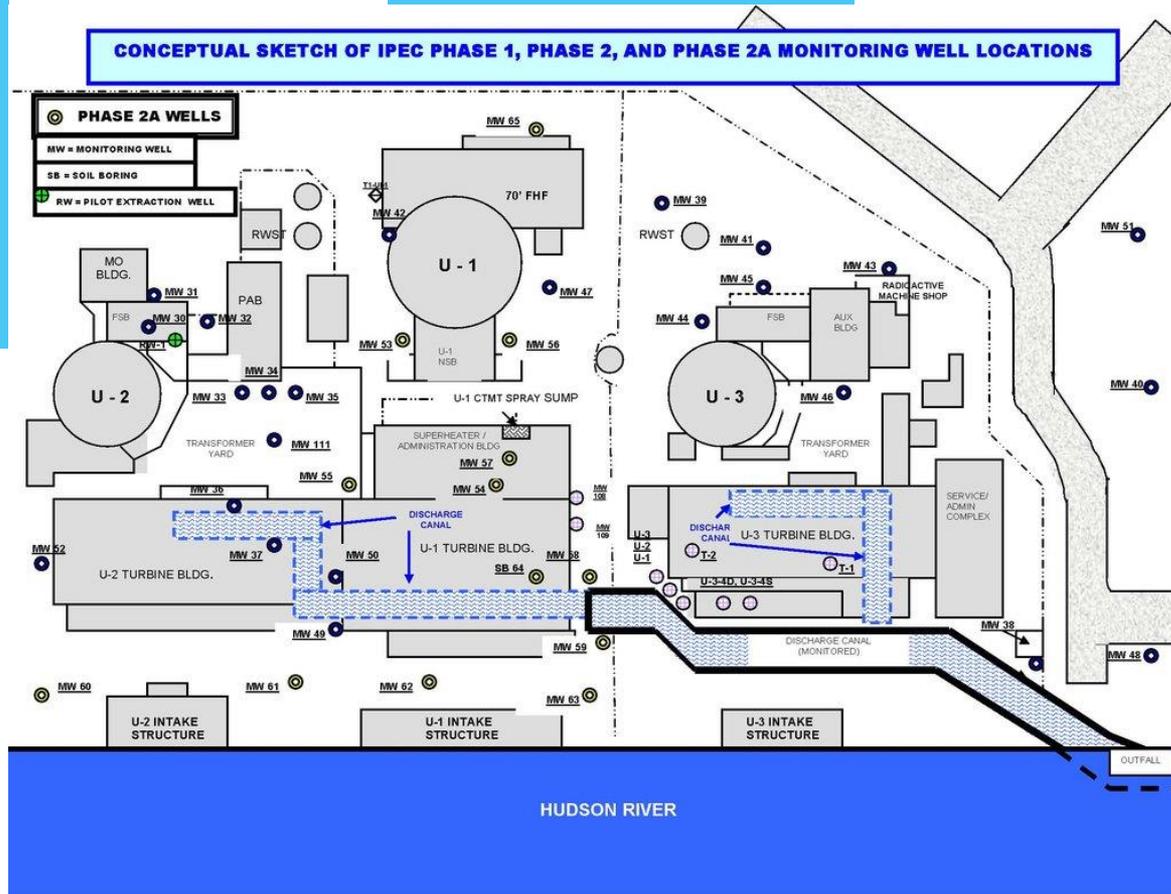
INDIAN POINT – THE BASICS

Next to the Northern Border is a public baseball field where kids play.

Broadway

At the Southern Border is the St. Patrick's Cemetery

CONCEPTUAL SKETCH OF IPEC PHASE 1, PHASE 2, AND PHASE 2A MONITORING WELL LOCATIONS



Indian Point – The Basics

- ***“Indian Point is one of the most inappropriate sites in existence for a nuclear plant”***
- ***“I think it is insane to have a three unit reactor on the banks of the Hudson River, 20 miles from The Bronx and 40 miles from Midtown Manhattan”***
 - These quotes from 1979 were from public testimony in Westchester and a report to the US House of Representatives by Director of the NRC Office of State Programs, Robert Ryan. Mr. Ryan was in charge of emergency planning for all 104 operating reactors in the US at that time.
- ***“No one can ever guarantee that there will not be a radiation release event at any nuclear plant.”***
 - NRC Region 1 Administrator Hubert Miller in response to my question, “Can you guarantee that there will not be a radiation release at Indian Point?” (NRC Annual Assessment of Indian Point – circa 2003 – 2004)

Indian Point – What is at risk?

- What are some of the precious US assets are we risking If the unexpected happens and there is a large radiation release?
 - 17 mile radius is defined as the Peak Fatality Zone and 50 mile radius is defined as the Peak Injury Zone*



**USMA
West Point
7.5 miles**



**Empire
State Building
33 miles**



**Kensico Reservoir
NYC's primary
source of drinking
water
16 miles**



**Wall Street
38 miles**

**About 300,000 people live within the 10 mile EPZ.
About 20,000,000 live or work within the 50 mile, Peak Injury Zone**

* Sandia National Laboratory CRAC-2 Report to US House of Representatives – 1982

Indian Point – The Basics

- Indian Point is a three unit pressurized water reactor (PWR) nuclear power plant.
 - Indian Point 2 and Indian Point 3 are operating reactors.
 - Indian Point 1 was permanently shut down in 1974 ***because of inadequate back-up cooling.***
 - *Indian Point 2 was licensed in 1973 and its license expired in September, 2013.*
 - ***It continues to operate without a current license because NRC regulations permit it to do so.***
 - Indian Point 3 was licensed in 1975 and its license expired on December 12, 2015.
- *The Governor, the Attorney General, Clearwater and Riverkeeper are in hearings with the Nuclear Regulatory Commission to keep Indian Point from being relicensed.*
 - ***It is my understanding that if the NRC grants a re-licensing, it will issue a new license, not an extension. If this is a new license, and the plant does not meet current siting standards, it should not be awarded a new license.***

How much power does Indian Point provide the Lower NY Grid?

Entergy says that Indian Point provides 25% of downstate electricity usage. ***Let's do the math.***

- According to the IPEC website. Indian Point produces 2069 MW. **Let's assume they sell all of their output into the Westchester/NYC grid.**
- The peak usage day in the downstate grid in 2014 was a little over 13,600 MW.
 - $2069 \div 13,600 = 15.2\%$
- On an average non-summer heat day, the Lower NY Grid uses about 9000 MW.
 - $2069 \div 9000 = 23\%$.
- ***So mathematically, the 25% of overall usage claim is overstated.***

BUT, do they actually sell all their output onto the Lower NY Grid?

How much power does Indian Point sell into the Lower NY Grid?

- When Entergy first bought Indian Point, Con Edison and the **New** York Power Authority signed long term contracts to buy all of IP's output. ***But those contracts have expired.***
- Con Edison is the sole distributor of electricity to the residential and businesses in this part of the grid.
 - **According to the 2013 ConEd Company Report, they contract only 500 MW from Indian Point.***
- NYPA is the sole distributor to municipal users in this part of the grid (Subways, Metro North, street lights, NY Housing Authority, Airports, Municipal buildings, etc.)
 - **NYPA terminated their contract with Entergy in 2013 and do not currently buy any of IP's output.****

* http://www.coned.com/documents/Con_Edison_2013_Annual_Report.pdf

** <http://www.reuters.com/article/2012/09/12/us-utilities-nypa-energy-indianpoint-idUSBRE88B1C020120912>

How much power does Indian Point sell into the Lower NY Grid?

- In February 2013, an article on the front page of the Business Section the New York Times about natural gas shortages in New England, authored by Matthew Wald who has now taken a position with the Nuclear Energy Institute (NEI), the primary lobbying group of the nuclear industry, reported:
 - *New England's problems have been moderated somewhat by imports. **"Without Indian Point, New England would have been toast," Mr. Short said. "We're importing 1,400 megawatts out of New York."** **
- **If two-thirds of Indian Point's total output was being exported to the New England grid, how could Indian Point be supplying 25% of our grid's electricity usage?**

* http://www.nytimes.com/2013/02/16/business/electricity-costs-up-in-gas-dependent-new-england.html?pagewanted=all&_r=0

How much power does Indian Point sell into the Lower NY Grid?

- In January 2012, two committees of the NYS Assembly held a hearing about replacing Indian Point. Here is what they said about Entergy and Indian Point,
- *“Finally, the Committee Chairs noted that **Entergy**, the owner of Indian Point, **was asked** well in advance of the hearing **to come prepared with records** detailing the price and quantity of the **power generated** by the reactors, **sales of that electricity** both through the Independent System Operator (ISO) and other contracts and the costs associated with operating the facilities. **Entergy failed to comply with the request.**”**
- **If they want to make the 25% claim they should document the info that substantiates the claim.**

* <http://assembly.state.ny.us/comm/?sec=post&id=014&story=46160>

Is there adequate replacement power for Indian Point's output?

“Between 2012 and 2015, market circumstances rapidly **changed.. Both Danskammer and Bowline, which were out of service and expected to be demolished** are now being refurbished and brought back online. As a consequence, 1650 MGW of unanticipated electricity is now available ***without the need for transmission accommodations.***

As a result, the PSC determined that no additional/new power plants were needed to replace IPEC. **Most significantly, in the fall of 2013, the PSC terminated the RFP Generation Contingency Component Case 12-E-0503**

Is there adequate replacement power for Indian Point's output?

In addition to Danskammer and Bowline, the following new supply is either already constructed or is nearing finalization*:

- Hudson Transmission Project (NJ to NY power Cable) 320 MW
- PSE&G (NJ to Ramapo) power line 380 MW
- Con Ed (Bergen County interconnection power line) 315 MW
- TOTS (Westchester & Rockland Counties) power lines 350 MW
- NYSERDA (Efficiency Projects) 200 MW
- AC Hudson Valley Transmission upgrades 1000+ MW

The following new transmission /power plant projects have received construction permits:

Champlain Hudson Power Express (Quebec to NYC) cable	1000 MW
Cricket Valley (Dutchess County) power plant	1100 MW
Competitive Power Ventures (Orange County)	720 MGW
NRG-Astoria (Queens County) poer plant	750 MW

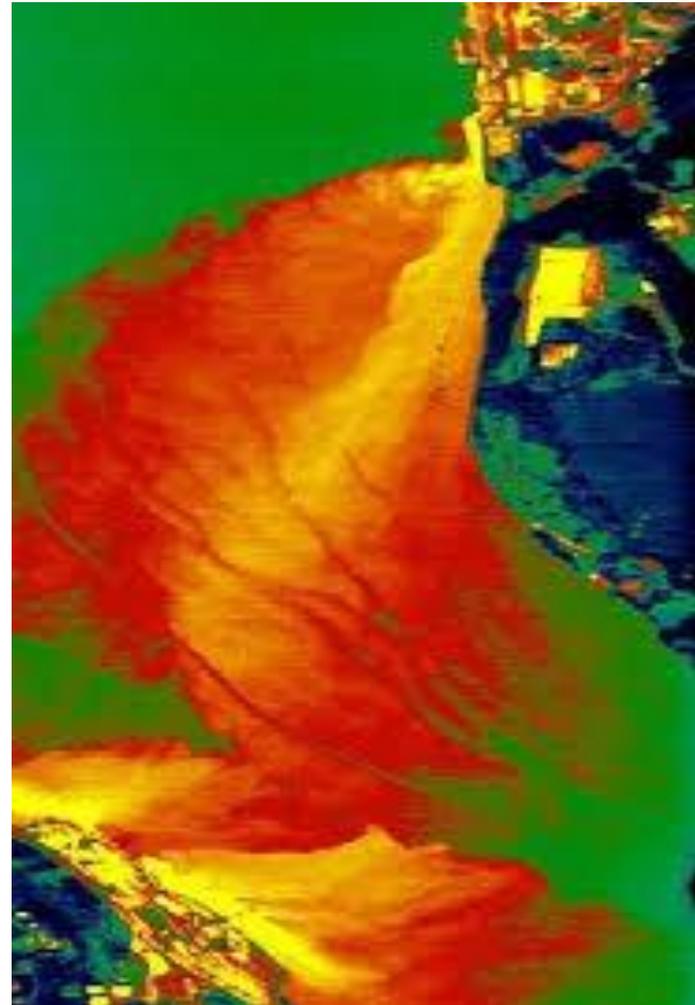
* Sierra Club Atlantic Chapter Energy Committee_(Oct. 19, 2015)

Indian Point – Hudson River Water Usage

Indian Point is the largest user of Hudson River water.

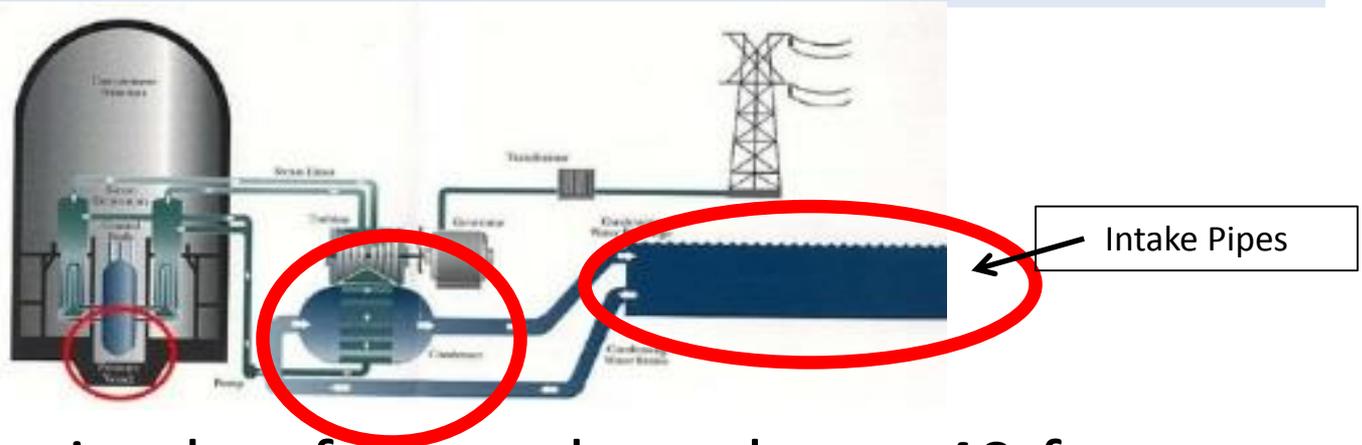
- Indian Point draws in **2.5 BILLION gallons of Hudson River water EVERY DAY.**

The once-through cooling system returns water back into the Hudson at about 110^{0*}, much hotter than ambient river temperature. This creates a large thermal plume (viewable with infra-red cameras) that disrupts fish breeding and migration patterns.



Indian Point

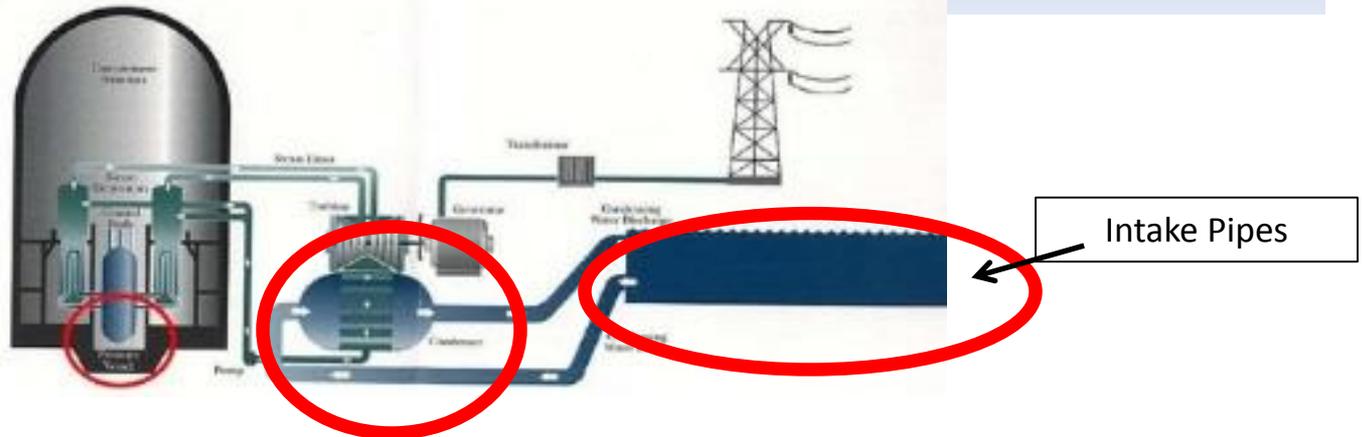
The Cooling System Controversy



- The massive intake of water through two 40-foot wide intake pipes with large screens kills billions of fish and smaller aquatic organisms that make up the Hudson River food chain.
- This is a violation of the US Clean Water Act that states that “Best Technology Available” (BTA) must be used to minimize fish kill.

Indian Point

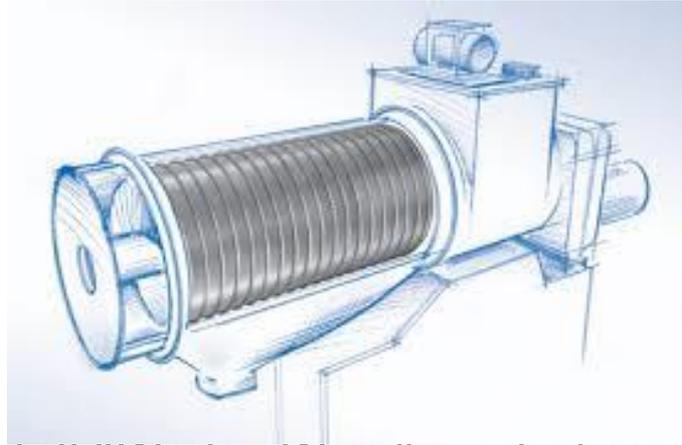
The Cooling System Controversy



- NYS Department of Environmental Conservation is withholding a Water Quality Certificate that the law says is required for the plant to receive a new 20-year operating license.
- NYS asserts that a closed cycle cooling system (something similar to what your car radiator uses, but much larger) is BTA. Periodic shutdowns of the plant during critical fish spawning and migration periods have been discussed as an alternative.
- ***Indian Point's original license granted by the Atomic Energy Commission (the predecessor on the Nuclear Regulatory Commission) included an addendum calling for Closed Cycle Cooling.****

Indian Point

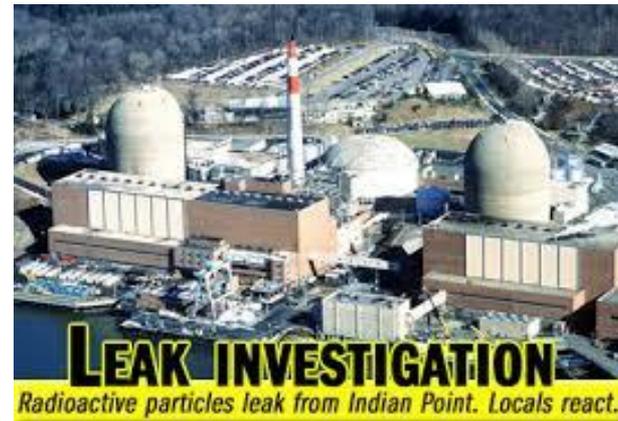
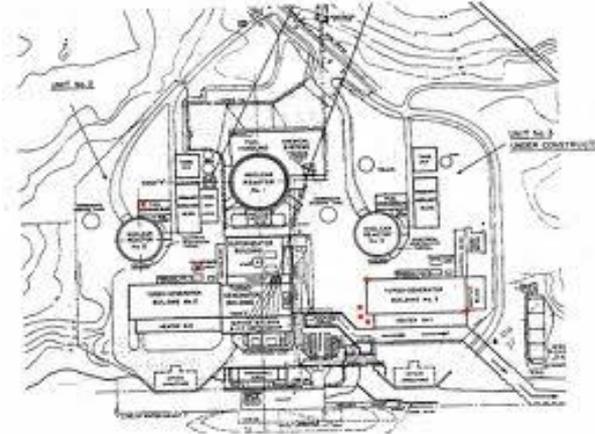
The Cooling System Controversy



- Entergy wants to install “Wedge Wire,” a set of screens that will decrease fish kill to some degree but will not affect the amount of water used or the thermal pollution.
- It is noteworthy that **in 2003, Entergy joined with Riverkeeper and Scenic Hudson** in a lawsuit against the US EPA which had suggested wedge wire as an option to mitigate fish kill. **Entergy argued that wedge wire was not designed for systems that required more than 100 million gallons***, and consequently was not viable for nuclear plants. Now, Entergy argues that a wedge wire system is viable for 25 times that amount.

*https://spoonsenergymatters.wordpress.com_July 19, 2014

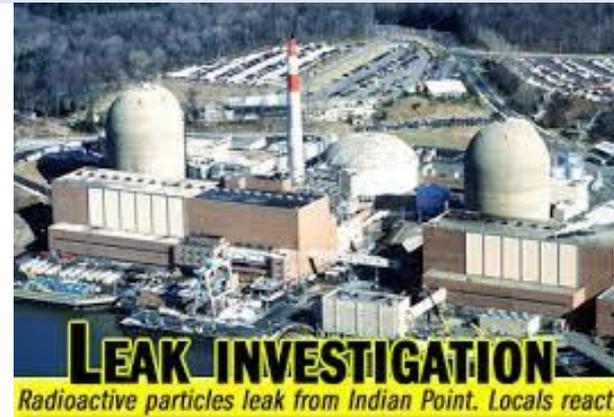
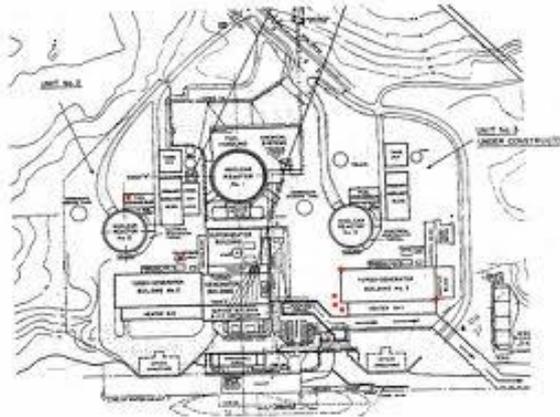
Indian Point Nuclear Waste Storage



- The **spent fuel pools have reinforced concrete walls**. The **buildings that contain the spent fuel pools are not reinforced**. They are basically commercial construction with quarter inch steel roofs, just like the Walmart at the Cortlandt Town Center strip mall.
- In 2005, when construction workers started excavation to start moving older high level wastes into dry cask storage it was discovered that spent fuel pools were leaking. Indian Point became the first nuclear plant in the US known to have leaked Strontium 90 into the plant groundwater.
 - Most of the nuclear plants in the US have leaked/are leaking Tritium.*

* <http://www.cbsnews.com/news/radioactive-leaks-found-at-75-of-us-nuke-sites/>

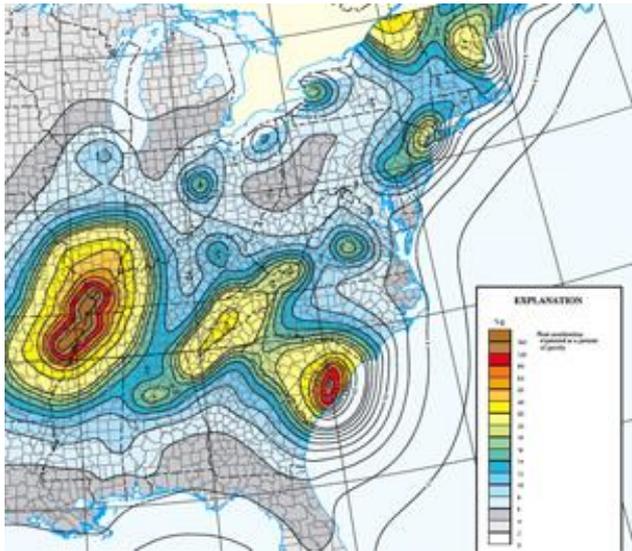
Indian Point Nuclear Waste Storage



- Indian Point has more than 2700 tons of spent fuel assemblies on-site.
- Both spent fuel pools at Indian Point were designed to hold 264 fuel assemblies.
- Because there is no place to move the spent fuel, the NRC now says that IP2 can accommodate 1374 assemblies and IP3 can accommodate 1345 assemblies. Both pools are near full capacity*
- Much of the waste could be moved to dry cask storage, but that would cost the operator a lot of money, so NRC says there is no need to expedite movement.
- The former NRC Chairman, Dr. Allison Macfarlane, was a co-author of a 2003 report from MIT that said dry cask storage is much safer than dense packed spent fuel pools.

* Correspondence from Arthur L. Burritt, Chief, Projects Branch 2, Division of Reactor Projects. July 21, 2014

Indian Point Earthquake Risk

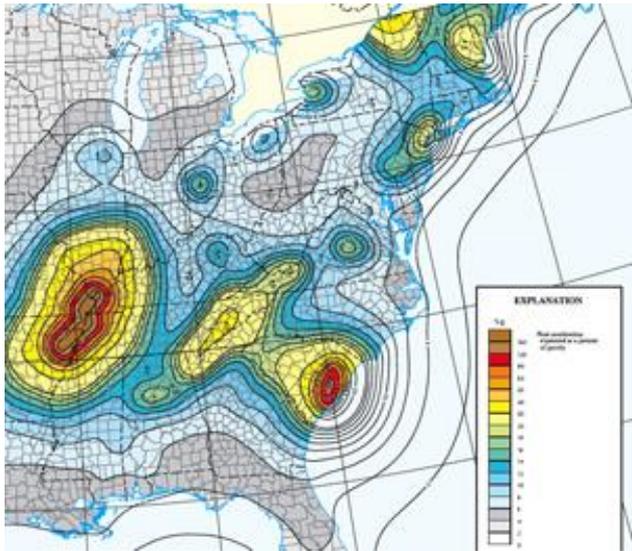


- Indian Point was knowingly built near the Ramapo fault and was designed to withstand a 5.3 magnitude earthquake.
- In 2008, The Lamont-Doherty Earth Observatory of Columbia University discovered a second seismic fault.
 - That Stamford to Peekskill Fault intersects the Ramapo Fault one mile from Indian Point 3.
- Lamont-Doherty estimates potential for a 7.0 earthquake from that intersection.

The NRC does not use The Richter Scale metric. They use g-force acceleration.

- Both Indian Point reactor buildings and the spent fuel pools were built to withstand .15g. The spent fuel pool buildings were not built to this standard.
- The 5.8 earthquake in Virginia in August, 2011 at the North Anna nuclear plant registered .26g - .28g.
 - The epicenter was 11 miles from the plant.
 - One can assume that a similar event, one mile from IP3 would be even stronger, and a 7.0 event would be far stronger.

Indian Point Earthquake Risk



- **Indian Point 3** has been **classified by the NRC** as the US nuclear plant **with the highest probability of suffering reactor core damage from a seismic event** .
- NRC has just classified both IP2 and IP3 in the “highest priority category” to assess their abilities to withstand a severe earthquake.

Given NRC’s concerns about IP’s seismic vulnerability, it is very disconcerting that Spectra Energy is planning to enlarge the Algonquin Natural Gas Pipeline to 42-inches which would double the gas pipeline capacity, AND NRC does not feel that is a safety risk.

If this concerns you, please go to www.sape2016.org

Indian Point - Evacuation



These photos are
the from
Fukushima.

← attempt to
evacuate

Evacuation →
reception center.



- In Japan, the entire country practices evacuation one day every year.
- When the Fukushima earthquake and Tsunami occurred on March 11, 2011, the entire evacuation plan broke down.
- **In a large nuclear plant radiation release, the term “evacuation” is a misnomer. What we are really talking about is a “forced relocation.”**
- **If you have any pets, you will not be allowed to bring them with you to any evacuation reception location.**

Indian Point - Evacuation



These photos are
the from
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← attempt to
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Evacuation →
reception center.



- There has never been a real evacuation drill in the 10-mile radius around Indian Point
- In 2002 – 2003, James Lee Witt, who ran the US Federal Emergency Management Agency (FEMA) for eight years under Bill Clinton, conducted a multi-month evaluation of the Indian Point Emergency Plan. His Executive Summary said,
 - **“it is our conclusion that the current radiological response system and capabilities are not adequate to overcome their combined weight and protect the people from an unacceptable dose of radiation in the event of a release from Indian Point. We believe this is especially true if the release is faster or larger than the typical exercise scenario. “ ***

Indian Point - Evacuation



- The Nuclear industry is indemnified by the Price-Anderson Act.
- The nuclear industry liability is capped at \$12.6 Billion.
 - In the 50-mile radius of Indian Point real estate value alone is \$8.5 Trillion
- If you have to evacuate, you will probably not return, but you will still be responsible for your mortgage.
- The Insurance industry will not cover anyone's property for radiologic contamination, no matter how big a premium you are willing to pay.

Indian Point – Where We Stand

- Nuclear Plant relicensing usually takes about two years to complete. The NRC has never rejected a relicensing application that was filed properly.
- Indian Point is in the eighth year of the relicensing fight.
 - There have never been as many contentions filed against relicensing as were filed against Indian Point, including contentions filed by New York State and environmental organizations.
- New York State DEC has refused to issue a Water Quality Certificate (WQC) to Indian Point until a closed cycle cooling system is installed.
 - A WQC is required for a nuclear plant to be relicensed.
- The New York Department of State has issued a report that Indian Point is not compliant with Coastal Management standards so they could be prohibited from using Hudson River water.
- Entergy tried to spin off their Entergy Nuclear Northeast into a separate company to limit liability of the parent company. The NY Public Service Commission prohibited that saying that “it was not in the best interest” of the people of New York State.
- Entergy has already closed the Vermont Yankee plant, and they have announced that they will be closing their Fitz Patrick plant in upstate New York and their Pilgrim plant on Cape Cod.
- ***There was a news story that some Entergy corporate officers have been selling off noteworthy amounts of company stock.***

What Can You Do?

- We have a **letter asking Mayor de Blasio to support a NYC Council Resolution calling for the closure of Indian Point**. If you sign one we will send it to the Mayor.
- We have **sign-up sheets if you would like to be on our email list**.
 - We do not overuse it. We send out relevant news or information, and sometimes ask for your help to show up at a meeting or event.
- **Write or call your Local elected officials** and let them know that you do not think that Indian Point should be relicensed and that it is not worth the risk we take by having it operate and continue making high level nuclear waste.
- **If you want to be able to educate your friends**, we have a sign up sheet to get an electronic copy of this presentation (in pdf format).