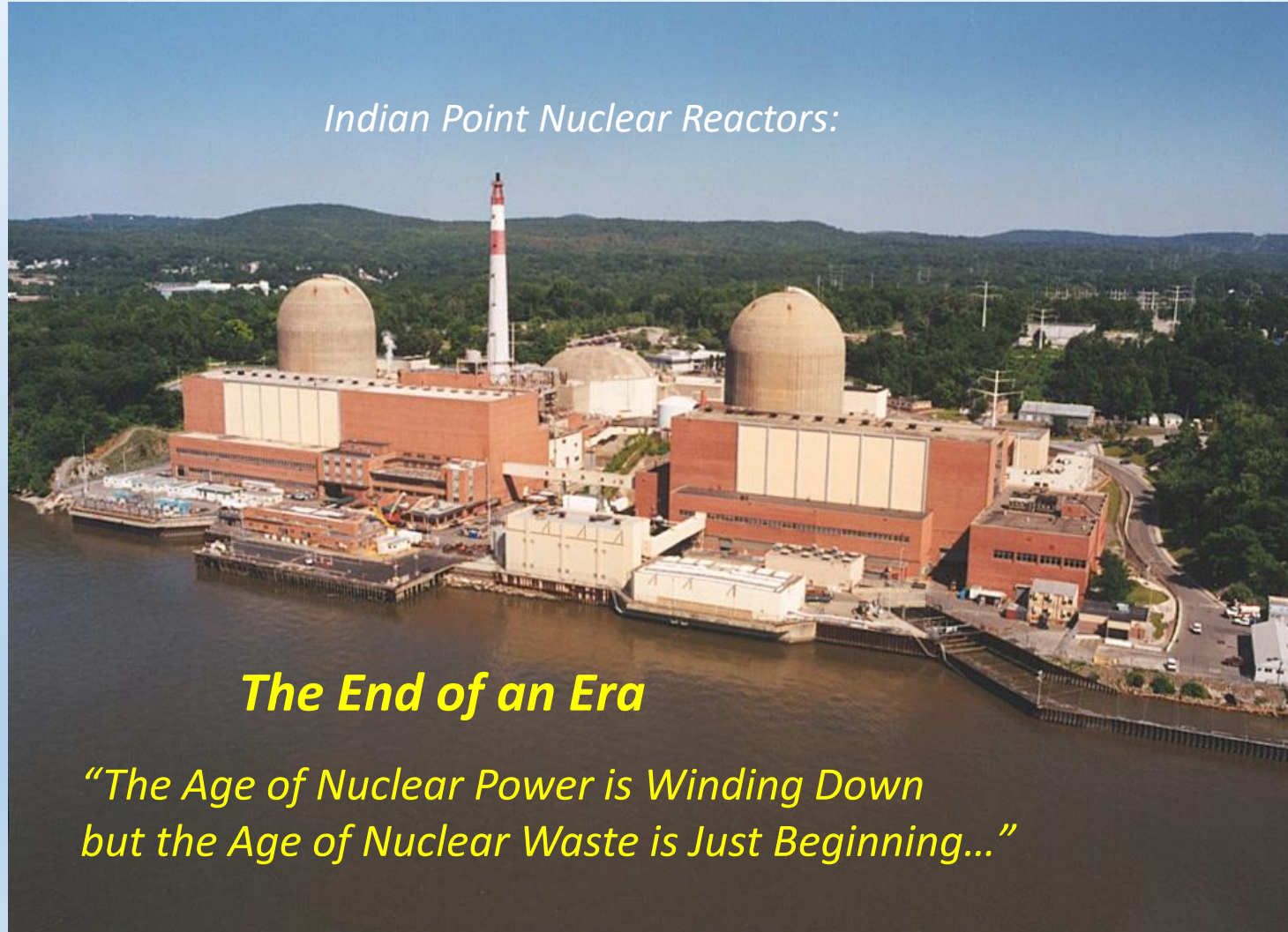


Indian Point: An Ever Present Danger

April 29, 2018

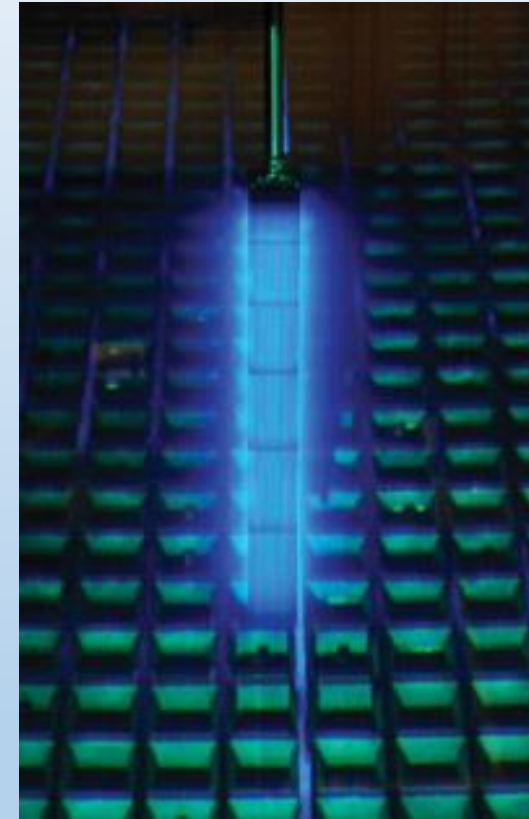
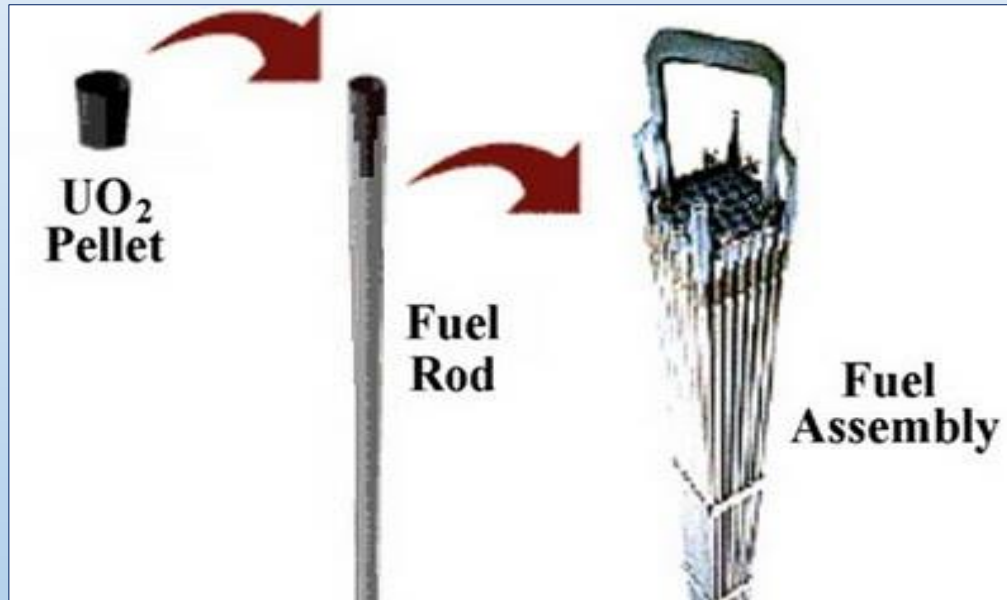


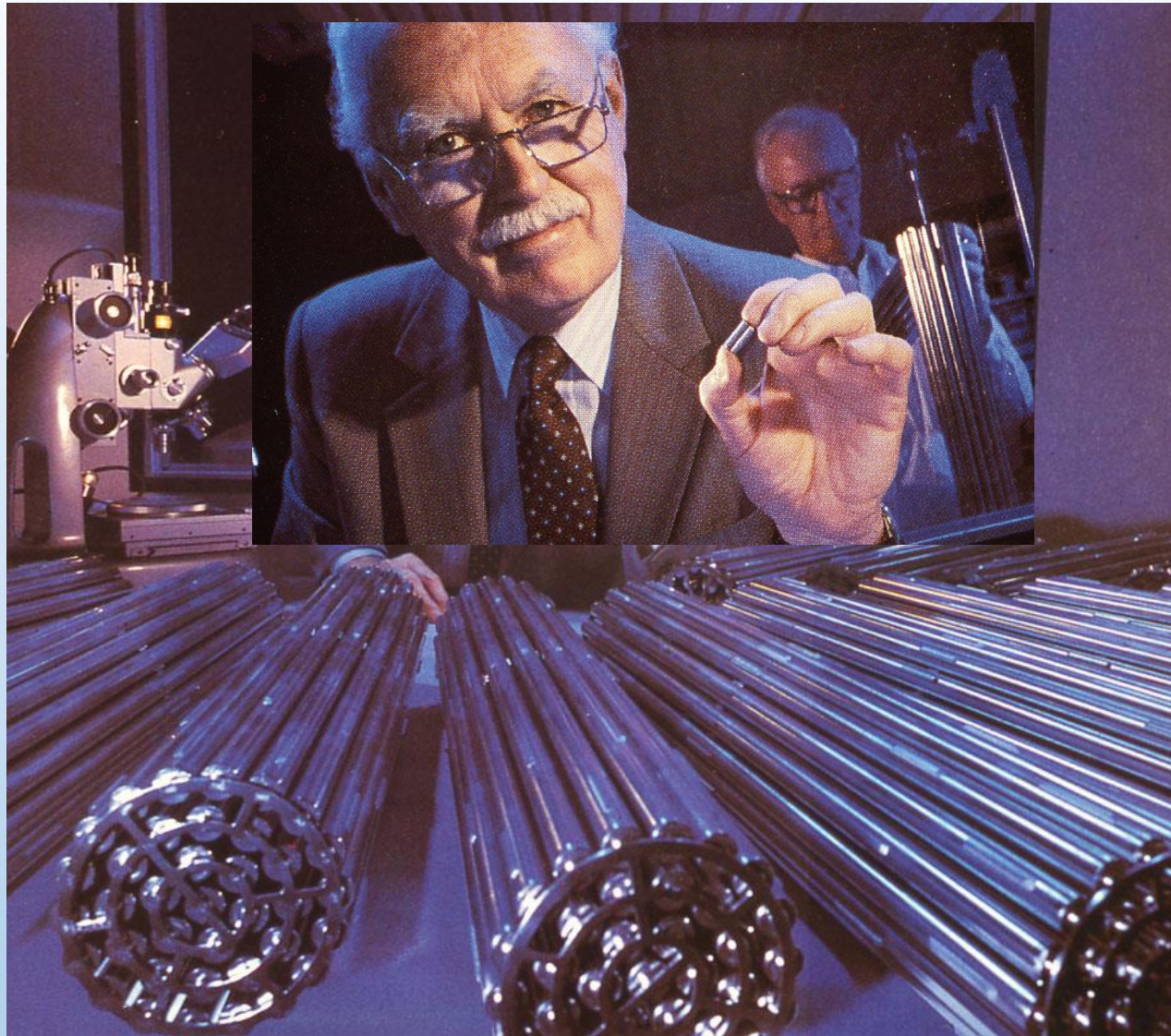
Indian Point Nuclear Reactors:

The End of an Era

***"The Age of Nuclear Power is Winding Down
but the Age of Nuclear Waste is Just Beginning..."***

What is Spent Fuel?

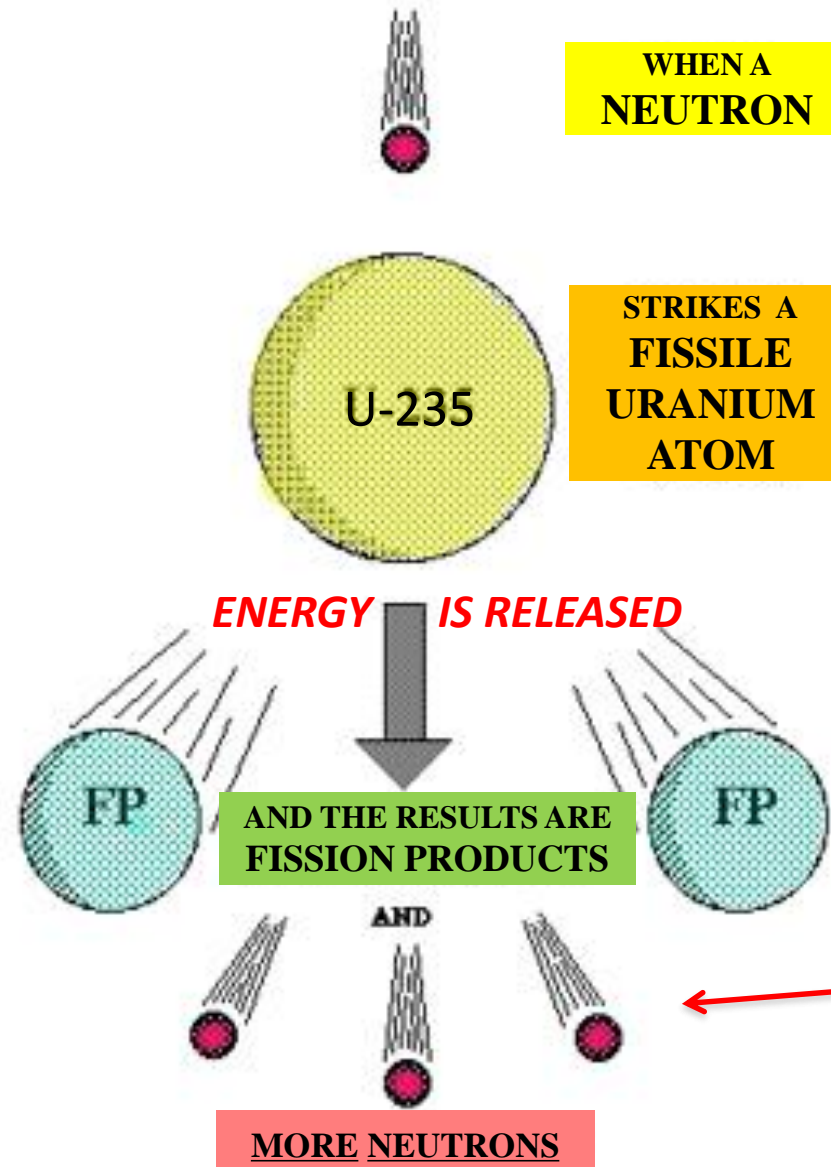




**Nuclear fuel rods and pellets can be handled safely before use.
Once used, the fission products will deliver a lethal dose of radiation in seconds.**

"Small Wonder" : Canadian Nuclear Association Ad

Nuclear Fission



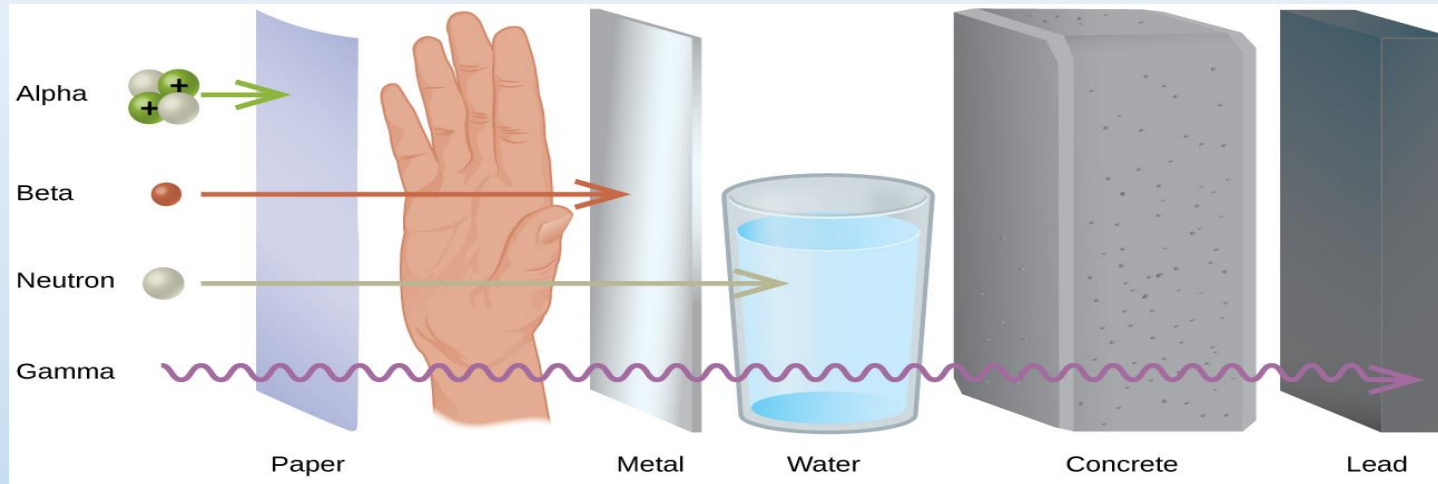
A subatomic projectile called a neutron starts a nuclear chain reaction by splitting a nucleus of “fissile uranium” (U-235).

The nucleus splits into two large fragments and energy is released – along with 2 or 3 extra neutrons.

The 2 broken pieces are new **radioactive** nuclei called “fission products”.

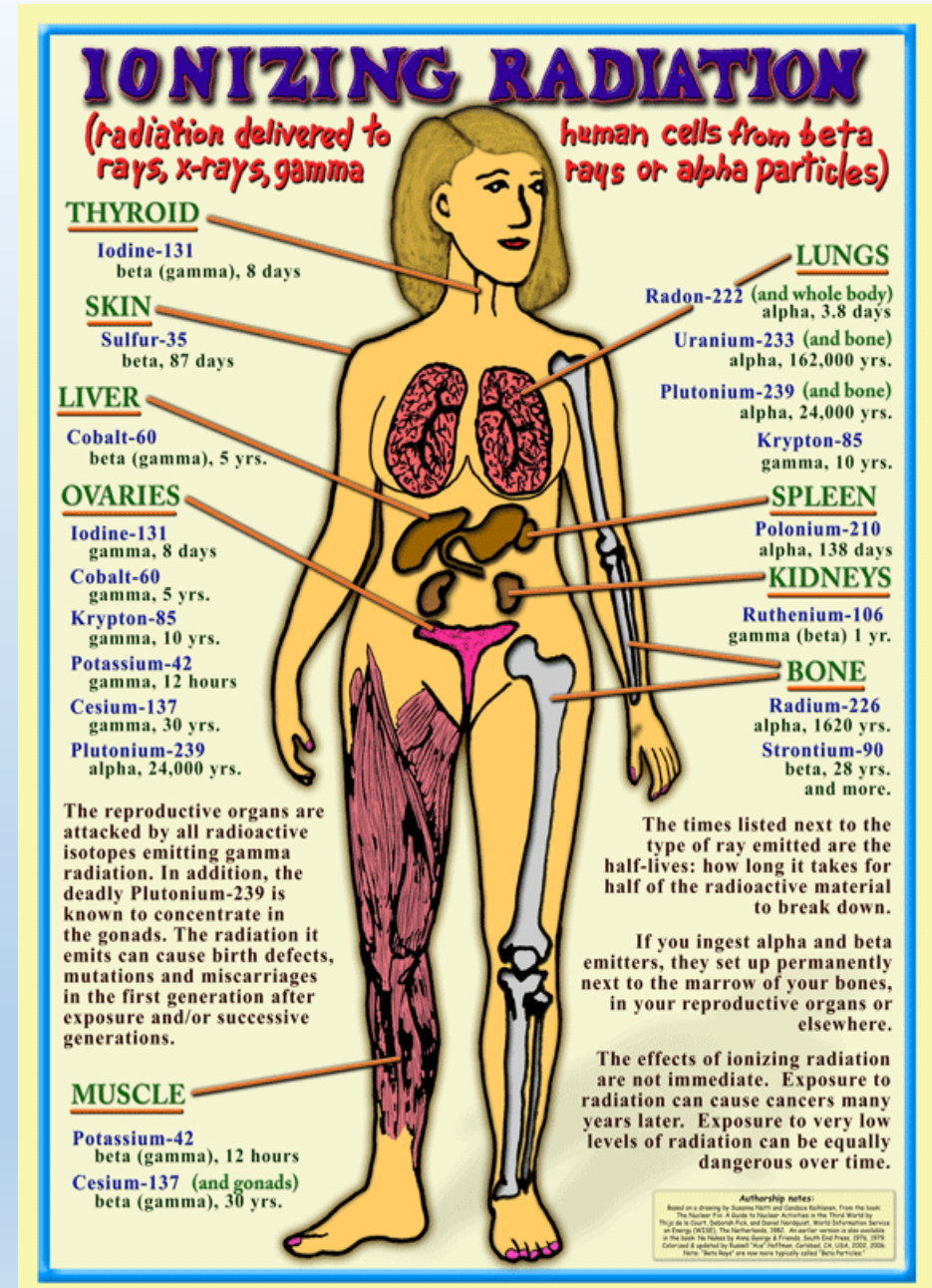
More neutrons trigger more fissions and so the energy release is multiplied enormously.

Where Do Radioactive Isotopes Go?



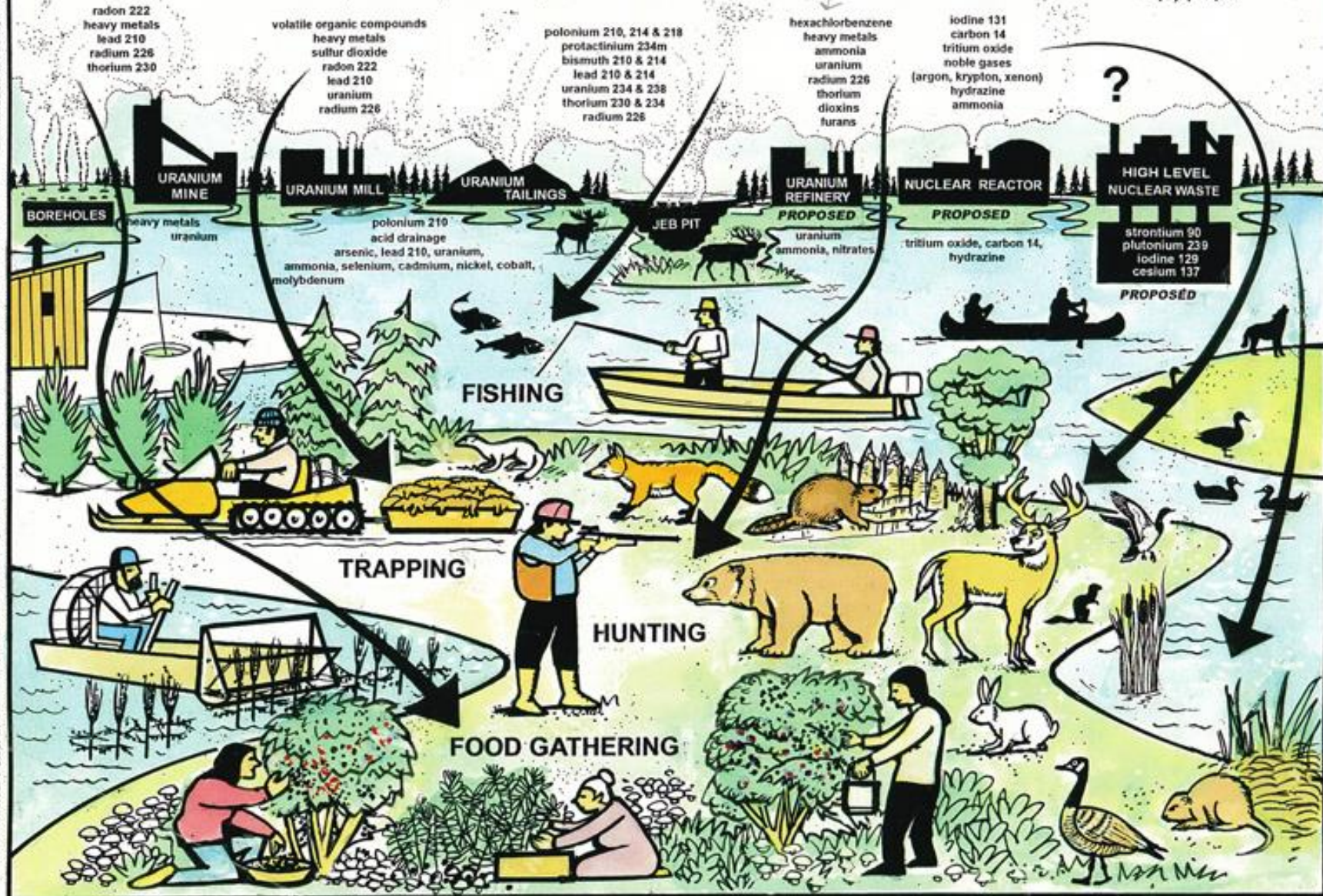
Chronic exposure to radioactive materials increases the incidence of **cancer, leukemia, genetic damage, anemia, damaged immune systems, strokes, heart attacks, and low intelligence**

There is a “latency period” for exposure at low levels – the onset of disease may occur years or decades after exposure.



POLLUTION FROM THE NUCLEAR FUEL CHAIN

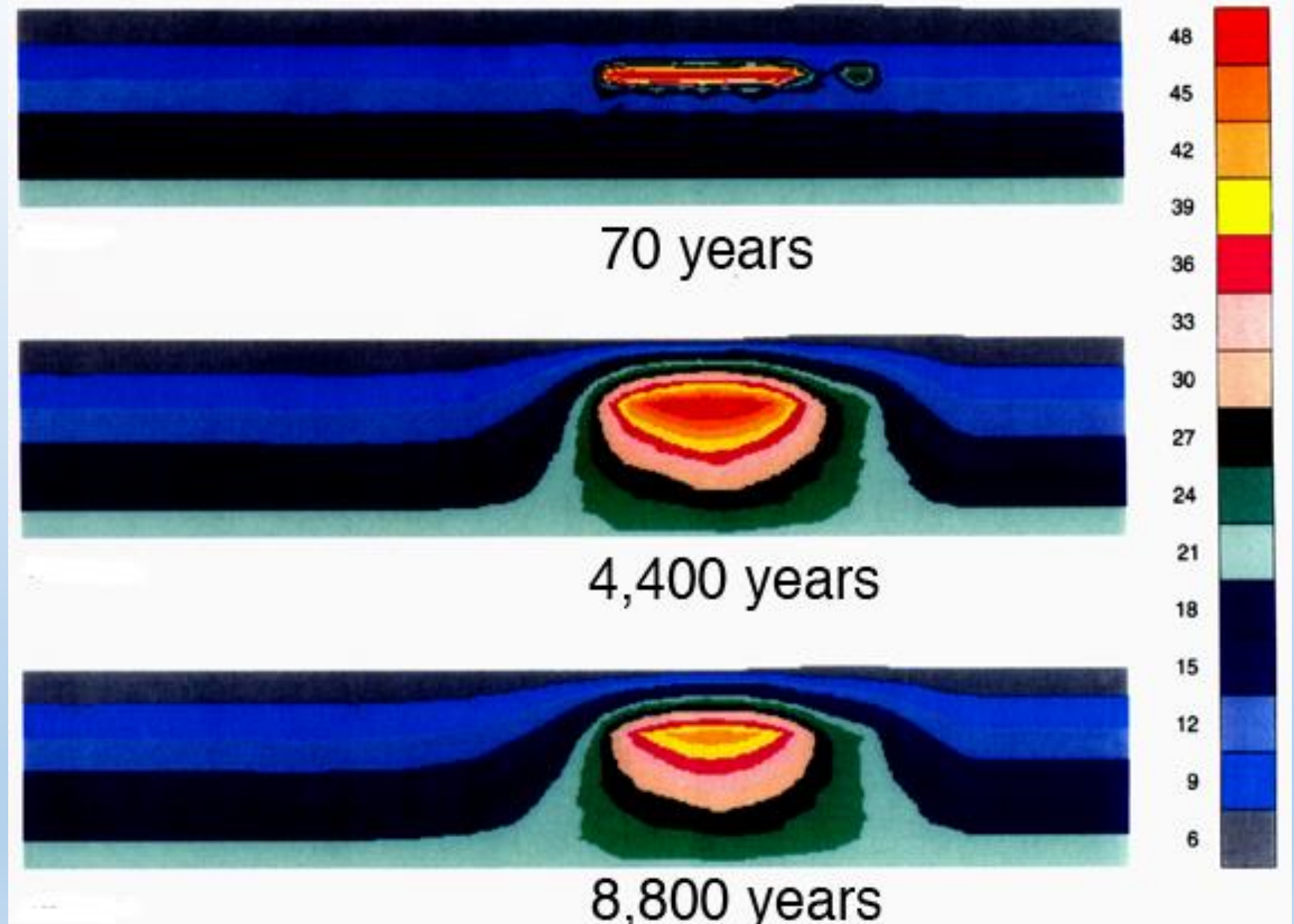
RADIOACTIVE AND CHEMICAL PARTICLES AND GASES CONTAMINATE THE LAND, WATER, PLANTS, ANIMALS AND PEOPLE OF NORTHERN CANADA



Geologic Disposal:

The horizontal lines represent underground rock layers. The colors indicate temperatures (in degrees Celsius). Heat from the buried irradiated nuclear fuel warms up the rocks.

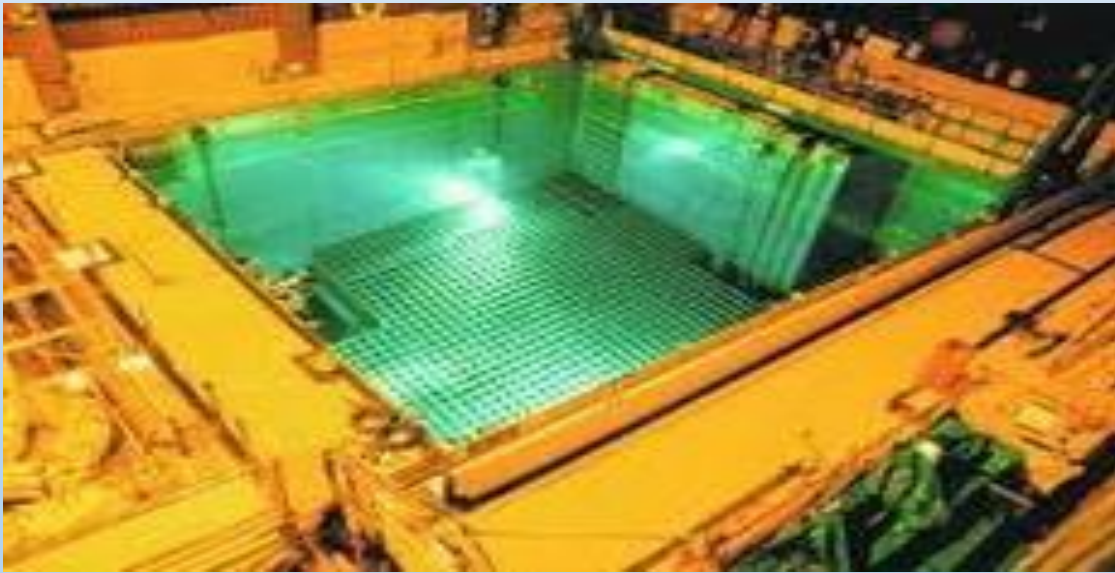
Heat continues to be generated by ongoing radioactive disintegration. This heat goes into the surrounding rock, raising the temperature. After **50,000 years** the temperature returns to about normal. This 50,000 year period is the “**thermal pulse**” – a small blip in time compared with the multi-million-year persistence of **radiotoxicity**.



from AECL's EIS on the Geologic Disposal Concept, 1994.

Irradiated Nuclear Fuel Transfer, from Pools to Casks

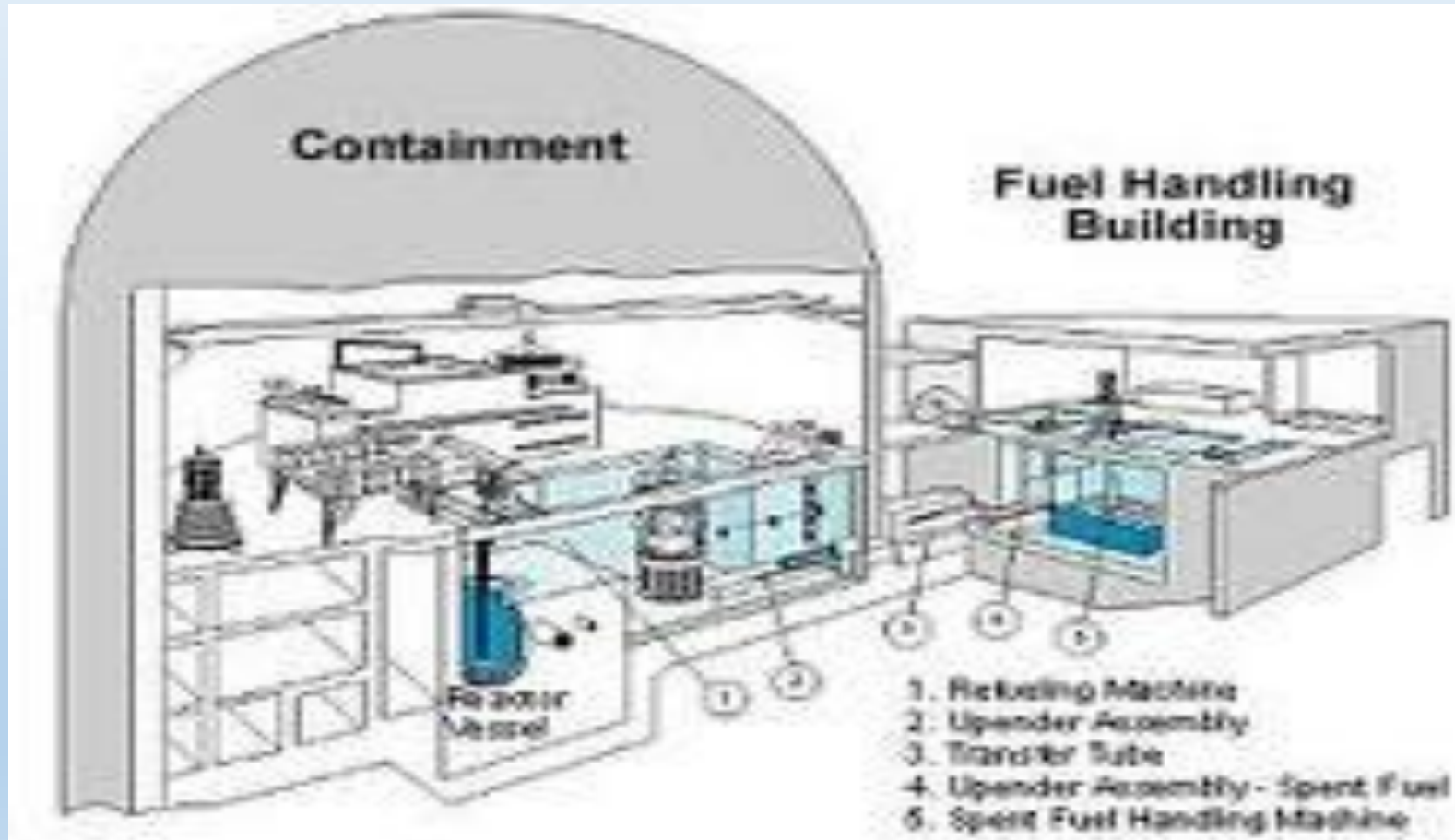
Indoor “Wet” Storage Pool →



Outdoor Dry Casks

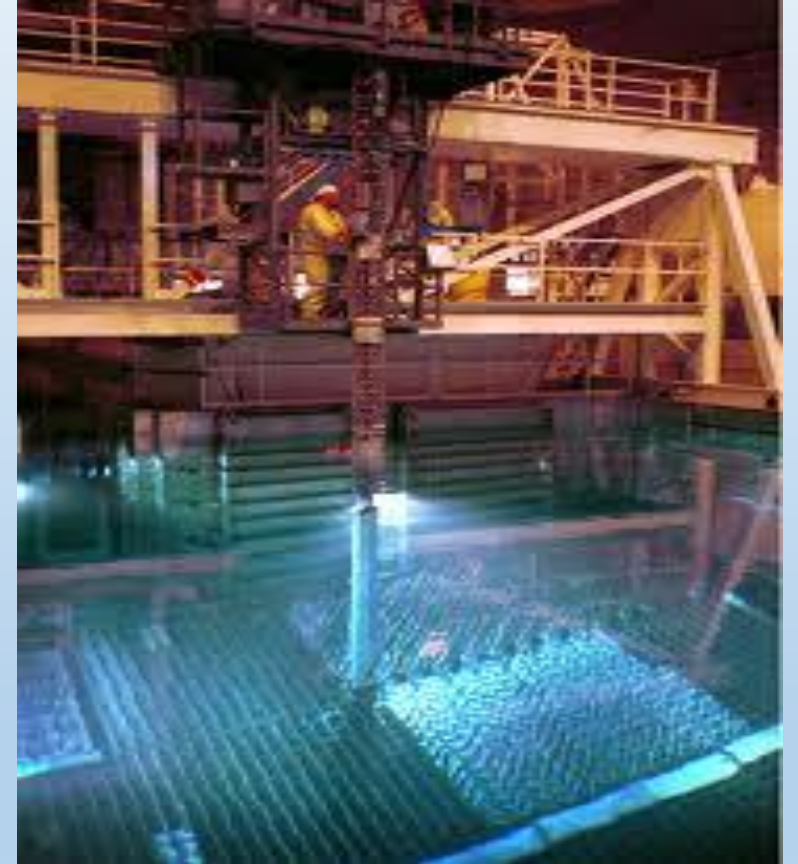


“Spent” Fuel Pools are outside robust containment



Risks of Pool Storage & Transfer

- ~ 1,750 tons of fuel rods stored in severely overcrowded fuel pools
- IP's long term (~early 1990s-present) pool leakage of radioactivity into soil, groundwater, Hudson River (tritium, Sr-90, radioactive cesium, cobalt, nickel)
- Heavy load drop risk of pool drain down, zirconium fire (Point Beach, MN & Palisades, MI transfer cask crane dangles; Vermont Yankee crane slip)

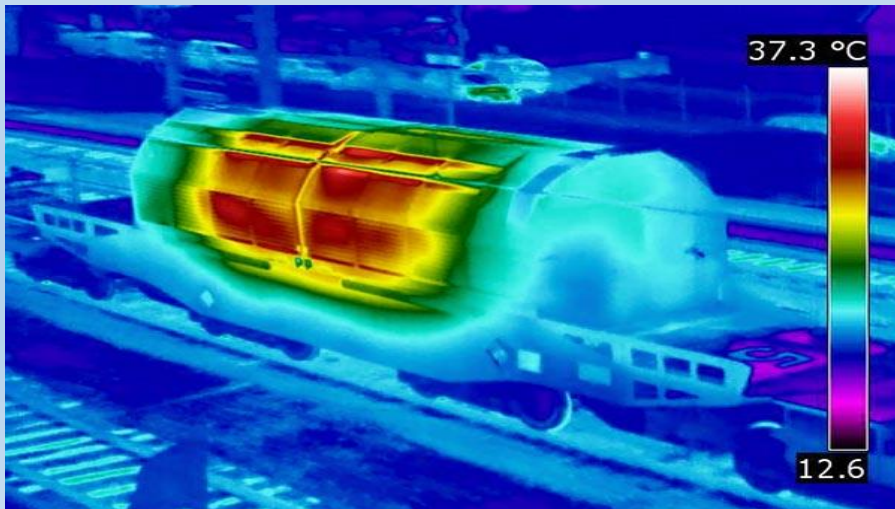


Crane Risks

Decommissioning Options

NRC Regulations Provide Three Options:

- **DECON** – rapid dismantlement
- **SAFSTOR** – up to 60 years to complete site restoration
- **Entombment** – never released for unrestricted use



Under NRC regulations, the decommissioning process must be complete within **60 years** after the end of operations, unless an extension is required to protect public health and safety

High Burn-Up fuel makes everything worse (thermal heat, radioactivity)

Dangers of Rapid Dismantlement (DECON)

- Exposure of workers to highly contaminated internals
- Contamination of site with hot particles
- Potential to contaminate the community
- Higher cleanup costs
 - More decontamination and worker protections
 - Higher waste disposal costs
- More radioactive waste to waste facility and communities
 - Barnwell, SC (Atlantic Compact: CT, NJ, SC)
 - Clive, Utah (Class A waste)
 - Andrews, Texas (Texas-Vermont Compact: open to other states)



Decommissioning: Thorough and Responsible

CAN & NIRS developed their own model to maximize the benefits and avoid the liabilities of the first two options:

Planned Decommissioning & Site Restoration (PDSR)

- **Begin immediately upon closure:**
 - Retain the skilled workforce with institutional memory
 - Transfer high-level irradiated fuel to hardened dry-cask storage
 - Survey site for groundwater contamination
 - Remove non-essential buildings
 - Provide routine radiological inspections
 - Undertake site characterization to establish baseline, followed by an ongoing environmental and radiation monitoring program
- **Decontamination and Dismantlement Plan**
 - Decontaminate and dismantle reactors last, after fuel has been transferred.
 - Can be accomplished in 20 – 25 years depending on site. Rancho Seco as a model.

Decommissioning Essentials:

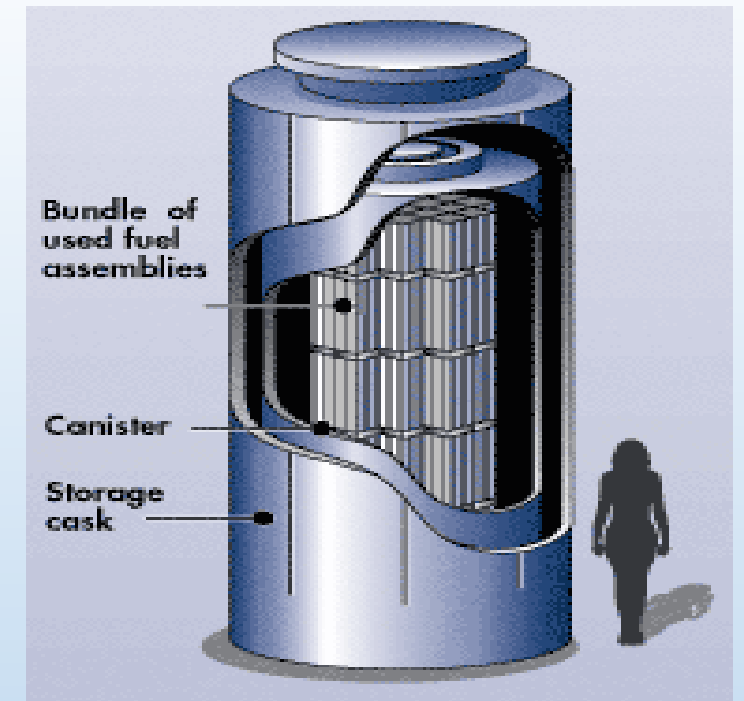
How can we manage Nuclear Waste Better?

- Transfer of High Level Waste to Hardened Dry Storage as soon as is safely possible.
- Store it as safely as possible in pools and on site.
- Utilize distributed configuration: Hardened On-Site Storage (HOSS); not clustered bowling pins.
- Wait 8 – 10 years to remove the highly contaminated internals
- Return site to unrestricted use:
 - Both in terms of radioactivity and chemical contamination
- Be wary of Interim Story
- Transportation is a huge problem.
- Create an independent Citizens Advisory Board (as allowed by NRC): Community Advisory Panel in Vermont; Community Engagement Panel in San Onofre, CA; proposed Citizen Oversight Board in New York.

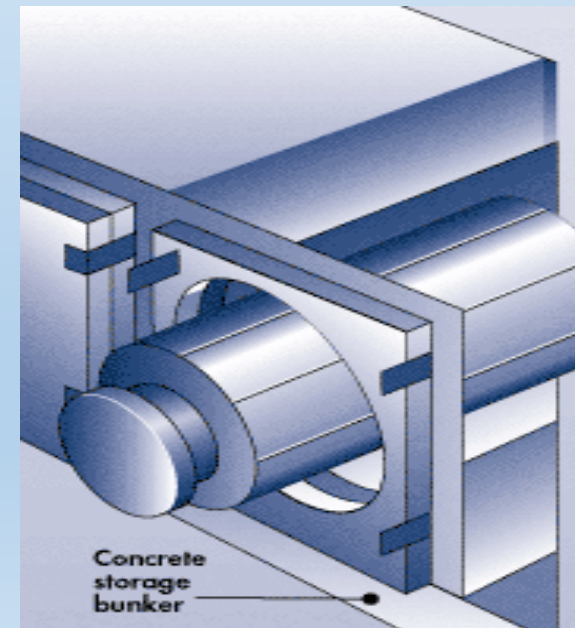


Independent Spent Fuel Storage Installation (ISFSI) Configurations

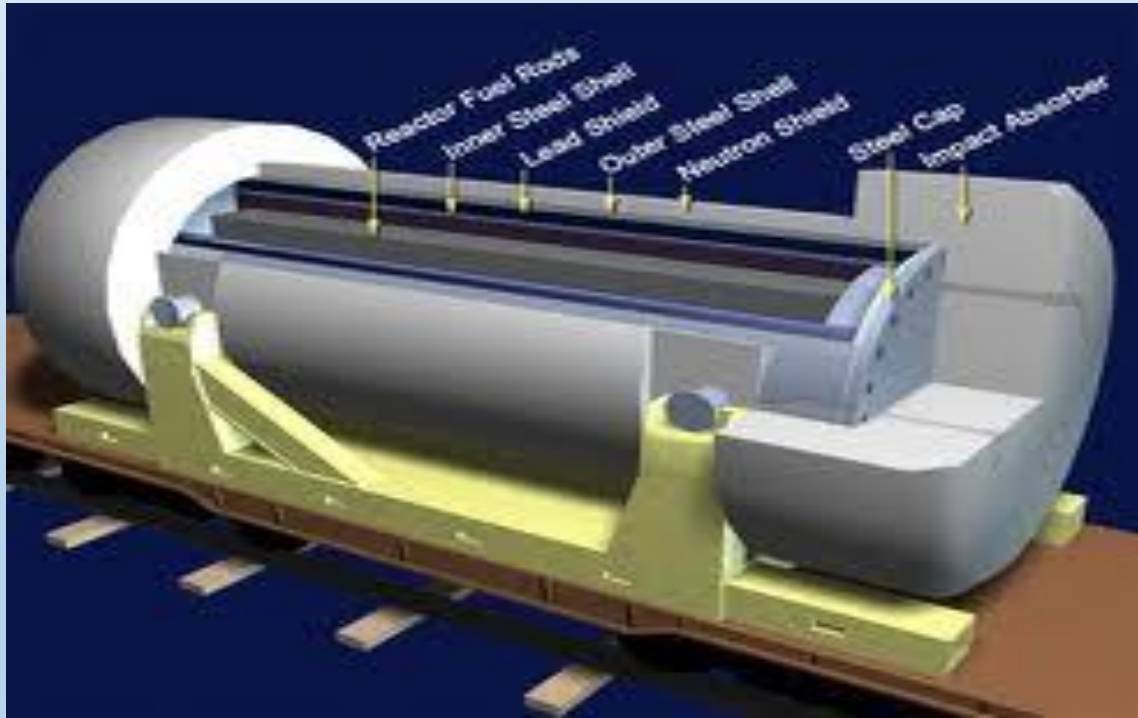
Vertical



Horizontal



Cask/Canister Integrity (Or Lack Thereof)



Whistle-Blower Allegations of Holtec QA Violations

- Faulty welds
- Unqualified fabrication materials
- Defective neutron shielding material
- Failure to perform coupon testing, Post-Weld Heat Treatment
- Bypassing hundreds of non-conforming conditions, without re-analysis of structural integrity
- Improper, uncertified design decisions and changes on the fly
- No root cause investigation of epidemic of QA violations
- Interference with QA audit, falsification of QA documentation
- NRC incompetence, or worse—collusion, complicity

<https://web.archive.org/web/20151020093217/http://www.nirs.org/radwaste//atreactorstorage/shiranialeg04.htm>

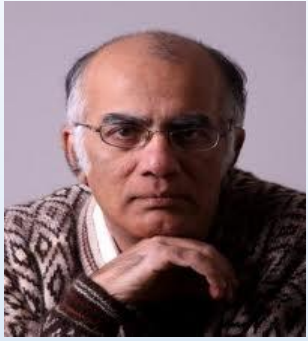
Oscar Shirani, Commonwealth Edison/Exelon, QA inspector:

- Holtec casks are “nothing but garbage cans” if they are not made in accordance with government specifications;
- **Questions Holtec casks’ structural integrity** sitting still, at 0 mph, let alone going 60 mph (accident forces)

Dr. Ross Landsman, NRC Region 3, Dry Cask Storage Inspector:

- Compared NRC/Holtec decision making to NASA’s that led to “Space Shuttles hitting the ground”





Dr. Arjun Makhijani,
IEER

Need for Robust, or Hardened On-Site Storage

Dispersed/Concealed HOSS vs. In Plain View/Clustered Configuration

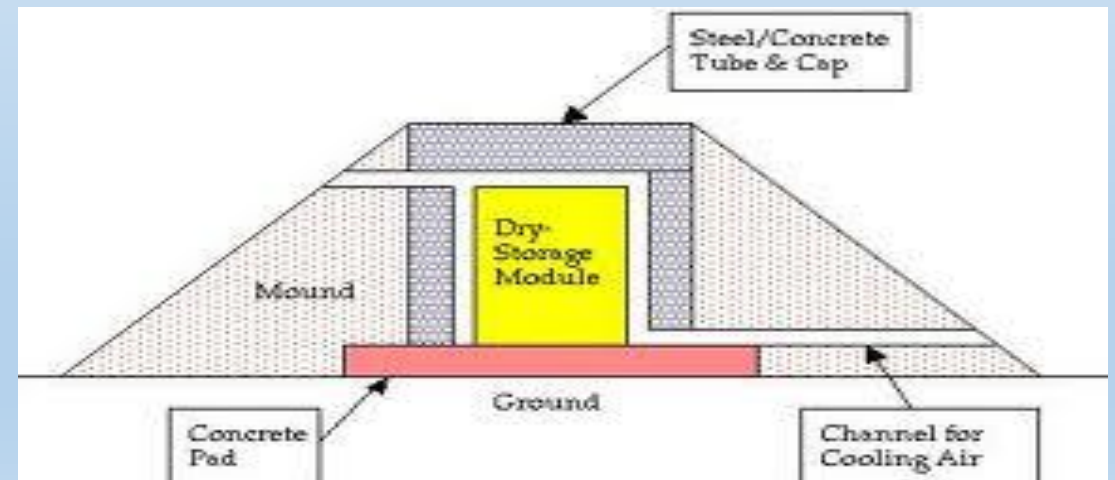


Dr. Gordon Thompson,
IRSS

“Bowling Pins”

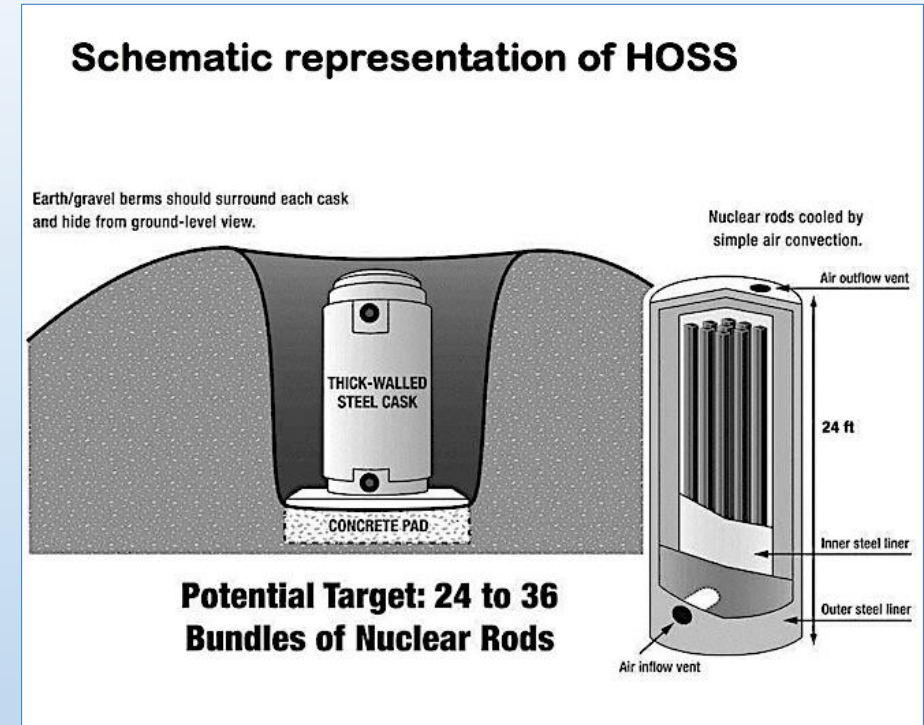


Graphic from “Robust Storage” by Dr. Gordon Thompson, Jan. 2003



Statement of Principles for Safeguarding Nuclear Waste at Reactors (HOSS)—2006; 2010

- Require a low-density, open-frame layout for fuel pools (to provide convection air current cooling);
- Establish **hardened on-site storage** (retrievability; **include real-time monitoring for radiation**, temperature, pressure -- as close as safely possible, to point of generation);
- Protect fuel pools (ideally they should be double-lined and in hardened buildings);
- Require periodic review of HOSS facilities and fuel pools;
- **Dedicate funding to local and state governments to independently monitor the sites;**
- Prohibit reprocessing.



http://ieer.org/wp/wp-content/uploads/2010/03/HOSS_PRINCIPLES_3-23-10x.pdf

Support for HOSS includes many hundreds of public interest and environmental organizations, representing all 50 states, including from NY State:

Coalition on West Valley Nuclear Wastes; Center for Health, Environment, and Justice; For a Clean Tonawanda Site (FACTS); Citizen's Environmental Coalition; Riverkeeper; Central New York Citizens Awareness Network; Hudson River Sloop Clearwater, IPSEC (Indian Point Safe Energy Coalition); Public Health and Sustainable Energy (PHASE); Council on Intelligent Energy & Conservation Policy (CIECP).

Need for Emergency Cask-to-Cask Transfer Capability

- Empty irradiated nuclear fuel from vulnerable and leaking storage pools into HOSS, but...
- Maintain operability of empty pool, in order to have cask-to-cask transfer capability
- Science fiction of NRC's on-site or away-from-reactor "Dry Transfer Systems"

Risks of Off-Site Transport



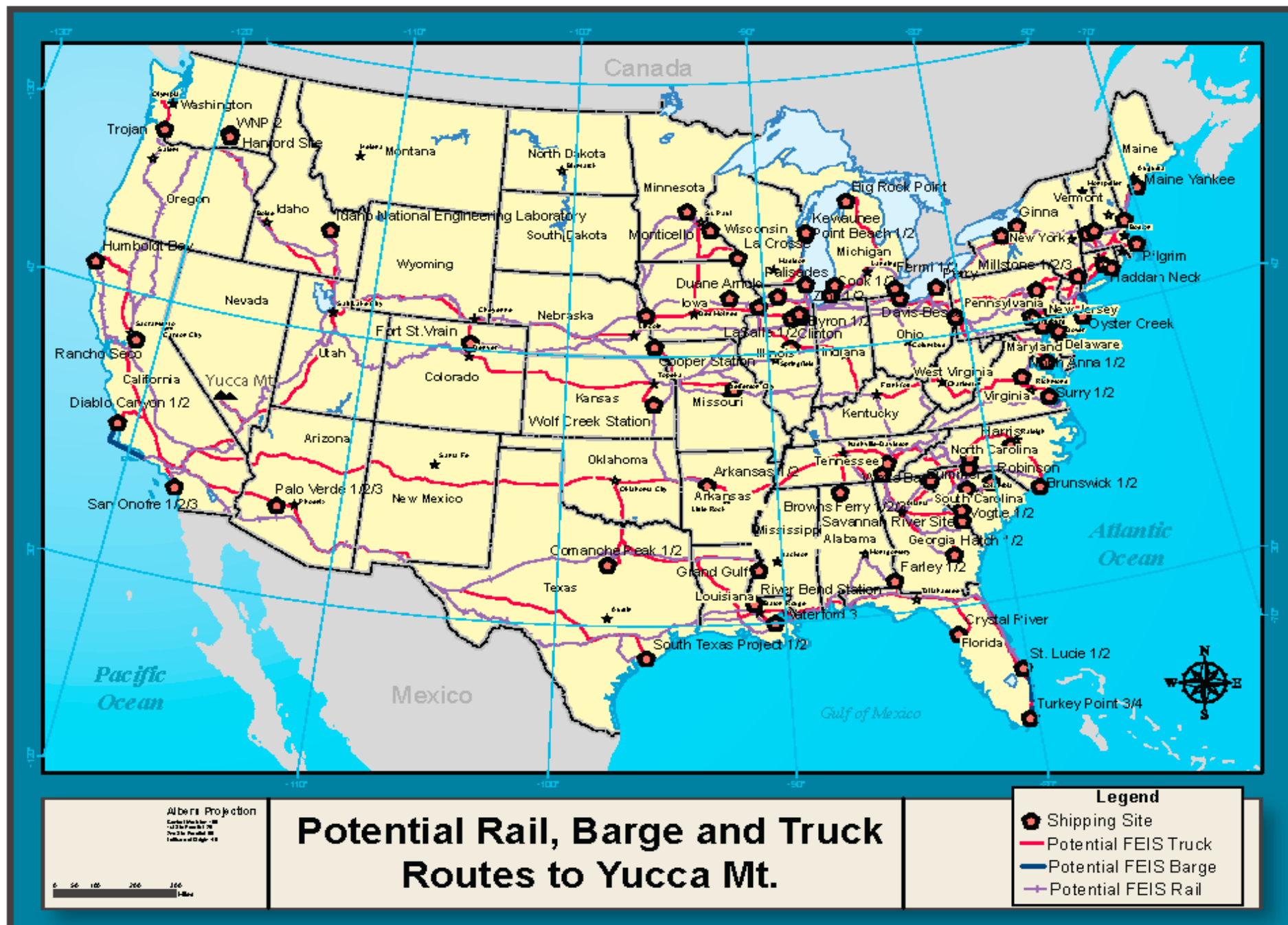
- Rail
- Roadway
- Barge



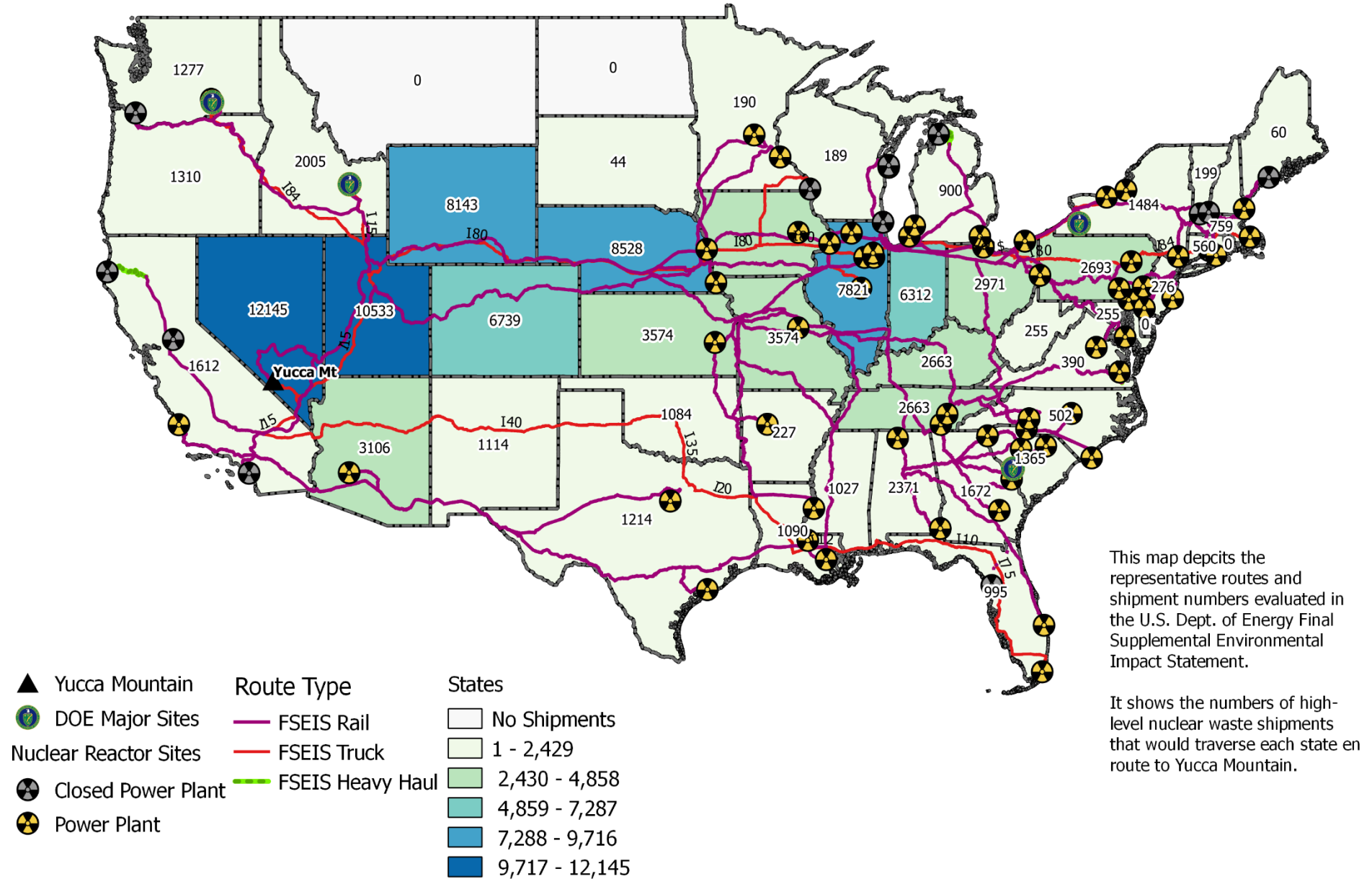
Other Risks:

- Severe accidents
- Mobile X-Ray Machines That Can't Be Turned Off
- Attacks (also a risk on site)





Representative Transportation Routes to Yucca Mountain and Transportation Impacts (Cask Shipments by State)



Not another Fukushima on the Hudson... or anywhere!

Fukushima Daiichi Unit 4



**Japanese Prime Minister
Naoto Kan**



Underfunded Merchant Reactors

- 1990s deregulation of energy production separated generation from transmission
- Created a fire sale on aging nuclear power plants
- Merchant plants sell their power to utilities or directly to the grid
- No rate base to return to replenish depleted decommissioning funds
 - Extended period of SAFSTOR
- Concerns about corporate responsibility and selling to “decommissioning experts”, such as North Star, with questionable reputations and motives.

Proposed Citizen Oversight Board (COB) Legislation

SUMMARY OF CITIZENS' OVERSIGHT BOARD (COB) LEGISLATION: The ACT would amend the Public Service Law to create a Board to oversee aspects of decommissioning the Indian Point Nuclear Power Plant in Buchanan, NY.

Purpose: To monitor the decommissioning of the Indian Point Energy Center, provide information to the community, gather public comments, and make reports and recommendations to state officials (as described below).

Members: Voting Members - 15 NY residents chosen by local, county, and state officials to represent specific constituencies including:

- First responders,
- Labor unions,
- Environmental organizations,
- Economically disadvantaged communities, and the general public.
- At least one member would have a science background; all would serve staggered 3-year terms
- Non-Voting Members - 8 designated state and county officials serving ex-officio



Meetings: At least 10 regular meetings per year with a provision for an emergency meeting in certain circumstances. All meetings shall be open for public attendance and comments.

Proposed Citizen Oversight Board (COB) Legislation

Duties:

- Advise the state and the public on issues including radioactive waste storage; site restoration and future use; emergency planning; plans for ongoing oversight or Rolling Stewardship;
- Monitor decommissioning fund and any modifications or amendments to the site or decommissioning process;
- Provide a forum for public comment;
- Review applications for license termination, transfer plans, or other permits, including State plans and permits;
- Produce an Annual Report.

Powers:

Information from Licensee - The Board can obtain the following information from the owner of the Indian Point facility on schedules specified in the Act:

- Post-Shutdown Decommissioning Activities Report;
- Any License Amendment Request(s);
- certain written communications between the licensee and the NRC;
- Audited financial statements for the funds held for decommissioning; and
- Any other information reasonably required to allow the Board to complete its duties.

Assistance from the State - The Dept. of Public Service shall provide administrative support including:

- Scheduling meetings and securing meeting locations;
- Producing minutes of meetings;
- Assisting in production of the Annual Report;
- Hosting a public website and other services as requested;
- Contracting for services of technical consultants to produce, compile, and analyze data; and
- Other reasonable and necessary expenses



JURISDICTIONAL ISSUES

- Nuclear Safety at reactors is federal only - NRC
- Other issues can be regulated by states
- CA banned new nuclear plants based on economic risks
- VT tried to regulate relicensing, but failed
- Must stick with economic issues, like site reuse
- Groundwater contamination becomes a state issue after decommissioning
- Designed state legislative efforts such as COB to have teeth, but cannot be about safety

Ensuring a Just Transition for Indian Point Workers

Principles:

- Income support for full duration of the transition
- Local economic development: Creation of jobs with family sustaining wages
- Authentic training for jobs in good paying fields
- Labor standards and collective bargaining
- Sector approach customized to region and work process
- R&D support for technological adjustments
- Social equity
- Knowledge sharing
- Inclusivity

UWUA Local 1-2 and Teamsters plant workers should be retained wherever possible because they have critical institutional memory that will ensure the safest possible decommissioning.



A view inside the control room at Indian Point.

HUDSON RIVER SLOOP CLEARWATER, INC.



Thank you!

With special acknowledgement to Gordon Edwards of CCNR, Kevin Kamps of Beyond Nuclear, Deb Katz of CAN, Tim Judson of NIRS, Ross Gould of WDI, and Richard Webster of Riverkeeper for sharing their slides, and to Nancy Vann of U4CE for help with COB overview.

For more info on the Hudson River: www.clearwater.org

or contact

Manna Jo Greene

845-454-7673 x 113

mannajo@clearwater.org