LIMERICK NUCLEAR PLANT'S

HIGH LEVEL

RADIOACTIVE WASTES

(DECEPTIVELY CALLED "SPENT" FUEL)
ARE AMONG THE DEADLIEST MATERIALS ON EARTH

ALL LIMERICK'S DEADLY RADIOACTIVE WASTES PRODUCED SINCE 1985 ARE STORED ON-SITE AT LIMERICK NUCLEAR PLANT, CREATING A DEFACTO RADIOACTIVE WASTE DUMP IN OUR BACKYARD. IN REALITY, WE LIVE WITH;

A "TICKING TIME BOMB"

LIMERICK MUST CLOSE
TO STOP MAKING THIS DEADLY WASTE

THIS REPORT EXPLAINS WHY ALL METHODS OF DEALING WITH LIMERICK'S DEADLY HIGH-LEVEL RADIOACTIVE WASTES PRESENT UNACCEPTABLE THREATS TO THE ENVIRONMENT, PUBLIC HEALTH, AND THE ECONOMY.

THERE'S "NO" SAFE SOLUTION

1. **SPENT FUEL POOLS - VULNERABLE TO ACCIDENTS AND ATTACKS**
2. **DRY CASK STORAGE - PROVEN CORROSION CONCERNS AND DESIGN FLAWS - RECIPE FOR DISASTER**
3. **TRANSPORTATION - "MOBILE CHERNOBYL"**
4. **REPROCESSING - ABYSMAL COSTLY FAILURE, CREATING LARGER RADIOACTIVE WASTE STREAMS AND POLLUTION**

When There Is NO SAFE SOLUTION For Limerick's Deadly Radioactive Wastes, The Best Solution Is To Close Limerick Nuclear Plant As Soon As Possible and STOP Producing Radioactive Waste For Which There Is NO SAFE SOLUTION.

In 2011 it was estimated about 1,143 TONS of this dangerous radioactive waste were already stored on Limerick's site. By the time Limerick's current license expires that level will rise to 2,000 metric tons on site in Limerick. How large of a dangerous defacto high-level radioactive waste dump will be left for future generations, to jeopardize their health, safety, and financial conditions?

As Long As Limerick Continues To Operate The Deadly Piles Of High-Level Radioactive Wastes Will Grow - Increasing Danger.

- ✓ **Over 1,000 Tons Are Stored On Site At Limerick Right Now. That's Enough To Cause A Disaster Worse Than Chernobyl and Impacts 100 Times Worse Than Hiroshima.**
- ✓ **If Limerick Operates Until Its Current License Expires In 2029, Over 2,000 Metric Tons Will Be There To Threaten Many Future Generations.**

The Least Bad Solutions

- ➢ **STOP MAKING IT – CLOSE LIMERICK**
- ➢ **STORE IT SAFER ON-SITE**

Detailed Summaries In This Report Include:

1. Spent Fuel Pools - A Catastrophe Waiting To Happen

- Limerick's Fuel Pools are OVERLOADED with massive amounts of high-level radioactive waste rods. Wastes held in pools exceed design expectations.
- Large volumes of Limerick's highly radioactive wastes produced since Limerick started operating in 1985 are stored in Limerick fuel pools.
- Pools are filled with radioactive fluids that are threatening to boil away, introducing radiation into the air.
- They are vulnerable to a 9/11 type terrorist attack with a plane or missile. That kind of attack could lead to an unstoppable radioactive fire which could impact people hundreds of miles away, according to an NRC study (2000).
- Pools are outside the reinforced containment structures for the reactors.
- With so much deadly radioactive wastes in the pools, an attack on Limerick's fuel pools could result in an unstoppable radioactive fire, with potentially worse consequences than Chernobyl.

2. Spent Fuel Stored In Above Ground Casks

- Are Threatened by Natural Disasters like Earthquakes, Tornadoes, and Floods
- If air flow vents get clogged for an extended period, rods can overheat and combust
- Corrosion of steel holding wastes is a huge concern
- Containers are expected to last 50 years - wastes stay dangerous over a million years
- Likely to stay on site for decades, if not forever
- How much of this deadly waste will be sitting in our back yard by 2029? 2049?
- Are Inviting Easy Target For Terrorists Missiles or Planes

3. **Transportation Risks - Too Deadly, Too Dangerous**
   - Loading and Unloading
   - Extraordinary health, environmental, and financial risks on-site and along the route
   - Train and truck accidents are of major concern, especially for fire from fuel

4. **Reprocessing - Extremely Polluting, Risky, and Costly To Taxpayers**
   - Increases Volume of Radioactive Wastes
   - Expensive for Taxpayers/Ratepayers

Limerick Nuclear Plant's

Radioactive Fuel Rods Are Among The

DEADLIEST MATERIALS ON EARTH

Estimated Fuel Rods Stored At Limerick

- **1,143 Tons**
- **6,203 Total Assemblies**

As Long As Limerick Continues To Operate, As Much As

40 TONS More Could Be Produced Every Year,

Increasing Catastrophic Risk For Our Entire Region

Radioactive "Spent" Fuel Rods Stored On-Site At Limerick Nuclear Plant In Fuel Pools and Above-Ground Casks Make Limerick Nuclear Plant

A Ticking Time Bomb

Over 1,000 Metric Tons Of Deadly Radioactive Wastes Are Vulnerable To Fire and Terrorist Attacks, Potentially Creating A Disaster 100 Times Worse Than Hiroshima.

Precautionary Action Is Urgently Needed!

A 2000 special report prepared by experts within the NRC and the Sandia National Laboratories (designated as an official NRC planning regulation in 2001) determined that:

A meltdown in a spent fuel pool could cause fatal radiation-induced cancer in thousands of people as far as 500 miles from the site.

Limerick Nuclear Plant's Spent Fuel Pools Are Packed, Containing More Radioactivity Than Limerick's Reactors Themselves.

Limerick's highly radioactive wastes (spent fuel rods) — Large volumes (over 6,000 assemblies-1,000 tons) are stored in densely packed fuel pools, elevated five stories above and outside the reinforced containment structure for the reactor.

Especially vulnerable to aircraft penetration, Limerick's fuel pools can be turned into weapons of mass destruction. Still, Exelon has not been required to spend the money to guard Limerick against terrorist missiles or air strikes.

Limerick's design is similar to reactors in meltdowns at Fukushima. Roof-top fuel pools are highly vulnerable to loss of power and cooling water from an earthquake or other natural disasters, in addition to a variety of attacks by terrorists.

With loss of cooling water, Limerick's fuel rods can heat up, self-ignite, and burn in an unstoppable fire, causing tens of thousands of deaths up to 500 miles away, according to a 2000 NRC study. **A meltdown in a spent fuel pool could cause fatal radiation-induced cancer in thousands of people as far as 500 miles from the site.**

Example Of A Fuel Pool

A Catastrophic Meltdown In The Spent Fuel Pool Of A Nuclear Power Plant Could Cause Fatal Radiation-Induced Cancer In Thousands Of People As Far As 500 Miles From The Site.

- **Limerick's Deadly Wastes Can and Must Be Stored Safer On-Site**
- **Limerick Must Be Closed To Stop Making More Deadly Waste For Which There Is NO SAFE SOLUTION.**

Limerick's "Spent Fuel" Is Deadly

RADIATION DOSE

Exposure 1 YARD AWAY Unshielded (DOE 1st Report)

- ✓ **Less Than 3 Minutes - LETHAL DOSE (500 REM)**
- ✓ **30 seconds - SIGNIFICNT INCREASE IN CANCER, GENETIC DAMAGE (100 REM)**

For Radioactive Wastes Like Those Stored At Limerick;

- **EPA Set A ONE MILLION-YEAR HEALTH STADARD**

LIMERICK'S "SPENT" FUEL POOLS ARE PACKED

- Spent Fuel In Pools Contain More Radioactivity Than Reactors
- Spent Fuel Rods Give Off Enough Radiation To Kill People In Seconds
- Pools Are At High Risk From Loss of Water Accidents

Limerick's Densely Packed Fuel Pools Are Vulnerable

- Most of the deadly radioactive wastes produced since 1985 when Limerick started operating are stored in Limerick's fuel pools.
- Limerick's design is similar to reactors at Fukushima with roof-top fuel pools highly vulnerable to loss of power and cooling water from an earthquake or other natural disasters, in addition to a variety of attacks by terrorists.
- With loss of cooling water, Limerick's fuel rods can heat up, self-ignite, and burn in an unstoppable fire, causing tens of thousands of deaths up to 500 miles away, according to a 2000 NRC study.

If Limerick's Fuel Pools Lose Water, Fuel Rods Can Heat and Melt Down

- **Without Enough Cooling Water, Rods Outer Shell Can Ignite With Enough Force To Propel Deadly Long-Lived Radioactive Fuel From Inside To Spread Over A Wide Area**
- **Radioactive Spent Fuel Rods Are As Dangerous In Spent-Fuel Pools As Fuel Rods Inside Reactor Vessels, Only Considerably MORE VULNERABLE.**

The Release of Radiation From Limerick's Fuel Pools Could Render Our Entire Region Uninhabitable!

"Spent" Fuel Pools Are At High Risk From Loss of Cooling Water Due To:

1. **Earthquake**
2. **Reactor Failure**
3. **Leakage**
4. **Evaporation**
5. **Explosion Inside or Outside Pool Building**
6. **Terrorist Acts**
   - ✓ **Aircraft Impact**
   - ✓ **Siphoning**
   - ✓ **Pumping**
   - ✓ **Accidental or Deliberate Drop of Fuel In Transfer**

See: Spent Fuel Pools Pose A Danger

Associated Press - March 17, 2011

Health and Economic Impacts Of A Terrorist Attack On Spent Fuel Pools Like Limerick's

Limerick's packed fuel pools can be turned into weapons of mass destruction. Fuel Pools are especially vulnerable to aircraft penetration. Still, Exelon has not been required to spend the money to guard Limerick against terrorists' missiles or air strikes.

Large volumes (over 6,000 assemblies-1,000 tons), of Limerick's highly radioactive wastes (spent fuel rods) are stored in densely packed fuel pools, elevated five stories above and outside the reinforced containment structure for the reactor.

Limerick's design is similar to reactors in meltdowns at Fukushima. Roof-top fuel pools are highly vulnerable to loss of power and cooling water from an earthquake or other natural disasters, in addition to a variety of attacks by terrorists. With loss of cooling water, Limerick's fuel rods can heat up, self-ignite, and burn in an unstoppable fire, causing tens of thousands of deaths up to 500 miles away, according to a 2000 NRC study.

A meltdown in a spent fuel pool could cause fatal radiation-induced cancer in thousands of people as far as 500 miles from the site.

A 2004 Study by Dr. Edwin Lyman, Senior Scientist at the Union of Concerned Scientists, Concluded:

- **As many as 44,000 near-term deaths from acute radiation poisoning**
- **518,000 long term deaths from cancer.**
- **Deaths could occur among people living as far as 60 miles downwind**.

A 2003 study by Dr. Frank Von Hippel, Director of Science and Global Security at Princeton University, concluded that:

- **A successful terrorist attack on a spent fuel storage pool could have consequences "significantly worse than Chernobyl."**
- **A catastrophic spent fuel fire could release a radiation plume that could contaminate 8 to 70 times more land than Chernobyl. (Would include the entire Philadelphia Metropolitan Region).**

A January 2003 study by Dr. Gordon Thompson, Director of the Institute for Resource and Security Studies (entitled "Robust Storage of Spent Nuclear Fuel: A Neglected Issue of Homeland Security") reviewed ways spent fuel pools are vulnerable to attack.

- **A nuclear fire in 1 spent fuel would release "render about 95,000 square kilometers of land uninhabitable," (would cover about 75% of New York State, and into, segments of NJ and CT.)**

SPENT FUEL FIRES

Experts Say:

- **"A Spent Fuel Fire Can Contaminate 8 To 70 Times More Land Than Chernobyl"**

- **"Spent Fuel Must Be Seen As Pre-Deployed Radiological Weapons"**

- **With Loss of Water, Spent Fuel Rods "Heat Up, Self-Ignite And Burn in an Unstoppable Fire."**

- **"Zirconium Cladding - Can Trigger a Reaction and Fire Which Can Burn Away Cooling Water"**

Experts Warned Spent Fuel Pools Are At High Risk From Loss of Water.

- Spent Fuel Pools Are Vulnerable To Attack - According to a January 2003 study by Dr. Thompson, Director of the Institute for Resource and Security Studies entitled, "Robust Storage of Spent Nuclear Fuel: A Neglected Issue of Homeland Security".
- Gordon Thompson, an international authority on the issue explained: In the event of a water loss, the spent fuel rods will "heat up, self-ignite and burn in an unstoppable fire."
- The zirconium cladding can trigger an exothermic reaction and fire, which can burn away the cooling water.

Fuel Rods In Pools At Limerick Risk Loss Of Water From A Fire Because:

- NRC didn't require Limerick to follow the safest fire safety regulations. NRC made a second set of standards followed by Limerick, determined to be "safe enough". That is not acceptable, given the consequences of a fire involving Limerick's fuel rods stored in pools.
- The pools are vulnerable to a 9/11 type terrorist attack and fire from jet fuel. NRC is failing to require Exelon to guard against this type of attack at Limerick.
- We need the most stringent precautions. Dr. Thompson concluded **a nuclear fire in the spent fuel pool (**of Indian Point Unit 2) **would: Release Enough Cesium-137 "To Render About 95,000 Square Kilometers Of Land Uninhabitable,"** (covering about 75% of New York. Similar distance would be true here.)

Fuel Rods Stored In Above Ground Casks Are Also At Risk From Fire and Attack.

- NRC is allowing Limerick to remove hot radioactive rods from Limerick's fuel pools far sooner than the 5-year cooling pool time, originally required by NRC.
- Casks are also vulnerable to a missile or even fire from fuel from an air strike. Still NRC failed to require Exelon to guard against this type of attack at Limerick.

DRY CASK STORAGE ABOVE GROUND

OF LIMERICK'S DEADLY RADIOACTIVE WASTES

Limerick's Independent Fuel Storage Installation was placed in service starting July 21, 2008.

Since 2008, Exelon started removing Limerick's dangerous deadly radioactive wastes from Limerick's fuel pools to above ground dry cask storage. From 1985, after Limerick started operating, until 2008, all Limerick Nuclear Plant's deadly high-level radioactive wastes were stored in Limerick's fuel pools. They become dangerously over crowded. Limerick's fuel pools are a similar design to those melting down at Fukushima.

Limerick's dangerous and deadly radioactive wastes will likely remain in our backyard forever, posing serious threats to us and future generations. Containers holding these deadly wastes are estimated to safely contain the waste for only 50 years, when the wastes remain deadly for hundreds of thousands of years.

Limerick Nuclear Plant has turned us into a DeFacto High-Level Radioactive Waste Dump. EPA set a million year health standard for high-level radioactive waste storage.

CASK DESIGN FLAWS – A SERIOUS CONCERN

A Nuclear Engineer Warned ACE About Design Flaws In Casks For Storing Limerick's High-Level Radioactive Wastes. ACE Reported The Information To All Local and State Officials, As Well As NRC. Sadly, Design Flaws Were Denied Or Ignored.

EVENTUALLY PROBLEMS COULD BECOME A RECIPE FOR DISASTER.

- ✓ UNDETECTED CORROSION
- ✓ INABILITY TO REMOVE IN CASE OF FIRE OR NATURAL DISASTER
- ✓ FAULTY CONCRETE
- ✓ EASY TERRORIST TARGET
- ✓ LAX NRC OVERSIGHT AND ENFORCEMENT

CORROSION

Research validates ACE concerns about corrosion of steel storing deadly wastes at Limerick Nuclear Plant. No one knows how long it will take for nuclear waste storage containers to break down from corrosion and eventually leak – It is only a matter of time.

How long will it take for steel to corrode that holds high-level radioactive wastes above ground in our back yard at Limerick Nuclear Plant?

2005 NRC'S OWN STUDY FOUND PROBLEMS WITH CORROSION RATES OF METALS USED TO STORE NUCLEAR WASTE.

- ➢ YET NRC STOPPED THE RESEARCH INSTEAD OF ADDRESSING THE CORROSIVE STEEL.

PROVEN CORROSION CONCERNS

- 2006 Testimony to Congress by Public Citizen - Provided evidence of scientific misconduct by NRC and DOE related to corrosion rates of metals used to store nuclear wastes.
  - ✓ In 2005 NRC found problems with the corrosion rates of metals used to store nuclear waste, yet failed to address the corrosion problems.
  - ✓ Research identifying corrosion problems was stopped, not the use of steel that would corrode.

- 2006 NRC dismissed important evidence identified by ACE related to corrosion of steel planned to hold Limerick's high level radioactive wastes in above ground casks.
  - ✓ Every day Limerick adds 324 pounds of toxic chemicals to cooling tower waters. MSDS sheets identify 10 of them to be corrosive, some highly corrosive and some specifically corrosive to steel. There is NO FILTRATION to prevent corrosive chemicals from entering the air from cooling tower

steam. Synergistic combinations of the corrosive additives can result in a serious corrosive threat to people and everything exposed to the drift from the cooling towers (35 to 42 million gallons every day), including steel holding deadly radioactive wastes stored inside casks that require cooling with outdoor air.

- ✓ Corrosive air enters casks holding high-level radioactive waste rods stored in steel.
- ✓ NRC admits corrosion will happen, yet dismissed ACE concerns without site specific testing of cooling tower emissions for specific and conversion corrosives. NRC's dismissive, misleading, and irresponsible conclusions defy logic. They can lead to irreparable disaster in our region.

- Corrosion can make it difficult, if not impossible, to move these extremely heavy casks. To date, there is no proof they can be moved safely after years of exposure to corrosive air.

NRC'S DENIAL AND NEGLIGENCE COULD EVENTUALLY LEAD TO DISASTER

- **NRC admits there were fabrication deficiencies in materials used for Limerick's canisters and concrete, but refuses to call them flaws, and claims they were corrected, even though that may not be entirely accurate. While the company was fined a nominal amount, in years to come, we could find cask design flaws could lead to a radioactive disaster.**

- July, 2006 Areva, the company making Limerick casks, received a Notice of Violation, documenting specific problems with casks already in place, yet NRC allowed casks for Limerick to continue to be built by this company.

- November, 2006 in a whistle blower letter it was revealed that there were specific concerns about casks planned to be used at Limerick.

- In an 11/06 letter to ACE, both NRC and Transnuclear (Areva) admitted there would be corrosion and settling of ground beneath 40 ton casks, yet NRC failed to require air testing in vicinity of casks for corrosives against metals being used for casks.

EARTHQUAKE THREATS TO CASKS

- The earthquake in Virginia proved heavy cement casks, each weighing many tons, can be jarred and even moved. Casks at a nuclear plant 12 miles from the epicenter of the August 23, 2011 earthquake in VA were moved by the earthquake.

- There are two earthquake faults very close to Limerick. One 9 miles away. The other 17 miles away.

- After a natural disaster like an earthquake, there is no proof that this deadly waste will be able to be removed safely, especially after corrosion has taken place. None have ever been removed after a long period of time.

- What could happen if damaged or overheating fuel rods in casks cannot be removed because of jarring from an earthquake? No one knows. It's like playing Russian Roulette.

NRC REFUSED TO PROVIDE A RISK ASSESSMENT FOR TERRORISTS

Limerick Is NOT Protected From Terrorists Missiles and Air Strikes.

ACE REPEATEDLY URGED NRC TO PROVIDE A RISK ASSESMENT FOR TERRORIST ATTACKS ON CASKS. **Limerick has one of the most heavily populated regions surrounding a nuclear plant. NRC was negligent in failing to provide a risk assessment for terrorist attacks related to above ground storage of high-level radioactive wastes at Limerick Nuclear Plant.**

A Federal Court Ordered NRC To Assess Terrorist Threats In California

A U.S. Court of Appeals 9th Circuit decision forced NRC to assess the threat of a terrorist attack on above ground storage at the Diablo Canyon Nuclear Plant in California.

ACE Asked NRC To Consider The Same Threats As Were Required At Diablo Canyon.

1) **The threat posed by a "land-based vehicle bomb."**
2) **A "ground assault with the use of an insider"**
3) **A "water-borne assault"**
4) **"A large aircraft impact similar in magnitude to the attacks of September 11, 2001."**

Similar threats exists at Limerick, yet NRC chose to interpret the 2006 court decision in a very narrow way.

- **NRC inexplicably claimed an assessment was not necessary at Limerick, even though vast numbers of people live very close to Limerick Nuclear Plant.**
- **NRC dismissed harmful health impacts from radiation exposure, irrationally claiming "a significant release of radiation affecting the public is "not reasonably expected to occur", when army testing suggests otherwise.**
- **NRC also ignored the potential for rods overheating and combusting.**

Consider The Following Limerick Specific Issues For A Risk Assessment to be Included In Limerick's Updated EIS.

1) **Limerick is not guarded against airplane or missile attacks.**

2) **Nuke waste housing can be penetrated by missiles (proven by army testing).**

3) **THREE AIRPORTS are too close to Limerick Nuclear Plant.**
   - ✓ **Army testing proves missiles can penetrate casks.**
   - ✓ **Pilots take lessons at Limerick Airport, only 1 mile away.**
   - ✓ **Helicopters fly into the Limerick Airport from which missiles could be launched.**

4) **An industrial railroad runs through the nuclear plant site.**
   Industrial rail tracks run directly through the nuclear plant property, providing a way for terrorists to enter the site undetected.

5) **A large portion of the site is bordered by the Schuylkill River.**
   Limerick Nuclear Plant property is bordered by the Schuylkill River (over a long distance), presenting a difficult, if not impossible challenge, for too few guards.

6) **Too few guards have to cover Limerick's 600 acres.**

7) **Heavily populated region surrounds Limerick Nuclear Plant - Over 8 Million people live within 50 miles.**

NRC Ignored Safety Requirements For Fuel Rod Removal From Pools, Jeopardizing The Health and Safety Of Limerick Workers and The Public

NRC's pamphlet, handouts, and other information state that 5 years is required for cooling fuel rods in pools before removal, to prevent overheating and radioactive fires. IMPORTANT POINT - The less cool down time in fuel pools, the thermally hotter and more radioactive the waste - the more risk of internal combustion and an unstoppable radioactive fire.

Since 2006, when Exelon first tried to convince the public that cask storage was safe, NRC and Exelon repeatedly stated 5 years was required to safely remove fuel rods from Limerick's fuel pools.

Dry cask technical specifications state: Radiation shielding and thermal heat removal require around 5 YEARS, minimum, cool down time in the pool before transfer to dry casks.

- **Yet, It Appears Limerick's High-Level Radioactive Fuel Rods Are Being Removed From Fuel Pools Far Sooner Than The 5 Year Cooling Time Required For Safety, To Avoid Potential For Overheating And A Radioactive Fire.**

Radioactive Fire Risk Increases When Limerick's Radioactive Spent Fuel Rods Are Removed From Pools Too Soon.

- **May 6, 2010 - An Exelon Employee At A Limerick Open House Said Older and Newer "spent fuel rods" are removed from Limerick's fuel pools at the same time. Older rods are placed outside of newer rods in assemblies for storage.**
- **Exelon employees said since 2008 Limerick rods were being removed in far less time than 5 years. Limerick may have removed some rods from pools in as little time as 1 year.**
- **When risk for a radioactive fire is increased, NRC should not allow Exelon to remove deadly waste from Limerick's fuel pools in less time than the 5-year requirement recommended in NRC's pamphlet and fact sheets.**

LIMERICK WORKERS AND THE PUBLIC ARE AT RISK BECAUSE NRC CHOSE TO IGNORE IMPORTANT SAFETY PRECAUTIONS

1. NRC negligently changed its position in a June 16, 2006 letter to ACE, stating 1 year storage in the fuel pool at Limerick was sufficient before removal for above ground storage. (June 16, 2006, NRC letter to ACE)

2. Just weeks later, NRC again clearly stated cool down time before removal from fuel pools was at least 5 years. (July 13, 2006 at a meeting in Limerick)

3. July 25, 2006 ACE received an e-mail from NRC stating: Cooling time in the pool is: **1 year or 3 years or 5 years.** ***From:*** James Trapp - NRC ***Date:*** 07/25/06 07:04:34
   In our letter to you dated June 16, 2006 we stated the time was at least 1 year. This statement was correct. I received the following information from Randy Hall that should help to clarify our statement..... Most spent fuel that is placed in dry storage must be aged for 5 years or more, as required by all NRC-approved Certificates of Compliance for dry cask storage systems....Purposely using the word most, because there are cask designs,

including NUHOMS, that would allow certain low-irradiated fuel to be placed in a cask with only 3 or more years of cooling in the spent fuel pool.

NRC Should Require Limerick To Follow The 5-Year Rule.

NRC Has Been Negligent! Allowing Dangerous Fuel Rod Removal Too Soon At Limerick Increases Risks From An Unstoppable Radioactive Fire. Consider The Dangers As Stated In NRC's Pamphlet.

NRC's 2002 Pamphlet Proves How Dangerous Nuclear Power Plant High-Level Radioactive Waste Is. Refer to:
U.S. NRC Washington, D.C. Office of Public Affairs Brochure
NUREG/BR-0216, Rev.2``May 2002 - Page 7 – How hazardous is high-level waste?

Standing near unshielded spent fuel could be fatal due to the high radiation levels.
TEN YEARS AFTER REMOVAL OF SPENT FUEL FROM A REACTOR:

RADIATION DOSE 1 Meter Away From A Typical Spent Fuel Assembly
EXCEEDS 20,000 Rems Per Hour

5,000 Rems Would Be Expected To Cause Immediate Incapacitation and Death within One Week
Clearly, removing spent fuel rods from pools to load dry casks far sooner than the 5-year requirement is an extremely dangerous experiment that needs to be stopped at Limerick.

While it frees space in pools for new wastes to be generated by Limerick, to make more money for Exelon, it presents unacceptable risks to workers and the public.

Consider The Following:

10 years after removal of spent fuel from a reactor:
- ✓ Radiation dose 1 meter away from a spent fuel assembly exceeds 20,000 Rems Per Hour
- ✓ 5,000 Rems would be expected to cause immediate incapacitation and death within 1 week.
  Information From: NRC's own pamphlet NUREG/BR-0216, Rev.2 May 2002

211 Radioactive Poisons found in every 10-yr. old irradiated fuel bundle (Canadian Study)
- ✓ Polonium 210 – Just 1 of 211 – the type that poisoned Alexander Litvinenko in 2006
- ✓ An alpha emitted with the ability to become airborne with ease
- ✓ 1 Gram could poison 100 million people - Extremely dangerous in milligrams or micrograms
- ✓ Biological ½ life in humans 30 to 50 days
- ✓ Targets organs - liver and spleen
- ✓ Short-term exposure carries long-term risk of death from cancer

The Electric Power Research Institute estimates that the total cost of placing the nation's spent fuel older than 5 years [not less than 5 years] into dry casks at $3.5 billion.

Without Full Disclosure or Our Consent, Limerick Nuclear Plant Turned Our Region Into A Dangerous Defacto High-Level Radioactive Waste Dump.

1997 Mercury News Predicted Today's Reality

"*Limerick's A Nuclear Waste Site*" - "*Limerick Could End Up a Nuclear Graveyard*"

➢ It's Now Clear Limerick Did End Up An Extremely Dangerous Nuclear Waste Graveyard, Likely FOREVER.

ACE Summary From Mercury Article By Erik Engquist 9-30-97

News Summaries Speak Volumes – Revealing PECO's Inaccurate False Claims

1. In 1971, PECO Energy President J.L.Everett said,
   "***If we ever decide we don't want radioactive wastes on earth, we have a simple solution. We can load them in rockets and shoot them into the sun."***
   - The prospect of an explosion dispersing nuclear waste over millions of people killed the rocket idea.
   - Similar fates have befallen every other plan to dispose of nuclear power's spent fuel.

2. In 1971, PECO VP Vincent Boyer assured the community that;
   "None of (Limerick's wastes) will be disposed of at the plant site."
   - The Mercury article said that the protracted search forced many Limerick advocates to eat his words, including PECO VP, Vincent Boyer.

In 1997, the Mercury reported that, 26 years later, the high-level radioactive waste is stored at Limerick and more than 75 other nuclear plants nationwide, although ratepayers have so far given the federal government $13 billion to put it somewhere else. Pennsylvanians alone paid more than $500 million.

"There's No Place to Send Deadly Spent Fuel Rods"

Limerick produces 30 TONS of high-level radioactive waste annually.

- It's stored on site underwater in concrete vaults lined with stainless steel.
- Spent fuel must be shielded by lead, steel, concrete or purified water.

Limerick will run out of space to store its high-level radioactive wastes by 2010.

- MacFarland said, "*The federal government's going to have a repository for us (before Limerick runs out of space in 2010). I firmly believe that."*
- A search for a nuclear waste dump went on since the 1960s. The Nuclear Waste Policy Act of 1982 formally called for the government to build depositories.
- In 1987, Congress targeted Yucca Mountain in Nevada with a projected opening date of 2010. Critics say earthquakes and volcanic activity make the site unsafe.

Limerick will need a dump site for the 50 tons of dry, low-level radioactive waste it produces each year.

- Limerick would have to store its dry waste temporarily on site. No municipality wants to host a proposed 500 acre low-level dump in PA when Limerick's low-level radioactive waste can no longer be shipped to South Carolina (closing 1994-95)

Jim Gaut, long-time Pottstown opponent, said,
"***Whatever you've got to do with it, you've got to keep doing it for 10,000 years. No government has ever lasted that long. No civilization has ever lasted that long. It's such bare-faced arrogance to start off doing something when you simply aren't going to last long enough to take care of it."***

Paul Gunter, director of Reactor Safety Projects for NIRS said in 1993,
"It's so highly radioactive, it will present a biological hazard for millions of years."
Spent fuel administers a lethal dose of radiation within seconds.

IT HAS BECOME CLEAR THAT LIMERICK IS A DEFACTO RADIOACTIVE WASTE DUMP, LIKELY FOREVER, AND THAT ALL RESIDENTS OF OUR ENTIRE REGION ARE CONTINOUSLY FORCED TO FACE CATASTROPHIC RISK FROM THAT DEADLY WASTE.

All Limerick's deadly high-level radioactive wastes produced since Limerick started operating in 1985, remain on site at Limerick Nuclear Power Plant. The longer Limerick operates the more waste will be produced and the more our risks from living with all that waste in our backyard increase.

Limerick's deadly radioactive wastes will remain a threat to human health and the environment in our entire region virtually forever. EPA set a million year health standard for a nuclear dump.

Evidence shows there is no safe way to store, transport, or recycle (reprocess) Limerick's high-level radioactive wastes. All seriously jeopardize our region.

Limerick's deadly wastes are vulnerable to terrorists' attacks causing unstoppable fires and natural disasters like earthquakes causing loss of water or ability to cool wastes in casks.

Most Limerick waste will continue to be stored in vulnerable jam-packed fuel pools, similar in design to those at Fukushima. Limerick's fuel pools already contain far more waste than Fukushima's.

Some radionuclides in Limerick's deceptively named "spent fuel" remain deadly for millions of years. Cask containers are not even "expected" to hold wastes effectively for 100 years.

LIMERICK'S RADIOACTIVE WASTES CAN BE TURNED INTO WEAPONS OF MASS DESTRUCTION

- A terrorist attack on Limerick's vulnerable fuel pools could result in the radioactive consequences of 100 Hiroshima or Nagasaki bombs.
- The devastating unstoppable fire in the fuel pool at Fukushima shows just what can happen.

WHAT HAPPENS IN THE EVENT OF A NATURAL DISASTER, OR EVENTUAL INEVITABLE LEAKING?

- We could have an unstoppable fire in Limerick's fuel pools like we are witnessing in Japan.
- Ground water and surface water could become so contaminated with radiation, it would be unable to be safely used for drinking water.
- How could it possibly be cleaned up? Who will pay to try?

FINANCIAL INJUSTICE

- Exelon expects ratepayers and taxpayers to pay to store Limerick's deadly wastes forever. As part of a nuclear industry legal settlement against taxpayers over nuclear waste, Exelon received $300 million until 2010 and $600 million until 2015, just to deal with moving and storing its own nuclear plant wastes in casks.
- Exelon avoids liability insurance costs - we could pay over $1 TRILLION in the event of a terrorist attack or disaster at Limerick, while the nuclear industry pays only the first $12 billion.

Limerick Nuclear Plant's Radioactive Wastes Are A Major Threat To Public Health, Safety, And The Economy.

As Long As Limerick Continues To Operate, More Of This Dangerous and Deadly Waste Will Be Produced.

The More We Learn About Limerick's Dangerous Deadly High-Level Radioactive Wastes, The More We See That The Only Logical Solution Is To Stop Making It.

- **FOR THIS REASON ALONE, LIMERICK SHOULD BE CLOSED AS SOON AS POSSIBLE, NOT RELICENSED.**

- **LIMERICK'S RADIOACTIVE WASTE ALREADY PRODUCED NEEDS TO BE STORED ON SITE SAFER.**

TRANSPORTATION OFF-SITE IS JUST AS RISKY – MAYBE WORSE.

REPROCESSING CREATES WORSE PROBLEMS.

RADIOACTIVE WASTE

TRANSPORTATION

CALLED "MOBILE CHERNOBYL"

FACTS IN THIS REPORT COMPILED BY ACE SHOW WHY

April, 2011

This Report Was Compiled By ACE For A PA Senate Program

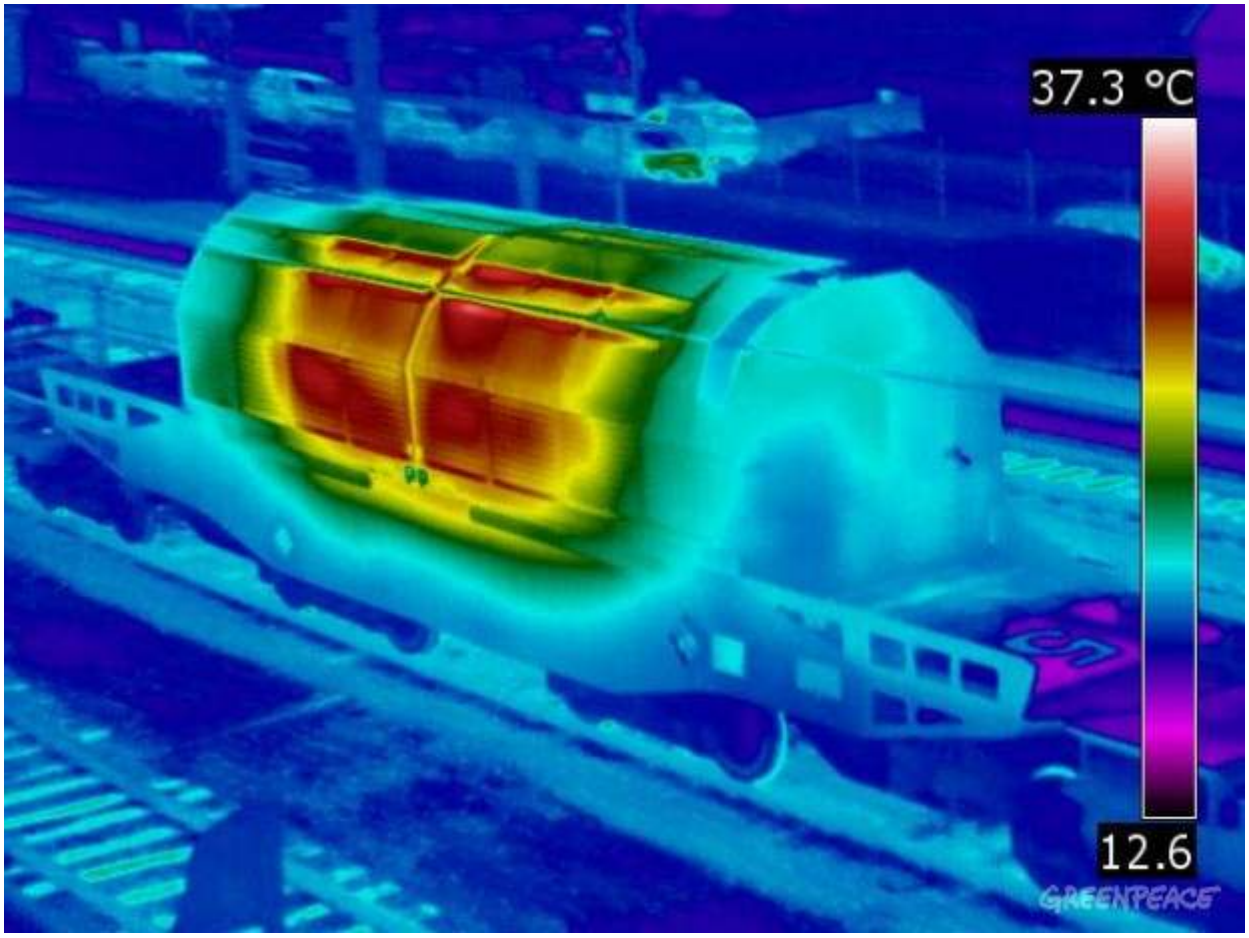
Legislation Was Discussed In PA In 2011 To Transport Nuclear Waste Across All Municipal Borders And Take Away Public Rights To Say No. The bill would have prohibited PA municipalities from approving any ordinance, rule, or regulation that prohibits transportation by rail, road, or water of any nuclear waste products through their municipal borders.

THIS REPORT SHOWS WHY HIGH-LEVEL RADIOACTIVE WASTE TRANSPORTATION IS TOO GREAT A RISK

Below A Thermal Image Of
Radioactive Waste Transport

It Reveals Why High-Level Radioactive Waste Transportation
Is Too Great A Risk To Our Region
And Vast Numbers Of People All Along The Transportation Route.

Transporting hundreds of high-level radioactive waste trucks and trains through PA communities is an unacceptable, unnecessary risk to millions of PA families, resulting in potentially devastating accidents and/or terrorist attacks. Each fuel assembly contains 10 times the long-lived radioactivity released by the Hiroshima bomb. Trucks contain 1 to 4 fuel assemblies. Trains contain up to 24 fuel assemblies. If a truck or train accident resulted in fire, spent fuel rods could "heat up, self-ignite and burn in an unstoppable fire." Incidents and accidents already happened. Transportation security has been proven to be lax. DOE reports size of region impacted for public health and safety along transportation routes would be 50 miles. DOE estimated a severe accident involving 1 radioactive waste cask, releasing a small amount of radiation, would contaminate about 42 square miles for well over 1 year, with devastating economic consequences in an urban setting.



1. **Nuclear power plant waste consists of high-level radioactive wastes that are among the deadliest materials on Earth. They are both thermally and radioactively hot decades after removal from fuel pools, making transport extremely dangerous.**

- **Transporting hundreds, possibly thousands of high-level radioactive waste trucks and trains through PA communities is an unacceptable, unnecessary risk to millions of PA families, resulting in potentially devastating accidents and/or terrorist attacks.**
  - ✓ Each fuel assembly contains 10 times the long-lived radioactivity released by the Hiroshima bomb.
  - ✓ Trucks contain 1 to 4 fuel assemblies.
  - ✓ Trains contain up to 24 fuel assemblies.

- **Accidents will happen.**
  - ✓ DOE estimates that at least 50 accidents could occur during shipments of the nation's radioactive wastes.
  - ✓ The more severe the accident, the more radiation would be released to the environment.
  - ✓ Even a low speed accident could unseat a valve or damage a seal, releasing radioactive particulates to the environment.
  - ✓ It could also crack brittle metal tubing around the fuel.
  - ✓ The American Petroleum Institute says at least 15 accidents are expected each year with thousands of truck shipments.
  - ✓ Some studies on spent fuel show the kind of damage that can be done by a nuclear fuel disaster during transport.
  - ✓ NRC studies are woefully inadequate and deceptive when they claim nuclear waste transport is totally safe.

- **FIRES associated with truck or rail accidents increase the probability of radioactive releases from nuclear wastes transported.**
  - ✓ If a truck or train accident resulted in fire, spent fuel rods could "heat up, self-ignite and burn in an unstoppable fire." Numerous scientific experts warn that burning fire on zirconium cladding of nuclear waste can trigger an exothermic reaction.
  - ✓ Shipping containers are only designed to withstand a 1/2 hour fire at a temperature of 1475 degrees. NEI's inadequate testing was only 90 minutes at 2000 degrees.
  - ✓ Rail fires could burn for hours, sometimes days, at temperatures considerably higher.
  - ✓ Heat could vaporize some of the radioactive materials and sweep them up into the air.
  - ✓ Persons downwind can inhale radioactive particles and later develop cancer or genetic defects.
  - ✓ It's important that fires are extinguished within 1/2 hour, yet there is often confusion about who has responsibility for cleanup and protecting public health in a radioactive emergency.
  - ✓ There is real potential for fire resulting from a transportation accident involving high-level radioactive wastes, which could have similar consequences as radiological weapons.
  - ✓ Fires could be caused by many things during nuclear waste transport by truck or train, both by accidents and terrorists.

- **Terrorists Attacks**
  - ✓ Transport casks are vulnerable to terrorist attacks with planes or missiles from afar, and/or bombs ignited on transport vehicles, causing fires that will release radiation. Some call transport a potential "Mobile Chernobyl".
  - ✓ Army testing proves transport casks can be penetrated with a missile.
  - ✓ Jet plane fuel from a deliberate crash into a transport vehicle could cause a devastating fire, even with a small plane.
  - ✓ The largest casks carry the equivalent of some 200 Hiroshima bombs in a long-lived radiological equivalent.

- **Lax Security Documented**
  - ✓ Evidence that "Waste Trains" are not protected from terrorists, **"*Security Breach on Nuclear Waste Train*."** *4-30-02 Durham, N.C.*
  - ✓ Inmates Jump Wrong Train, Revealing Vulnerability.
  - ✓ Terrorists would not have boarded the train unarmed.
  - ✓ If these people intended to cause serious harm, they were in perfect position.
  - ✓ Defenders did not deny access.
  - ✓ If those who boarded the train had been attackers carrying explosives who were willing to sacrifice their lives, there could have been an extraordinary disaster.

  It is absurd for the nuclear industry to suggest that their wastes are self-protecting due to exposure to radioactivity. This ignores reality, including the real potential for air strikes and missile attacks.

2. INCIDENTS / ACCIDENTS ALREADY HAPPENED

- **72 transport "Incidents" and accidents were documented by** Nevada Agency for Nuclear Projects - **"*Reported Incidents Involving Spent Fuel Shipment, 1949 to 1996"***

- "Incidents" can be quite significant, according to Dr. Marvin Resnikoff's 1983 book, "***The Next Nuclear Gamble: Transportation and Storage of Nuclear Waste..."*** One incident led to radiation contamination of hundreds of miles of PA Highways in 1981. It went unreported for 5 days. NRC never took action.

3. Local elected officials should have a right to say no to the transport of deadly wastes through their communities when it could seriously jeopardize health and financial interests of their entire region.

- DOE reports size of region impacted for public health and safety along transportation routes:
  - ✓ 50 Miles (80 kilometers) for Accident Conditions
  - ✓ .5 mile (800 meters) on either side of the transportation right of way (non-accident conditions).

- DOE estimated a severe accident involving 1 radioactive waste cask, releasing a small amount of radiation, would:
  - ✓ Contaminate about 42 square miles for well over 1 year, with devastating economic consequences in an urban setting.
  - ✓ A period greater than 1 year to attempt to clean up radioactive residue.
  - ✓ NRC 1980 study estimated economic consequences at $2 Billion.

- Radiation dose from an accident or terrorist attack breaching transport containers (1 yard away) could result in:
  - ✓ A lethal radiation dose (500 rem) in less than 3 minutes
  - ✓ Significant increased risk for cancer or genetic damage in just 30 seconds (100 rem)

- NRC's pamphlet says 10 years after waste is removed from reactors, an unshielded radiation dose could exceed 20,000 rems per hour.
  - ✓ 5,000 rems can cause incapacitation and death within a week

- Thermal Images of Traveling Nuke Wastes Suggest You Wouldn't Want To Get Stuck In Traffic Anywhere Near One.
  - ✓ Traveling nuclear waste casks could emit significant radiation.

4. INJUSTICE - The nuclear industry is promoting unjust legislation that seriously jeopardizes the public's rights, safety, public health, and financial interests.

- Many Jurisdictions Officially Opposed Nuclear Waste Transportation Through Their Communities,
  - ✓ Including Philadelphia, Bucks County, and Falls Township in PA.

The state should not take away the right of communities to protect their residents. Given the unthinkable risk of health and financial devastation involved, it's not only unfair, it's immoral and unethical.

- At stake - health and potential total loss of homes and all possessions for generations.

- Property values decline along nuclear waste routes, a fact verified in 5 states, by damages for reduced property values
  - ✓ Residents should not be "stuck" with property that they can't sell along a nuclear waste transportation route.
  - ✓ Most states have disclosure laws, requiring buyers to be told.

- Insurance Does Not Cover Radiological Incidents or Accidents:
  - ✓ Homeowners insurance will not cover loss of real estate use or personal property caused by radiological accidents.
  - ✓ Health insurance would not cover your long-term or permanent radiological damage or other long-term serious illnesses caused by a nuclear accident.

- PA residents are especially vulnerable to high-risk, high-level radioactive waste transport accidents or terrorist attacks because PA has the 2nd highest number of nuclear plants and high-level radioactive waste in the nation.
  - ✓ PA communities would be exposed to large amounts of nuclear waste in all too frequent shipments as long as nuclear plants continue to operate and build up piles of deadly radioactive wastes.

- Communities get the risks - The nuclear industry gets the benefits.
  - ✓ Once the waste leaves the site, the public has all the financial responsibility to store this deadly waste for an eternity.
  - ✓ EPA set a million-year health standard.
  - ✓ Why should taxpayers have to foot the bill for any problems caused by the nuclear industry's deadly wastes?

- It is outright deception for nuclear industry supporters to assert that transport to another location will remove risks at nuclear plants.
  - ✓ As long as nuclear plants operate, this deadly waste will keep piling up in fuel pools and casks.
  - ✓ Transport won't reduce the number of radioactive waste sites, it just adds enormous risk to the already unprecedented threats from high-level radioactive wastes.

5. LEAST BAD SOLUTION: STORE IT ON-SITE "SAFER"

➢ And STOP MAKING IT!

- There is no safe way to store this deadly waste.
  - ✓ **Evidence shows we don't need and can't afford dirty, dangerous, and costly nuclear power and its deadly waste.**
  - ✓ **Solar, wind, geothermal, and other renewables are ready right now, don't create these kinds of risks, and are cheaper than nuclear power if all costs to the public for nuclear power are included.**

REPROCESSING
RADIOACTIVE WASTE

- **EXPENSIVE FOR TAXPAYERS / RATEPAYERS**
- **EXTREMELY POLLUTING**
- **INCREASES VOLUME OF RADIOACTIVE WASTE**

To Call It Recycling Is Misleading!

Reprocessing Generates Much Larger Waste Streams.

DOE Estimates Reprocessing Results In:
3 to 11 Times More Low-Level Radioactive Waste Generated
163 Times More "Greater than Class C Waste"

Internationally, Reprocessing Has Been An Abysmal Failure

- ✓ France dumps 100 million gallons of radioactive waste into the English Channel every year.
- ✓ The United Kingdom has released over 1,000 pounds of plutonium into the Irish Sea.
- ✓ More than $20 billion has been spent on the Japanese reprocessing plant, which failed to start after more than two years of attempts;

Dangers and Costs of Reprocessing Nuclear Waste

Reprocessing is not the solution to the nuclear waste problem. It has been a very expensive boondoggle.

- ✓ Reprocessing is extremely expensive
- ✓ Extremely Polluting
- ✓ It would be a dangerous shift in U.S. global nonproliferation policy.

Reprocessing is the most polluting part of the nuclear fuel cycle.

Reprocessing would dramatically increase the threat from and complexity of dealing with nuclear waste from power plants. Rather than solving our nation's nuclear waste problem, it actually makes more waste.

Reprocessing is NOT fiscally sound.

Lifecycle cost analysis for the program shows it is astronomically expensive. It appears no reprocessing program in the world has been commercially successful. Such a program in the United States would likely be paid for in full by U.S. taxpayers.

- ✓ According to a 1996 estimate by the National Academy of Sciences, reprocessing will "easily" cost taxpayers $100 billion.
  - ✓ This estimate is only for existing U.S. irradiated fuel.
  - ✓ It does not include waste produced as a result of 20-year license extensions, waste from new domestic reactors, or the importation of foreign waste to the United States for reprocessing.

- ✓ U.S. taxpayers are still paying several billion dollars each year to clean up contamination from reprocessing programs in the 1960s and 1970s for nuclear weapons at the following locations:
  - ✓ Hanford Site (WA)
  - ✓ Savannah River Site (SC) And for reprocessing of naval irradiated fuel at the
  - ✓ Idaho National Laboratory (ID)
  - ✓ Commercial reprocessing at West Valley (NY).

- ✓ The only commercial reprocessing site ever to operate in the U.S. is in West Valley, New York.
  - ✓ Projected clean-up cost for this site alone is more than $5 Billion
  - ✓ Only a fraction of the nuclear waste was sent there between 1966 and 1972.
- ✓ Reprocessing was abandoned in the US for over 30 years.
  - ✓ France, Britain, and Russia are reaping hideous environmental legacies of contamination and disease from reprocessing.
  - ✓ Every processing site is a catastrophe, with massive releases of radioactivity to air, land, and water, high worker radiation exposures, and residues harder to handle than original wastes.

- ✓ Reprocessing is also a threat to U.S. nonproliferation efforts.
  - ✓ It would increase the likelihood that a terrorist could obtain fissile material to build a nuclear bomb
  - ✓ Materials, technical personnel, technologies and specialized equipment involved in these processes could leak out, as they have in the past, to foreign clandestine weapons programs or be diverted within a state's program to make nuclear weapons.

- ✓ Reprocessing would NOT eliminate the need for a geologic repository – It's NOT RECYCLING
  - ✓ Reprocessing actually increases waste volume and destabilizes nuclear wastes
  - ✓ It doesn't reduce radioactivity – it actually spreads radioactive contamination.
  - ✓ It would actually increase the number of radioactive waste streams to be managed.

DOE officials testified to Congress that they do not know whether the full complement of necessary technologies, including reprocessing, fast reactors, and fuel fabrication, would ever work or be economically competitive.

- ✓ Massive funding would be needed for:
  - Siting facilities
  - Completing Environmental Impact Statements
  - Soliciting commercial vendors
  - Ordering equipment for reprocessing, fast reactor, and fuel fabrication plants

- ✓ Reprocessing in France - France reprocesses spent nuclear fuel by soaking it in acid to extract plutonium and slightly enriched uranium. This results in massive releases of radioactive gases and liquids that place people and the environment at great risk.

- ✓ Much of the so-called low-level – but highly radioactive wastes generated by reprocessing are discharged into the sea and air from LaHague on the Normandy Coast.
  - Discharges have been measured 17 million times more radioactive than normal sea water.
  - Liquid discharges have resulted in contamination of area beaches and seen as far away as the Arctic Circle.
  - They may have contributed to elevated leukemia rates near La Hague.

- ✓ La Hague routinely releases radioactive gases into the air.
  - Krypton-85 at levels thousands of times higher than natural radiation levels.
  - Carbon-14 that is the most damaging to human health.

THE EVIDENCE IS COMPELLING!

LIMERICK NUCLEAR PLANT MUST CLOSE TO STOP PRODUCING DEADLY RADIOACTIVE WASTES FOR WHICH THERE IS NO SAFE SOLUTION!

CONTACT ELECTED OFFICIALS TODAY!

URGE THEM TO REVIEW THIS WEBSITE

AND CALL ON REGULATORS

TO CLOSE LIMERICK NUCLEAR PLANT TO PROTECT PUBLIC HEALTH, SAFETY, AND FINANCIAL INTERESTS

FOR ALL IN OUR REGION AND BEYOND.