IT'S TOO RISKY

TO CONTINUE OPERATING LIMERICK

RELICENSING AGING, DANGEROUS NUCLEAR PLANTS LIKE LIMERICK IS A JOURNEY INTO THE UNKNOWN. IT'S LIKE PLAYING RUSSIAN ROULETTE WITH MILLIONS OF LIVES AND THE THERAT OF FINANCIAL RUIN IN THE BALANCE.

AFTER REVIEW OF THIS REPORT, WE BELIEVE ANYONE WITHOUT A VESTED INTEREST WILL AGREE TO PROTECT THE ENVIRONMENT, HEALTH, AND THE ECONOMY IN THE ENTIRE PHILADELPHIA REGION, PREVENTION AND PRECAUTION ARE IMPERATIVE.

AFTER AN 11 YEAR INVESTIGATION ON LIMERICK NUCLEAR PLANT, ACE CONCLUDED:

LIMERICK NUCLEAR PLANT MUST BE CLOSED, NOT RELICENSED

LIMERICK CAN'T BE MADE FAILSAFE EVIDENCE RELATED TO LIMERICK SHOWS:

DESIGN FLAWS

DETERIORATION

CORROSION

MECHANICL BREAKDOWN

ACCIDENTS

WEAKENED REGULATIONS

LAX OVERSIGHT AND ENFORCEMENT

Signs of Limerick's aging, deterioration, and corrosion are too numerous to mention.

An honest evaluation of evidence in this report should inspire you to contact elected officials and urge them to call for closing Limerick Nuclear Plant as soon as possible.

Evidence of aging in Exelon's own relicensing application, along with the body of evidence provided to NRC from ACE, should result in NRC saying NO to Limerick relicensing for 20 years.

Closing Limerick Nuclear Plant Could Prevent A Catastrophic Meltdown.

Limerick's Design Is Similar To Fukushima's Melting Reactors
"Redundant Safety Systems" Failed In Japan

Fukushima reactors were having problems too, yet were relicensed right before the Fukushima meltdowns.

Evidence Suggests Limerick's So-Called "Redundant Safety Systems" Likely Won't Prevent A Limerick Meltdown Either.

There Are Inherent and Growing Risks For A Limerick Radioactive Disaster, From Limerick's Design Flaws And Materials Degradation.

It Doesn't Take An Earthquake To Lose Power And Cooling Water That Can Lead To Meltdown

Many Limerick Design Flaws and Serious Aging Threats Can't and/or Won't Be Fixed.

- ✓ **Limerick's inferior containment would release far more radiation in an accident or terrorist attack.**
- ✓ **An engineer involved with building Limerick testified 9-22-11 to a number of errors made and not corrected during Limerick construction, including what he called a "terrible mistake".**
- ✓ **A flaw was identified by GE, the company that built Limerick reactors, and first reported to NRC September 2010, that the flaw affected a key Limerick "Safety Mechanism" related to the ability to shut down Limerick's reactors quickly in the event of a meltdown threat.**
- ✓ **6-5-11, NRC inspection results were reported. Some parts of Limerick might not be reliable to prevent fire and flood mitigation capabilities in the event of an emergency.**
- ✓ **Miles of buried underground pipes and cables under Limerick continuously carry highly radioactive corrosive fluids. It's difficult, if not impossible, to replace all of them.**
- ✓ **While Exelon claims to be replacing aging deteriorating equipment, the industry admits some parts are just too big and expensive to replace.**

MOST PEOPLE WHO HONESTLY AND OBJECTIVELY EVAULUATE LIMERICK MELTDOWN THREATS SHOULD SUPPORT THE CALL FOR LIMERICK TO CLOSE SOONER THAN 2029:

- ✓ **After Watching Japan's Nuclear Power Plant Catastrophe Unfold**
- ✓ **After Learning About Limerick's Design Flaws**
- ✓ **After Reviewing Limerick's Lists Of Unplanned Shutdowns In Recent Years**

IT WOULD BE NEGLIGENT TO RELICENSE LIMERICK

AP historical records and interviews with engineers who helped develop nuclear power show:

"Reactors Were Made To Last Only 40 Years" PERIOD!

When Limerick Nuclear Plant went into operation in 1985, it was licensed for, and designed to last 40 years.

Everything Reaches An End Of Its Life Span

After only 26 years, alarming signs of aging, deterioration, and corrosion are already evident. Some of the problems could potentially lead to meltdown.

LIMERICK MUST CLOSE TO PREVENT ANOTHER CHERNOBYL OR FUKUSHIMA

Given The Potential Consequences NRC's Rubberstamp Permitting Is NOT Acceptable!

It is not credible for NRC to claim the original license for 40 years had nothing to do with aging equipment. Nuclear engineers, who were involved, have said 40-year licenses were based on life expectancy.

It is not credible for Exelon and NRC to assert that aging is no issue or claim relicensing will be safe because old equipment and pipelines will be replaced. The nuclear industry admitted,

- **SOME PARTS ARE TOO BIG AND TOO EXPENSIVE TO REPLACE.**

- Of particular concern, the reactor vessel becomes too brittle as do miles of underground buried pipes and cables critical for safe operations. Corrosion and weakness in miles of underground pipeline are also alarming.
  - Complicated Aging Equipment With Miles of 25-Year Old Corroding, Deteriorating, Brittle Underground Pipes and Cables, All Vulnerable to Failures Can Lead To DISASTER.

- Exelon claims they will replace aging equipment, but Exelon will not spend the money to replace the reactor vessel nor all the miles of buried pipelines and cables under and through Limerick, crucial for safe operations.

- Exelon's history suggests they will cut corners to avoid spending money and use dangerous delay tactics. Fire safety is one example.
  - For decades, Exelon avoided compliance with the safest fire safety regulations at Limerick.

There is NO independent proof it would be safe to operate Limerick Nuclear Plant for 60 years. In fact, evidence suggests it may not be safe to operate Limerick until its 40-year license expires in 2029.

- **To Protect the Philadelphia Region, NRC must say NO to Limerick Relicensing.**

How could anyone believe it is safe or logical to run Limerick equipment harder through Limerick "Uprates" and 20 years longer than the 40-year license? While running Limerick for 60 years would increase Exelon's bottom line, it would dramatically increase risk for a Limerick meltdown caused by mechanical failure.

Why Close Limerick Nuclear Plant Rather Than Relicense To 2049?

Information Compiled By ACE - Summarized November, 2011

1. Design Flaws

Limerick has design flaws that could lead to meltdown and to more radiation released in the event of a meltdown.

- Some Limerick Systems, Structures, and Components Could Be Unreliable If An Earthquake Occurs. With Limerick 3rd on the Earthquake Risk List, This is Alarming.
- Flood and Fire Prevention Seals May Not Tolerate A Seismic Event.
- Control rods might not fully insert to perform the required safety function, a substantial safety hazard.
- It may not be possible to make corrections in design flaws in fire safety related areas.
- Limerick's Containment is Substandard - More radiation would be released in a meltdown.
- Limerick's Fuel Pools Are Vulnerable (Like Japan's) - Not under same containment as generators.

Limerick's design could not be built today. It is neither logical nor appropriate to extend the license beyond 2029.

2. Shutdowns

Limerick has had far too many unplanned shutdowns.

Examples Reported In The Newspaper

3 Unplanned Shutdowns Occurred Within 1 Week - Reported June 4, 2011

1 February 26, 2011 A Limerick Shutdown Was Reported Lasting Over 2 Days

1 June 23, 2010 - Limerick Shutdown Reported - Loss of Both Limerick's Reactor Recirculation Pumps caused a Manual Shutdown of Limerick's Unit One

5 Unplanned Shutdowns Occurred At Limerick Nuclear Plant In 1 Year (2007-08)

- ✓ All these unplanned shutdowns suggest problems, yet NRC uses a "rolling average" to dismiss public concern. NRC failed to increase oversight, and failed to take the shutdowns seriously enough to do an independent investigation for cause. How can we trust NRC? Exelon and NRC claim they don't know what is causing shutdowns, but claim there is no risk.
- ✓ Three unplanned shutdowns occurred in just 3 months and involved unit 2 - February to April 2008 - Yet NRC failed to provide a written explanation in response to ACE's request.
- ✓ As of April, 2008 Exelon could not or would not identify the root cause of the 2/2/08 shutdown.
- ✓ April 24, 2007 shutdown was the result of a low coolant level. 15 days later the problem was still under investigation, yet Exelon claimed no risk to the public. Low Coolant levels can lead to meltdown.
- ✓ April, 9, 2007 – 5 days after refueling, there was another unplanned shutdown due to a seal on a pump.

3. Materials Degradation

Like a car, the longer and harder you run it, the more chance for problems. When it's a nuclear plant, those problems can be catastrophic.

- Percent (%) of time Limerick Nuclear Plant is in operation will increase risk of mechanical breakdown and disaster. From 1999-2005, Limerick reactors were already operational 96.7% / 96.3% of the time, according to NRC data through February 2005.
- Limerick is trying to get 20% Uprates, which would increase risk.

Materials Degradation - A Concern Right Now - Not Future Speculation

An NRC Whistleblower said, "*I have seen nuclear plants experience*":

- Cooling Towers Collapsing
- Leaks In Underground Piping
- Circumferential Crack Indications in a pressurizer nozzle weld
- Spent Fuel Pool Leaks
- Transformer Failures
- Tritium Leaks
- Degraded Underground Cables
- Other Issues

What Kind of Materials Degradation Will Limerick Nuclear Plant Experience:

- ✓ **Due To Uprates?**
- ✓ **Operating Until Limerick's License Expires in 2029?**
- ✓ **If Relicensed for Another 20 Years?**

4. Historic Problems

Indicators That Limerick Equipment Problems Existed For Years.

Limerick has had many problems over the years. See Attachments for examples of problems reported in the newspaper. Other examples:

- ✓ Limerick Had 2 Near Misses - Identified In NRC Documentation (Reported by Greenpeace): 2 "near misses" at Limerick Nuclear Plant – Unit 1 in 1995, Unit 2 in 2001
- ✓ Limerick Had Crack in the Moat That Went Inadequately Addressed For Years – Details Available
- ✓ Issuance of Amendment to Limerick's Operating License, under Proposed Significant Hazardous Consideration Determination, and Opportunity for a Public Hearing by the Nuclear Regulatory Commission.

Both Limerick's fans of the 2D drywell unit cooler were inoperable and out of service. This consideration of Significant Hazards was serious enough to trigger the consideration of an amendment to Limerick's operating permit for Unit 2 and an opportunity for public comments and a public hearing.
The combination of an increase in the drywell average air temperature during the summer months and the standard regulatory process for noticing license amendment requests could have resulted in a Limerick Nuclear Plant shutdown.

- ✓ Proposed Significant Hazards Consideration Determination - June 20, 2006 - This was serious enough for NRC to consider an amendment to Limerick's operating permit for Unit 2.

- ✓ Both fans of the 2D drywell unit cooler were inoperable and out of service, which resulted in an increase in drywell average air temperature from approximately 129 degrees F to approximately 142 degrees F.
- ✓ An evaluation of components in the drywell determined that the capability to perform their safety function was okay for the qualified life for the remainder of the current operating cycle. Given NRC's track record, that may or may not be true.

- **This is just one important example of why Limerick must be closed in 2029 when its current license expires.**

U.S. NRC Safety Evaluation Report

Related to the Operation of Limerick Generating Station Units 1 and 2 - October 1984

This report, from the NRC Office of Nuclear Reactor Regulation in 1984, identified several **deviations from guidelines**, **that were allowed** at that time to Philadelphia Electric Company:

- NRC allowed numerous deviations from 3 hour rated barrier fire safety guidelines for 2 hour barriers, 1 1/2 hour rated doors, insulation, or sprinkler systems
- NRC allowed reduced systems for hot and cold shutdown capabilities free of fire damage
- NRC allowed the hydrogen piping in safety related areas that was designed to seismic Category I requirements
- NRC allowed lighting and communication cables, as non-safety systems, to be routed in conduit instead of all metal cable trays
- NRC allowed the absence of ventilating systems designed to specifically exhaust smoke or other products of combustion, approving the use of portable smoke ejectors

The number of deviations and alternate approvals provided to PECO for Limerick in 1984 is indicative of the deference shown to nuclear plant operators even then.

It is evident that the original design, with its intended 40 year expected life, could not be built and approved in 2011.

It makes no sense to relicense Limerick for an additional 20 years after its expected closing in 2029.

Examples Of Indications of Equipment and Materials Deterioration, Mechanical Problems and Breakdowns, and Accidents at Limerick

Listed below are several examples that occurred at Limerick in May and June 2011:

- Two unexpected shutdowns or "SCRAM" events were experienced less than 36 hours apart at Unit 2 in May 2011
- The Pottstown Mercury reported on both shutdowns June 1, 2011, and referenced previous shutdowns in February 2011 and June 2010 citing problems with recirculation pumps
- Mechanical problems involving pumps, control valves, or switches occurred in February, April, May, and June 2011

Additional concerns with the equipment at Limerick include:

- After decades of operation, the reactor vessel at Limerick has been subjected to stress, and has become embrittled, exposing the vessel to cracking
- Several serious malfunctions have occurred with Exelon failing to identify the root cause(s) prior to restarts of the reactor for NRC or the public
- Several instances of equipment malfunction or failure have occurred with Exelon failing to identify a determination of corrective action
- It is evident that NRC has been complacent in allowing Exelon to restart reactors without identifying and correcting the root cause(s) involved
- It is apparent that NRC failed to address embrittlement concerns, as well as serious threats to the environment and public safety raised in a 2011 petition filed by Thomas Saporito, on a technicality rather than the issues identified

This history highlights the seriousness of the events that have occurred during the brief period of six months at Limerick. SCRAM events, or any events where the nuclear reactor automatically shuts down or trips off, place substantial stress on the entire nuclear reactor system and supporting equipment. Units 1 and 2 at Limerick are operating near or at the end of their safety design basis and functional lives.

U.S. NRC Plant Inspection Findings Reported First Quarter 2011 for Limerick Unit 1

The attached report from the NRC identified five categories of findings / violations for Limerick Unit 1, which occurred between September and December 2010:

- Latching mechanism malfunction finding (September 2010)
- Multiple failures to revise the Updated Final Safety Analysis Report as required (December 2010)
- Unreliable unit coolers (3 of 4) due to various planned and unplanned conditions (December 2010)
- Failure to take compensatory action for an inoperable fire door (September 2010)
- Failure to perform adequate preventive maintenance on emergency diesel generators bypass valves (September 2010)

The attached report from the NRC identified four categories of findings / violations for Limerick Unit 2, which occurred between September and December 2010:

- Multiple failures to revise the Updated Final Safety Analysis Report as required (December 2010)
- Unreliable unit coolers (3 of 4) due to various planned and unplanned conditions (December 2010)
- Failure to take compensatory action for an inoperable fire door (September 2010)
- Failure to perform adequate preventive maintenance on emergency diesel generators bypass valves (September 2010)

ACE is concerned that this many findings, violations, and failures by Exelon in just one three month period in 2010 may indicate the ominous potential for increasingly frequent mechanical breakdowns in the future of aging and deteriorating equipment at Limerick.

THERE ARE OTHER TROUBLING ISSUES:

Dominant Core Damage - Sequence

Failures of:

- ✓ Offsite Power Recovery in 5 to 10 hours
- ✓ Recirculation pump seals
- ✓ High Pressure Coolant Injection

15 Day Repair Period

Run Time Between Failure - May 5 and 24 - 2010 (Repair Time)
Exposure Period - 19 DAYS

Between April 5 and May 5, 2010 - Run Time Failure 22 Hours
Exposure Period - 30 DAYS

Cross Cutting Aspect

- ✓ Human Performance
- ✓ Resources

Exelon failed to provide complete, accurate and up-to-date documentation.

June 23, 2010
Supply Cable Faulted - Tripped over current -
Resulted in LOSS OF POWER to the OPERATING WATER COOLING PUMP-

April 29, 2010
Incorrect Calculating of Radiation Monitor Being Used.
Radiation monitor INOPERABLE from 3--19-10 to 4-22-10 (over a month)

Associated Press Investigation On NRC NEGLIGENCE Findings Reported 6-20-11

The Findings Of The Following AP Investigation Are Significant To Every Person In The Greater Philadelphia Region.

NRC
WEAKENS SAFETY RULES

NRC RUBBERSTAMPS PERMITS!

- NRC and industry rewrite history of operations at nuke plants
  "NRC Colluded With Industry To Weaken Safety Standards"

TO PROTECT EXELON'S INTERESTS AND BOTTOM LINE, NRC WILL LIKELY USE THE DECEPTIVE AND DANGEROUS TACTICS LISTED BELOW AT LIMERICK NUCLEAR PLANT.

- NRC Weakens Standards With: **"Pencil Engineering"**
  This Policy Significantly Undermines Safety, Inching Reactors Like Limerick Closer To Catastrophe

- In an effort to meet safety standards, Aging Reactors are Coming up with: **"Backfit After Backfit"** Retired NRC chairman said:
  "It's Like Driving Model T's Today And Trying to Bring Them Up To Current Mileage Standards."

- Safety Experts Call NRC Regulating: **"Tombstone Regulation"**
  NRC allows problems to fester until something goes very wrong.
  "Until There Are Tombstones, They Don't Regulate"

- NRC worked with the nuclear industry to keep Deteriorating, Corroding, Aging, Dangerous Reactors Operating Beyond their 40-Year Permit, by
  "Fudging The Numbers"

- NRC Justified Many Safety Changes With A: **Flawed Process Called "Risk-Informed" Analysis.** Employed widely by industry since the 1990s: Regulators set aside a strict check list applied to all systems. Instead they focus on features deemed to carry the highest risk.

  FLAW: Risk-informed analysis doesn't explicitly account for age.
  - An older reactor is not viewed as inherently more unpredictable than a younger one.
  - Ed Lyman, a physicist with the Union of Concerned Scientists, says risk-informed analysis weakens regulations, rather than strengthen them."

Examples of Dangerous Deception:

- When Valves Leaked NRC Allowed Up To 20 Times More Than The Original Leakage Limit.
- Valves to Confine Steam to the Reactor in Accidents at BWR like Limerick Were Originally Permitted to Leak at 11.5 Cubic Feet Per Hour - 1999, the Limit was Relaxed to 200 Cubic Feet Per Hour. Bigger Leaks Still Occur.

- When Cracking Caused Radioactive Leaks From Steam Generator Tubing - An Easier Test Was Devised So Plants Could Meet Standards.

- The Deck Is Stacked In Relicensing To Ignore Increased Population Using A: **"Back-Fit Rule".**
- NRC Has Been Relaxing Standards Left and Right To Permit License Extensions For 71 US Reactors - NONE were rejected making It: **"Rubberstamp Permitting".**

NRC NEVER PROTECTED OUR INTERESTS: 1981 NRC WAS SUED IN FEDERAL COURT

In 1981, even before Limerick was built, NRC was sued in federal court, accusing NRC of violating the National Environmental Policy Act by not forcing PECO to consider Safety Enhancing Design Alternatives for Limerick Nuclear Power Plant.

- ✓ From the beginning, PECO cut corners to save money.
  - NOTE: Bectel, the same company that built Limerick, installed a reactor vessel at San Onofre backwards in 1977 and was forced to redo the job...
- ✓ The 3rd Circuit Court of Appeals in Philadelphia ordered NRC to listen to the proposals for alternatives for improved safety in design, which was a major embarrassment to NRC and a setback for PECO.
- ✓ But the case dragged on nearly nine years, during which time Unit 1 was finished and Unit 2 approved.

TO VALUE THE HEALTH, LIVES, AND ENVIRONMENT OF CURRENT AND FUTURE RESIDENTS OF THE ENTIRE PHILADELPHIA REGION;

NRC MUST SAY NO TO RELICENSING, AND REQUIRE IMMEDIATE IMPROVED PRECAUTIONS UNTIL LIMERICK CLOSES IN 2029:

1. **Extend Back-Up Power - To Last Days, Not Hours**
2. **Enforce SAFEST Fire Safety Regulations**
3. **Guard Against A 9/11 Plane or Missile Type Terrorist Attack**
4. **Extend Evacuation Zone To 50 Miles, Not Just A10-Mile Evacuation Zone**
5. **SAY NO TO LIMERICK NUCLEAR PLANT:**
   - **UPRATES - Run Plant Harder**
   - **RELICENSING - Run Plant Longer**

AGING RISKS WILL BE INCREASING FROM UPRATES

Exelon is planning to run Limerick over 20% harder through "Uprates." That means far greater risk to us. Limerick is already running at 96.7%. 20% more is way over 100%. 20% more energy production at Limerick means for us more water use, more water pollution, more air pollution, more risk of disaster from mechanical breakdown, corrosion, etc.

Limerick Nuclear Plant should be closed before 2029 when its license expires, to attempt to avoid a Chernobyl / Fukushima type catastrophe at Limerick.

There are many signs of serious problems after several decades of operation.
What Could Happen By 2029, After 40 years,
When Limerick's Original License Expires?

Miscellaneous Information

Nuclear Disaster Could Happen At Limerick

Published: Friday, May 20, 2011

Many Things Can Trigger A Limerick Meltdown!

Mercury articles informed residents about the horrific Japan nuclear disaster. But, it can happen here at Limerick Nuclear Power Plant. Many things could trigger a Limerick meltdown. The Japan nuclear disaster revealed that nuclear power's so-called "redundant safety systems" fail and when they do the consequences are cataclysmic.

The whole idea of "safety" is a baseless huge leap of faith.

A nuclear disaster at Limerick Nuclear Plant can be triggered by a fire, terrorist attack, hurricane, tornado, human error, or equipment failure, like at TMI. Each could cause loss of power and/or cooling water that can lead to a meltdown. While Limerick is ranked 3rd on the earthquake risk list, a Limerick disaster with generations of devastating unthinkable consequences can be caused by so many other factors.

You and your family could become nuclear refugees just as those in Japan. ACE identified great cause for concern at Limerick. Many in our region have long been concerned about an accident or terrorist attack causing a nuclear disaster at Limerick Nuclear Plant.

ACE informed elected and agency officials through letters, packets, meetings, and copies of our TV shows. Most ignored valid concerns including numerous reported accidents which fortunately didn't result in a meltdown:

- Limerick Nuclear Plant had two “Near Misses” (1996 - 2001), according to a 2006 report based on NRC records called “American Chernobyl”.
- That report reveals that Limerick has “Substandard Containment”, meaning far more radiation would be released in an accident or terrorist attack.
- Limerick Nuclear Plant is NOT in compliance with NRC’s most stringent fire safety regulations, even though fires are a major factor in meltdowns Weaker regulations reduce Exelon’s regulatory burdens and costs, but increase risk of meltdown.
- Limerick lost coolant causing shut-down April 24, 2007. 15 days later, NRC still had no explanation. Remember, the disaster in Japan started with loss of coolant.
- Limerick had five unplanned shutdowns in just over a year. April 9, 2007 – 5 days after refueling there was a problem with a seal on the pump.

Claims that NRC oversight will prevent meltdowns are delusional. NRC's decisions are based largely on their baseless ad nauseum "beliefs". NRC’s track record and responses to ACE concerns suggest NRC puts nuclear industry profits ahead of public safety. Don’t count on NRC oversight to prevent a Limerick meltdown.

NRC’s negligence should concern everyone in our region. Examples:

- Fire - NRC acquiesced to nuclear industry convenience and bottom line by developing a second weaker set of fire safety standards which allow Limerick to deceptively claim compliance. NRC says it’s “SAFE ENOUGH”. Knowing fires can cause meltdowns, we need the safest fire barriers and other safeguards and object to “Reduced Regulatory Burden”, “Exemptions”, and “Flexibility”.
- Terrorist Attacks - NRC failed to require Limerick to guard against a 9/11 type terrorist attack by plane or missile. Either could lead to a nuclear fire and meltdown. Limerick Airport is about one mile away.
- An Al-Qaida suspect worked at Limerick 2002 to 2007. How effective are NRC screening requirements for the 2000 workers that come to refuel each year?

Experts call high level radioactive fuel rods the single greatest security vulnerability in the U.S.

An estimate of over 1,000 tons are stored at Limerick in fuel pools and above ground in casks. Every year Limerick operates 2,000 tons more will be produced.

- Water loss in Limerick pools can heat up spent fuel rods, which can then self-ignite and burn in an unstoppable fire, releasing so much radioactivity they’re seen by experts as pre-deployed radiological weapons.
- Fuel rods are to be cooled 5 years before removal to above ground casks. NRC allowed Limerick to remove fuel rods for transfer far earlier. We’re told some were removed in just one year, creating risk of a highly radioactive fire in casks too.
- One expert said that a nuclear fire in a spent fuel pool would release enough cesium-137 to render about 95,000 square kilometers of land uninhabitable.

- A 2000 NRC report determined a catastrophic meltdown in spent fuel pools could cause fatal radiation-induced cancer in thousands of people as far as 500 miles from the site.

Prevention is imperative. Evaluation plans are unrealistic. There would be complete gridlock. Chaos is inevitable. We are too heavily populated. Escape routes are too crowded even in rush hour. Many would flee into the radioactivity. Japan proves a 10-mile evacuation zone is ludicrous. Minimally, a 50-mile evacuation zone is imperative. That would include almost eight million people. Philadelphia is only about 20 miles away in the predominant wind direction. Where would everyone go?

The 1982 Calculated Risk Accident Consequences (CRAC) report to Congress estimated staggering numbers impacted by a Limerick accident or terrorist attack. Costs would be astronomical.

- 74,000 Early Fatalities
- 610,000 Early Injuries (most for any U.S. reactor)
- 34,000 Cancer Deaths.
- Estimated costs $417 Billion for Limerick 1, $386 Billion – Limerick 2.

Since 1980, population more than doubled, doubling harms and costs. NRC's current cost estimate could be over a trillion dollars, largely paid by taxpayers. Exelon pays only the first $11 Billion.

Given the stakes, and reality of actual risks for meltdown, we disagree with Exelon and their promoter NRC, that Limerick Nuclear Plant is "Safe Enough".

Elected and agency officials need to demand precautions to reduce risks for all of us becoming nuclear refugees, losing everything we have, including our health.

- **Extend Back-Up Power To Last For Days, Not Just Hours**
- **Guard Limerick Against A 9/11 Type Terrorist Attack With A Plane or Missile**
- **Extend The Evacuation Zone To 50 Miles, Not Just 10**
- **CLOSE Limerick - Not Relicense Until 2049.**

If You Agree,
Contact ACE and Join the Growing List of Citizens Trying To Prevent A Nuclear Catastrophe In Our Region.

(610) 326-2387 aceactivists@comcast.net

The Alliance For A Clean Environment April, 2011

The Pottstown Mercury (**pottsmerc.com**), Serving Pottstown, PA

Flaw Found in Safety Mechanism at Limerick Nuke Plant

Wednesday, October 5, 2011 By Evan Brandt, **ebrandt@pottsmerc.com**

LIMERICK — Even before an earthquake and tsunami refocused the world's attention on the dangers inherent in nuclear power, the manufacturer of a key safety mechanism at many nuclear power plants, including Limerick Generating Station, was warning it might not work during an earthquake.

GE Hitachi first issued the warning to the Nuclear Regulatory Commission in September 2010 and confirmed the concern again last month.

The concern refers to the "control rods" for boiling water reactor models, the type of reactor at Exelon Nuclear's plant along the Schuylkill River. The control rods are inserted into the reactor between the rods of nuclear fuel in order to shut it down quickly, a procedure called "a scram," and are meant to be used in an emergency and more slowly during scheduled downtime. The control rods work by absorbing neutrons, shutting down the nuclear fission reaction that creates the heat that boils the water and drives the turbine to create electricity.

But engineering evaluations by GE Hitachi showed the design for the mechanism that inserts the control rods "do not address the potential impact of a seismic event on the ability to scram," according to its first Sept. 3, 2010, notice.

The problem, NRC spokesman Neil Sheehan said, is friction in the assembly that moves the control rods into position might be made worse by an earthquake.

On Sept. 26, GE Hitachi informed NRC it had "determined that the scram capability of the control rod drive mechanism" in reactors like those at Limerick and Peach Bottom Atomic Generating Station on the Susquehanna "may not be sufficient to ensure the control rod will fully insert."

The problem only occurs, according to GE's analysis, "when the reactor is below normal operating pressure" and an earthquake hits.

"In this scenario, a substantial safety hazard results because the affected control rods might not fully insert to perform the required safety function," the company told NRC.

"There need to be three conditions present for this kind of scenario to happen," Sheehan explained in an email.

"1) The control rods (or at least some of them) already have to be 'sticky,' or for some friction to already be present. That can occur when fuel gets older and bowing of fuel rods sometimes takes place," Sheehan wrote.

"2) The reactor is operating at low pressure. The control rod mechanisms (the pistons that force

boiling water reactor control rods in from the bottom of the vessel) use pressure from the reactor vessel to inject the rods. There is less forcing pressure when the reactor is running at low pressure," wrote Sheehan.

"3) A severe earthquake," he concluded.

While there may have been a time when the chances of such a string of events happening at once might have been dismissed as too unlikely, the earthquake and subsequent tsunami in Japan in March, and the earthquake in Virginia in August have given such "what-if" scenarios added credence.

More significantly, Sheehan confirmed that some of the reactors at the Fukushima plant affected by the Japanese earthquake are boiling water reactors, similar to those at Limerick.

He wrote that "the loss of power at Fukushima knocked out safety systems. That was the major contributor to the accident. Details of exactly what happened, including the insertion of control rods or lack thereof, are still being determined."

He also confirmed that the 5.8 magnitude earthquake centered in Louisa County, Va., that struck on Aug. 23 and was felt as far north as New York City was beyond what the nearby North Anna Nuclear Plant had been designed to withstand. The reactors at that plant are of a type known as pressurized water reactors and so were not subject to the concerns highlighted by GE Hitachi.

Nevertheless, reactors at that plant in Virginia remain shut down while the owners, Dominion Power, and the NRC determine whether the plant sustained any damage. NRC announced last week more inspections would need to be conducted before a decision is made about starting North Anna's reactors up again.

The North Anna plant is among 27 that a preliminary NRC review recently found may need upgrades to protect against earthquake risk. That list also includes the Limerick Generating Station's two reactors.

Joe Szafran a spokesman for Exelon Nuclear's Limerick Generating Station did not respond to requests for comment.

Sheehan said the NRC does not believe the potential problem is cause for extreme concern.

"The plants have procedures for dealing with stuck control rods. They also have procedures for dealing with rods that only insert partially," Sheehan wrote in an email.

"Plant operators can also inject boron to halt fissioning. Based on these capabilities, we believe the plants remain safe to operate as work on this issue continues," Sheehan wrote.

"While GE Hitachi will be working with each potentially affected plant on remedies, it is also developing a long-term solution that involves a redesign that would result in fewer tolerances, i.e., less friction, between the control rods and the nuclear fuel," Sheehan wrote.

In the meantime, GE Hitachi has recommended plants monitor the equipment for any problems.

The NRC began re-examining the issues related to earthquakes as early as 2003 and continued in the wake of new analysis of seismic risks in the eastern half of the U.S. by the U.S. Geological Survey.

On Sept. 19, according to the Associated Press, the NRC issued a new report urging the agency to “immediately require operators to re-evaluate whether U.S. nuclear plants can withstand earthquakes and floods.”

The report identifies “seven steps the NRC should take ‘without delay’” including “immediate reviews of seismic and flooding risks at the nation’s 104 reactors.”

Sheehan wrote that although the matter of the control rods is “a separate and distinct issue,” that “seismic vulnerabilities will clearly be among the key areas to be reviewed as part of our post-Fukushima reviews.”

Last month, the Associated Press published a report analyzing NRC data and concluding that “the risk an earthquake would cause a severe accident at a U.S. nuclear plant is greater than previously thought — 24 times as high in one case.”

The AP analysis mirrored one done by **MSNBC.com** in March that also used NRC data to determine that the risk of earthquake damage was greater than once thought by the federal agency. The **MSNBC.com** report ranked Limerick as the plant with the third highest risk of being damaged by an earthquake.

The risk of an earthquake damaging either or both reactors at Limerick was increased by 141 percent under the **MSNBC.com** analysis. That analysis found the chance of an earthquake damaging the plant was raised in the study to 1 in 18,868. The previous risk rating was 1 in 45,455.

The NRC disavowed both the **MSNBC.com** and AP analysis, saying NRC data had been used in a way that is inconsistent with how the agency measures risk.

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NRC Inspection Raises New Issues At Limerick Plant

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LIMERICK — Some parts of Exelon Nuclear's Limerick Generating Station might not be reliable to prevent damage from flood or fire if the plant was struck with an earthquake, a government inspection has found.

The inspections were meant to look at issues arising from extraordinary events, similar to those that occurred at Japan's Fukushima Daiichi plant as the result of the March 11 earthquake and tsunami.

However, an NRC spokesman confirmed some of the elements called into question by the site inspectors "could adversely impact the plant's fire and flood mitigation capabilities," even if the emergency were within the bounds of a disaster the plant was designed to withstand.

The NRC has taken an increased interest in how plants would handle extreme emergencies like those in Japan, now considered at least as bad as the Chernobyl accident in 1986.

During the NRC's annual community briefing on the plant's operation on May 18, Branch Chief Paul Krohn referred to Japan repeatedly and talked about what lessons the NRC is attempting to draw from events there.

The NRC recently initiated a series of preliminary inspections at all 104 of the nation's nuclear plants, including Limerick.

Out of 65 operating reactor sites, 12 had issues with one or more of the emergency response requirements during the inspections, the NRC reported May 20.

“Our resident inspectors did a good job of spotting problems, as well as helping the plants identify areas for improvement,” NRC Chairman Gregory Jaczko said in a news release on the subject.

Nine sites had issues regarding emergency strategies; three had issues with their strategies for dealing with a black-out, and two had issues with dealing with extreme flooding events.

Nevertheless, “none of these issues undermine the plants’ abilities to respond to extreme events,” the release stated.

That was the conclusion two resident inspectors at the Limerick plant reached in late April about the plant’s ability to deal with fire and flooding

“The inspectors concluded that the licensee meets the current licensing and design bases for fire protection and flooding,” the report concludes.

This conclusion was reached despite findings that “many of the (systems, structures and components) relied upon to mitigate flood and fire events at Limerick are not designed to meet seismic qualification standards. Therefore, a design basis seismic event at the site could adversely impact the plant’s fire and flood mitigation capabilities,” inspection report documents stated.

In an e-mail to The Mercury, NRC spokesman Neil Sheehan wrote that the issues raised in the inspection report “involve potential seismic vulnerabilities that are within the plant’s ‘design basis.’”

Sheehan wrote, “each plant is built to withstand certain events, i.e., the worst historical earthquake for the area, with margin added on top of that. That would be the plant’s ‘Design Basis.’”

He added, “I would note that there is a difference between ‘seismically qualified’ and capable of withstanding an earthquake. Further analysis might determine these systems, structures and components would still be capable of performing their functions.”

“An issue that is ‘Beyond Design Basis’ would be an extreme event, such as severe flooding combined with a significant earthquake,” Sheehan wrote.

Problems were found among some system in that category as well.

According to the report — which can be read in full by clicking here — the inspectors further found some (systems, structures and components) “could not be relied upon to fulfill their flood mitigation function following a design basis earthquake.”

Some examples cited by the inspectors include:

• “Many of the turbine buildings walls are credited for external and internal flood scenarios. Although analysis has shown that the turbine building will not collapse due to a safe shutdown earthquake, it is not known what impact a seismic event would have on its flood mitigating capabilities.”

• “Limerick’s flood and fire penetration seals are not specifically designed or tested to be seismic.”

It should be noted that “the above-stated vulnerabilities are considered beyond-design-basis,” the inspectors wrote.

Sheehan indicated it is too early to draw long-term conclusions from the inspection report.

“This inspection was our first cut at each site for possible implications of the Japanese reactor events.

Further evaluation will be needed," Sheehan wrote.

The NRC is also looking at how well U.S. nuclear plants would be able to respond to events that are "beyond design basis," wrote Sheehan.

While the disasters that struck Japan, an earthquake followed by a tsunami, might seem extreme. The plant there was built anticipating their possibility, just not at the strength at which they struck.

Although the risk of severe earthquake at the Limerick site is extremely low, a U.S. Geologic Survey study completed two years ago provided data that shows it's not as low as once thought.

One analysis used the USGS data, and an NRC review that followed it, to conclude the risk of earthquake damage at Limerick is 141 percent more likely than previously thought.

The U.S. Geologic Survey's 2008 updating of earthquake risks around the country, used better data and more sophisticated measurements and modeling than were used in the 1996 and 2002 efforts.

The new geological information led NRC in 2010 to re-examine earthquake risks for nuclear plants east of the Mississippi.

An investigation by MSNBC.com, published online March 17, added NRC's new earthquake risk analysis to existing NRC data for western plants, where earthquakes are more prevalent, and created an earthquake damage risk ranking for the nation's 104 nuclear plants.

MSNBC.com concluded that because most eastern plants were built assuming a low risk of earthquake, unlike their more robustly constructed western cousins, that the Limerick plant is the nation's third most at risk of damage from earthquake.

The NRC analysis found the chance of an earthquake damaging the plant was raised in the study to 1 in 18,868.

The previous risk rating was 1 in 45,455.

For comparison purposes, the MSNBC.com article noted the chance of winning the grand prize in the Powerball lottery in March was 1 in 195,249,054.

The analysis also reveals that of the top 10 nuclear plants most at risk from earthquake damage, three are in Pennsylvania, more than any other state.

The other two are the Shippingport Atomic Power Station in Beaver County and the Three Mile Island plant in Dauphin County.

In fact, just over a week ago, a very minor earthquake struck the Philadelphia area according to an Associated Press report.

USGS geophysicist John Bellini told AP the May 27 earthquake was centered near Cornwells Heights and Eddington, just northeast of Philadelphia and west-northwest of Beverly, N.J.

Bellini says the magnitude-1.7 quake was so small it was unable to do any damage. He said to residents it might have sounded like "a big truck going by."

Philadelphia police and firefighters told AP some residents felt their houses shake.

While the risk of catastrophic earthquake combined with another major disaster, such as a flood, remains relatively remote, Japan's experience has convinced NRC it is worth re-examining the current U.S. situation to assess risk.

During the May 18 annual meeting in Limerick, Krohn said the biggest advances in nuclear safety have come as a result of what is learned in the wake of the biggest disasters, such as Chernobyl and Three-Mile Island.

Sheehan wrote, “we would say this about this initial phase of our Japan-related reviews:

•The results of the inspections indicate general compliance with the regulations though some potential findings have been noted.

• The inspections assess U.S. nuclear plants’ capabilities to respond to extraordinary plant challenges.

• The inspections assessed some capabilities that are not current regulatory requirements (that is, they are beyond the ‘design basis’ for the plant, or the phenomena it was designed to withstand).”

The inspection report also shows the site inspectors checked all emergency back-up generators, batteries and related equipment and reported them adequate to respond to a loss of power at the plant.

That emergency response also includes agreements with off-site fire companies that they have ladder trucks and pumps that can be used to spray water into a spent fuel pool, according to the report. There was some concern listed by the inspectors about whether adequate power would be available for four hours under certain disaster scenarios but, while under review, these concerns were not determined to “significantly impact Limerick’s response.”

Sheehan wrote that the information from the inspections, as well as a request for information on how nuclear plants plan to deal with the potential loss of large areas of the plant after extreme events, will all be examined by the NRC.

Assessment of that information “will be used to determine future regulatory actions,” Sheehan wrote.

The NRC Task Force “(overseeing the agency’s Japan-related reviews) will continue to review and evaluate to determine if future actions are required,” he wrote.

Opinion

Post-Japan nuke inspection raises questions

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Lessons come from things gone wrong.

That was the essence of the NRC's Paul Krohn's comments during an annual community briefing on the post-Japan inspection of Exelon's Limerick Nuclear Generating Station.

Krohn said the biggest advances in nuclear safety have come as a result of what is learned in the wake of the biggest disasters, such as Chernobyl and Three-Mile Island.

Now, the NRC is trying to learn from the events at Japan's Fukushima Daiichi plant that occurred as the result of the March 11 earthquake and tsunami.

What they are learning as it relates to Limerick bears a closer look.

The NRC recently initiated a series of preliminary inspections at all 104 of the nation's nuclear plants,

including Limerick.

The results of the inspections at Limerick indicate some systems, structures and components "could not be relied upon to fulfill their flood mitigation function following a design basis earthquake."

Examples cited by the inspectors include the potential that turbine buildings' flood and fire prevention seals might not tolerate a "seismic event."

NRC spokesman Neil Sheehan noted that any findings that raised questions were on issues that went beyond what would be considered normal. In other words, it's not realistic to expect a tidal wave in Montgomery County, Pennsylvania.

But at the same time the NRC is studying the events in Japan, geological data is being re-evaluated showing that earthquakes are more likely in Pennsylvania than was once believed.

The realization that the region has potential for an earthquake along with renewed areas of concern brought to light in inspections is certainly good reason for more analysis with a critical eye.

The greatest lesson to be learned from Japan is that worst-case scenarios can occur, and when they do, a nuclear plant can become the center of spreading disaster.

"That will never happen here" is a dangerous attitude.

Rather, Exelon and the NRC should work to insure that every scenario is addressed with adequate safety measures —especially the worst-case ones.

Opinion

Concerns About Nuclear Safety Remain Unanswered

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I attended the Nuclear Regulatory Commission meeting about Limerick Nuclear Plant safety and issues related to Japan's nuclear disaster. "Limerick plant ranked 3rd on U.S. quake-risk list," (Mercury article 3-17-11), yet NRC couldn't or wouldn't answer my question about the exact location of the fault line closest to Limerick. Someone claimed it went through the Limerick site. Now I'm really curious.

Even after Japan, the Nuclear Regulatory Commission and PA Emergency Management Agency appear unchanged, unrealistic, and irresponsible. There's no plan to expand the evacuation zone or accommodate for the direction of a radioactive plume from Limerick.

Evacuation was discussed. The school evacuation plan is a "Paper Tiger." PEMA's comments suggested they are relying more on a theoretical model and plan for evacuation than reality. I talked to a teacher, principal, and superintendent who believes PEMA evacuation "drills" are limited exercises typically not requiring complete physical evacuation, focusing on communications and check lists.

During a terrorist attack or accident at Limerick Nuclear Plant, you better hope your children aren't in school. My child's school said no one would be issuing KI pills, even if I provided them, because there's no personnel to distribute them. PEMA's representative was dismissive of my concerns, claiming all schools are capable of distributing KI pills.

It was reported some bus drivers said they wouldn't return for a second run after radioactive fallout from Limerick. PEMA claimed there were enough buses to evacuate all children from elementary, middle and high schools in one run. Doubtful! Even if true, there wouldn't be enough qualified, licensed, or experienced drivers for one run from all schools in the 10-mile zone.

NRC said it would take nine months to decide if improved safety and security are needed. That's unacceptable. Limerick keeps having mechanical problems. Limerick's Unit 2 shut down again 5-29-11 from electrical malfunction (Mercury). February, the same reactor shut down due to recirculating pumps. During 2007, there were five unplanned shutdowns and loss of cooling water that couldn't be explained 15 days later. An earthquake just hit Philadelphia. 2011 is already the deadliest year for tornadoes. Limerick's spent fuel storage poses unacceptable risks. An Al-Qaida suspect worked at Limerick (2002 to 2007) during refueling. A Limerick guard altered his license to hide arrests. Small planes can cause fire which can trigger a meltdown, yet planes and helicopters still fly in and out of Limerick Airport, just a mile away. Helicopter trips are made back and forth to the Pottstown hospital, about a mile away.

NRC just approved plans to operate Limerick harder, and may soon approve Limerick operations 20 years longer (until 2049). Both are far too risky. Say no to running Limerick harder and longer. Forty years of such risks and threats are more than enough.

We must have immediate improved precaution and prevention at Limerick Nuclear Power Plant. Without your voice that won't happen.

LORRAINE RUPPE

Pottstown