

LIMERICK NUCLEAR PLANT RADIATION

CONTAMINATING OUR LIFE SUPPORT SYSTEMS AND OUR BODIES

Since 1985 Limerick Nuclear Plant Routinely Released A Broad Range Of Dangerous Radionuclides (Some With Long Half-Lives) Into The Region's Air, Water, Soil, Sediment, Food, and People.

- **As Long As Limerick Nuclear Plant Continues To Operate, The Environment And People In Our Region Will Continue To Be Poisoned With Radiation From Limerick Nuclear Plant.**
- **The Only Way To Stop Radiation Threats To Us and Our Environment From Limerick Nuclear Plant Is To Close Limerick.**

Exelon And NRC Are Involved In A Cover-Up About Limerick Nuclear Plant's Routine And Accidental Radiation Releases And Their Harmful Impacts On Us And Our Environment.

- First, They Falsely Claimed Radiation Was Not Released From Limerick Nuclear Plant, Even Though Exelon's Yearly Radiological Monitoring Reports To NRC Proved Otherwise.
- Now They Admit Radiation Is Released From Limerick, But Make The Unsubstantiated Absurd Claim That Limerick's Radiation Releases Are So Low They Cannot Cause Harm.

THE NATIONAL ACADEMY OF SCIENCES 2005 BEIR VII REPORT SHOWS THERE IS "NO SAFE DOSE". PHYSICIANS FOR SOCIAL RESPONSIBILITY SUPPORT THAT CONCLUSION.

- Independent Research Disputes Illogical Claims That Radiation Released Into Our Air And Water From Limerick Nuclear Plant Since 1985 Is Not Harmful.
- Levels of Specific Radionuclides Associated With Limerick Operations Reported By Exelon Are Misleading, When Independent Research Shows There Is No Safe Dose, When Reporting Is Only Required On Levels Above An Arbitrary "Background" Levels, When Reporting Can Be Estimated And Averaged, and When NOT ALL Radionuclides Are Individually Reported.
- Exelon's Radiation Testing for Limerick Nuclear Plant Proves Limerick's Radiation Is In Our Air Particulates, Groundwater, Surface Water, Fish, Sediment, Vegetation, and Milk. A Study Found High Levels Of Strontium-90 Radiation In Baby Teeth Of Children Around Limerick.
- Skyrocketing cancer rates and other illnesses since Limerick started operating in 1985 provide evidence of harm, including childhood cancer rates rising to 92.5% higher than the national average in the late 1990s, and infant mortality rates higher than Philadelphia, Reading, or the state average. For details see section on Cancer Links.

To Determine The Actual Degree Of Harms, We Would Need A Year Of Continuous Independent Monitoring and Reporting On All Levels Detected Above Zero, for Over 100 Limerick Radionuclides.

- Long-Term Additive, Cumulative, and Synergistic Harmful Health Impacts Would Need To Be Estimated and Evaluated. That Has Never Been Done. It Would Be Cost Prohibitive, But Necessary To Determine Actual Harms. Absent That, NO ONE KNOWS Just How Much Harm We Face From Limerick's Radiation.

FROM EXELON'S RADIATION REPORT FOR LIMERICK NUCLEAR PLANT

Taken From Exelon's 2007 RADIATION REPORT TO NRC

Example: Radiological Environmental Monitoring Program (REMP) - Offsite Dose Calculation Manual

Radiation Detected "Above Background" - Limerick Nuclear Plant Testing

- **Surface and Drinking Water** **12 Different Radionuclides**
- **Fish** **9 Different Radionuclides**
- **Sediment and Vegetation** **8 Different Radionuclides**
- **Air Particulates** **6 Different Radionuclides**
- **Milk** **5 Different Radionuclides**

15 DIFFERENT RADIONUCLIDES Reported In LIMERICK TESTING

Exelon's 2007 - 2009 Radiological Reports To NRC For Limerick Nuclear Power Plant

	Radionuclides	½ Life
1.	Cesium Cs-134	30 Years
2.	Cesium Cs-137	30 Years
3.	Iodine I-131	8 Days
4.	Strontium Sr-90	28 Years
5.	Manganese Mn-54	314 Days
6.	Zinc Zn-65	250 Days
7.	Cobalt Co-58	70 Days
8.	Cobalt Co-60	70 Days
9.	Zirconium Zr-95	65 Days
10.	Beryllium Be-7	53 Days
11.	Iron Fe-59	46.6 Days
12.	Niobium Nb-95	35 Days
13.	Barium Ba-140	13 Days
14.	Lanthanum La-140	40 Hours
15.	Potassium K-40	1 Day

NOTE: These Radionuclides Reported For Limerick Nuclear Plant Testing, In Water, Sediment, Vegetation, Fish, End Up In Gardens, Food, Milk, And People

- ✓ Harmful Health Impacts From Additive, Cumulative and Synergistic Exposures, Including From All Routes Of Exposure Are Unknown.
- ✓ Actual Radiation Levels Routinely Released From Limerick Nuclear Plant Into Air and Water Are Unknown. There Is No Continuous Monitoring By Any Agency For The Over 100 Radionuclides Potentially Released.
- ✓ Testing Loopholes Hide Reality Of Risk.

From Exelon's 2007 and 2009 Radiological Reports To NRC For Limerick Nuclear Power Plant

DRINKING WATER And SURFACE WATER TESTING

12 Radionuclides - Reported "Above Background"

It's Not Just Tritium

Radionuclides	½ Life
1. Cesium Cs-134	30 Years
2. Cesium Cs-137	30 Years
3. Manganese Mn-54	314 Days
4. Zinc Zn-65	250 Days
5. Cobalt Co-58	70 Days
6. Cobalt Co-60	70 Days
7. Zirconium Zr-95	65 Days
8. Iron Fe-59	46.6 Days
9. Niobium Nb-95	35 Days
10. Iodine I-131	8 Days
11. Barium Ba-140	13 Days
12. Lanthanum La-140	40 Hours

Note: The Hazardous Life of a Radioactive Isotope is Ten to Twenty Times its Half-Life

Reality: Synergistic, Additive, and Cumulative Harmful Impacts Are Obviously Significant

Problems: Many Radionuclides go Unreported and Unmonitored

Exelon, a Company that Can't Be Trusted, Controls the Process

From Exelon's 2007 Radiological Report To NRC For Limerick Nuclear Power Plant Testing

FISH - 9 Radionuclides Reported "Above Background"

Radionuclides	½ Life
1. Cesium Cs-134	30 Years
2. Cesium Cs-137	30 Years
3. Manganese Mn-54	314 Days
4. Zinc Zn-65	250 Days
5. Cobalt Co-58	70 Days
6. Cobalt Co-60	70 Days
7. Iron Fe - 59	456.6 Days
8. Potassium K-40	1 Day
9. Iodine I-131	8 Days

From Exelon's 2007 Radiological Report To NRC For Limerick Nuclear Power Plant Testing

SEDIMENT and BROAD LEAF VEGETATION - 8 Reported "Above Background"

Radionuclides	½ Life
1. Beryllium Be-7	53 Days - Unstable
2. Cesium Cs-134	30 Years
3. Cesium Cs-137	30 Years
4. Manganese Mn-54	314 Days
5. Cobalt Co-58	70 Days
6. Cobalt Co-60	70 Days
7. Iodine I-131	8 Days
8. Potassium K-40	1 Day

Limerick's Dangerous Radionuclides End Up In: Gardens, Food, Milk, And People.

DISTANCES FROM LIMERICK'S REACTORS TO:

GARDENS 4 Less Than ONE Mile - 8 ONE to TWO Miles - 3 Within THREE Miles

MILK FARMS 3 TWO to THREE Miles - 2 FOUR to FIVE Miles

Surface and Drinking Water - 2007 Monthly Samples Detected Tritium

Tritium Was Detected in Drinking Water in the Vicinity of LNPP In:
Well Water and In Schuylkill River (Downstream from Limerick)

NRC FALSELY ASSERTS JUST TRITIUM IS CONTAMINATING WATER FROM NUCLEAR PLANTS.

- **EXELON'S OWN RADIATION MONITORING REPORT TO NRC FOR LIMERICK NUCLEAR PLANT PROVES OTHERWISE**

EVIDENCE OF CONTAMINATION FROM OTHER RADIONUCLIDES BELOW WAS FROM EXELON'S REPORT ON LIMERICK NUCLEAR PLANT.

IT PROVES WATER CONTAMINATION IS NOT JUST TRITIUM, AS CLAIMED BY NRC.

Detected In All Drinking Water Samples In Vicinity of Limerick

- Tritium
- Total Gross Beta
- Gamma Emitters

Cesium 137 - Attributed to Limerick Nuclear Plant's Liquid Release

Cs-137 -Found in every pathway modeled by REMP And In Sediment Detected in Vicinity of Limerick

Gamma Radiation Was Detected Vicinity of Limerick Nuclear Plant In:

- Surface Water
- Drinking Water
- Sediment
- Fish - Gamma Emitters Were Detected In Predator and Bottom Feeder Fish in Vicinity of Limerick

Examples Of Harmful Health Impacts To Specific Parts Of The Body

- | | | |
|----------------|----------------------|--------------------------|
| • Iodine – 131 | Beta / Gamma Emitter | Thyroid - Ovaries |
| • Cobalt – 60 | Beta / Gamma Emitter | Liver - Ovaries |
| • Zinc – 65 | Gamma / Beta Emitter | Bone - Ovaries |
| • Cesium – 137 | Beta / Gamma Emitter | Muscles - Ovaries |

Reproductive Organs Are Attacked By All Radioactive Isotopes Emitting Gamma Radiation.

Radionuclides Above Documented In Surface and Drinking Water From Limerick Nuclear Plant are of great concern.

- The National Academy of Sciences declared there really is **NO SAFE DOSE.**
- An April, 2008 Report "Poisoned Rivers from Nukes" - Three health professionals from the Illinois EPA testified to big increases in leukemia and other cancers from poisoned waters.
- In the region around Limerick there are highly elevated cancers, including leukemia.

Radiation Reported For Limerick Nuclear Plant Can Cause Cancer, Birth Defects, Mutations, and Miscarriages In 1st and/or Successive Generations After Exposure.

IT'S NOT JUST TRITIUM

It's NOT CREDIBLE for NRC to claim Tritium is the only radionuclide getting into groundwater or surface water from Limerick Nuclear Plant. That absurd claim is proven false by Exelon's own Radiological Monitoring Reports for Limerick Nuclear Plant, summarized below.

Documentation From Exelon's 2009 Radiological Monitoring Report Summary Below Disproves NRC's False Claim That Radioactive Contamination Of Drinking Water Sources From Limerick Nuclear Plant Is "Just Tritium".

Below Are Radionuclides Reported by Exelon In Groundwater and Surface Water In Limerick Nuclear Power Plant's 2009 Radioactive Test Results Reported To NRC

RADIOACTIVE GROUNDWATER - LIMERICK TEST RESULTS

15 of 15	Gross Beta (dissolved)	Detected
3 of 15	Gross Beta (suspended)	Detected
9 of 15	Gross Alpha (dissolved)	Detected
5 of 15	Gross Alpha (suspended)	Detected
3 of 15	Gamma Emitters	Detected
4 of 5	Uranium 233/234	Detected

RADIOACTIVE SURFACE WATER - LIMERICK TEST RESULTS

6 of 7	Gross Beta (dissolved)	Detected
1 of 7	Gross Alpha (dissolved)	Detected

Different Types Of BETA Radiation From Limerick Nuclear Plant Are Contaminating The Schuylkill River and Groundwater

Beta / Gamma Emitters Harmful Health Impacts - All Can Cause Cancer

Iodine – 131	Thyroid	Ovaries
Cobalt – 60	Liver	Ovaries
Zinc – 65	Bone	Ovaries
Cesium – 137	Muscles	Ovaries
Strontium-90	Bone, Immune, Hormonal,	Central Nervous Systems

NOTE: Synergistic, Additive, and Cumulative Harmful Impacts Are Unknown

- Limerick's Radionuclides Detected In Drinking Water Can Cause Cancer, Birth Defects, Mutations, and Miscarriages, In 1st and/or Successive Generations After Exposure
- All Radioactive Isotopes Emitting Gamma Radiation Attack Reproductive Organs
- BEIR VII Report Says There Is NO SAFE LEVEL of EXPOSURE to RADIATION
- POISONED RIVERS FROM NUKES 4/08 Report Big Increase in Leukemia and Other Cancers - Reported by Three EPA Illinois Professionals

OVER 100 RADIONUCLIDES ARE ASSOCIATED WITH LIMERICK NUCLEAR POWER PRODUCTION.

When Over 100 Radionuclides Are Associated With Producing Nuclear Power, When Limerick Routinely Releases Radiation Into Our Air, and Continuously Discharges Radiation Into A Drinking Water Source;

- It's NOT CREDIBLE for NRC to claim Limerick's radioactive releases are not a major factor in cancer rates that skyrocketed after Limerick started operating in 1985, especially in children.

RADIATION EXPOSURE DAMAGES CELLS, CAUSES THEM TO MUTATE, POTENTIALLY LEADING TO CANCER

AMONG LIMERICK'S CONFIRMED RADIATION CONTAMINATION:

- **Strontium - 90 Attaches To Bone /Enters Bone Marrow**
- **Cesium – 137 Disperses In Soft Tissue**
- **Iodine – 131 Enters The Thyroid**

NRC's unsubstantiated denial of harm about radiation released from Limerick Nuclear Plant is based on illusion, not on logic, reality, or verifiable scientific facts.

- For Example - Actual Radiation Or Levels Reported To NRC By Exelon Should Be Viewed With Skepticism For Many Reasons. They Fail To Accurately Assess Or Honestly Disclose Health Harms.

Radiation Testing and Reporting Are Flawed

Radiation Monitoring Tactics Avoid Full and Accurate Disclosure

Industry and Government Monitoring And Reporting Are Plagued by CONFLICTS of INTEREST.

- Nuclear plants report radiation emitted and detected ONLY if it EXCEEDS an ARBITRARY INFLATED "Background Level".
- Emissions data can be estimated.
- Data is averaged to dilute results.

Radiation Standards and Regulations - Based On Illusion, Not Reality

1. Testing and reporting are all done by Exelon;

- ✓ The company with a vested interest in the outcome

- ✓ A company that has shown elsewhere and at Limerick that it shouldn't be trusted to provide full and accurate disclosure.

2. Only a fraction of radionuclides are tracked in all routes of exposure.

- ✓ Only a fraction of radionuclides are monitored, tested, and reported. when over 100 radionuclides are associated with nuclear power production
- ✓ Without continuous independent monitoring, with frequent testing, and reporting, on all radionuclides in all routes of exposure, it is inaccurate to claim to know full and accurate actual risks.

3. There are major flaws in data interpretation and reporting.

- ✓ **Minimum Detectable Concentration (MDC) is an after the fact ESTIMATE**
- ✓ **Lower Limit Detection (LLD) - LLD does not mean the actual level detected.** Arbitrary limits are set, then only levels above that limit are reported. Levels are then defined as smallest concentration of radioactive material in a sample that would yield a net.
- ✓ **Net Activity is calculated by subtracting background from sample.** Background VARIES according to length of build-up.
- ✓ **Gamma Spectroscopy Means and Standard Deviations of Positive Results Were "CALCULATED"**
Standard deviations represent variability of measured results for different samples rather than single analysis uncertainty.

4. It Appears When Nuclear Plant Owners Don't Like Radiation Data, They Simply Don't Report It, Using Equipment Failure As An Excuse.

- ✓ **Limerick Nuclear Plant Radiation Monitoring Reports Show Repeated Claims of Equipment Failure.**
- ✓ **95% of Fukushima Radiation Detectors Stopped Working Three Hours After The Nuclear Disaster Started March 11. COINCIDENCE? Probably Not.**
 - 22 out of the 23 monitors stopped sending data.
 - 3 months later, we learned radiation emissions were twice as bad as reported.
- ✓ **Other examples of tactics which can hide full and accurate disclosure:**
 - **TMI - During critical periods of time throughout the TMI event, radiation monitors were not functioning or their detection limits were being exceeded by an unknown amount.** The monitors at TMI were wrecked: the stack monitors were saturated and went off scale... one thermoluminescent dosimeter in the northwest quadrant, where the wind was blowing, showed very high readings. they discounted it by calling it the "northwest anomaly". They have no idea how much radiation escaped at TMI. In federal court, the judge threw out the class action health damages suit, saying not enough radiation escaped to cause health damage.
 - **Turkey Point - During Hurricane Andrew 1992, the Turkey Point rad monitors and meteorological monitoring equipment were destroyed. There was no way to prove or disprove rad leakage.**
 - **Brown's Ferry Monitoring Data - Public document room records show EVERY time there were higher than normal readings, the diagnosis was always, MONITORS MALFUNCTIONED.**

5. Our Radiation Exposure Risks Are Additive, Cumulative, and Synergistic.

- ✓ Yet, NRC continues to ignore the total harmful health impacts of the risks people in our region face over time, from Limerick Nuclear Plant's continuous radiation releases.

RADIATION Is The Most Dangerous Carcinogen, Yet Additive, Cumulative, and Synergistic Impacts Are Ignored. Who Is Most Harmed?

- ✓ Developing Fetuses, Infants, and Children Are Most Susceptible To Harmful Impacts From Limerick's Radiation.
- ✓ Children are Extra Sensitive to DNA-Damaging Effects of Radioactive Energy. Radiation Releases Are Confirmed To Be Getting Into Our Children's Bodies Through The Tooth Fairy Study.

- ✓ Even In Small Doses Childhood Cancer Is A Key Indicator Of Impacts. Childhood Cancer Rates In Communities Around Limerick Far Exceed The Nation, State, and Tri-County. Carcinogenic Impacts Of Radiation Exposure On Children Were Confirmed After Chernobyl.
- ✓ While we are continuously exposed to a broad range of Limerick's radionuclides in our air, water, soil, sediment, food, and milk - other massive hazardous toxics released from Limerick increase radiation threats from Limerick.

“OZONE WORKS SYNERGISTICALLY WITH RADIATION TO ENHANCE THE CANCER-CAUSING EFFECTS OF RADIATION.”

- ✓ For example, a DEP fact sheet identified the following synergism that disputes inaccurate claims of no harm from nuclear plant radiation:
 - ✓ VOC's + NOx = Ground-Level OZONE - Limerick's air pollution contains both
 - ✓ RADIATION INTERACTING with OZONE Enhances Cancer Risks
 From Mc Donnell, M.D. Health Effects Research Laboratory - EPA Testimony, April 9, 1987, to U.S. Senate

STRONTIUM 90 (SR-90) - A BETA EMITTER

Exelon's 2009 Monitoring Report For Limerick Also Proves Strontium-90 Is In Our Water, Soil, Milk, and Vegetation

Research On Baby Teeth From Children Around Limerick Proves Strontium-90 Is In Our Children's Teeth

PA Cancer Registry Proves Childhood Cancer Rates Skyrocketed To 92.5% Above The National Average After Limerick Started Operating.

To Review Childhood Cancer Data See Cancer Section Of The ACE Website
 For RPHP Baby Tooth Report On Region Around Limerick
 Read "Radioactive Baby Teeth : The Cancer Link" by Joseph Mangano

Strontium-90 (Sr-90) Research Links SR-90 To Bone Damage and Cancer:

- Studies of SR-90 in baby teeth of children living near Limerick have shown some of the highest levels of Strontium-90 of any area around nuclear plants or other areas studied in the U.S.
- Children living near Limerick have suffered some of the highest cancer rates in the U.S., skyrocketing after Limerick opened in 1985 to the late 1990s. Childhood cancer rates rose from 30% higher than the national average in the late 1980s to 92.5% higher in the late 1990s.
- Signature cancers of Sr-90 are cancers of the bone, including Ewing's Sarcoma.
- Sr-90 closely resembles calcium and is readily taken up into the bones and teeth - considered the most hazardous bone-seeking element of nuclear fission because it so closely resembles calcium.
- Sr-90 lodges near the bone marrow, where stem cells form blood and immune system cells, increasing risk of many forms of cancer, especially in newborn infants.
- Sr-90 is considered very hazardous because of its long half-life of 28 years. Low dose exposure to Sr-90 is so serious because of protracted exposure over periods of days, months or years.
- Research confirms that low dose exposures over months or years can be hundreds to thousands of times more damaging than the same dose received in short diagnostic medical exposures or flashes from a nuclear bomb explosion. (Petkau)
- Damage is known to involve the developing immune, hormonal, and central nervous systems of infants and children.

**OUR CHILDREN PAY THE ULTIMATE PRICE
IT'S NOT ONLY CANCER
STATE DATA SHOWS
“DISTURBING NUMBERS”**

For

INFANT MORTALITY

And

NEONATAL MORTALITY

In The Greater Pottstown Area

FAR ABOVE STATE AVERAGE

Even Surpasses Cities Like Philadelphia And Reading.

Reported October 5, 2003

1. New Articles Report Concern About High Infant Mortality Since 1997 – By 2003, Infant Mortality Rates Remained Far Higher Than The State Average, and Were Far Higher Than Philadelphia and Reading.
2. Infant Mortality Has Been Linked To Radiation Exposure – Limerick Nuclear Power Plant started releasing radiation into our air, water, and soil in the mid 1980s.
3. Lifestyle Alone Does Not Account For Such High Continuing Infant Mortality Rates Compared to the State, Philadelphia, and Reading.

LEARNING DISABILITIES

SHOCKING INCREASE - 1990 to 2000 – MONTGOMERY COUNTY

94% INCREASE - Double State Increase

RADIATION EXPOSURE

Research Shows Continuous Low-Dose Radiation Exposure Over Time, Can Be Just As Harmful As One High-Level Dose

It Can Affect The Whole Body

Specific Types Of Radiation Have Been Linked To Damage To:

- Bone
- Thyroid
- Breast
- Brain
- Bladder
- Kidneys
- Liver
- Pancreas
- Spleen
- Lungs
- Muscle
- Ovaries
- Skin

Radionuclides Inhaled or Ingested Can Be Even More Harmful to Health

As Long As Limerick Nuclear Plant Continues To Operate, We Will Be Continuously Exposed To Routine and Accidental Radiation Emissions From Limerick's Radioactive Releases In Many Routes Of Exposure. Limerick's Routine and Accidental Radiation Releases and Discharges Are In Our Air, Water, Milk, Soil, Vegetation, Food, Fish, and Bodies.

**Limerick Nuclear Plant
Needs To Close
To Reduce
Radiation Public Health Threats**

CONTACT ELECTED OFFICIALS AND ASK THEM TO DEMAND CLOSURE NOW!

October 2011, ACE Presented A Detailed Summary To NRC For The Updated EIS As Part Of Over 1,000 Pages Urging NRC To Close, Not Relicense Limerick Based On:

Unprecedented Environmental Harms, Threats, and Risks From Limerick

Radiation Into Air and Water From Routine and Accidental Emissions

- The additive, cumulative, and synergistic radiation doses from continuous releases of all Limerick's radionuclides from all routes of exposure, since 1985 when Limerick started operating 26 years ago are unknown, but obviously significant, given our documented cancer crisis and extremely high infant and neonatal mortality rates.
- Research shows that low dose exposure over time can be just as harmful as one high level dose with fetuses and children the ignored victims. They can be 10 times more vulnerable to the impacts of radiation exposure than adults.

**Our Exposure Risks Are Additive, Cumulative, And Synergistic
Limerick Nuclear Plant Should Be Closed, NOT Relicensed 20 More Years**

The Only Way To Stop Limerick's Continuous Radiation Releases Into Our Air, Water, Soil, Vegetation, Food, Milk, and Bodies, Is To Close Limerick Nuclear Plant As Soon As Possible.

40 Years Of Limerick Radiation Releases Is Far Too Long.

- **As long as Limerick operates vast numbers of families in our region will continue to be subjected to a broad range of radionuclides continuously poisoning our air, water, soil, vegetation, food, milk, and our children.**
- **Limerick's routine radiation emissions over the past 26 years logically are a major factor in our documented health crisis after Limerick started operating. We believe documented research and other evidence shows it is unethical to continue to poison our region with radiation from Limerick Nuclear Power Plant.**

Consider The Reality - Independent scientists and physicians have presented compelling research suggesting that it's time for NRC to stop, making unsubstantiated denials of harm.

- The National Academy of Sciences BEIR VII Report says there is no safe level of radiation exposure.
- Research shows low level radiation exposure over time can be just as harmful as one high level dose.
- Because we are continuously exposed to Limerick Nuclear Plant's Routine Radiation Emissions, we are more at risk from other sources of radiation. Other radiation sources should not be used as an excuse to dismiss nuclear plant radiation.
- We can choose to avoid other radiation sources.
- Living near Limerick Nuclear Plant's routine radiation emissions, it is Precautionary to LIMIT (1) Unnecessary Radioactive Medical Tests, like Xrays and Cat Scans (2) Flying (3) Use Of Microwaves, Cell Phones , Etc.

To Add Another 20 Years Of Radiation Exposure To Our Region Would Be Negligent!

NRC is charged by Congress with the grave responsibility to protect public health and the environment related to the operation of nuclear plants like Limerick.

Until Limerick closes, NRC should:

- ✓ Provide families living around Limerick with a guide on how to avoid exposure to Limerick Nuclear Plant's radiation releases.
- ✓ Explain the difference between gamma radiation exposure from planes, etc. and beta radiation from the air and water.
- ✓ Encourage water treatment plants and residents to use the most precautionary filtration to remove as many of Limerick's radionuclides as possible from drinking water.

For Additional Detailed Information To Support The Conclusion That Our Region Can't Afford To Continue To Be Subjected To Limerick Nuclear Plant's Routine and Accidental Radiation Releases, Call ACE To Make An Appointment To Visit The ACE Office. You Can Review Documents On Harmful Health Impacts of Radiation Released From Nuclear Power Plants Including Limerick Nuclear Power Plant. Examples Included:

1. "Radiation's Harmful Health Impacts", ACE Overview, February 2007
2. ACE Comments to the Secretary of the Nuclear Regulatory Commission urging NRC to approve the petition for rulemaking that would provide more protective radiation standards at older nuclear plants like Limerick, January 2007
3. Childhood Cancer Rates - 92.5% Higher than the National Average in Six Communities Close to Limerick Nuclear Power Plant (1995 to 1999). Alarming Upward Trend in Childhood Cancer Rates from the mid 1980s when Limerick Started Operating to the late 1990s. Data Source: PA Cancer Registry
4. Childhood Cancer Deaths (Ages 1 to 14) 1981-89 to 1990-98. Dramatic Increases
Data Source: CDC
5. "Radioactive Baby Teeth: The Cancer Link" by Joseph Mangano, March, 2008
6. Radiation in Baby Teeth, Highest Near Limerick Nuclear Plant. Reported November 2003
7. Child Cancer Soars In Counties Near Limerick Nuclear Plant - Reported April, 2005
8. "Child Cancer Risk Higher Near Nuclear Plants: German Study". Reported December 2007. Study confirms connection between increased risk of childhood cancer and the distance between a home and a nuclear plant.
9. "Case-Control Study on Childhood Cancer in the Vicinity of Nuclear Power Plants in Germany 1980-2003", European Journal of Cancer, October 2007
10. "Increased Cancers Near Nuclear Plants", New Scientist, 2008. 17 research papers covering 136 nuclear sites in the UK, Canada, France, the US, Germany, Japan, and Spain all found higher rates of childhood cancer depending on proximity to the nuclear facilities. European Journal of Cancer Care vol 16, p355 "Childhood Cancer in the Vicinity of Nuclear Power Plants", Children living within 5 kilometers of nuclear plants were more than twice as likely to contract cancer as those living further away - Published in the International Journal of Cancer (vol 122, p 721) and the European Journal of Cancer (vol 44, p 275).
11. "Radiation and Children: The Ignored Victims", Nuclear Information Resource Service, August 2004

12. EPA said, Children can be up to 10 times more vulnerable to harmful impacts from hazardous chemicals such as radiation than adults - EPA moves to protect kids from chemicals - 2003
13. Children Most At Risk Near Limerick Nuclear Plant - 22 Schools Within 3 Miles - List and Map
14. Cancer Rates in Six Communities Close to Limerick Nuclear Plant are Far Higher than the National and Tri-County Averages for 8 of 11 of the most common US Cancers (1995 to 1999). Data Source: PA Cancer Registry
15. Alarming County Cancer Increases Since Limerick Started Operating in 1985
Increases from 1985-86 to 1996-97 Data Source: PA Cancer Registry
16. Thyroid Cancer Incidence Skyrocketed with a 128% Increase since Limerick Nuclear Plant started operating in 1985. Thyroid Cancer Rates in 1998, 1999, and 2000 were about 75% Higher than the US Rate, which is also rising. Source: PA Cancer Registry
A Thyroid Cancer Epidemic Was Linked With Nuclear Plants in a 2009 Scientific Article.
Evidence suggested the closer you live to Limerick, the more risk of getting Thyroid Cancer.
17. Leukemia Rates In Six Communities Near Limerick Nuclear Power Plant Nearly Double State Average (1985 to 1994). Source: PA Cancer Registry. 48% County Increase Leukemia since Limerick Started Operating in 1985 (1985 to 1997). County - PA Cancer Registry. Leukemia Overview Near Limerick and Research Links to Low-Level Radiation.
18. Brain / Central Nervous System Cancers among the highest in children in six communities close to Limerick. Upward trend similar to rising childhood cancer rates after Limerick started operating in 1985. Brain Cancer - significantly higher closest to Limerick Nuclear Plant.
19. Breast Cancer Far Higher Than The National and Tri-County Averages (1995 to 1999), in Six Communities Close to Limerick Nuclear Power Plant (all ages). Highest rates among young women. 61% County Increase 1985-86 to 1996-97 Sources: PA Cancer Registry Research Links to Low Level Radiation.
20. Ionizing Radiation From Nuclear Plants Can Affect the Whole Body - Body Chart and List
21. "No Safe Dose" - "Biological Effects of Ionizing Radiation", National Academy of Sciences BEIR VI Report, 2005
22. No Safe Dose - Compilation of Quotes on Radiation Exposure Risks From Scientific Experts - Nuclear Information Resource Service, June 2003
23. "Hidden Radioactive Releases from Nuclear Power Plants in the United States", Nuclear Information and Resources Service, November 2005
24. "Nuclear Reactor Emissions are Toxic", Radiation and Public Health Project Brochure, 2009
25. Limerick Nuclear Plant's Radionuclides Found Above Background in Surface Water, Drinking Water, Fish, Sediment, Broad Leaf Vegetation - Lists From Limerick's 2007 Radiation Report to NRC - ACE Analysis of Findings According to Environmental Experts
26. Exelon's Annual Radioactive Release Report No.35 to the Nuclear Regulatory Commission. - Selected Pages Document That Radiation Is Emitted From Limerick Nuclear Plant.
27. Limerick Nuclear Power Plant has Accidental Radiation Release - Example: Pottstown Mercury March 2003 - Accidental radiation releases are not measured or reported.
28. "Nuclear Power Causes Cancer: What Industry Doesn't Want You To Know" August, 2009 article by Samuel S. Epstein, Cancer Prevention Expert at U. of IL School of Public Health

29. "Facts Strongly Suggest Nukes Are Not Safe" Article and Sources by Joseph Mangano, MPH MBA, RPHP Executive Director 2009 www.radiation.org
30. Radiation Standards - Comments to NRC by Joseph Mangano, MPH MBA Radiation and Public Health Project Director. Professional Resume of Joseph J. Mangano, Director, RPHP, 2010 with selected lists of publications.
31. Ernest Sternglass, Ph.D, Emeritus Professor of Radiological Physics - Presentation in Pottstown 2004 / Janette Sherman, M.D., Toxicologist and Doctor of Internal Medicine, Presentation in Pottstown 2000.
32. "Chernobyl: Lessons Learned" Children are by far the most vulnerable to radiation exposure, even in relatively small doses. Children exposed to radiation suffer from higher cancer rates, and have a greater likelihood of developing breast cancer as adults. American Academy of Pediatrics concluded children are extra sensitive to the DNA-damaging effects of radioactive energy. Life Extension, Page 60, December 2004

WHY YOU SHOULD CALL ELECTED OFFICIALS TODAY

No dose too low

Every radiation exposure can cause cancer

~ A NUKEWATCH FACT SHEET ~

There is no safe level of exposure to radiation, even legally "allowable" doses. Every federal agency that regulates industrial releases or the medical uses of radiation warns that any external or internal exposure to radiation, no matter how small, increases one's risk of cancer.

NRC and PA DEP are quick to down-play or outright misstate the potential health and environmental consequences of risks from Limerick Nuclear Plant's routine and accidental radiation releases.

The second or third sentence in each Limerick reactor incident or radiation release story often from the nuclear industry includes the phrase "no danger to the public".

New York Times reported on increased cancer risk from radiation: "But even the new estimate that radiation is a more potent carcinogen than previously believed should cause no concern for the average person, experts said, because the public is not exposed to enough radiation to exceed levels considered safe."¹ **This is false.**

➤ **Today radiobiologists all agree that "one can no longer speak of a 'safe' dose level."² What should have been reported is that the public is not supposed to be exposed to doses that exceed *allowable* levels.**

Following are the official U.S. government regulatory agency assessments:

U.S. Environmental Protection Agency

"Based on current scientific evidence, any exposure to radiation can be harmful (or can increase the risk of cancer). In other words, it is assumed that no radiation exposure is completely risk free."³

"[T]here is no level below which we can say an exposure poses no risk. ... Radiation is a carcinogen. It may also cause other adverse health effects, including genetic defects in the children of exposed parents or mental retardation in the children of mothers exposed during pregnancy."⁴

"Current evidence suggests that any exposure to radiation poses some risk, i.e. there is no level below which we can say an exposure poses no risk."⁵

U.S. Department of Energy

"[T]he effects of low levels of radiation are more difficult to determine because the major effect is a very slight increase in cancer risk. However, U.S. Government regulations assume that the effects of all radiation exposures are cumulative and should be limited as much as reasonably possible."⁶

U.S. Nuclear Regulatory Commission

"[T]he radiation protection community conservatively assumes that any amount of radiation may pose some risk for causing cancer and hereditary effect, and that the risk is higher for higher radiation exposures. A linear no-threshold dose-response relationship is used to describe the relationship between radiation dose and the occurrence of cancer. ... any increase in dose, no matter how small, results in an incremental increase in risk."⁷

U.S. Department of Health and Human Services

"Ionizing radiation is invisible, high-frequency radiation that can damage the DNA or genes inside the body.

"Some patients who receive radiation to treat cancer or other conditions may be at increased cancer risk. ... it is possible that there is a small risk associated with this exposure.

"... children whose mothers received diagnostic X-rays during pregnancy. ... were found to have increased risks of childhood leukemia and other types of cancer, which led to the current ban on diagnostic X-rays in pregnant women."⁸

National Academy of Sciences

The National Academy of Sciences' 7th study on the effects of radiation exposure declared that any exposure, regardless of how small, may cause the induction of cancer. BEIR-VII also dismissed as baseless the industry-sponsored sham "hormesis" theory that some radiation exposure is good for you.⁹ Committee Chair Richard Monson of Harvard's School of Public Health said, "The scientific research base shows that there is no threshold of exposure below which low levels of ionized radiation can be demonstrated to be harmless or beneficial."¹⁰

National Council on Radiation Protection

"... every increment of radiation exposure produces an incremental increase in the risk of cancer."¹¹

1. Philip Hilts, "Higher Cancer Risk Found in Low-Level Radiation," *New York Times*, Dec. 20, 1989.

2. Ian Fairlie & Marvin Resnikoff, "No dose too low," *The Bulletin of the Atomic Scientists*, Nov/Dec 1997, p. 54

3. U.S. EPA, "Ionizing Radiation Series," No.2, Air & Radiation, 6601J, EPA 402-F-98-010, May 1998.

4. U.S. EPA, "Radiation: Risks & Realities," Air & Radiation, 6602J, E PA 402-K-92-004, Aug. 1993.

5. *Ibid.*

6. U.S. Dept. of Energy, DOE/NE-0074, "Understanding Radiation," p. 8 & 9.

<http://www.ne.doe.gov/pdfFiles/UNDERRAD.PDF>.

7. U.S. NRC, "How Does Radiation Affect the Public?" www.nrc.gov/what-we-do/radiation/affect.html.

8. U.S. Dept. of Health & Human Services, "Cancer and the Environment: Ionizing radiation," p. 10.

www.cancer.gov/images/Documents/5d17e03e-b39f-4b40-a214-e9e9099c4220/Cancer%20and%20the%20Environment.pdf.

9. National Academy of Sciences, "Health Risks from Exposure to Low Levels of Ionizing Radiation: BEIR VII, Phase 2," Committee to

Assess Health Risks from Exposure to Low Levels of Ionizing Radiation, National Research Council, June 29, 2005.

10. Associated Press, "Study: No Radiation Level Safe," June 29, 2005.

11. National Council on Radiation Protection, "Evaluation of the Linear-Non-threshold Dose-Response Model for Ionizing Radiation," NCRP report 136, Bethesda, MD, June 4, 2001, cited in *Science for Democratic Action*, IEER, June 2005.

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Dangerous Deception!

WHY PERMISSIBLE DOES NOT MEAN SAFE.

Evidence Compiled By ACE Since 2000 Shows Why We Can't Believe Illogical, Unsubstantiated Claims By NRC and Exelon When They State That Limerick's Routine Radiation Releases Are Too Small To Cause Harm.

Research By Independent Scientists Show There Is No Safe Dose Of Exposure To Radiation. The 2005 National Academy of Sciences BEIR VII STUDY, funded by the EPA, found that the smallest radiation dose has the potential to cause increased risk to humans.

Limerick's Routine Radiation Emissions Are NOT Safe. And, Deception In Denying Harms INCREASED March, 2011.

AFTER Japan's Nuclear Disaster March, 2011, NRC Legally Sanctioned INCREASED RADIATION HARM When Announcing:

BACKGROUND RADIATION WAS INCREASED

From 360 to 620 Millirems Per Year

➤ **This Means Even More Deception In Exelon's Radiological Monitoring Reports For Limerick Nuclear Plant.**

PLUS

January 15, 2009 - Right Before The Bush Administration Departed
<http://www.committeetobridgethegap.org/radiation.html>.

RADIATION EXPOSURE LIMITS WERE WEAKENED

By The Bush Administration's EPA - An Action Sought By NRC And DOE

DRASTIC HIKES WERE PERMITTED IN RADIATION EXPOSURE LIMITS FOR DRINKING WATER, AIR, AND SOIL

Example:

- **What Drastic Hikes In Radiation Limits Mean To Residents In Our Region**

DRINKING WATER - EPA RADICALLY INCREASED PERMISSIBLE RADIATION LIMITS

Increased Limits Would Permit Radionuclide Concentrations

- **Up To 7 Million Times Higher Than Current Radiation Standards In The Safe Drinking Water Act**

Examples: Radical Increases In Permissible Radiation Concentrations In Water

Strontium-90	Nearly 1000 Fold Increase
Iodine-131	3000 to 100,000 Fold Increase

What This Means To Drinking Water Impacted By Limerick Nuclear Plant Operations

- 1) **Schuylkill River** - Limerick Nuclear Plant discharges radioactive wastewater into this major source of drinking water 24 hours a day, 365 days a year (over 5 billion gallons each year). Limerick's waste water contains a broad range of radionuclides. Astronomical permissible limits allow Exelon to irresponsibly assert there is no health threat because Limerick meets permissible limits.
- 2) **Radioactive Groundwater** - Limerick leaks into groundwater under the site have led to a broad range of radionuclides detected in 15 of 15 monitoring wells at the Limerick site. Many residential wells are within a short distance from Limerick. Radioactive levels can rise dramatically in residents' drinking water and still irresponsibly be called safe.

CLEAN-UP - RADIATION STANDARDS WERE WEAKENED

Radiation Clean-Up Standards Were Drastically Weakened To Be

- **Thousands Of Times More Lax Than Previous Radiation Clean-Up Standards.**

PUBLIC HEALTH WAS OVERRIDDEN BY ECONOMIC CONSIDERATIONS

Rather than specify clean-up standards to protect health, "benchmarks" were weakened to allow radiation doses so immensely high that:

✓ **1 in 4 People Can Get Cancer, On Top of Their Normal Cancer Risk.**

Lax Unprotective Radiation Clean-Up Standards Allow Exelon to Avoid Safe, Comprehensive Clean Up From Limerick Nuclear Power Plant's Radioactive Emissions Into The Region's Water and Soil.

✓ **Vegetation, Food, Milk, and Fish Can Remain Contaminated, Further Jeopardizing Public Health In Our Region.**

Drastically Relaxing Clean-Up Standards Could Have Serious Impacts To Our Region In The Event Of A Meltdown At Limerick Nuclear Plant.

OVER 200 MELTDOWN RADIONUCLIDES COULD BE RELEASED - Consider The Impacts From Over 200 Radionuclides That Could Be Released In A Meltdown, Listed In The Reactor Safety Study (WASH-1400) (commonly known as the Rasmussen Report) Published by the US Nuclear Regulatory Commission 1974

➤ **The Following 54 Are Among The Most Dangerous Radionuclides Released In A Meltdown With Half-Lives Up To 24,000 Years**

Radioactive Inventory				
No.	Radionuclide	(Source Term in curies)		Half Life
==	=====	=====	=====	=====
1	Cobalt-58		780 thousand	10.1 weeks
2	Cobalt-60		290 thousand	5.25 years
3	Krypton-85		560 thousand	10.8 years
4	Krypton-85m		24 million	4.4 hours
5	Krypton-87		47 million	1.25 hours
6	Krypton-88		68 million	2.8 hours
7	Rubidium-86		26 thousand	2.67 weeks
8	Strontium-89		94 million	7.4 weeks
9	Strontium-90	3 million	700 thousand	30.2 years
10	Strontium-91		110 million	9.7 hours
11	Yttrium-90		390 thousand	2.67 days
12	Yttrium-91		120 million	8.4 weeks
13	Zirconium-95		150 million	9.3 weeks
14	Zirconium-97		150 million	17.0 hours
15	Niobium-95		150 million	5.0 weeks
16	Molybdenum-99		160 million	2.8 days
17	Technetium-99m		140 million	6.0 hours
18	Ruthenium-103		110 million	5.64 weeks
19	Ruthenium-105		72 million	4.44 hours
20	Ruthenium-106		25 million	1.0 years
21	Rhodium-105		49 million	1.50 days
22	Tellurium-127	5 million	900 thousand	9.38 hours
23	Tellurium-127m	1 million	100 thousand	15.6 weeks
24	Tellurium-129		31 million	1.15 hours
25	Tellurium-129m	5 million	300 thousand	8.16 hours
26	Tellurium-131m		13 million	1.25 days
27	Tellurium-132		120 million	3.25 days
28	Antimony-127	6 million	100 thousand	3.88 days
29	Antimony-129		33 million	4.30 hours
30	Iodine-131		85 million	8.05 days
31	Iodine-132		120 million	2.30 hours
32	Iodine-133		170 million	21.0 hours
33	Iodine-134		190 million	53 minutes
34	Iodine-135		150 million	6.72 hours
35	Xenon-133		170 million	5.28 days

36	Xenon-135		34 million	9.2 hours
37	Cesium-134	7 million	500 thousand	2.05 years
38	Cesium-136		3 million	13.0 days
39	Cesium-137	4 million	700 thousand	30.1 years
40	Barium-140		160 million	12.8 days
41	Lanthanum-140		160 million	1.67 days
42	Cerium-141		150 million	4.6 weeks
43	Cerium-143		130 million	1.38 days
44	Cerium-144		85 million	40.6 weeks
45	Praseodymium-143		130 million	13.7 days
46	Neodymium-147		60 million	11.1 days
47	Neptunium-239	1 billion	640 million	2.35 days
48	Plutonium-238		57 thousand	89.0 years
49	Plutonium-239		21 thousand	24,000 years
50	Plutonium-240		21 thousand	6,571 years
51	Plutonium-241	3 million	400 thousand	14.6 years
52	Americium-241	1 thousand	7 hundred	410.7 years
53	Curium-242		500 thousand	23.3 weeks
54	Curium-244		23 thousand	18.1 years

We're Overexposed To Radiation, Even Without A Limerick Nuclear Disaster

March 16, 2011 - Shortly After Japan's Nuclear Plants Started Releasing Massive Radiation Into The Air, Water, Soil, and Vegetation,

➤ **NRC Announced Another Drastic Increase In Background Radiation Dose From 360 To 620 Millirems Per Year**

History of Radiation Dose Limits:

- ✓ Radiation Limits were raised after Chernobyl: From 80-100 Millirems Per Year to 360 Millirems Per Year.
- ✓ Natural Radiation - Originally 60-80 Millirems Per Year Increased to 80-100 Millirems Per Year in 1964 (Secret Fallout by Ernest Sternglass - Pg. 213)

By 2009, Americans Were Receiving Radiation Doses Each Year That Doubled Yearly Radiation Dose Levels From The 1980s (Reported May 5th, 2009) <http://nukefree.org/news/USradiationdosehasdoubled>

Americans (on average) receive more than twice as much radiation each year as in 1980s, according to National Council on Radiation Protection and Measurements.

- Logically, people living near routine radiation emissions from nuclear plants, like Limerick, are receiving more radiation doses than the average population.
- Raising Radiation Limits Increases Risks - It Doesn't Reduce Them.

Significance Of Increased Background Related to Limerick Nuclear Plant's Yearly Radiological Monitoring Report:

- In Essence, Limerick Received Approval for Major Increases in Routine Radiation Releases into Our Air, Water, Soil, Vegetation, Fish, and Milk. Radiation Levels Detected in These Routes of Exposure Will Not Be Reported if They are Under 620 Millirems Per Year.
- Limerick Nuclear Plant will only report on radionuclides determined to be "above background", now arbitrarily determined by NRC to be 620 Millirems Per Year, due to the Japan nuclear disaster.
- This allows residents to be further deceived about additive, cumulative, and synergistic radiation doses they are receiving from Limerick Nuclear Plant's emissions in many routes of exposure.

The Precautionary Principle

“When an activity raises threats of harm to human health or the environment, precautionary measures should be taken, even if some cause and effect relationships are not fully established scientifically.”

If someone asks what can be done to get the Greater Pottstown Community back on track and prevent our neighbors from suffering more environmentally related cancers and other illnesses, your answer should be contact your elected officials and insist they follow and adopt the Precautionary Principle.

It is the duty of our officials to support the Environmental Amendment of the PA Constitution and the Mission of PA DEP and NRC. We have the right to clean air and water and protection of our health and safety from air, land, and water pollution.

If you really care about helping others and the future of Pottstown, you will do this to let Harrisburg know what our community is having to put up with. Documented evidence of harm shows that DEP and NRC are failing to protect us and our basic right to a healthy future. And, EPA just verified that current standards don't protect our children.

PA cancer registry statistics document alarming breast cancer rates, as well as childhood cancers and many others, all far higher than the nation and tri county. These elevations can't all be blamed on smoking and lifestyle habits, when people everywhere have similar habits. Our region is exposed to potent cancer causing chemicals.

We can't ignore the preliminary findings of the ACE health survey, which clearly shows hot spots and upward trends in PA Cancer Registry statistics. EPA also recently confirmed what I have said for many years, there are many illnesses elevated here in addition to cancer.

There is a tendency to emphasize detection and treatment of disease, especially cancer, which is certainly very necessary. But common sense should tell us that PREVENTION should be a number one objective for control of environmental pollution.

1. Preventing pollution would reduce our higher rates of asthma, birth defects, and learning disabilities, as well as cancer.
2. It would help reduce the astronomical and escalating health costs for detection and treatment of diseases and provide a brighter future for our children.
3. And, think of the suffering that prevention could avoid.
4. Prevention could also help our Pottstown community recover from the kind of degradation which has occurred

The Precautionary Principle would be best served by reductions of cancer causing emissions into our air, water, and soil. So, show your good will for others and join our responsible physicians in support of the Precautionary Principle.



For Immediate Release: April 5, 2010 Contact: Kirsten Stade (202) 265-7337

RADIATION EXPOSURE DEBATE RAGES INSIDE EPA — Plan to Radically Hike Post-Accident Radiation in Food & Water Sparks Hot Dissent

Washington, DC — A plan awaiting approval by the U.S. Environmental Protection Agency that would dramatically increase permissible radioactive releases in drinking water, food and soil after “radiological incidents” is drawing vigorous objections from agency experts, according to agency documents released today by Public Employees for Environmental Responsibility (PEER). At issue is the acceptable level of public health risk following a radiation release, whether an accidental spill or a “dirty bomb” attack.

The radiation arm of EPA, called the Office of Radiation and Indoor Air (ORIA), has prepared an update of the 1992 “Protective Action Guides” (PAG) governing radiation protection decisions for both short-term and long-term cleanup standards. Other divisions within EPA contend the ORIA plan geometrically raises allowable exposure to the public. For example, as Charles Openchowski of EPA’s Office of General Counsel wrote in a January 23, 2009 e-mail to ORIA:

“[T]his guidance would allow cleanup levels that exceed MCLs [Maximum Contamination Limits under the Safe Drinking Water Act] by a factor of 100, 1000, and in two instances 7 million and there is nothing to prevent those levels from being the final cleanup achieved (i.e., it’s not confined to immediate response of emergency phase).”

Another EPA official, Stuart Walker of the Office of Superfund Remediation and Technology Innovation, explains what the proposed new radiation limits in drinking water would mean:

“It also appears that drinking water at the PAG concentrations...may lead to subchronic (acute) effects following exposures of a day or a week. In a population, one should see some express acute effects...that is vomiting, fever, etc.”

“This critical debate is taking place entirely behind closed doors because this plan is ‘guidance’ and does not require public notice as a regulation would,” stated PEER Counsel Christine Erickson. Today, PEER sent EPA Administrator Lisa Jackson a letter calling for a more open and broader examination of the proposed radiation guidance. “We all deserve to know why some in the agency want to legitimize exposing the public to radiation at levels vastly higher than what EPA officially considers dangerous.”

The internal documents show that under the updated PAG a single glass of water could give a lifetime’s permissible exposure. In addition, it would allow long-term cleanup limits thousands of times more lax than anything EPA has ever before accepted. These new limits would cause a cancer in as much as every fourth person exposed.

PEER obtained the internal e-mails after filing a lawsuit this past fall under the Freedom of Information Act (FOIA) but the EPA has yet to turn over thousands more communications. “EPA touts its new transparency but when it comes to matters of controversy the agency still puts up a wall,” added Erickson, who filed the FOIA suit. “Besides the months of stonewalling, we are seeing them pull stunts such as ORIA giving us rebuttals to other EPA documents they have yet to release.”

Permissible Levels of Exposure

The US National Council on Radiation Protection and Measurement gave expression to the theoretical resolution of this human dilemma by articulating the implicit reasoning behind subsequent radiation protection standards development:[20]

1. A value judgment which reflects, as it were, a measure of psychological acceptability to an individual of bearing slightly more than a normal share of radiation-induced defective genes.
2. A value judgment representing society's acceptance of incremental damage to the population gene pool, when weighted by the total of occupationally exposed persons, or rather those of reproductive capacity as involved in Genetically Significant Dose calculation.
3. A value judgment derived from past experience of the somatic effects of occupational exposure, supplemented by such biomedical and biological experimentation and theory as has relevance.

This is now an internationally accepted approach to setting standards for toxic substances when no safe level of the substance exists.

In short, this elaborate philosophy recognises the fact that *there is no safe level of exposure to ionising radiation*, and the search for quantifying such a safe level is in vain. A *permissible* level, based on a series of value judgments, must then be set. This is essentially a trade-off of health for some 'benefit' -- the worker receives a livelihood, society receives the military 'protection' and electrical power is generated. Efforts to implement these permissible standards would then logically include convincing the individual and society that the 'permissible' health effects are acceptable. This has come to mean that the most undesirable health effects will be infrequent and in line with health effects caused by other socially acceptable industries. Frequently, however, the worker and/or public is given the impression that these 'worst' health effects are the only individual health effects. A second implication of the standards-based-on-value-judgments approach is that unwanted scientific research resulting in public scrutiny of these value judgments must be avoided.

The genetic effect considered by standard setters as most unacceptable is serious transmittable genetic disease in live-born offspring. These severely damaged children are usually a source of suffering for the family and an expense for society which must provide special institutions for the mentally and physically disabled. Severely handicapped people rarely have offspring; many die, are sterile or are institutionalised before they are able to bear children. Workers and the public are told that the probability of having such severely damaged offspring after radiation exposure within permissible levels is slight. By omission, a mildly damaged child or a miscarriage is implied to be 'acceptable'.

From a column in the *Yomiuri Shinbun* (19 January 1965; evening edition)

A nineteen-year-old girl in Hiroshima committed suicide after leaving a note: 'I caused you too much trouble, so I will die as I planned before.' She had been exposed to the atomic bomb while yet in her mother's womb nineteen years ago. Her mother died three years after the bombing. The daughter suffered from radiation illness; her liver and eyes were affected from infancy. Moreover, her father left

home after the mother died. At present there remain a grandmother, age seventy-five; an elder sister, age twenty-two; and a younger sister, age sixteen. The four women had eked out a living with their own hands. The three sisters were all forced to go to work when they completed junior high school. This girl had no time to get adequate treatment, although she had an A-bomb victim's health book.

As a certified A-bomb victim, she was eligible for certain medical allowances; but the [A-bomb victims' medical care] system provided no assistance with living expenses so that she could seek adequate care without excessive worry about making ends meet. This is a blind spot in present policies for aiding A-bomb victims. Burdened with pain and poverty, her young life had become too exhausted for her to go on

There is something beyond human expression in her words 'I will die as I planned before.'

Quoted in Kenzaburo Oe, *Hiroshima Notes*, YMCA Press Tokyo (English translator Toshi Yonezawa; English editor David L. Swain).

Standard setters judge that the most severe damage done directly to the person exposed is a fatal radiation-induced cancer, and again, this is a rare occurrence when exposure is within permissible levels. All other direct damage is by omission considered 'acceptable'.

In its 1959 report recommending occupational standards for internal radiation doses (i.e. radioactive chemicals which are permitted to enter the body through air, water, food or an open wound), the International Commission on Radiological Protection (ICRP) formed the following definition:

A permissible genetic dose [to sperm and ovum], is that dose [of ionising radiation], which if it were received yearly by each person from conception to the average age of childbearing [taken as 30 years], would result in an acceptable burden to the whole population.[16] [Emphasis added.]

This might be paraphrased to say that the general public (governments) may be willing to accept the number of blind, deaf, congenitally deformed, mentally retarded and severely diseased children resulting from the permissible exposure level. Defined this way, the problem becomes primarily an economic one, since society needs to estimate the cost of providing services for the severely disabled. Once reduced to an economic problem, some nations may choose to promote early detection of foetal damage during pregnancy and induced abortion when serious handicap is suspected. When a foetus is aborted prior to sixteen weeks' gestation the event may not need to be reported and included in vital statistics. It becomes a non-happening, and the nation appears to be in 'good health', having reduced the number of defective births.

Mild mutations, such as asthma and allergies, are ordinarily not even counted as a 'cost' of pollution. The economic burdens, 'health costs', fall more on the individual and family than on the government. Their pain and grief do not appear in the risk/benefit equation. Parents and children are unaware of the 'acceptable burden' philosophy.

The prediction of the magnitude of the burden of severe genetic ills on an exposed population is essential to this philosophy. However, the data accumulated at Hiroshima and Nagasaki did not give clear answers. Either through ineptitude or loss of survivors of the bombing, who died before their story was told, the researchers failed to find any severe genetic ills clearly attributable to the parental exposure to radiation at low doses.[21] Probably the more fragile individuals in the population died from the blast, fire and trauma of the bombs, the women not surviving long enough to become pregnant.[22]

Governments could not use the research on genetic damage in children of medical radiologists,[23] although this damage was measurable, because, in the early days, radiation exposure to physicians was not measured. No quantitative dose/response estimates could be derived.

Animal studies of radiation-related genetic damage abounded, and the recommending body, ICRP, used (and still uses) mouse studies as a basis of its official predictions of the severe genetic effects of ionising radiation in humans.

As late as 1980, a US National Academy of Science publication from its committee on the Biological Effects of Ionising Radiation[24]stated:

New data on induced, transmissible genetic damage expressed in first generation progeny of irradiated male mice now allow direct estimation of first generation consequences of gene mutations on humans . . . As with BEIR I, a major obstacle continues to be the almost complete absence of information on radiation-induced genetic effects in humans. Hence, we still rely almost exclusively on experimental data, to the extent possible from studies involving mammalian species [i.e. mice].

These mouse studies are used as the basis of prediction, and permissible doses are set so that the expected number of severe transmittable genetic effects in children of those exposed could be presumed to be an *acceptable* burden for governments choosing a nuclear strategy.

The introductory section of ICRP Publication 2, 1959, states:

The permissible dose for an individual is that dose, accumulated over a long period of time or resulting from a single exposure, which, in the light of present knowledge carries a negligible probability of *severe* somatic [damage to the individual] or genetic [damage to the offspring] injuries, furthermore, it is such a dose that any effects that *ensue more frequently* are limited to those of a minor nature that would not be considered *unacceptable* by the exposed individual and by competent medical authorities. Section 30.[16] [Emphasis added.]

Mild mutations are notably happenings of a minor nature, normally neither reported nor monitored in the population. They are likely to be statistically hidden by normal biological variations and unconnected in the mind of the individual or his/her physician with the exposure. The publication continues: The permissible doses *can therefore be expected to produce effects* [illnesses] that could be detectable only by statistical methods applied to large groups. Section 31.[16] [Emphasis added.]

In spite of this clarity, no such statistical audit of all health effects including chronic diseases in exposed people and mild mutations in their offspring has ever been done. More than 25 years have expired since this document was published and the world is more than 35 years into the nuclear age.

As late as 1965, ICRP Publication 9[25] stated:

The commission believes that this level [5 rems radiation exposure per 30 years for the general public] provides *reasonable latitude* for the expansion of atomic energy programs in the foreseeable future. It should be emphasised that the limit may not in fact represent a proper balance between possible harm and probable benefit because of the uncertainty in assessing the risks and benefits that would justify the exposure. [Emphasis added.]

The committee protected itself against accusations of wrongdoing but failed to protect the public from its possible error. It defines its role as recommending, with the responsibility of action to protect worker and public health resting with individual national governments. Governments in turn tend to rely on ICRP recommendations as the best thought of internationally respected experts.

In spite of this uncertainty about responsibility and safety levels for exposure of the public, 5 rem *per year*, rather than per 30 years, was permitted for workers in the nuclear industry. The 5 rem per 30 years was set as the *average* dose to a population, with a maximum of 0.5 rem per year (15 rem per 30 years) for any individual member of the public.

For twenty years, between 1945 and 1965, health research on the effects of ionising radiation exposure has focused on *estimating* (not measuring) the number of *excess* radiation-induced fatal cancers and *excess severe* genetic diseases to be expected in a population (i.e. a whole country) given the *average estimated* exposure to radiation for the country. Disputes among scientists usually have to do

with the magnitude of these numbers. Omitted from this research are other radiation-related human tragedies such as earlier occurrence of cancers which should have been deferred to old age or even might not have occurred at all because the individual would have died naturally before the tumour became life-threatening. These are not excess cancers, they are accelerated cancers. This approach also omits other physiological disorders such as malfunctioning thyroid glands, cardio-vascular diseases, rashes and allergies, inability to fight off contagious diseases, chronic respiratory diseases and mildly damaged or diseased offspring. The implications of such 'mild' health effects on species survival seem to have either escaped the planners of military and energy technology, or to have been deliberately not articulated. Other obvious limitations of this national averaging approach include the failure to deal with global distribution of air and water with the result that deaths and the cumulative damage to future generations are not limited to one country.

The usual procedure for setting the standard for a toxic substance or environmental hazard is to decide the relevant medical symptoms of toxicity and determine a dose level below which these symptoms do not occur in a normal healthy adult. This cut-off point is sometimes called the tolerance level and it represents a sort of guide to the human ability to compensate for the presence of the toxic substance and maintain normal health. The tolerance level for a substance, if one can be determined, is then divided by a factor (usually 10) to give a safe level. This allows for human variability with respect to the tolerance level and also for biological damage which may occur below the level at which there are visible signs of toxicity, i.e. sub-clinical toxicity.

Human experience with ionising radiation had been recorded for more than fifty years prior to the nuclear age, the early history of handling radioactive material having been fraught with tragedy. The discoverer of the X-ray, W. K. Roentgen, died of bone cancer in 1923, and the two pioneers in its medical use, Madame Marie Curie and her daughter, Irene, both died of aplastic anaemia at ages 67 and 59 respectively. At that time, bone marrow studies were rarely done, and it was difficult, using blood alone, to distinguish aplastic anaemia from leukaemia. Both diseases are known to be radiation-related. Stories of early radiologists who had to have fingers or arms amputated abound. There were major epidemics among radiation workers, such as that among the women who painted the radium dials of watches to make them glow in the dark. Finally, there were the horrifying nuclear blasts in Hiroshima and Nagasaki.

The painful period of growth in understanding the harmful effects of ionising radiation on the human body was marked by periodic lowering of the level of radiation exposures permitted to workers in radiation-related occupations. For example, permissible occupational exposure to ionising radiation in the United States was set at 52 roentgen (X-ray) per year in 1925,[26] 36 roentgen per year in 1934,[27] 15 rem per year in 1949[28] and 5 to 12 rem per year from 1959 (depending on average per year over age 18) to the present.[29] Recently there has been an effort to increase permissible doses of ionising radiation to certain organs such as thyroid and bone marrow[30] in spite of research showing the radiosensitivity of these tissues. This newer trend probably reflects economic rather than physiological pressures, especially given the lack of an acceptable audit of physiological cost.

Radiation's Harmful Health Impacts

ACE Overview - February, 2007

Since 1995, ACE has been collecting research on the harmful health impacts of radiation exposure. A body of scientific evidence shows there is no safe level of radiation exposure.

Research shows that low dose radiation exposure over time can be just as harmful as one high level dose. With every dose comes an added risk.

- ✓ Government radiation standards are based on unprotective, outdated science. They fail to protect public health.

Current radiation standards are based on an average healthy male adult, not fetuses, children, and those already sick.

- ✓ Radiation standards currently ignore the unique vulnerability of fetuses and children, as well as people already sick and the elderly.

ACE collected an enormous body of documented research showing radiation can harm human health, even at low levels, such as levels regularly released into the air, water, and soil during everyday routine operations from Limerick Nuclear Power Plant.

- ✓ “Allowable” radiation limits for Limerick Nuclear Power Plant’s routine radiation releases into air and water are based on outdated science and unprotective standards. “Allowable” does not mean safe.

RADIATION - NO SAFE DOSE

For many years well renowned scientists too numerous to mention, tried to warn the public that there is no safe dose of radiation exposure. “No Safe Dose” quotes by leading radiation experts were compiled by Cindy Folkers, Nuclear Information and Resource Service at www.nirs.org nirsnet@nirs.org

Research Shows There is NO SAFE LEVEL of EXPOSURE To Routine Radiation Coming Out Of Nuclear Power Plants.

June 29, 2005, the National Academy of Science released a report titled “The Biological Effects of Ionizing Radiation,” (BEIR VII), stating that:

- ✓ *“the smallest dose of low-level ionizing radiation has the potential to cause an increase in health risks to humans.”*
- ✓ *“The health risks – particularly the development of solid cancers in organs – rise proportionally with exposure. As the overall lifetime exposure increases, so does the risk.”*
- ✓ *“In living organisms, such radiation can cause DNA damage that could eventually lead to cancers.”*

It is the seventh in a series of assessments from the Research Council called the Biological Effects of Ionizing Radiation. The report provides a comprehensive assessment of these risks based on a review of the scientific literature from the past 15 years. <http://www.nationalacademies.org/morenews/>

The report was sponsored by the U.S. departments of Defense, Energy, and Homeland Security, the U.S. Nuclear Regulatory Commission, and the U.S. Environmental Protection Agency. The National Research Council is the principal operating arm of the National Academy of Sciences and the National Academy of Engineering. It is a private, nonprofit institution that provides science and technology advice under a congressional charter.

Why aren’t regulators taking the BEIR VII research into account for nuclear power plant radiation releases into air and water radiation?

Research Shows Exposure To Radiation Increases Risk Of Damage To:

- Tissues
- Cells
- DNA

Radiation Exposure Potentially Causes Programmed Cell Death (apoptosis)

Radiation Exposure Increases Risk Of:

1. Cancer
2. Leukemia
3. Birth Defects
4. Genetic Mutations
5. Reproductive Disorders
6. Immune Disorders
7. Cardiovascular Disorders
8. Endocrine System Disorders

A body chart in the ACE office shows 29 different kinds of ionizing radiation and the specific parts of the body affected, such as the thyroid, lungs, skin, spleen, liver, kidneys, ovaries, bone, and muscle.

Experts On Radiation Exposure and Public Health

To better understand the relationship between the radiation regularly released during routine operations at Limerick Nuclear Power Plant and alarming increases of cancer and leukemia and other serious increasing problems such as infant mortality, ACE hosted presentations in Pottstown by experts in the field of radiation exposure.

- In 2000, Janette Sherman, a doctor of internal medicine and toxicologist, made a presentation at our hospital for physicians and others, as well as a public presentation.
- In 2001, Joseph Mangano, Radiation and Public Health Project national director, came to Pottstown to begin their "Tooth Fairy Study" in our region.
- In 2003, Ernest Sternglass, Ph.D., a world renowned expert of radiological physics, made a presentation in Pottstown connecting nuclear bombs, nuclear power plant radiation, and their impact on human health.

Radiation's harmful impacts on fetuses and children - our local retired radiologist.

Fred Winter, M.D., was instrumental in gathering medical research on the harmful health impacts of radiation from the medical library. His concern about radiation exposure, especially for fetuses and children, led him to send numerous letters expressing concern to government and agency officials, as well as the local newspaper urging precautionary action.

Polonium 210 – An Example

The serious radiation threats from Limerick Nuclear Power become increasingly more apparent with incidents such as the Polonium 210 radiation used to kill a Russian man, November, 2006. A Canadian study proves Polonium 210 was just one of 211 radioactive chemicals still found in their "spent fuel" rods 10 years after removal from their reactors.

Human Harm From Low-Level Exposure

This report from **Rachel's Hazardous Waste News #185 - June 13, 1990**, discusses human data provided by accidents that released large amounts of ionizing radiation at Chernobyl, Soviet Union (1986), Three Mile Island, PA (1979), and Savannah River, Georgia (1970). These reports are from a shocking book: *Deadly Deceit*, by Jay Gould and Ben Goldman.

- These three accidents indicate that the lowest doses of ionizing radiation cause the greatest human damage per unit of radiation.

- This provides confirmation that allowable limits for human exposure to ionizing radiation will allow more deaths than our government officially admits. Bomb survivor data indicate 30 times more, but even this may be low, according to Gould and Goldman.
- Bomb survivor data show: infants and children are the most sensitive to damage from low levels of ionizing radiation.
- The cumulative weight of evidence is persuasive. Over the past 15 years scientists have confirmed what the authors of “Deadly Deceit” appeared to know already in 1990, that our government is not telling the full truth about the effects of low-level radiation.

Biological Hazard of Low-Level Cobalt-60 and Other Radioactive Chemicals Released Into The Environment

This January 4, 1994 report by Dr. Ernest Sternglass, on published studies of the health effects of very low levels of radioactivity far below permitted limits discharged into the environment, indicated that the chronic, long-lasting exposures they produce appear to be thousands of times more serious per unit dose than the short exposures to X-rays or gamma rays from nuclear explosions on the basis of which standards were set. Contact ACE for a printed copy of this report.

The cumulative weight of evidence should have led the Nuclear Regulatory Commission (NRC) to require more protective radiation standards for routine radiation released every day into the air and water from nuclear power plants.

In 2007, NRC is finally considering more protective radiation standards for routine emissions from older nuclear power plants such as Limerick. ACE provided comprehensive comments to urge NRC to require more protective radiation standards for Limerick Nuclear Power Plant. We included alarming cancer statistics in Montgomery County and communities near Limerick, especially in children, and for cancers specifically linked to radiation.

August 3, 2004, Dr. Ernest Sternglass, an expert in nuclear power's radiation exposure, made a presentation in Pottstown, which enabled our community to have a better understanding of radiation health risks from living near a nuclear plant.

Ernest Sternglass, Ph.D.

Emeritus Professor of Radiological Physics

Dr. Sternglass made his first presentation in Pottstown decades ago to try to prevent unnecessary health harm by testifying in opposition to building Limerick Nuclear Power Plant.

Ernest Sternglass carried out extensive studies of the effects of nuclear fallout and reactor releases on human health, particularly on the developing fetus and infants.

- **ACE obtained copies of his slide presentation referencing research on harmful radiation health impacts, available for review.**
- **Dr. Sternglass also appeared on ACE's PCTV show, discussing the impacts of radiation on health, especially related to nuclear plants. For a video copy of his appearance on "The ACE Report" call ACE (610) 326-6433.**

Dr. Sternglass testified at hearings concerning nuclear bomb test fallout and nuclear reactor releases on human health at the U.S. Congress, the National Academy of Sciences, U.S. Government Regulatory Agencies, and State Legislatures

Ernest Sternglass is the author of over one hundred and fifty scientific papers in the areas of health effects of fission products released into the environment, instrumentation, particle physics and cosmology, and radiological imaging.

Dr. Ernest Sternglass is the Author of:

Low-Level Radiation

Published by Ballantine in 1972

Secret Fallout

Published by McGraw-Hill in 1981

Before the Big Bang

Published by Hour Walls Eight Windows, New York in 1997

Ernest Sternglass received a B.E.E., M.S., and a Ph.D from Cornell University. He started his career as Assistant to the Director of the Westinghouse Research Laboratory, 1952 to 1967, where he worked on the physics of electronic imaging systems for use in medicine and astronomy.

In 1967, Dr. Sternglass became director of the University of Pittsburgh's School of Medicine Radiological Physics and Engineering Laboratory, to develop new imaging techniques to improve the diagnostic value of X-ray and nuclear medicine examinations and to reduce the dose required using electronic and computer technology. This significantly reduced the radiation risks in mammography for detecting breast cancer.

Dr. Ernest Sternglass currently serves as the Scientific Director of the Radiation and Public Health Project, an independent non-profit research organization with headquarters in New York City.

THE RADIATION EXPOSURE SUMMARY IN THIS SECTION WAS BASED ON EVIDENCE COMPILED BY ACE SINCE 2000 AND SUBMITTED TO NRC ON THE RECORD 10-26-11 FOR LIMERICK NUCLEAR PLANT'S UPDATED ENVIRONMENTAL IMPACT STATEMENT (EIS)

SEE ADDITIONAL INFORMATION ON RADIATION DOSE IMPACTS AND LINKS TO CANCER IN ACE WEBSITE SECTIONS:

➤ **RADIATION DOSE - PERMISSIBLE DOES NOT MEAN SAFE**

➤ **CANCER AND LIMERICK NUCLEAR PLANT'S ROUTINE RELEASES**

Radiation and Public Health Project

Tooth Fairy Project / Radiation Health Impacts

www.radiation.org

Nuclear Information Resource Service

www.nirs.org

John W. Gofman, M.D., Ph.D

<http://www.anawa.org.au/power/chernobyl/htm>