

From: aceactivists@comcast.net
Sent: Tuesday, January 14, 2014 2:23 PM
To: Bower, Fred
Cc: Evan Brandt
Subject: Re: NRC Response to ACE Concerns Related to High Burnup Fuel at Limerick (EDATS 2013-0370)

1-14-14

To: Fred Bower, NRC

**From: Alliance For A Clean Environment
Dr. Lewis Cuthbert, ACE President**

**RE: NRC's Refusal To Address ACE Concerns
Related to High Burnup Fuel Use at Limerick Nuclear Plant**

Mr. Bower,

We are frustrated by your repeated refusals to actually address the many valid concerns we identified in e-mails to you about Limerick Nuclear Power Plant's use of high burnup nuclear fuel.

Your 12-31-13 e-mail to ACE stated it was the "third and final" e-mail on high burnup fuel, but none of your responses actually addressed our specific concerns, nor answered several simple questions about Limerick's use of high burnup fuel. It is inaccurate for you to claim you were "responsive in a logical, forthright and comprehensive manner". That is absolutely not true.

Millions of people in our region can face devastating consequences from Limerick's use of high burnup fuel. We need honest, straight-forward, site-specific answers from NRC, the agency responsible for protecting our safety. That is far from what we have received from you.

Your absolute refusal to address serious threats from high burnup fuel use at Limerick suggests to us that NRC has NO logical or defensible responses for NRC allowing its use BEFORE proving it would be safe for storage or transport, BEFORE Limerick's operating permit was changed, or BEFORE NRC knew how much more radioactive fission gases could be unleashed on our region.

We can only conclude:

1. NRC allowed this dangerous "NUCLEAR FUEL EXPERIMENT" at Limerick, for the purposes of Exelon profits, without adequate testing or full consideration of serious health and safety risks and the potential for eventual disaster in our region.
 - You referred us to an NRC December 2013 document which confirms the fact that NRC has allowed high burnup fuel use WITHOUT ADEQUATE TESTING TO PROVE IT IS SAFE TO USE, STORE, OR TRANSPORT.
 - NRC's "BACKGROUNDER" admits NRC is now STARTING and WILL CONTINUE testing on "how ... cladding on [high burnup] spent fuel will behave" during dry storage and transportation.
 - This testing should have been completed BEFORE NRC allowed the use of high burn-up fuel. How could NRC have allowed use of high burnup fuel BEFORE NRC knew how cladding would behave in dry storage or transport? That constitutes unbelievably inept negligence in oversight.

- **NRC is ignoring growing evidence showing why it is not safe, and allowing this experiment to continue in spite of the following:**
 - Evidence shows that high burn-up fuel has resulted in corrosion and degradation of fuel assemblies, and cracking of fuel pellets, resulting in excessive leaks of dangerous radionuclides from the fuel.
 - **Citizen Radiation Monitoring detected higher radiation in the air near Limerick.**
 - Higher radiation releases could be from higher fission gas releases due to Limerick's use of high burnup fuel.
 - **High burnup fuel remains hotter and more radioactive for longer periods. It must be stored in fuel pools as long as 20 years according to some reports. This is especially dangerous in Limerick's fuel pools, already packed far beyond design capacity.**
 - Limerick's fuel pools are packed and vulnerable to terrorist attacks, accidents, and meltdowns. They are similar to those at Fukushima, above the reactors, with no containment.
 - Limerick's fuel pools were built with substandard cement.
 - Limerick's fuel pools are already corroding and thinning at rates up to 10 times faster than anticipated.
 - **High burnup fuel is even more radioactive, creating far greater storage and transportation risks.**
 - Transport of even more dangerous and deadly radioactive waste through our densely populated Greater Philadelphia Region would increase huge unnecessary health and financial risks to millions of people.
- 2. Your refusal to tell us when Limerick started using high burnup fuel confirms for us that NRC likely allowed Limerick to start using high burnup fuel BEFORE Limerick's license conditions were amended for its use.**
- **NRC failed to inform the public about Limerick's use of high burnup fuel BEFORE ALLOWING ITS USE, and failed to provide any meaningful public process for comment on the additional health and safety risks to our region.**
- 3. Your 12-31-13 "third and final" email, refusing to provide Limerick-specific responses, suggests to us, that NRC either doesn't know the answers or can't respond without admitting to grossly negligent regulatory oversight related to high burnup fuel.**
- **NRC has provided NO VALID DEFENSE to refute our original conclusions which you characterized in your December 20, 2013 e-mail as assertions of malfeasance, when we stated:**
 - "...NRC grossly mischaracterized and mismanaged oversight of high burnup fuel..."
 - "...made unsubstantiated claims and mischaracterized NRC's negligent approval process for high burnup fuel..."
 - "It is beyond negligent for NRC to have approved use of high burnup fuel..."
 - **It is shameful that you expect and suggest the public should go to the extraordinary measure of contacting the Inspector General for answers.**
 - In reality, it is highly unlikely the Inspector General has answers about Limerick's use of high burnup fuel that we seek, or that this action would lead to the outcome we seek, which is for Limerick to STOP USING HIGH BURNUP FUEL.

Time after time, NRC has weakened regulations and made unprotective

decisions that benefit Exelon's profits related to Limerick Nuclear Plant operations.

NRC's unethical and unprotective regulatory decisions have further jeopardized our already victimized Greater Philadelphia Region.

ACE URGES NRC TO STOP LIMERICK'S USE OF HIGH BURNUP FUEL FOR ALL THE VALID REASONS WE HAVE REPEATEDLY IDENTIFIED.

This Comment To ACE 12-31-13 Is What We Have Referred To Above
Dr. Cuthbert (ACE),

I am writing you for a third and final time on the topic of high burnup nuclear fuel.

Respectfully,

Fred Bower

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From: aceactivists@comcast.net [mailto:aceactivists@comcast.net]
Sent: Friday, December 20, 2013 10:10 AM
To: Bower, Fred
Subject: ACE Response to NRC e-mail 12-11-13 - High-Burn Fuel Used At Limerick

December 20, 2013

To: NRC, Fred Bower
From: The Alliance For A Clean Environment
Dr. Lewis Cuthbert, President
Subject: HIGH-BURN NUCLEAR FUEL USE AT LIMERICK NUCLEAR PLANT

Mr. Bower,

ACE is a group of citizen volunteers trying to make our region a healthier, safer place to live. Since 2000 we investigated and uncovered numerous significant threats and harms to the health and safety of millions of people in the Greater Philadelphia Region related to Limerick Nuclear Plant. Time after time, instead of taking protective actions for the public, NRC tells us to contact the Office of Inspector General for an investigation.

Once again, instead of answering our questions and concerns, your 12-11-13 e-mail said, *"If you feel*

that NRC has mismanaged elements of our reactor oversight program, you should feel free to contact the Office of the Inspector General (OIG) at NRC."

We do feel NRC grossly mischaracterized and mismanaged oversight of high burnup fuel, but citizen volunteers should not have to contact the Office of the Inspector General for an investigation, in order to get NRC to protect public health and safety.

- 1. NRC NEVER ACTUALLY PROVED HIGH BURNUP FUEL CAN BE SAFELY STORED OR TRANSPORTED, BUT APPROVED ITS USE ANYWAY.**
- 2. NRC IS IGNORING INCREASED RADIOACTIVE THREATS TO PUBLIC HEALTH FROM USE OF HIGH BURNUP NUCLEAR FUEL.**
- 3. BASED ON INDEPENDENT EVIDENCE OF GREATER RISKS FROM RADIOACTIVE RELEASES, STORAGE, AND TRANSPORT, ACE URGES NRC TO STOP EXELON FROM USING HIGH BURNUP FUEL AT LIMERICK NUCLEAR POWER PLANT.**

Yet again, NRC is further jeopardizing long-term public health and safety for nuclear industry profits. The nuclear industry switched to high burnup fuel because it can stay in reactors six years instead of three, allowing the industry to delay or avoid procuring expensive dry cask storage systems.

People in the Greater Philadelphia Region are impacted by unprecedented threats from Limerick Nuclear Plant's high-level radioactive wastes. NRC has allowed those threats to increase for Exelon's profits. The public deserve honest answers, preventive actions, and protection. NRC is failing in its mission to protect our future.

Mr. Bower, your 12-11-13 responses to ACE still failed to answer the following questions we first asked NRC 9-13:

1. When did Limerick Nuclear Plant started using high burnup fuel?
2. When was Limerick's license amended to start using this fuel?
3. Does NRC plan to continue allowing Limerick to use this fuel, despite serious concerns about increased risks of long-term storage and transport?

You stated, *"We still cannot provide specific fuel loading information at the Limerick Nuclear Power station as it is Security-related information."*

That excuse is evasive and illogical. How can answers to the questions above be security related when U.S. DOE published a copy of the detailed inventory of all spent power reactor fuel in the U.S., including Limerick (3-31-11)?

DOE's 3-31-11 Report Shows (Limerick 1 - 2,379) (Limerick 2 - 0)

- **When did Limerick 1 start using high burnup fuel?**
- **Has Limerick 2 started using high burnup fuel? If so, when?**

You stated, *"it is information that is not normally collected by the NRC"*.

There is no excuse for NRC to have failed to collect all information on high burnup fuel use. That reveals lax, negligent oversight. There must be accountability to the public for the large volumes of the deadly, dangerous nuclear wastes used at Limerick Nuclear Plant, especially for high-burn fuel.

ACE submitted information to you 12-11-13 (restated below), showing why high burnup fuel results in unacceptable risks. In your response you ignored this information.

PLEASE PROVIDE DETAILED RESPONSES TO THE FOLLOWING CONCERNS:

With higher burn up, nuclear fuel rods undergo several risky changes that include:

- Increasing oxidation, corrosion and hydriding of the fuel cladding.
- Oxidation reduces cladding thickness, while hydrogen (H3) absorption of the cladding to form a hydrogen-based rust of the zirconium metal from the gas pressure inside the rod can cause the cladding to become brittle and fail;
- Higher internal rod gas pressure between the pellets and the inner wall of the cladding leading to higher fission gas release. Pressure increases are typically two to three times greater.
- Elongation or thinning of the cladding from increased internal fission gas pressure;
- Structural damage and failure of the cladding caused by hoop (circumferential) stress;
- Increased debris in the reactor vessel, damaging and rupturing fuel rods;
- Cladding wear and failure from prolonged rubbing of fuel rods against grids that hold them in the assembly

as the reactor operates (grid to rod fretting).

- A significant increase in radioactivity and decay heat in the spent fuel.
- A potentially larger number of damaged spent fuel assemblies stored in pools.
- Upgraded pool storage with respect to heat removal and pool cleaning.
- Requiring as much as 150 years of surface storage before final disposal.

The National Academy of Engineering of the National Academy of Sciences raised concerns about the viability of high-burnup fuel by noting,

- "the technical basis for the spent fuel currently being discharged (high utilization, burnup fuels) is not well established...."
- "Spent fuel that may have degraded after extended storage may present new obstacles to safe transport."
- "NRC has not yet granted a license for the transport of the higher burnup fuels discharged from reactors."

A New York Times story mentions:

- Fuel assemblies with enough uranium were approved by NRC to run for 6 years instead of the standard 3 years.
- "Some of the younger fuel shows signs of degrading with age."
- "The "high burn-up fuel" spent longer in the harsh environment of a reactor, and now shows signs of corrosion and cracking."

Mr. Bower, in your 12-11-13 e-mail response, you made unsubstantiated claims and mischaracterized NRC's negligent approval process for high burnup fuel.

Below ACE is responding to your 12-11-13 e-mail comments concerning NRC's handling of the use, transportation, and storage of high burnup fuel."

Your 12-11-13 e-mail stated, *"we can provide background on high burnup fuel including what NRC has done to ensure it does not pose an undue risk to public health and safety"*

ACE Responses:

In reality, NRC did NOTHING to prevent undue risk to public health and safety from use of high burnup fuel. Our radiation risks from high-burnup fuel could increase.

HIGH BURNUP FUEL CAN CAUSE:

2 to 3 Times Higher Radioactive Fission Gas Releases - logically more radiation will be released.

Significant Increased Radioactivity and Decay Heat in Limerick's Spent Fuels:

Cancer increases skyrocketed in communities near Limerick after Limerick started operating in 1985. We can't afford more radiation released from Limerick operations for any reason.

Citizen Monitoring Recently Detected Radiation Spikes Near Limerick. NRC Provided NO Proof That This Isn't From Limerick's Use of High Burnup Fuel.

1. NRC Did NO Independent Radiation Monitoring

2. NRC Failed To Respond To Concerns For Four Days

- After ACE was alerted to a higher than usual radiation spike taken from a resident's RadAlert 11-22-13, ACE started collecting regular data on radiation spikes above what ACE's RadAlert previously detected during our regular radiation monitoring in 2006.
- Due to the surprising number of radiation spikes detected over several hours, ACE contacted NRC by e-mail 11-22-13.
- Four days later, after our second e-mail alert, NRC finally responded, but claimed no problem, WITHOUT ANY INDEPENDENT NRC RADIATION MONITORING. NRC used ONLY Exelon data, even though Exelon showed it can't be trusted to provide full and accurate disclosure.
- Citizen RadAlert data since November 22, 2013 continued to show radiation spikes for several weeks.
- Bottom line, NRC waited 4 days to respond to the public about concern over radiation spikes, then dismissed citizen findings.
- Even if it can't be proven that high burnup fuel caused radiation spikes detected by citizens, NRC has NO ANSWERS for what did cause them, and we know high burnup fuel releases more radioactive gases.
- **By stopping the use of high burnup fuel, NRC could honestly claim they had prevented some of Limerick's undue risks to public health and safety.**

You used typical language to make the following deceptive claim, *"We (NRC) believe that our oversight of the industry's use of high burnup fuel provides a reasonable assurance of safety"*.

ACE Responses:

NRC is claiming reasonable assurance of safety WITHOUT SUFFICIENT EVIDENCE to support that claim. NRC CANNOT assure long-term safety.

NRC's "reasonable assurance of safety" is based on unsubstantiated claims by the nuclear industry.

- NRC jeopardized public safety by allowing the nuclear industry to save money by using this obviously more dangerous "high burnup" fuel, based ONLY on financially self-serving, unsubstantiated claims by the untrustworthy nuclear industry and their lobbyists.
- With NO PROOF of the safety of long-term storage and transport of high burnup fuel, and despite evidence suggesting it isn't safe, NRC approved use of high burnup fuel and continues to allow its use.

DOE's "Demonstration Project" proves NRC's reasonable assurance of safety is baseless.

- It will be another 4 years before the U.S. DOE and the Electric Power Energy Institute even start the demonstration project to figure out actual safety implications of "high burnup" spent fuel cask storage and transport. The Electric Power Energy Institute will design and demonstrate dry cask technology for evaluating the condition of "high burnup" spent nuclear fuel during storage.
- If it was safe, DOE would not need to begin a costly five-year "Demonstration" project, with 2017 as a target date to load the fuel into the demonstration cask. This "demonstration project", reported 11-1-13, is costly to the public, who will largely foot the \$15.8 million dollar bill. The nuclear industry, which financially benefits from the use of high burnup fuel, is only required to pay 20%.

You said, "High burnup fuel has been safely stored for many years"

ACE Responses:

Evidence suggests it cannot be stored safely, much less for the time it remains deadly.

- High burnup fuel has not been stored many years, considering this radioactive waste can stay dangerous for over a million years.
- What does NRC consider many? Math suggests high burnup fuel has NOT been in fuel pools many years.
- NRC approved high burnup fuel use since the 1990s. It can be used in reactors for 6 years.
- In the few years it has been stored, evidence shows significant increased radioactivity and decay heat, with increased corrosion, thinning, and brittleness of fuel cladding.

You said, "There are many storage system designs that have been approved for the long-term storage of high burnup fuel. A number of transportation packages have also been approved to transport high burnup fuel."

ACE Responses:

We cannot understand why NRC approved high burnup fuel use without independent proof that long-term storage or transport is safe.

- NRC issued negligent approvals, in spite of admitting there is limited data to show cladding of spent fuel with burnups will remain undamaged, even during the licensing periods.
- The evidence suggests NRC could not prove long-term storage and transport were safe when NRC approved long-term storage and transportation packages.

You said, *the Certificates of Compliance for all approved storage and transportation system designs are publically available in NRC's online documents database. in 10 CFR Part 71 or for storage in 10 CFR Part 72.*

ACE Response:

Certificates of Compliance with unprotective regulations are meaningless.

You said, "High burnup fuel, undergoes a rigorous NRC technical review. The NRC does not approve a spent fuel transportation package or storage system until it completes a full safety review and verifies the design meets the requirements for transportation".

ACE Responses:

A body of evidence suggests NRC's definition of "rigorous review" falls far short of insuring safety.

- Growing evidence shows that as a result of higher burn-ups, nuclear fuel cladding cannot be relied upon as a primary barrier to prevent the escape of radioactivity, especially during dry storage.
- The nuclear industry and NRC staff have known this for several years. Damage in the form of pinhole leaks, and small cracks can lead to breaching of fuel cladding.
- NRC admits there is limited data.
- NRC's reviews are compromised from the start, as evidenced by this very dangerous high burnup fuel fiasco.
- This is "not explicitly defined in [NRC] Regulations, staff guidance or standards."

It is beyond negligent for NRC to have approved use of high burnup fuel without solid evidence that fuel could actually be stored and transported safely.

- Unfortunately, NRC bases its technical reviews on financially self-serving information provided to NRC by the nuclear industry and supporting enterprises.
- NRC's leap of faith on behalf of nuclear industry interests must be reversed and NRC should immediately STOP the use of this dangerous process. There could be a serious radiation accident with fuels already stored.

Despite evidence of increased risk and harm, NRC continues to allow

use of this dangerous fuel. NRC never proved high burnup fuel can be safely stored or transported. NRC is ignoring increased radioactive threats to public health from use of high burnup nuclear fuel.

On behalf of the health and safety of millions of people in the Greater Philadelphia Region, ACE is urging NRC to stop the use of high burnup fuel at Limerick Nuclear Plant based on serious concerns over:

- 1. Damage to fuel rods**
- 2. More dangerous storage and transport**
- 3. Higher fission gas releases**

This request is supported by a growing body of evidence:

- 2 to 3 Times Higher Radioactive Fission Gas Releases
- Significant Increased Radioactivity and Decay Heat in Limerick's Spent Fuels
- Increased Corrosion, Thinning, and Brittleness of Fuel Cladding
- Increased Damage and Rupture of the Fuel Rods in the Reactor Vessels, Leading To Radiation Leaks in Spent Fuel Pools and Casks

From: "Fred Bower" <Fred.Bower@nrc.gov>

To: aceactivists@comcast.net

Cc: "Scott Barber" <Scott.Barber@nrc.gov>, "Eugene DiPaolo" <Eugene.DiPaolo@nrc.gov>, "Michael Scott" <Michael.Scott@nrc.gov>, "Diane Scenci" <Diane.Scenci@nrc.gov>, "Neil Sheehan" <Neil.Sheehan@nrc.gov>, "Nancy McNamara" <Nancy.McNamara@nrc.gov>, "Doug Tiff" <Doug.Tiff@nrc.gov>, "Emily Monteith" <Emily.Monteith@nrc.gov>, "Rick Ennis" <Rick.Ennis@nrc.gov>, "Christopher Jackson" <Christopher.Jackson@nrc.gov>

Sent: Wednesday, December 11, 2013 5:12:04 PM

Subject: RE: Response to ACE - High-Burn Fuel Used At Limerick (EDATS 2013-0321)

Dr. Cuthbert (ACE),

I am writing in response to your email dated October 30, 2013, which was a follow up to our October 21 response to questions you asked on high burnup fuel. We still cannot provide specific fuel loading information at the Limerick Nuclear Power station as it is Security-related information and it is information that is not normally collected by the NRC. However, we can provide background on high burnup fuel including what NRC has done to ensure it does not pose an undue risk to public health and safety.

The reactor core includes an array of fuel rods that creates heat from a controlled nuclear reaction that occurs when control rods are withdrawn. Burnup refers to the uranium consumed in the nuclear reaction within the fuel rods. It is expressed in gigawatt-days per metric ton of uranium (GWd/MTU) - a measure of how long a fuel rod is in the core and the power level it reaches. "High burnup fuel" is in the reactor core for longer than "low burnup fuel." For the purposes of spent fuel transportation, high burnup commercial spent nuclear fuel is understood to mean fuel burnup in a

reactor to greater than 45 GWd/MTU.

As stated in the Applicant's Environmental Report - Operating License Renewal Stage (<http://www.nrc.gov/reactors/operating/licensing/renewal/applications/limerick/lgs-er-web.pdf>), for the Limerick reactors, fuel enrichment and average peak rod burnup conditions are no more than 5 percent uranium-235 and 62,000 megawatt-days per metric ton of uranium (MWd/MTU), respectively.

New fuel designs, including high burnup fuel, undergo a rigorous NRC technical review, and are generally approved for use via a Topical Report that provides the technical evaluation of the new fuel design and lists any limitations for its use. Once the new fuel design is approved with an associated Topical Report, all NRC reactor licensees are permitted to use that fuel design within their reactor core without requesting specific NRC approval, as long as the core continues to meet all applicable design and safety limits. In an operating nuclear reactor, burnup is one of the many parameters that are considered in designing the fuel and core for each operating cycle. Many parameters are evaluated throughout the operating cycle to verify that design specific limits are met. Data-based, predictive tools are used to evaluate these parameters over the cycle. Throughout the cycle, physics testing is also done to confirm key physics parameters are consistent with predictions. When a new fuel is designed its use is limited by the data available to support the associated predictive tools. As such, burnup is limited for a particular fuel by the supporting predictive tools, the data supporting the predictive tools, and the requirement to not exceed any design limit. The fuel is required to meet all safety limits at all times during the operating cycle.

High burnup fuel has been safely stored for many years. There are many storage system designs that have been approved for the long-term storage of high burnup fuel. A number of transportation packages have also been approved to transport high burnup fuel. The Certificates of Compliance for all approved storage and transportation system designs are publically available in NRC's online documents database. The NRC does not approve a spent fuel transportation package or storage system until it completes a full safety review and verifies the design meets the requirements for transportation in 10 CFR Part 71 or for storage in 10 CFR Part 72. This summarizes some of our activities related to the use, transportation, and storage of high burnup fuel.

We believe that our oversight of the industry's use of high burnup fuel provides a reasonable assurance of safety. If you feel we have grossly mischaracterized or mismanaged our oversight of high burnup fuel then I suggest you contact the Office of the Inspector General as outlined below.

If you feel that NRC has mismanaged elements of our reactor oversight program, you should feel free to contact the Office of the Inspector General (OIG) at NRC. The OIG established the Hotline (**1-800-233-3497**) program to provide the NRC employee, other government employee, licensee/utility employee, contractor employee, and the public with a confidential means of reporting incidences of suspicious activity to the OIG concerning fraud, waste, abuse, and employee or management misconduct. Mismanagement of agency programs or danger to public health and safety may also be reported through the Hotline.

It is not OIG's policy to attempt to identify people contacting the Hotline. People may contact the OIG by telephone, through an online form, or by mail. There is no caller identification feature associated with the Hotline or any other telephone line in the Inspector General's office. No identifying information is captured when you submit an online form. You may provide your name, address, or phone number, if you wish.

Thank you for your email,

Fred Bower

Chief | Projects Branch 4 | Division of Reactor Projects | Region I | U.S. NRC

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✉: Fred.Bower@nrc.gov

From: aceactivists@comcast.net [<mailto:aceactivists@comcast.net>]

Sent: Wednesday, October 30, 2013 3:16 PM

To: Bower, Fred

Cc: Evan Brandt

Subject: ACE Resp to NRC - High-Burn Fuel Used At Limerick

October 30, 2013

To: NRC, Fred Bower

From: ACE, Dr. Lewis Cuthbert

RE: NRC'S Refusal To Disclose Information On Limerick Nuclear Plant's Use Of Extremely Dangerous High-Burn Nuclear Fuel

Mr. Bower,

On 10-21-13 you responded to an email ACE sent Mr. Mel Gray on September 18, 2013, regarding the use of High Burn-up Nuclear Fuel at the Limerick Nuclear Plant.

While you responded, you did NOT answer the three simple questions we asked.

1. What month and year did Exelon start using "high-burn-up fuel" at Limerick Nuclear Plant?
2. What quantity of this fuel has been used by Limerick to date?
3. Does NRC plan to continue to allow the use of "high-burn-up fuel" at Limerick?

Your failure to provide answers is unacceptable, given the facts about "High-Burn Nuclear Fuel." We are extremely concerned with good reason. The entire Greater Philadelphia Region already faces unprecedented risks and harms from Limerick Nuclear Plant's deadly high-level radioactive waste.

Growing evidence confirms devastating consequences from burning "High-Burn Nuclear Fuel". Evidence shows "High-Burn Fuel" at Limerick Can Result In:

- **Significant Increased Radioactivity and Decay Heat in Limerick's Spent Fuels**

- **2 to 3 Times Higher Radioactive Fission Gas Releases**
- **Increased Corrosion, Thinning, and Brittleness of Fuel Cladding**
- **Increased Damage and Rupture of the Fuel Rods in the Reactor Vessels, Leading To Radiation Leaks in Spent Fuel Pools and Casks**

➤ **The more "High-Burn Nuclear Fuel" used at Limerick, the greater our risks. The public has a right to full and accurate disclosure of the long-term consequences of using this fuel, with opportunity for meaningful public discussion and comment.**

By allowing "High-Burn Nuclear Fuel" to be used at Limerick Nuclear Plant, NRC has taken a dangerous leap of faith with respect to the safe operation, storage, and disposal of Limerick Nuclear Plant's spent nuclear fuel. It seems clear that NRC's decision to allow the use of "High-Burn Nuclear Fuel" has been motivated by economics. NRC bowed to the wishes of the nuclear industry, doubling the time nuclear fuel can be irradiated in a reactor. NRC admits, "there is limited data to show that the cladding of spent fuel with burnups ... will remain undamaged during the licensing period." NRC has no proof this is safe.

Your 10-21-13 e-mail said "*NRC will not disclose specific information related to ... special nuclear material in use at nuclear power plants.*" This excuse is unacceptable! **We wonder if NRC even has verifiable answers to our questions.**

NRC's own records for Limerick reveal that time after time Exelon does whatever it wants to do, making changes (mostly to reduce their cost of doing business at Limerick), then gets NRC to approve after-the-fact license amendments or other approvals, even when those amendments further jeopardize public safety.

➤ **Did Exelon start using "High-Burn Nuclear Fuel" without a prior NRC license amendment?**

We have yet to see proof this is safe! Growing evidence shows that as a result of higher burn-ups, nuclear fuel cladding cannot be relied upon as a primary barrier to prevent the escape of radioactivity, especially during dry storage. The nuclear industry and NRC staff have known this for several years. Damage in the form of pinhole leaks, and small cracks can lead to breaching of fuel cladding. This is "not explicitly defined in [NRC] Regulations, staff guidance or standards."

Detailed Issues of Concern:

With higher burn up, nuclear fuel rods undergo several risky changes that include:

- Increasing oxidation, corrosion and hydriding of the fuel cladding.
- Oxidation reduces cladding thickness, while hydrogen (H₂) absorption of the cladding to form a hydrogen-based rust of the zirconium metal from the gas pressure inside the rod can cause the cladding to become brittle and fail;
- Higher internal rod gas pressure between the pellets and the inner wall of the cladding leading to higher fission gas release. Pressure increases are typically two to three times greater.
- Elongation or thinning of the cladding from increased internal fission gas pressure;
- Structural damage and failure of the cladding caused by hoop (circumferential) stress;
- Increased debris in the reactor vessel, damaging and rupturing fuel rods;
- Cladding wear and failure from prolonged rubbing of fuel rods against grids that hold them in the assembly as the reactor operates (grid to rod fretting).
- A significant increase in radioactivity and decay heat in the spent fuel.

- A potentially larger number of damaged spent fuel assemblies stored in pools
- Upgraded pool storage with respect to heat removal and pool cleaning.
- Requiring as much as 150 years of surface storage before final disposal.

The National Academy of Engineering of the National Academy of Sciences raised concern about the viability of high-burnup fuel by noting,

- "the technical basis for the spent fuel currently being discharged (high utilization, burnup fuels) is not well established..."
- "Spent fuel that may have degraded after extended storage may present new obstacles to safe transport."
- "NRC has not yet granted a license for the transport of the higher burnup fuels discharged from reactors."


A New York Times story mentions:


- Fuel assemblies with enough uranium were approved by NRC to run for 6 years instead of the standard 3 years.
- "Some of the younger fuel shows signs of degrading with age."
- "The "high burn-up fuel" spent longer in the harsh environment of a reactor, and now shows signs of corrosion and cracking."

Your failure to provide answers to our questions is irresponsible, given the facts about "High-Burn Nuclear Fuel". Your excuses for not answering are unacceptable.

You certainly could and should answer the following:

- 1. When Limerick started using this fuel**
- 2. When Limerick's License was amended to start using it.**
- 3. If NRC plans to continue allowing Limerick to use it, despite the increased risks faced by our region.**

 **backgrounder-high-burnup-spent-fuel.pdf**
116 KB

 **br0215r2_Public Involvement in the Nuclear Regulatory Process.pdf**
939 KB

From: "Fred Bower" <Fred.Bower@nrc.gov>

To: aceactivists@comcast.net

Cc: "Stephanie Coffin" <Stephanie.Coffin@nrc.gov>, "Eric Benner" <Eric.Benner@nrc.gov>, "Aladar Csontos" <Aladar.Csontos@nrc.gov>, "Meraj Rahimi" <Meraj.Rahimi@nrc.gov>, "Christian Araguas" <Christian.Araguas@nrc.gov>, "Damaris Marcano" <Damaris.Marcano@nrc.gov>, "Guita Irani" <Guita.Irani@nrc.gov>, "Rick Ennis" <Rick.Ennis@nrc.gov>, "Michele Evans" <Michele.Evans@nrc.gov>, "Veronica Rodriguez" <Veronica.Rodriguez@nrc.gov>, "Fred Bower" <Fred.Bower@nrc.gov>, "Michele Sampson" <Michele.Sampson@nrc.gov>, "Eugene DiPaolo" <Eugene.DiPaolo@nrc.gov>, "Benjamin Beasley" <Benjamin.Beasley@nrc.gov>, "Juan Ayala" <Juan.Ayala@nrc.gov>, "Michael Scott" <Michael.Scott@nrc.gov>, "Margaret Thompson" <Margaret.Thompson@nrc.gov>, "Laurie Pinkham" <Laurie.Pinkham@nrc.gov>, "Christopher

Jackson" <Christopher.Jackson@nrc.gov>, "Scott Barber" <Scott.Barber@nrc.gov>, "Diane Screnci" <Diane.Screnci@nrc.gov>, "Neil Sheehan" <Neil.Sheehan@nrc.gov>, "Doug Tifft" <Doug.Tifft@nrc.gov>, "Nancy McNamara" <Nancy.McNamara@nrc.gov>

Sent: Tuesday, December 31, 2013 2:26:48 PM

Subject: RE: NRC Response to ACE Concerns Related to High Burnup Fuel at Limerick (EDATS 2013-0370)

Dr. Cuthbert (ACE),

I am writing you for a third and final time on the topic of high burnup nuclear fuel. Specifically, I am writing in response to your email dated December 20, 2013. Your email was a follow up, to my two previous email responses dated December 11 and October 21, regarding questions you asked about high-burn nuclear fuel.

I believe that my responses thus far have been accommodating and responsive in a logical, forthright and comprehensive manner. Additionally, I fail to see anything new or actionable in your December 20, 2013, email. Therefore and firstly, I am providing you with the attached "Backgrounder on High Burnup Spent Fuel." Please note that the document header provides contact information if you have questions regarding its content.

Secondly, I would like to provide you with the attached NRC brochure (NUREG/BR-0215), "Public Involvement in the Nuclear Regulatory Process." This attached brochure describes additional methods for members of the public to be involved in the regulatory process including: 2.206 petitions, reporting safety concerns and freedom of information act (FOIA) requests. Please note that if you choose to exercise the petition and enforcement processes, that additional guidance on the petition process located in "Public Petition Process" (NUREG/BR-0200, Rev. 5) states that: "Unsupported assertions of "safety problems," general opposition to nuclear power, or identification of safety issues without seeking enforcement action are not considered sufficient grounds for consideration as a 2.206 petition."

Thirdly, since your December 20, 2013, email appears to make the following assertions of malfeasance:

- "...NRC grossly mischaracterized and mismanaged oversight of high burnup fuel..."
- "...made unsubstantiated claims and mischaracterized NRC's negligent approval process for high burnup fuel..."
- "It is beyond negligent for NRC to have approved use of high burnup fuel..."

I would like to remind you that you may contact the Office of the Inspector General (OIG) at NRC. The OIG has a Hotline (1-800-233-3497) program to provide the NRC employee, other government employee, licensee/utility employee, contractor employee, and the public with a confidential means of reporting incidences of suspicious activity to the OIG concerning fraud, waste, abuse, and employee or management misconduct. Mismanagement of agency programs or danger to public health and safety may also be reported through the Hotline.

It is not OIG's policy to attempt to identify people contacting the Hotline. People may contact the OIG by telephone, through an online form, or by mail. There is no caller identification feature associated with the Hotline or any other telephone line in the Inspector General's office. No identifying information is captured when you submit an online form. You may provide your name, address, or phone number, if you wish.

Fourth and finally, although I do not plan to respond to another ACE email regarding the use of high burnup nuclear fuel at Limerick, I am willing to discuss this issue with you on the telephone if you contact me at 610-337-5200.

Respectfully,

Fred Bower

From: aceactivists@comcast.net [mailto:aceactivists@comcast.net]
Sent: Friday, December 20, 2013 10:10 AM
To: Bower, Fred
Subject: ACE Response to NRC e-mail 12-11-13 - High-Burn Fuel Used At Limerick

December 20, 2013

To: NRC, Fred Bower
From: The Alliance For A Clean Environment
Dr. Lewis Cuthbert, President
Subject: HIGH-BURN NUCLEAR FUEL USE AT LIMERICK NUCLEAR PLANT

Mr. Bower,

ACE is a group of citizen volunteers trying to make our region a healthier, safer place to live. Since 2000 we investigated and uncovered numerous significant threats and harms to the health and safety of millions of people in the Greater Philadelphia Region related to Limerick Nuclear Plant. Time after time, instead of taking protective actions for the public, NRC tells us to contact the Office of Inspector General for an investigation.

Once again, instead of answering our questions and concerns, your 12-11-13 e-mail said, *"If you feel that NRC has mismanaged elements of our reactor oversight program, you should feel free to contact the Office of the Inspector General (OIG) at NRC."*

We do feel NRC grossly mischaracterized and mismanaged oversight of high burnup fuel, but citizen volunteers should not have to contact the Office of the Inspector General for an investigation, in order to get NRC to protect public health and safety.

- 1. NRC NEVER ACTUALLY PROVED HIGH BURNUP FUEL CAN BE SAFELY STORED OR TRANSPORTED, BUT APPROVED ITS USE ANYWAY.**
- 2. NRC IS IGNORING INCREASED RADIOACTIVE THREATS TO PUBLIC HEALTH FROM USE OF HIGH BURNUP NUCLEAR FUEL.**
- 3. BASED ON INDEPENDENT EVIDENCE OF GREATER RISKS FROM RADIOACTIVE RELEASES, STORAGE, AND TRANSPORT, ACE URGES NRC TO STOP EXELON FROM USING HIGH BURNUP FUEL AT LIMERICK NUCLEAR POWER PLANT.**

Yet again, NRC is further jeopardizing long-term public health and safety for nuclear industry profits. The nuclear industry switched to high burnup fuel because it can stay in reactors six years instead of three, allowing the industry to delay or avoid procuring expensive dry cask storage systems.

People in the Greater Philadelphia Region are impacted by unprecedented threats from Limerick Nuclear Plant's high-level radioactive wastes. NRC has allowed those threats to increase for Exelon's profits. The public deserve honest answers, preventive actions, and protection. NRC is failing in its mission to protect our future.

Mr. Bower, your 12-11-13 responses to ACE still failed to answer the following questions we first asked NRC 9-13:

1. When did Limerick Nuclear Plant started using high burnup fuel?
2. When was Limerick's license amended to start using this fuel?
3. Does NRC plan to continue allowing Limerick to use this fuel, despite serious concerns about increased risks of long-term storage and transport?

You stated, *"We still cannot provide specific fuel loading information at the Limerick Nuclear Power station as it is Security-related information."*

That excuse is evasive and illogical. How can answers to the questions above be security related when U.S. DOE published a copy of the detailed inventory of all spent power reactor fuel in the U.S., including Limerick (3-31-11)?

DOE's 3-31-11 Report Shows (Limerick 1 - 2,379) (Limerick 2 - 0)

- **When did Limerick 1 start using high burnup fuel?**
- **Has Limerick 2 started using high burnup fuel? If so, when?**

You stated, *"it is information that is not normally collected by the NRC"*.

There is no excuse for NRC to have failed to collect all information on high burnup fuel use. That reveals lax, negligent oversight. There must be accountability to the public for the large volumes of the deadly, dangerous nuclear wastes used at Limerick Nuclear Plant, especially for high-burn fuel.

ACE submitted information to you 12-11-13 (restated below), showing why high burnup fuel results in unacceptable risks. In your response you ignored this information.

PLEASE PROVIDE DETAILED RESPONSES To The Following Concerns:

With higher burn up, nuclear fuel rods undergo several risky changes that include:

- Increasing oxidation, corrosion and hydriding of the fuel cladding.
- Oxidation reduces cladding thickness, while hydrogen (H3) absorption of the cladding to form a hydrogen-based rust of the zirconium metal from the gas pressure inside the rod can cause the cladding to become brittle and fail;
- Higher internal rod gas pressure between the pellets and the inner wall of the cladding leading to higher fission gas release. Pressure increases are typically two to three times greater.
- Elongation or thinning of the cladding from increased internal fission gas pressure;
- Structural damage and failure of the cladding caused by hoop (circumferential) stress;
- Increased debris in the reactor vessel, damaging and rupturing fuel rods;
- Cladding wear and failure from prolonged rubbing of fuel rods against grids that hold them in the assembly as the reactor operates (grid to rod fretting).
- A significant increase in radioactivity and decay heat in the spent fuel.
- A potentially larger number of damaged spent fuel assemblies stored in pools.
- Upgraded pool storage with respect to heat removal and pool cleaning.
- Requiring as much as 150 years of surface storage before final disposal.

The National Academy of Engineering of the National Academy of Sciences raised concerns about the viability of high-burnup fuel by noting,

- "the technical basis for the spent fuel currently being discharged (high utilization, burnup fuels) is not well established..."
- "Spent fuel that may have degraded after extended storage may present new obstacles to safe transport."
- "NRC has not yet granted a license for the transport of the higher burnup fuels discharged from reactors."

A New York Times story mentions:

- Fuel assemblies with enough uranium were approved by NRC to run for 6 years instead of the standard 3 years.
- "Some of the younger fuel shows signs of degrading with age."
- "The "high burn-up fuel" spent longer in the harsh environment of a reactor, and now shows signs of corrosion and cracking."

Mr. Bower, in your 12-11-13 e-mail response, you made unsubstantiated claims and mischaracterized NRC's negligent approval process for high burnup fuel.

Below ACE is responding to your 12-11-13 e-mail comments concerning NRC's handling of the use, transportation, and storage of high burnup fuel."

Your 12-11-13 e-mail stated, *"we can provide background on high burnup fuel including what NRC has done to ensure it does not pose an undue risk to public health and safety"*

ACE Responses:

In reality, NRC did NOTHING to prevent undue risk to public health and safety from use of high burnup fuel. Our radiation risks from high-burnup fuel could increase.

HIGH BURNUP FUEL CAN CAUSE:

2 to 3 Times Higher Radioactive Fission Gas Releases - logically more radiation will be released.

Significant Increased Radioactivity and Decay Heat in Limerick's Spent Fuels:

Cancer increases skyrocketed in communities near Limerick after Limerick started operating in 1985. We can't afford more radiation released from Limerick operations for any reason.

Citizen Monitoring Recently Detected Radiation Spikes Near Limerick. NRC Provided NO Proof That This Isn't From Limerick's Use of High Burnup Fuel.

1. **NRC Did NO Independent Radiation Monitoring**
2. **NRC Failed To Respond To Concerns For Four Days**

- After ACE was alerted to a higher than usual radiation spike taken from a resident's RadAlert 11-22-13, ACE started collecting regular data on radiation spikes above what ACE's RadAlert previously detected during our regular radiation monitoring in 2006.

- Due to the surprising number of radiation spikes detected over several hours, ACE contacted NRC by e-mail 11-22-13.
- Four days later, after our second e-mail alert, NRC finally responded, but claimed no problem, WITHOUT ANY INDEPENDENT NRC RADIATION MONITORING. NRC used ONLY Exelon data, even though Exelon showed it can't be trusted to provide full and accurate disclosure.
- Citizen RadAlert data since November 22, 2013 continued to show radiation spikes for several weeks.
- Bottom line, NRC waited 4 days to respond to the public about concern over radiation spikes, then dismissed citizen findings.
- Even if it can't be proven that high burnup fuel caused radiation spikes detected by citizens, NRC has NO ANSWERS for what did cause them, and we know high burnup fuel releases more radioactive gases.
- **By stopping the use of high burnup fuel, NRC could honestly claim they had prevented some of Limerick's undue risks to public health and safety.**

You used typical language to make the following deceptive claim, "We (NRC) believe that our oversight of the industry's use of high burnup fuel provides a reasonable assurance of safety".

ACE Responses:

NRC is claiming reasonable assurance of safety WITHOUT SUFFICIENT EVIDENCE to support that claim. NRC CANNOT assure long-term safety.

NRC's "reasonable assurance of safety" is based on unsubstantiated claims by the nuclear industry.

- NRC jeopardized public safety by allowing the nuclear industry to save money by using this obviously more dangerous "high burnup" fuel, based ONLY on financially self-serving, unsubstantiated claims by the untrustworthy nuclear industry and their lobbyists.
- With NO PROOF of the safety of long-term storage and transport of high burnup fuel, and despite evidence suggesting it isn't safe, NRC approved use of high burnup fuel and continues to allow its use.

DOE's "Demonstration Project" proves NRC's reasonable assurance of safety is baseless.

- It will be another 4 years before the U.S. DOE and the Electric Power Energy Institute even start the demonstration project to figure out actual safety implications of "high burnup" spent fuel cask storage and transport. The Electric Power Energy Institute will design and demonstrate dry cask technology for evaluating the condition of "high burnup" spent nuclear fuel during storage.
- If it was safe, DOE would not need to begin a costly five-year "Demonstration" project, with 2017 as a target date to load the fuel into the demonstration cask. This "demonstration project", reported 11-1-13, is costly to the public, who will largely foot the \$15.8 million dollar bill. The nuclear industry, which financially benefits from the use of high burnup fuel, is only required to pay 20%.

You said, "High burnup fuel has been safely stored for many years"

ACE Responses:

Evidence suggests it cannot be stored safely, much less for the time it remains deadly.

- High burnup fuel has not been stored many years, considering this radioactive waste can stay dangerous for over a million years.
- What does NRC consider many? Math suggests high burnup fuel has NOT been in fuel pools many years.
- NRC approved high burnup fuel use since the 1990s. It can be used in reactors for 6 years.
- In the few years it has been stored, evidence shows significant increased radioactivity and decay heat, with increased corrosion, thinning, and brittleness of fuel cladding.

You said, "There are many storage system designs that have been approved for the long-term storage of high burnup fuel. A number of transportation packages have also been approved to transport high burnup fuel."

ACE Responses:

We cannot understand why NRC approved high burnup fuel use without independent proof that long-term storage or transport is safe.

- NRC issued negligent approvals, in spite of admitting there is limited data to show cladding of spent fuel with burnups will remain undamaged, even during the licensing periods.
- The evidence suggests NRC could not prove long-term storage and transport were safe when NRC approved long-term storage and transportation packages.

You said, the Certificates of Compliance for all approved storage and transportation system designs are publically available in NRC's online documents database. in 10 CFR Part 71 or for storage in 10 CFR Part 72.

ACE Response:

Certificates of Compliance with unprotective regulations are meaningless.

You said, "High burnup fuel, undergoes a rigorous NRC technical review. The NRC does not approve a spent fuel transportation package or storage system until it completes a full safety review and verifies the design meets the requirements for transportation".

ACE Responses:

A body of evidence suggests NRC's definition of "rigorous review" falls far short of insuring safety.

- Growing evidence shows that as a result of higher burn-ups, nuclear fuel cladding cannot be relied upon as a primary barrier to prevent the escape of radioactivity, especially during dry storage.
- The nuclear industry and NRC staff have known this for several years. Damage in the form of pinhole leaks, and small cracks can lead to breaching of fuel cladding.
- NRC admits there is limited data.
- NRC's reviews are compromised from the start, as evidenced by this very dangerous high burnup fuel fiasco.
- This is "not explicitly defined in [NRC] Regulations, staff guidance or standards."

It is beyond negligent for NRC to have approved use of high burnup fuel without solid evidence that fuel could actually be stored and transported safely.

- Unfortunately, NRC bases its technical reviews on financially self-serving information provided to NRC by the nuclear industry and supporting enterprises.
- NRC's leap of faith on behalf of nuclear industry interests must be reversed and NRC should immediately STOP the use of this dangerous process. There could be a serious radiation accident with fuels already stored.

Despite evidence of increased risk and harm, NRC continues to allow use of this dangerous fuel. NRC never proved high burnup fuel can be safely stored or transported. NRC is ignoring increased radioactive threats to public health from use of high burnup nuclear fuel.

On behalf of the health and safety of millions of people in the Greater Philadelphia Region, ACE is urging NRC to stop the use of high burnup fuel at Limerick Nuclear Plant based on serious concerns over:

- 1. Damage to fuel rods**
- 2. More dangerous storage and transport**
- 3. Higher fission gas releases**

This request is supported by a growing body of evidence:

2 to 3 Times Higher Radioactive Fission Gas Releases
 Significant Increased Radioactivity and Decay Heat in Limerick's Spent Fuels
 Increased Corrosion, Thinning, and Brittleness of Fuel Cladding
 Increased Damage and Rupture of the Fuel Rods in the Reactor Vessels, Leading To Radiation Leaks in Spent Fuel Pools and Casks

From: "Fred Bower" <Fred.Bower@nrc.gov>

To: aceactivists@comcast.net

Cc: "Scott Barber" <Scott.Barber@nrc.gov>, "Eugene DiPaolo" <Eugene.DiPaolo@nrc.gov>, "Michael Scott" <Michael.Scott@nrc.gov>, "Diane Screnci" <Diane.Screnci@nrc.gov>, "Neil Sheehan" <Neil.Sheehan@nrc.gov>, "Nancy McNamara" <Nancy.McNamara@nrc.gov>, "Doug Tiff" <Doug.Tiff@nrc.gov>, "Emily Monteith" <Emily.Monteith@nrc.gov>, "Rick Ennis" <Rick.Ennis@nrc.gov>, "Christopher Jackson" <Christopher.Jackson@nrc.gov>

Sent: Wednesday, December 11, 2013 5:12:04 PM

Subject: RE: Response to ACE - High-Burn Fuel Used At Limerick (EDATS 2013-0321)

Dr. Cuthbert (ACE),

I am writing in response to your email dated October 30, 2013, which was a follow up to our October 21 response to questions you asked on high burnup fuel. We still cannot provide specific fuel loading information at the Limerick Nuclear Power station as it is Security-related information and it is information that is not normally collected by the NRC. However, we can provide background on high burnup fuel including what NRC has done to ensure it does not pose an undue risk to public health and safety.

The reactor core includes an array of fuel rods that creates heat from a controlled nuclear reaction that occurs when control rods are withdrawn. Burnup refers to the uranium consumed in the nuclear reaction within the fuel rods. It is expressed in gigawatt-days per metric ton of uranium (GWd/MTU) - a measure of how long a fuel rod is in the core and the power level it reaches. "High burnup fuel" is in the reactor core for longer than "low burnup fuel." For the purposes of spent fuel transportation, high burnup commercial spent nuclear fuel is understood to mean fuel burnup in a reactor to greater than 45 GWd/MTU.

As stated in the Applicant's Environmental Report - Operating License Renewal Stage (<http://www.nrc.gov/reactors/operating/licensing/renewal/applications/limerick/lgs-er-web.pdf>), for the Limerick reactors, fuel enrichment and average peak rod burnup conditions are no more than 5 percent uranium-235 and 62,000 megawatt-days per metric ton of uranium (MWd/MTU), respectively.

New fuel designs, including high burnup fuel, undergo a rigorous NRC technical review, and are generally approved for use via a Topical Report that provides the technical evaluation of the new fuel design and lists any limitations for its use. Once the new fuel design is approved with an associated Topical Report, all NRC reactor licensees are permitted to use that fuel design within their reactor core without requesting specific NRC approval, as long as the core continues to meet all applicable design and safety limits. In an operating nuclear reactor, burnup is one of the many parameters that are considered in designing the fuel and core for each operating cycle. Many parameters are evaluated throughout the operating cycle to verify that design specific limits are met. Data-based, predictive tools are used to evaluate these parameters over the cycle. Throughout the cycle, physics testing is also done to confirm key physics parameters are consistent with predictions. When a new fuel is designed its use is limited by the data available to support the associated predictive tools. As such, burnup is limited for a particular fuel by the supporting predictive tools, the data supporting the predictive tools, and the requirement to not exceed any design limit. The fuel is required to meet all safety limits at all times during the operating cycle.

High burnup fuel has been safely stored for many years. There are many storage system designs that have been approved for the long-term storage of high burnup fuel. A number of transportation packages have also been approved to transport high burnup fuel. The Certificates of Compliance for all approved storage and transportation system designs are publically available in NRC's online documents database. The NRC does not approve a spent fuel transportation package or storage system until it completes a full safety review and verifies the design meets the requirements for transportation in 10 CFR Part 71 or for storage in 10 CFR Part 72. This summarizes some of our activities related to the use, transportation, and storage of high burnup fuel.

We believe that our oversight of the industry's use of high burnup fuel provides a reasonable assurance of safety. If you feel we have grossly mischaracterized or mismanaged our oversight of high burnup fuel than I suggest you contact the Office of the Inspector General as outlined below.

If you feel that NRC has mismanaged elements of our reactor oversight program, you should feel free to contact the Office of the Inspector General (OIG) at NRC. The OIG established the Hotline (**1-800-233-3497**) program to provide the NRC employee, other government employee, licensee/utility employee, contractor employee, and the public with a confidential means of reporting incidences of suspicious activity to the OIG concerning fraud, waste, abuse, and employee or management misconduct. Mismanagement of agency programs or danger to public health and safety may also be reported through the Hotline.

It is not OIG's policy to attempt to identify people contacting the Hotline. People may contact the OIG by telephone, through an online form, or by mail. There is no caller identification feature associated with the Hotline or any other telephone line in the Inspector General's office. No identifying information is captured when you submit an online form. You may provide your name, address, or phone number, if you wish.

Thank you for your email,

Fred Bower

Chief | Projects Branch 4 | Division of Reactor Projects | Region I | U.S. NRC

2100 Renaissance Boulevard, STE 100, King of Prussia, PA 19406 | ☎: (610) 337-5200 | BB: (610) 731-1920 |

✉: Fred.Bower@nrc.gov

From: aceactivists@comcast.net [mailto:aceactivists@comcast.net]

Sent: Wednesday, October 30, 2013 3:16 PM

To: Bower, Fred

Cc: Evan Brandt

Subject: ACE Resp to NRC - High-Burn Fuel Used At Limerick

October 30, 2013

To: NRC, Fred Bower

From: ACE, Dr. Lewis Cuthbert

RE: NRC'S Refusal To Disclose Information On Limerick Nuclear Plant's Use Of Extremely Dangerous High-Burn Nuclear Fuel

Mr. Bower,

On 10-21-13 you responded to an email ACE sent Mr. Mel Gray on September 18, 2013, regarding the use of High Burn-up Nuclear Fuel at the Limerick Nuclear Plant.

While you responded, you did NOT answer the three simple questions we asked.

1. What month and year did Exelon start using "high-burn-up fuel" at Limerick Nuclear Plant?
2. What quantity of this fuel has been used by Limerick to date?
3. Does NRC plan to continue to allow the use of "high-burn-up fuel" at Limerick?

Your failure to provide answers is unacceptable, given the facts about "High-Burn Nuclear Fuel." We are extremely concerned with good reason. The entire Greater Philadelphia Region already faces unprecedented risks and harms from Limerick Nuclear Plant's deadly high-level radioactive waste.

Growing evidence confirms devastating consequences from burning "High-Burn Nuclear Fuel". Evidence shows "High-Burn Fuel" at Limerick Can Result In:

- **Significant Increased Radioactivity and Decay Heat in Limerick's Spent Fuels**
- **2 to 3 Times Higher Radioactive Fission Gas Releases**
- **Increased Corrosion, Thinning, and Brittleness of Fuel Cladding**
- **Increased Damage and Rupture of the Fuel Rods in the Reactor Vessels, Leading To Radiation Leaks in Spent Fuel Pools and Casks**

- **The more "High-Burn Nuclear Fuel" used at Limerick, the greater our risks. The public has a right to full and accurate disclosure of the long-term consequences of using this fuel, with opportunity for meaningful public discussion and comment.**

By allowing "High-Burn Nuclear Fuel" to be used at Limerick Nuclear Plant, NRC has taken a dangerous leap of faith with respect to the safe operation, storage, and disposal of Limerick Nuclear Plant's spent nuclear fuel. It seems clear that NRC's decision to allow the use of "High-Burn Nuclear Fuel" has been motivated by economics. NRC bowed to the wishes of the nuclear industry, doubling the time nuclear fuel can be irradiated in a reactor. NRC admits, "there is limited data to show that the cladding of spent fuel with burnups ... will remain undamaged during the licensing period." NRC has no proof this is safe.

Your 10-21-13 e-mail said "NRC will not disclose specific information related to ... special nuclear material in use at nuclear power plants." This excuse is unacceptable! **We wonder if NRC even has verifiable answers to our questions.**

NRC's own records for Limerick reveal that time after time Exelon does whatever it wants to do, making changes (mostly to reduce their cost of doing business at Limerick), then gets NRC to approve after-the-fact license amendments or other approvals, even when those amendments further jeopardize public safety.

➤ **Did Exelon start using "High-Burn Nuclear Fuel" without a prior NRC license amendment?**

We have yet to see proof this is safe! Growing evidence shows that as a result of higher burn-ups, nuclear fuel cladding cannot be relied upon as a primary barrier to prevent the escape of radioactivity, especially during dry storage. The nuclear industry and NRC staff have known this for several years. Damage in the form of pinhole leaks, and small cracks can lead to breaching of fuel cladding. This is "not explicitly defined in [NRC] Regulations, staff guidance or standards."

Detailed Issues of Concern:

With higher burn up, nuclear fuel rods undergo several risky changes that include:

- Increasing oxidation, corrosion and hydriding of the fuel cladding.