

**From:** Bower, Fred  
**Sent:** Monday, December 08, 2014 3:01 PM  
**To:** 'aceactivists@comcast.net'  
**Cc:** 'Evan Brandt'; Thompson, Margaret; Pinkham, Laurie; Barber, Scott; DiPaolo, Eugene; Montgomery, Richard; Sheehan, Neil; Screnci, Diane; Tifft, Doug; McNamara, Nancy; Nieh, Ho; Scott, Michael; Gray, Mel; Plasse, Richard; Ennis, Rick; Bower, Fred; Medoff, James; Diaz-Sanabria, Yoira; Morey, Dennis  
**Subject:** RE: ACE QUESTION(s) - (EDATS 2014-0366)

Dr. Cuthbert (ACE),

I am writing in response to your questions regarding the embrittlement of Limerick's reactor pressure vessels (RPVs). The Nuclear Regulatory Commission (NRC) and the American Society of Mechanical Engineers (ASME) have long been aware of the importance of monitoring the fracture toughness of reactor pressure vessels (RPVs) in the U.S. light water nuclear power reactor fleet. Ensuring adequate fracture toughness during all modes of operation provides adequate assurance that pressure-retaining components of the reactor coolant pressure boundary of light water nuclear power reactors provide adequate margins of safety during any condition of normal operation, including anticipated operational occurrences and system hydrostatic tests, to which the pressure boundary may be subjected over its service lifetime. Neutron embrittlement is one factor that affect fracture toughness. As required by 10 CFR 50.60, "Acceptance Criteria For Fracture Prevention Measures For Light-Water Nuclear Power Reactors For Normal Operation," licensees for all light water nuclear power reactors must meet fracture toughness requirements and maintain a material surveillance program for the reactor coolant pressure boundary. These requirements are set forth in 10 CFR 50, Appendix G, "Fracture Toughness Requirements," and in 10 CFR 50, Appendix H, "Reactor Vessel Material Surveillance Program." The ASME Boiler and Pressure Vessel Code (ASME Code) forms the basis for the requirements of these appendices. Exelon is required to ensure that both Limerick Units 1 and 2 meet the above requirements throughout the plants' operating lifetimes. Additional information on reactor pressure vessel issues and reactor vessel integrity can be found on the NRC's website at: <http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/prv.html> and <http://www.nrc.gov/reactors/operating/ops-experience/reactor-vessel-integrity.html>

After consulting with staff in the NRC's Office of Nuclear Reactor Regulation (NRR), Division of License Renewal (DLR), we determined that agency staff recently evaluated Exelon's Reactor Vessel Surveillance Program for the period of extended operation as described in the license renewal application for Limerick Units 1 and 2. The staff's evaluation of Exelon's Reactor Vessel Surveillance Program for the reactor pressure vessels is documented in Section 3.0.3.1.11 of the Limerick Safety Evaluation Report (SER) and it concluded that Limerick's program satisfies the requirements of 10 CFR Part 50, Appendix H. The Limerick SER is contained in NUREG-2171 and can be located in ADAMS using accession number ML14276A156. The staff ensured adequate monitoring by requiring the licensee to perform applicable pressure temperature analyses and upper shelf energy analyses for the reactor pressure vessels in accordance with 10 CFR Part 50, Appendix G. The staff's evaluation of these analyses is located in Section 4.2 of the Limerick SER. The implementation of these programs and analyses ensures that embrittlement of reactor components will be effectively analyzed and monitored for the period of extended operation.

Regarding your question related to License Renewal Commitment No. 46, we again consulted with the staff in NRR, DLR. The staff informed us that the Limerick SER (ADAMS ML14276A156), Appendix A, page A-27, discusses the staff's review of this commitment. The source of the commitment is an Exelon letter dated October 12, 2012. This letter can be located in ADAMS using accession number ML12286A293. In this letter, Exelon described their specific commitment to enhance the Limerick operating experience program as it related to aging and age related degradation. Specifically, Exelon committed to the following:

“The Operating Experience program is an existing program that will be enhanced to ensure, through the ongoing review of both internal and external operating experience, that the license renewal aging management programs are effective to manage the aging effects for which they are credited throughout the period of extended operation. The programs are either enhanced or new programs developed when the review of operating experience indicates that the existing programs do not provide reasonable assurance that aging effects are being effectively managed.

The Operating Experience program will be enhanced to:

1. Explicitly require the review of operating experience for aging-related degradation.
2. Establish criteria to define aging-related degradation.
3. Establish identification coding for use in identification, trending and communications of aging-related degradation.
4. Require communication of significant internal aging-related degradation, associated with SSCs in the scope of license renewal, to other Exelon plants and to the industry. Criteria will be established for determining when aging-related degradation is significant.
5. Require review of external operating experience for information related to aging management, and evaluation of such information for potential improvements to LGS aging management activities.
6. Provide training to those responsible for screening, evaluating and communicating operating experience items related to aging management.

These enhancements will be implemented no later than the date that the renewed operating licenses are issued and conducted on an ongoing basis throughout the terms of the renewed licenses”.

Thank you for contacting the NRC with your questions.

Fred Bower

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

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✉: [Fred.Bower@nrc.gov](mailto:Fred.Bower@nrc.gov)

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**From:** Bower, Fred

**Sent:** Thursday, November 13, 2014 2:14 PM

**To:** [aceactivists@comcast.net](mailto:aceactivists@comcast.net)

**Cc:** Evan Brandt; 'Margaret Thompson'; 'Laurie Pinkham'; 'G. Scott Barber

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Scott, Michael; Mel Gray ([Mel.Gray@nrc.gov](mailto:Mel.Gray@nrc.gov)); Plasse, Richard; Ennis, Rick  
**Subject:** RE: ACE QUESTION(s)

Dr. Cuthbert (ACE),

I was out of the office earlier this week and received your email and list of questions today.

Region I staff will need to coordinate with license renewal technical staff in the NRC's Office of Nuclear Reactor Regulation to address some of your questions.

I also note that your email states: "*We have seen reports to NRC that equipment deterioration is occurring faster than aging models predicted.*" Providing copies of these reports or specific links to these reports will allow us to review the reports and provide a more specific response.

However, we will respond to your email as soon as we are able to do so, likely within 30 days.

Sincerely,

Fred Bower

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

**Sent:** Sunday, November 09, 2014 10:38 AM

**To:** Bower, Fred

**Cc:** Evan Brandt

**Subject:** QUESTION

Mr. Bower,

We are very concerned about embrittlement of Limerick's reactors.

We can find no reports of destruction testing since the plant was built.

Has NRC or Exelon ever done borehole testing on Limerick's reactors?

Was that a requirement for relicensing? If not, why not.

We are also concerned about the elimination of Commitment No. 46 from Limerick's re-licensing application.

We have seen reports to NRC that equipment deterioration is occurring faster than aging models predicted.

Without proof that Limerick's reactors are not deteriorating faster than expected, how did NRC verify Exelon's claims of reactor safety for Limerick re-licensing?

Please provide written responses to these issues. Phone conversations are not acceptable.

Dr. Lewis Cuthbert