**From:** <Marc.Ferdas@exeloncorp.com>
**To:** <msf2@nrc.gov>
**Date:** 2/23/06 7:19AM
**Subject:** FW: Clarification write-up on the Press article discussing 74%..

> -----Original Message-----
> From: Hufnagel Jr, John G
> Sent: Tuesday, February 21, 2006 2:01 PM
> To: Ferdas, Marc
> Cc: Barnes, Kathy; Quintenz, Tom; O'Rourke, John F.; Gallagher, Michael P; Polaski, Frederick W; Godknecht, Michael P; Kandasamy, Jhansi R.
> Subject: Clarification write-up on the Press article discussing 74%..
>
> Marc,
>
> After the License Renewal exit on Friday, you and Mike Gallagher were discussing some of the information in the Asbury Park Press, relating to the potential for containment failure. Mike indicated we would provide you some follow-up information. The attached write-up helps explain the context of that statement. The explanation came from information prepared by Erin Engineering (PRA consultant) and Mike Godknecht at the site. It is not an official report, but provides information. Hope this is useful. If you have questions, you can contact Mike Godknecht at the site ,the personnel cc'd above or me.
>
> - John H.
>
> > <<Response to Questions about 74% Contaiment Failure.doc>>
>
>

**Mail Envelope Properties** (43FDA82B.C80 : 4 : 52352)

**Subject:** FW: Clarification write-up on the Press article discussing 74%..
**Creation Date:** 2/23/06 7:18AM
**From:** <Marc.Ferdas@exeloncorp.com>

**Created By:** Marc.Ferdas@exeloncorp.com

**Recipients**
nrc.gov
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MSF2 (Marc Ferdas)

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| kp1_po.KP_DO | nrc.gov |

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| MESSAGE | 1999 | 02/23/06 07:18AM | |
| TEXT.htm | 3511 | | |
| Response to Questions about 74% Containment Failure.doc | | | 35328 |
| Mime.822 | 56763 | | |

**Options**
**Expiration Date:** None
**Priority:** Standard
**Reply Requested:** No
**Return Notification:** None

**Concealed Subject:** No
**Security:** Standard

Discussion Regarding Newspaper Article Claiming 74% Containment Failure at Oyster Creek

The 74% "containment failure" discussion in the newspaper article was drawn from information contained in the SAMA (Severe Accident Mitigation Alternatives) evaluation. The SAMA evaluation was performed using the Oyster Creek PRA (Probability Risk Assessment), which is a mathematical model used to evaluate the chance of occurrence (probability) of various events. This model is constructed to represent a "best estimate" risk evaluation of the Oyster Creek reactor, containment and important Plant systems. However, conservative assumptions may be applied for issues where detailed data is not available.

The PRA is used to determine the probability that an event can occur at Oyster Creek that could damage the reactor core. Core damage in the PRA is defined as any damage – even if it is only a single fuel pin breach. It includes damage up to and including what was seen at TMI and Chernobyl. Significant effects on the health and safety of the Public would only be seen at high levels of fuel damage. The chance of the Oyster Creek core being damaged in any way has been calculated at about 1 in 100,000 in any year of operation. Another way of stating this would be that if the Plant were to operate for 100,000 years, there is a good chance that an event that could damage the reactor core could occur. However, to put this value in perspective, it is about 3 times more likely that an asteroid large enough to kill 2 million people will hit the USA.

In the event that the reactor core is damaged, the PRA also provides an estimate on the chances that radioactive material would be released from the Plant. The Primary Containment is designed to contain the radioactive materials generated during a fuel damage event. A release of radioactive material would only occur if the Primary Containment was breached or bypassed in some way.

1. Based on discussions with ERIN Engineering who developed the PRA and SAMA evaluation for Oyster Creek, the Primary Containment performance can be described as follows:

   - 0% of the events within the design basis of the Plant lead to core damage or a release from the Primary Containment. Only events that progress beyond the design basis for the Plant can lead to fuel damage.

   - 26% of the beyond design basis events that result in core damage, do not require Primary Containment venting or result in leakage from the Primary Containment greater than design. This is described in the SAMA evaluation as the Primary Containment being "intact".

   - 74% of the beyond design basis events that result in core damage, do require Primary Containment venting and/or result in leakage from the Primary Containment greater than design. This is not formally described in the SAMA evaluation; however, it can be implied that this is a condition that is "not intact".

   - What is not clear from the SAMA evaluation is that some instances where the Primary Containment is considered to be "not intact" are cases where the Plant Operators use controlled venting of the Containment to maintain the continued integrity of the Primary Containment. About 13% of the beyond design basis events that result in core damage require controlled Primary Containment venting but do not lead to damage to the containment structure.

2. The beyond design basis events that result in core damage and include a release of radioactive material due to Containment venting or leakage (74% of all the core damage events) can be broken down further as follows:
   - 34% of the beyond design basis events that result in core damage could have a release that may have minor (less significant) health effects because a small amount of radioactive material is released.
   - 25% of the beyond design basis events that result in core damage could have a release that may have an increased significance on health effects because of the increased amount of radioactivity released, but the timing of the release of radioactive material is after 5 hours when evacuation is well underway.
   - 9.5% of the beyond design basis events that result in core damage are postulated to progress to the point where the release from the Primary Containment could be sufficient to cause significant health effects – i.e. substantial release of radioactive material occurs before evacuation is complete.
   - 5.5% of the beyond design basis events that result in core damage are postulated to progress to the point where the release from the Primary Containment is sufficient to cause fatalities (High/Early) – i.e. the release occurs before evacuation is complete and a large amount of radioactive material is released.
   - It must be noted that the above estimates found in the SAMA evaluation only consider the short term or acute health effects. The long-term health effects such as the increased probabilities of cancer or other illnesses due to an exposure to higher than normal levels of radiation have not been factored in. These long-term effects would need to be considered separately from the SAMA evaluation and this document.
3. The results of the PRA, including the 74% of events that may require Primary Containment venting and/or result in leakage from the Primary Containment greater than design, have been determined using very conservative analytical modeling. This ensures that uncertainties due to lack of hard data do not lead to underestimating the risk potential. Expert judgment believes that this conservatism could result in reporting of Containment damage probabilities six (6) times greater than what would actually occur. It is believed that this conservative approach to risk evaluation is appropriate for day-to-day operation of the Oyster Creek Plant.

SUMMARY

1. With regard to the "74% containment failure" discussed in the newspaper article:
   - This discussion is only applicable to events that are beyond the required design basis for Oyster Creek. All events for which the Plant is designed will result in an "intact" Primary Containment.
   - There will be no release of radioactive material greater than the design leakage of the Primary Containment for any event within the design basis.
   - The 74% discussed in the article relates to events where core damage has occurred and Primary Containment venting is required to maintain containment integrity or leakage from the Primary Containment is greater than design.

- 59% of the events that result in core damage could have a release that may have some less significant health effects. Either the amount of radioactive material released is small, or the point in time when the release occurs is after the Emergency Planning Zone has been significantly evacuated.
- Only 15% of the events that result in core damage are postulated to have a release that may result in significant health effects or fatalities.
- The expected Primary Containment performance during events where the reactor fuel is damaged was developed from a PRA model designed to ensure a conservative approach to risk evaluation and monitoring is used at Oyster Creek.

2. Effective probabilities of these events:
   - Beyond design basis event that leads to fuel damage – 1.05 E-5
     (≃ 1 chance in 100,000 or 1 event every 100,000 years of operation)
     Point of Reference: The chance of the USA being hit by an asteroid large enough to kill 2 million people is 3 time greater than an event that leads to fuel damage.
   - Event leading to a release of material from Primary Containment – 74% = 7.8 E-6
     (≃ 1 chance in 129,000 or 1 event every 129,000 years of operation)
   - Event leading to significant health effects or death – 9.5% + 5.5% = 1.6 E-6
     (≃ 1 chance in 625,000 or 1 event every 625,000 years of operation)
   - Event leading to exceeding NRC criteria for Large Early release – 5.5% = 5.8 E-7
     (~ 1 chance in 1,724,000 or 1 event every 1,724,000 years of operation)
     Point of Reference: The probability of the earth being hit by an asteroid large enough to be an "End-of-Life Event" (>1 mile in diameter) is ~ 1 E-6 or 1 event every 1,000,000 years.
3. If it is assumed that the PRA conservatisms only double the actual accident/release probabilities:
   - Probability of a release that would lead to significant public health effects – 8 E-7 or 1 event every 1,250,000 years of operation.
     Point of Reference: The probability of the earth being hit by an asteroid large enough to be an "End-of-Life Event" (>1 mile in diameter) is ~ 1 E-6 or 1 event every 1,000,000 years.
   - In the event that a release from the Primary Containment occurs, the Secondary Containment provides an additional barrier to minimize release to the public. The Secondary Containment will contain a significant part of any release from the Drywell or Torus. The Reactor Building ventilation system will direct any release to the Stack for an elevated release.