Group D

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Q&As FOR DAVIS-BESSE SHIELD BUILDING ISSUES

Q&As ON NEWLY DISCOVERED CRACKS DAVIS-BESSE SHIELD BUILDING

Q1. How did the licensee identify the previously undiscovered cracking?

A1. As part of a Confirmatory Action Letter issued by the NRC, the licensee committed to developing and implementing a long term shield building monitoring program. One of the conclusions of the licensee's root cause analysis was that the previously identified cracking was from one severe weather event that occurred in 1978. The licensee also concluded that the discovered cracks were stable, i.e. they would not grow and other cracks would not develop during normal operation. Hence, the long term monitoring program served as an extra check to validate that conclusion and to provide early identification in case of unexpected crack propagation. This year was the third time interval the core bores were inspected.

This inspection this year used a different bore scope than that used in previous inspections. The bore scope used this year had better resolution and magnification than the previously used scope. Additionally the head of the scope (i.e. the tip of the scope) had better articulation capability that the previously used scope. Both properties of the new scope permitted a better examination of the existing bores.

On August 26, 2013, as part of their long term monitoring program for the shield building as established in their commitments to close the CAL, the licensee identified a previously unidentified crack in a bore. As of September 17, 2013, the licensee has inspected 41 bores and found 6 previously unidentified cracks. The licensee has plans to inspect the remaining 41 bores. The last bores need scaffolding or similar equipment to permit personnel to reach the bores. The NRC is closely following the ongoing inspections.

Q2. Are these newly forming cracks?

A2. The licensee believes that three of these newly identified cracks are not new but because of the limitations of the previous bore scope were not previously identified. Specifically, these three newly identified cracks correspond to breaks that were observed in the cores that were extracted from the bores when the licensee performed its initial extent of condition inspections. The licensee had previously believed that the breaks were due to the forces associated with withdrawing the core from the bore after initial drilling. These newly discovered cracks are very tight/thin (approximately 0.005 inches) and have less width that the originally discovered cracks and that contributed to not seeing the cracks in previous inspections. With respect to the other three newly identified cracks, the licensee generated a condition report to evaluate whether the laminar cracking condition could be propagating in localized regions. NRC inspectors continue to observe and evaluate licensee plans and actions to address this question.

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Q3. What is happening in the Shield Building?

A3. The licensee presently believes that the Shield Building is stable; there are no new cracks forming. However, to further investigate its assumptions and to understand any additional mechanisms that might be occurring, the licensee is planning on additional testing and analyses. The licensee has contracted with Performance Improvement International (PII). PII was involved with the original root cause analysis. The NRC will continue to follow the licensee's efforts to understand the current conditions and, if any new mechanisms are identified, to follow the licensee's efforts to understand the potential impacts of such mechanisms.

Q4. Is the Shield Building operable and capable of doing it safety functions?

A4. With the originally discovered cracking, through quantitative structural analyses the licensee showed that the Shield Building was capable of performing its design safety functions and thus could be considered operable. The analyses included safety conservative assumptions on the load bearing capability of the building's rebar and location of the cracks. The newly discovered cracking remains bounded by the previous analysis, and therefore there is reasonable confidence that the shield building remains capable of performing its design safety functions. In addition, the licensee believes that the results of concrete/rebar bonding capacity testing performed by contract labs and additional structural calculations performed by engineering contractors for the licensee provide additional assurance that additional similar cracking that could exist would not impact structural integrity of the building (the reinforcement can maintain capacity in areas of cracking). NRC inspectors are currently evaluating this additional information.

Q5. If the Shield Building is operable and capable of doing it safety functions, what is the issue?

A5. If this newly discovered cracking is new or the original found cracks are growing, implications for the previous root cause need to be evaluated. The root cause concluded that no new cracks would develop and that existing cracks were stable. While the licensee's root cause conclusions were reasonable based on the evidence and structural analyses performed, the long term monitoring program was intended as an additional conservative measure to provide early identification in case of unexpected crack propagation. Hence, the licensee needs to evaluate the new information from that effort and determine whether other actions are needed to ensure the continued long term operability of the building into the future.

The NRC is following and will continue to evaluate the licenses efforts to properly characterize the newly discovered cracks and the licensee's efforts to analyze the impacts of these cracks.

Q&As FROM PREVIOUSLY IDENTIFIED CRACKS AFTER ROOT CAUSE EVALUATION RELEVANT TO NEWLY DISCOVERED CRACKS (From Communications Plan dated June 2012)

1. How can you definitively say that these cracks all over the shield building happened because of the 1978 blizzard?

As documented in the Root Cause Report, the licensee's Root Cause Team applied the TapRoot Methodology, Problem Solving and Decision Making, Equipment Apparent Cause Evaluation, Event and Causal Factors Charting, Barrier Analysis, Change Analysis, and Fault Tree Analysis methods and techniques in their root cause analysis of the identified shield building laminar cracking. These methods and techniques are recognized standards for an effective root cause evaluation. Using these methods and techniques, the licensee's root cause team compiled a comprehensive list of 45 potential failure modes

The licensee further evaluated the comprehensive list of 45 potential failure modes, and only the conditions postulated during of 1978 blizzard resulted in shield building laminar cracking. In addition, the licensee provided a reasonable basis to justify the shield building conditions that resulted in concrete tensile stress of sufficient magnitude to initiate laminar cracking.

The failure mode evaluated by the license that resulted in a prediction of shield building laminar cracking was supported by observations of laminar cracking identified in cylindrical reinforced concrete structures in Ontario, Canada. The licensee evaluated shield building conditions likely created during the blizzard of 1978 that resulted in tensile stress of sufficient magnitude to initiate and propagate laminar cracking in the shield building concrete vertical wall, specifically water penetration at the outer surface due to wind driven rain followed by freezing of trapped water due to a rapid temperature drop resulted in concrete tensile stress of sufficient magnitude. Licensee analyses without effect of freezing penetrated water did not result in tensile stress of sufficient magnitude to predict initiation of laminar cracking.

7.
a. If the shield building "does not meet the current design and licensing bases," doesn't that mean that if FENOC were applying for its license today, the license would be denied because the shield building did not conform to existing design and licensing criteria?

b. And doesn't it also mean that FENOC's relicensing application would be denied unless FENOC was able to restore the shield building to a condition that did conform to the existing design and licensing criteria?

Upon identification of shield building laminar cracks near the outer face reinforcement mat, the licensee entered the issue into its corrective action program and evaluated the safety significance of the concern. The licensee and NRC staff both concluded that the Davis Besse

shield building is capable of performing its safety function (operable), but does not conform to its existing design and licensing basis. The licensee in its Root Cause Report identified Direct Cause Corrective Action 2 – Engineering plan to re-establish the design and licensing basis for the shield building. Common approaches to addressing non-conforming conditions include repair/modification, developing new information that demonstrates the existing licensing basis is actually met, changing the licensing basis by requesting NRC approval of a license amendment, or some combination thereof. The licensee is currently exploring viable options with the outcome of several actions described in the Root Cause Report likely to factor into the licensee's engineering plan including:

- Direct Cause Corrective Action 1 – Testing program to investigate the steel reinforcement capacity adjacent to structural discontinuities.
- Extent of Condition Corrective Action 1 – Additional examination of the shield building exterior wall.
- Extent of Condition Corrective Action 2 – Issue engineering change package for additional shield building core bores.

While we won't speculate on the outcome of a hypothetical licensing review, the licensing process does allow for proposal and approval of alternate approaches that the NRC staff deems adequate to protect the public health and safety. However, the licensee would need to provide justification acceptable to the NRC staff.

The first principle of license renewal is that with the exception of age-related degradation and possibly a few other issues related to safety only during the extended period of operation of nuclear power plants, the existing regulatory process is adequate to ensure that the licensing bases of all currently operating plants provide and maintain an acceptable level of safety. The second and equally important principle of license renewal holds that the plant-specific licensing basis must be maintained during the renewal period in the same manner and to the same extent as during the original licensing term. This would be accomplished, in part, through a program of age-related degradation management. So while the shield building licensing basis must be maintained under both the current and a renewed license, re-establishing the design and licensee basis would be necessary via existing regulatory requirements versus through the license renewal process. However, NRC evaluation of a shield building monitoring program as part of the aging management program would be pertinent to a license renewal decision.

8. At the public officials meeting on Jan 5, one of the NRC engineers drew four concentric circles on the board to describe four increasing levels of strength of the shield building wall. Those four circles were described as follows:

1. Strength sufficient to support itself and avoid collapsing under its own weight
2. Strength enough to withstand anticipated events
3. Design and licensing strength
4. As-built strength
Number 3 was described as providing a margin of safety beyond the strength necessary to withstand anticipated events, and Number 4 was described as providing an additional margin of safety beyond that (because the wall, as built, was stronger than the design and licensing requirements).

Am I correct that FENOC's admission, that the shield building wall no longer meets the design and licensing criteria, means that the additional margin of safety provided by Number 4 no longer exists and that the remaining margin of safety has been reduced below Number 3?

The licensee demonstrated through calculations that the shield building retained structural strength (as-built strength) beyond that required by the current design and licensing basis, despite the laminar cracking. Specifically, as documented in NRC inspection report 05000346/2012-007 (ML12128A443), the licensee performed calculations that confirmed the calculated shield building stresses remained within acceptance limits specified in the original design and licensing bases (design and licensing strength). The licensee calculations evaluated appropriate loads including design basis earthquake, tornado wind and differential pressure, and tornado generated missile loads (anticipated events). The licensee also identified additional conservatism in the calculations that was not credited and could provide additional safety margin. However, the licensee used a different calculation methodology than specified in the licensing basis. In particular, the licensee used a more modern, sophisticated finite element iterative computational approach compared to the older manual equation approach from the initial licensing review. In doing so, the licensee also made other changes such as using the alternative differential pressure design load from Regulatory Guide 1.76, "Design-Basis tornado and Tornado Missiles for Nuclear Power Plants," Revision 1. We won't make a definitive conclusion regarding the conservativeness of one approach versus the other given that the licensee did not provide us with an analysis of the cracking using the licensing basis approach. However, it is possible that while being more precise, the chosen approach is not as conservative as the licensing basis approach. However, after extensive review, and some resulting revision by the licensee, our structural experts concluded that the chosen methodology overall had sufficient conservatism to provide reasonable confidence that the shield building stresses would remain within their licensing basis acceptance limits and the building would continue to perform its safety functions. Given that the calculational approach for reaching that conclusion was substantially different from that considered in plant licensing and that the licensing basis design codes applicable to the shield building do not specifically address laminar cracking, they also concluded that the shield building with the laminar cracking was not in conformance with its current licensing basis.

1. How is FE going to make sure the shield building is safe if the NRC relicense the plant?

Reviews of licensee investigations and calculations have indicated to the NRC that the shield building remains capable of performing its safety function. The licensee has also proposed additional actions to ensure that the performance of that safety function is not compromised in the future. NRC inspectors have and will continue to monitor the licensee's activities and review results from the licensee's ongoing corrective actions.

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COMMUNICATIONS PLAN

Davis-Besse Nuclear Power Plant

This is an addendum to the Reactor Vessel Head Replacement Communication Plan (ML11312A191)

Shield Building Issue

October – November 2011
POC: David Hills, RIII
630-829-9733

GOALS

- Be prepared to answer public question on the cause, extent of condition and actions going forward related to the cracks identified in the concrete of the shield building.
- Be prepared to answer internal questions on the cause, extent of condition and actions going forward related to the cracks identified in the concrete of the shield building.

KEY MESSAGES

- On October 10, 2011, during hydro-demolition operations, indications of cracks were identified in various sections of the opening in the reinforced shield building concrete.
- The discovery of the cracks in the concrete of the shield building does not represent an immediate safety concern because the plant is currently shut down.
- It is important to emphasize that the shield building at Davis-Besse is not the primary containment vessel. The containment vessel is made of one and a half inch thick welded steel and sits inside the shield building separated by about four and a half feet of void space. The shield building's primary safety function is to protect the containment vessel against external hazards. The containment vessel is designed to keep the radiation inside the reactor from reaching the environment.
- NRC inspectors are closely following the utility's actions to understand the cracks through direct on-site inspections along with reviews of records and calculations to make sure the issue is understood and addressed.
- If there are any challenges with the safety function of the shield building, the NRC will ensure that the licensee will address them prior to restarting.

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- The NRC is performing an independent review of the licensee's evaluation and will be communicating the results of this review, to the public, prior to the plant restarting.

- NRC will periodically update this communication plan as it finalizes its position on this issue.

BACKGROUND

The NRC was informed by FirstEnergy on October 10 that it had identified what looked like a crack in the concrete shield building of the Davis-Besse nuclear power plant in Oak Harbor, Ohio. The plant had been shut down and workers were starting to cut a hole in the side of the building in order to move and replace the reactor head when they found the crack. The shield building is made of two and a half feet of steel reinforced concrete.

It is important to emphasize that the shield building at Davis-Besse is not the primary containment vessel. The containment vessel is made of one and a half-inch thick welded steel and sits inside of the shield building separated by about four and a half feet of void space. The shield building's primary function is to protect the containment vessel against external hazards. The containment vessel is designed to keep the radiation inside the reactor from reaching the environment.

There is no threat to public health and safety because the plant is currently shut down. Furthermore, this issue did not meet the NRC's reporting requirements because it did not constitute an immediate safety concern.

Nevertheless, the NRC immediately sent a structural expert to the plant. In addition, there were already two resident inspectors and several specialists from the Region III office in Lisle, Ill., on the site inspecting the reactor head replacement activities. They are now also conducting an independent assessment of this new issue and are reviewing the utility's efforts to address the issue and any potential safety significance. If there are any challenges identified with the design function of the shield building the NRC will ensure that the utility to resolve them before restarting.

The activities the licensee has performed to date to address this issue include impulse response testing on various areas of the shield building's outer surface and several core bore samples. Our structural experts in the regional office as well as headquarters are currently performing a detailed review of the licensee's evaluation and extent of condition to independently verify whether the shield building is able to perform its safety function. The NRC will ensure all issues are addressed to its satisfaction prior to the licensee's restart of the unit. The results of NRC's review will be communicated to the public (e.g. press release).

The safety functions of the shield building are, during operation, to provide additional shielding from radiation originating in the reactor and provide environmental and tornado missile

protection for the containment vessel. In case of an accident, the shield building is a part of the ventilation system that filtrates radioactivity before it is released to the environment.

CHALLENGES

Currently identified challenges include:

- Effectively communicating the difference between the structural region and the architectural region.
- Effectively communicating the difference between the conclusions that have been drawn based on analysis and what is still preliminary information.

Q&As FOR DAVIS-BESSE SHIELD BUILDING ISSUES

Does NRC have regulatory requirements on the condition of the shield building from the safety perspective?

Yes, the Shield Building is a safety related structure. The licensee is required to maintain the quality of this structure in a condition that ensures it will be able to fulfill its safety function. The shield building was designed to withstand the impact of earthquakes, tornadoes and external objects.

How about the security implications of having the building that is supposed to protect the plant from an airplane crash develop a crack or even multiple cracks?

We cannot publicly discuss security related information. However we can say that since 9/11, the NRC has implemented a number of actions that ensure nuclear power plants are able to cope with a catastrophic event.

Does having a hole cut in the shield structure compromise its security function of protecting the plant from missiles?

We cannot publicly discuss security related information. The site performed a safety evaluation of this temporary condition, which the NRC reviewed to ensure it would not compromise the safety of the plant.

How come there is no event report on this issue? Is it reportable to the NRC?

The issue didn't have to be reported because it did not represent an immediate safety concern because the plant was shut down. The licensee is still evaluating the safety significance of the issue.

How come neither FE nor the NRC was aware of an 8-foot long crack?

The indications noted in the concrete of the shield building are still being evaluated by the site. The cracks identified in the shield building are contained within the structure and are not visible from the outside. The licensee is currently taking actions to address the extent of the cracking and performing analyses. The NRC will evaluate the licensee's analyses. As part of the evaluation the NRC will address the safety significance of the issue and based on the results, verify if any actions could have been taken to preclude this condition.

How come the NRC hasn't communicated to the public on this issue?

The NRC released a Preliminary Notification that provided a summary of the current condition of the shield building at that point in time. The NRC is currently involved in activities addressing the licensee's actions and evaluations concerning the cracks identified in the shield building. To date, the NRC has not reached any conclusions or made any decisions regarding the licensee's actions and evaluation results. When the NRC has a definitive conclusion, it will be communicated to the public. In the interim, the NRC has been answering questions from the media, public and congress, and providing assurance that all issues will be addressed to NRC's satisfaction prior to restart.

Does having the crack undiscovered constitute a violation?

NRC inspectors are currently on-site performing an independent inspection of the conditions identified in the concrete of the shield building as well as evaluating the licensee's analysis and actions taken to disposition these indications. If any discrepancies are identified between the licensee's actions and the NRC's requirements, NRC will take the appropriate measures to address them.

Is the NRC concerned about this issue from the safety point of view and from the security point of view? If not, why not?

The NRC is conducting inspections and independently assessing the cracks and the licensee's actions to ensure the issue is adequately evaluated and adequate corrective actions are taken, if necessary. There is no immediate safety concern because the plant is currently shut down.

How vulnerable does the crack make the containment and the reactor?

Right now the containment and the reactor are in a safe condition. An initial evaluation was completed by the licensee that addresses the cracks identified in the shield building. The NRC is currently evaluating the licensee's ongoing analysis and will ensure any concerns are addressed prior to the licensee restarting the plant.

Was the reactor safe when it was operating with a crack in the shield building?

The NRC is currently reviewing the licensee's analysis and evaluating the safety significance of the issue.

And if the answer is yes, how can you say that? What if there was a terrorist attack by flying a plane into the reactor?

We cannot publicly discuss security related information. However, we can say that since 9/11, the NRC has implemented a number of actions that help ensure nuclear power plants are able to cope with a catastrophic event.

Are the public and the environment safe with the hole in the containment vessel and the shield building plus a crack in the shield building?

Yes. The temporary condition has been evaluated by the licensee and the NRC. Prior to cutting a doorway in the containment vessel the fuel was removed from the reactor vessel. The cut in the shield building was evaluated prior to creating the temporary maintenance access.

What can you tell us about the crack?

Cracks have been identified in various sections of the concrete of the shield building. The licensee is currently completing its evaluation of the these crack indications and determining their extent as well as performing an evaluation of the current condition of the shield building to ensure it will be able to meet its safety functions. NRC is reviewing the licensee's evaluation of this issue and will confirm that all issues are addressed prior to restart.

When was the NRC informed about the crack?

After the condition was discovered on Monday, October 10, the licensee immediately notified the NRC resident inspectors.

Was it visible from the outside? If so, how come it wasn't discovered?

No, the indications identified to date are internal to the structure and cannot be viewed from the outside

The discovery of the crack in the containment means that this plant is a danger to the public. Is the NRC really going to even consider renewing the plant's license after all the "surprise" problems it has had?

The potential concrete cracking is in the shield building which is not equivalent to the containment vessel. The licensee is currently completing the evaluation of the crack indications in the shield building. Once the evaluation is complete, the NRC will review it and take any

actions necessary to ensure the licensee is taking the actions necessary to ensure the shield building will perform its design function and the safety of the plant is maintained.

What actions are the NRC taking?

There are currently NRC structural inspectors on-site monitoring this issue. They will be monitoring the conditions through completion. They are also consulting with other experts in our regional and headquarters offices. Also, the NRC will review the licensee's analysis of the cracks and their assessment of whether they interfere with the building's ability to fulfill its design function.

What is the NRC doing about this problem?

Immediatedly after being notified of the crack indications, the NRC dispatched additional inspectors to monitor FENOC's assessment and analysis of these indications. Once we have a complete evaluation from the utility on the scope and potential impact of the cracks on the shield building's ability to fulfill its safety functions, the NRC will conduct independent evaluations to determine whether we agree with that assessment. NRC will take all appropriate and necessary actions following the completion of our review to ensure public health and safety.

Are there extra inspections? Does NRC have inspectors; inspections specifically to look into this?

Yes, the NRC has structural experts, onsite. Currently, the NRC inspectors are reviewing the concern as part of the inspection activities associated with the oversight of the modifications in the plant for the replacement of the reactor vessel head. Headquarters experts are also involved in the evaluation of the licensee's analysis.

Is there going to be a special inspection into this problem?

The site is still in the process of evaluating the condition. Though no need for a special inspection has been identified, the NRC has already added additional inspectors onsite and additional Headquarters support is being provided. NRC managers and staff are continually evaluating the information we gather through our inspection efforts, and if safety concerns come to light in the course of the review, NRC will take all appropriate and necessary actions to ensure public health and safety.

Is the NRC going to make the plant delay its restart and inspect the rest of the shield building for cracks?

The licensee evaluation of all the indications identified in the shield building has not been completed. If during our review we identify any concerns, the licensee will have to address them before restart.

Do they have to fix this before restarting?

The licensee will need to ensure the building is safe before restart. The NRC is assessing the licensee's actions and will not hesitate to prevent the plant from restarting if a safety concern exists.

What does it say about their safety culture?

The licensee identified the concern, put it in their corrective action program and is evaluating it in accordance with their corrective action program.

Did they conceal this from the NRC and the public?

No, it is our understanding that they communicated the conditions they identified immediately after discovery.

How is this different from Crystal River?

Comparisons have been made between the cracks found in the shield building at Davis-Besse and cracks in the containment structure at the Crystal River nuclear plant in Florida. However, there are significant differences between the two plants. Crystal River's containment vessel is attached to the shield building serving as a single structure to prevent radiation from reaching the environment whereas at Davis-Besse the free-standing steel containment vessel, that is separate from the shield building, serves that function. Because of this difference, the cracks identified in the containment structure at Crystal River in 2009 challenge its safety and that is why the plant is currently shut down.

Crystal River has been shut down for a long time because of a similar problem. How come the NRC isn't requiring DB to shut down?

Davis-Besse is currently in a shutdown condition. The problem at Crystal River is different from the conditions identified at Davis-Besse (see above). Also, the conditions at Davis-Besse have not been fully evaluated yet and therefore, no determination has been made with respect to the actions going forward.

What is the difference between the architectural region and the structural region?

Both what is being described as the architectural region and the structural region are part of the shield building structure. The architectural portions of the shield building, otherwise known as "shoulders", have a cosmetic function. They are not needed for the building to fulfill its safety function of protecting the containment vessel against earthquakes, tornadoes and outside objects.

Why is it ok for there to be cracks in the architectural region?

The site is currently evaluating the cracks identified in the shield. Before the NRC can make an independent determination on the impact these cracks have on the function of the shield building, they will be reviewing the licensee's evaluation and addressing any questions or concerns that may arise. The NRC will ensure all our concerns are addressed prior to the plant restarting.

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COMMUNICATIONS PLAN

Davis-Besse Nuclear Power Plant

This is an addendum to the Reactor Vessel Head Replacement Communication Plan

Shield Building Root Cause Report

October 2011 – March 2012
POC: David Hills, RIII
630-829-9733

GOAL

• Be prepared to answer public questions on the details and analysis of the root cause report related to the cracks identified in the concrete of the shield building based upon the NRC's evaluation of the root cause review process.

KEY MESSAGES

• The shield building remains capable of performing its safety function in its current condition.

• The NRC is ensuring the licensee continues to monitor the shield building in accordance with the commitments made in the Confirmatory Action Letter (CAL).

• If any concerns are identified during the root cause review, the NRC will ensure actions are taken to address these concerns and protect the public health and safety.

• The results of the NRC's inspection of the root cause evaluation will be documented in a publicly available inspection report and presented during a subsequent public meeting.

• Reviewers at our headquarters office are taking into consideration the root cause of the cracking as part of their assessment of the Davis Besse aging management program.

BACKGROUND

The NRC was informed by FirstEnergy on October 10, 2011 that it had identified what looked like a crack in the concrete shield building of the Davis-Besse nuclear power plant in Oak Harbor, Ohio. The plant had been shut down and workers were starting to cut a hole in the side of the shield building in order to move and replace the reactor head when they found the crack. The shield building is made of two and a half feet of steel reinforced concrete.

It is important to emphasize that the shield building at Davis-Besse is not the primary containment vessel. The containment vessel is made of one and a half-inch thick welded steel and sits inside of the shield building separated by about four and a half feet of void space. The containment vessel is designed to keep the radiation inside the reactor from reaching the environment.

The safety functions of the shield building are, during operation, to provide additional shielding

from radiation originating in the reactor and provide environmental and tornado missile protection for the containment vessel. In case of an accident, the shield building is a part of the ventilation system that filtrates radioactivity before it is released to the environment.

There is no threat to public health and safety because the plant is currently shut down. Furthermore, this issue did not meet the NRC's reporting requirements because it did not constitute an immediate safety concern.

Nevertheless, the NRC immediately sent a structural expert to the plant. In addition, there were already two resident inspectors and several specialists from the Region III office in Lisle, Ill., on the site inspecting the reactor head replacement activities. The NRC inspectors, along with experts from headquarters conducted an independent assessment and reviewed the utility's efforts to address the issue and any potential safety significance. The NRC ensured all issues were addressed to its satisfaction prior to the licensee's restart of the unit.

The activities the licensee has performed to date to address this issue include impulse response testing on various areas of the shield building's outer surface and several core boring samples in response to the Confirmatory Action Letter (CAL) issued on December 2, 2011. Our structural experts in the regional office as well as headquarters are currently performing a detailed review of the licensee's root cause report. The results of NRC's review will be communicated to the public (e.g. press release). The root cause report was received on February 28, 2012, in accordance with the CAL.

CHALLENGES

Currently identified challenges include:

- Effectively communicating the length of time the root cause report evaluation will take.
- Effectively communicating that the shield building continues to perform its intended safety function during the review.
- Provide a means of receiving and responding to public comments throughout the review process

Q&As FOR DAVIS-BESSE ROOT CAUSE REPORT

Q1. Is the licensee's root cause report going to be publically available?

A1. Yes, the licensee's root cause report is publically available through the NRC's document control system, ADAMS, with accession number ML120600056.

Q2. Are the documents used to evaluate the root cause going to be publically available?

A2. In addition to the root cause report itself, FENOC has stated the intent to provide a non-proprietary version of the more detailed Performance Improvement International (PII) technical report on which the Shield Building Root Cause Analysis Report was based and that can be publically released. However, it may take up to several weeks for that report to be produced.

Q3. What happens if the root cause isn't thorough?

A3. NRC inspectors have been closely monitoring FENOC root cause analysis activities and are currently evaluating FENOC's conclusions and rationale described in its Root Cause Analysis Report. This process involves extensive discussions with FENOC and its contractors' staffs as well as review of underlying technical data, calculations, and evaluations. We are ensuring that FENOC addresses any questions that we have and we will take actions to ensure identified deficiencies, if any, in the root cause analysis are addressed.

Q4. Is the NRC *conducting its own, independent root cause investigation? If no* – why not? We don't trust FENOC!

A4. No, the NRC is not conducting its own investigation. The NRC will thoroughly review the analyses conducted and submitted by the licensee. If the NRC develops any concerns with the analyses, other courses of actions will be pursued.

Q5. How do we know the NRC won't just rubberstamp an analysis that lets Davis-Besse of the hook as the NRC has done in the past?

A5. The root cause report is being reviewed by a team of inspectors which will take time to complete. The review will be very thorough and take considerable amount of resources between the region and headquarters.

Q6. Is the NRC going to discuss their conclusions with the public and take comments on the root cause before making the final decision?

A6. Yes, the NRC will discuss its conclusions in a public forum and take comments regarding the root cause. Once the root cause report review is completed, a public meeting notice will be issued to discuss the NRC's conclusions.

Q7. What happens after the NRC decides if the root cause is adequate?

A7. NRC inspectors have not yet determined whether the root cause is adequate or not. They are performing a thorough and rigorous review of the licensee's root cause and proposed corrective actions. If the NRC determines the licensee's root cause and proposed corrective actions are reasonable, then we will continue to monitor licensee actions to ensure they are appropriately implemented within a reasonable time period.

Q8. Is the plant going to fix the cracks?

A8. The licensee has proposed corrective actions to develop a comprehensive plan for re-establishing the shield building conformance to its design and licensing basis. NRC inspectors are currently performing a thorough and rigorous review of the licensee's root cause and proposed corrective actions.

Q9. Are you still considering renewing the license of the plant that has cracks in the shield building? It's only going to get worse with age.

A9. NRC inspectors are currently performing a thorough and rigorous review of the licensee's root cause and proposed corrective actions. NRC license renewal staff are monitoring those activities to ascertain aspects, if any, that warrant consideration with respect license renewal.

Q10. How long is the root cause review going to take?

A10. The NRC's review of FENOC's root cause analysis is currently ongoing and there is no specific completion date. The inspectors will take what time is necessary to ensure a thorough and rigorous review. The results of that review will be communicated to the public. The NRC blog will be updated periodically stating the status of the inspection.

Q11. How are you going to keep the public informed about the status of the review, especially if the NRC finds major problems with the analysis?

A11. The NRC will keep the public informed via the NRC blog and press releases issued by the Office of Public Affairs.

Q12. Is the NRC going to provide Rep. Kucinich and Kaptur with regular briefings about the status of the review?

A12. The NRC will provide periodic updates to the Representatives through the Office of Congressional Affairs.

MILESTONE TIMELINE

Davis-Besse Shield Building Inspection & License Renewal Milestone Coordination Schedule

The following link is the NRC's SharePoint site for the Davis-Besse Shield Building:

Davis-Besse Shield Building SharePoint Site

The folder with the updated milestone schedule is listed as "Davis Besse Shield Building Milestones."

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COMMUNICATIONS PLAN

Davis-Besse Nuclear Power Plant

This is a shield building addendum to the Reactor Vessel Head Replacement Communication Plan in preparation of the release of the shield building cracking root cause and corrective action inspection report.

Shield Building Issue

June 2012
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GOALS

• Be prepared to answer public questions on the cause, extent of condition and actions going forward related to the cracks identified in the concrete of the shield building.

• Be prepared to answer internal questions on the cause, extent of condition and actions going forward related to the cracks identified in the concrete of the shield building.

KEY MESSAGES

-The shield building is safe. It can fulfill its safety functions despite the cracking including withstanding earthquakes and tornados.

-The NRC conducted a thorough and independent review of the licensee's root cause analysis of what caused the shield building cracks to make sure its causes are well understood.

-The NRC put together a special team of inspectors who took a wide range of actions to make sure the company's data and the analysis are sufficiently thorough and rigorous. NRC inspectors:

- observed the shield building tests and analyses;
- examined the rigor of the licensee's calculation methodology, the scope of the shield building testing and results;
- reviewed the credentials of personnel the licensee assigned to the root cause investigation;
- continued to ask the company questions during multiple onsite inspections and regional reviews until the NRC was satisfied with the quality of the answers.

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-The NRC conducted a detailed analysis of the company's proposed actions to ensure shield building safety going forward and concluded that the actions proposed by the company to address the cracking issue would prevent recurrence of the laminar cracking if properly implemented.

-The NRC will continue to make sure the shield building remains safe. NRC staff continues to perform inspections associated with this issue and is developing a longer term inspection plan for continued NRC focus to ensure the licensee implements the corrective actions outlined in its root cause analysis in a thorough and timely manner.

-As a result of NRC's observations regarding the licensee's analysis, the company submitted a revised root cause report which addresses the NRC's comments. The NRC's observations are primarily associated with providing additional details to support the licensee's analysis and proposed corrective actions. The NRC will conduct a thorough review of this revision and make its conclusions available to the public.

-We will schedule a public meeting to discuss this issue and the NRC's actions going forward.

-The NRC's license renewal experts are evaluating the implications of this issue in the context of the NRC's aging management requirements.

TALKING POINTS

• The licensee provided a sufficient basis for the causes of the shield building laminar cracking related to the environmental factors associated with the 1978 blizzard, the lack of an exterior moisture barrier, and the structural design elements of the shield building.

• Although we had no issues with the licensee's long term monitoring plans, we have deferred any final conclusions thereof pending review of the new aging-management program, "Shield Building Monitoring Program," through the license renewal process.

• The NRC performed two extensive, in-depth inspections with respect to the laminar cracking which resulted in additional actions by the licensee. The first inspection, which evaluated the ability of the shield building to perform its safety functions, resulted in the licensee conducting more extensive testing of the building, more extensive quantitative analyses, and reversing its position regarding the shield building conformance with its licensing basis. The second inspection, which evaluated the licensee's root cause analysis of the shield building cracking, resulted in the licensee revising the Root Cause Report to address minor weaknesses noted by the NRC and broadening of two of the corrective actions outlined in the original report. These minor weaknesses did not affect the final outcome of the root cause evaluation.

• The NRC didn't identify any violations associated with the root cause. The licensee identified the root cause of the cracking to be the absence of protective moisture coating on the shield building. This did not constitute a violation because the original design specifications for construction of the shield building did not require the application of such coating. The building was designed in accordance with applicable design codes and requirements.

• Although the shield building is capable of performing its safety functions (operable), it does not conform to its existing licensing basis in its present condition. Specifically, the licensee performed calculations that confirmed the calculated shield building stresses remained within

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acceptance limits specified in the original design and licensing bases (design and licensing strength). However, the licensee used a different calculation methodology than specified in the licensing basis. In addition, the concrete codes that are pertinent to the shield building licensing basis do not specifically address laminar crackling. Hence, the continuing need for the licensee to address the licensing basis. The licensee in its Root Cause Report identified Direct Cause Corrective Action 2 – "Engineering plan to re-establish the design and licensing basis for the shield building" and expected to have the plan in place by December 2012.

• The licensee submitted a revised Root Cause Report on May 16, 2012, with changes to address the minor weaknesses identified during the NRC inspection. The NRC will review the revised report in conjunction with future inspection activities. This review will include evaluating the Union of Concerned Scientists concern raised in its May 25, 2012, letter that the revised Root Cause Report is evidence of a 50.9 violation. The NRC is developing a follow-up inspection plan focused on verification and evaluation of licensee corrective action implementation though the NRC's baseline inspection program.

• Due to the high level of public concern about Davis-Besse, the NRC has taken extra steps to ensure communications and openness to the public. The NRC issued a publically available preliminary notification (PN) regarding the licensee's discovery of the cracking. The NRC later issued a confirmatory action letter prior to plant restart which documented NRC conclusions regarding shield building operability. The NRC also conducted a public meeting subsequent to plant restart to provide the licensee the opportunity to communicate details regarding their evaluation of the cracking and for the NRC to describe its related inspection activities. The licensee's Root Cause Report was submitted as publically available. The two NRC inspection reports also contain considerably more detail than the norm including inspection observations. The NRC has released several press releases and blogs regarding the shield building issue, responded to questions from the media and congressional representatives, and conducted government to government meetings. The NRC plans to conduct another public meeting to discuss the licensee's root cause evaluation and related NRC inspection activities.

• The NRC is evaluating whether there is a potential for generic applicability regarding the absence of a building exterior sealant and considering whether some type of generic communication would be appropriate.

BACKGROUND

• On October 10, 2011, during shield building hydro-demolition operations to create an opening to replace the reactor pressure vessel head, indications of potential cracks were identified in various sections of the opening in the reinforced concrete shield building (SB). The licensee immediately informed the NRC. Through additional extent of condition activities the licensee determined that laminar cracking running next to and parallel to the outer rebar mat existed in the SB flute shoulders, around the main steam line penetrations, and in various locations near the top of the building wall.

• The containment system was designed to provide protection for the public from radiological consequences of hypothetical accidents including a break of the largest reactor coolant piping. The containment vessel is made of one and a half inch thick welded steel and sits inside the shield building separated by about four and a half feet of void space. The containment vessel (CV) provides the primary means to contain the post-accident environment and was designed to withstand and hold against accident pressure. <u>The identified cracking did not involve the CV.</u>

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The design basis of the SB provided: (1) environmental protection of the containment vessel; (2) for a controlled release of the annulus atmosphere during accidents; and (3) shielding from radiation sources within the SB. Specifically, the SB's function was to provide biological shielding and, in case radioactive leakage escapes from the CV during accident conditions, to allow the Emergency Ventilation System to draw a suction from the annulus region and filter that leakage. In addition, the SB protects the CV from external environmental hazards such as tornado winds and tornado driven missiles. The SB must also function to withstand earthquakes.

• After extensive review by Region III and Headquarter's structural experts, and additional resulting efforts by the licensee's staff with respect to extent of condition and technical evaluation, the NRC concluded that the licensee had provided sufficient rationale to demonstrate that the SB remained capable of performing its safety function despite the cracking, but the building was nonconforming with respect to its licensing basis (NRC inspection report 05000346/2012007 (ML12128A443)). In order to provide continued long-term confidence, the NRC issued Confirmatory Action Letter 3-11-001 (ML11336A355) on December 2, 2012, prior to plant restart to document licensee commitments to provide a root cause analysis and corrective actions, a long term monitoring plan, and specific short term monitoring efforts to ensure the cracking doesn't get worse in the interim. Related NRC conclusions and their bases were discussed during a public meeting held on January 5, 2012 (ML12030A141).

• The licensee submitted its Root Cause Report (ML120600056) on the public docket on February 27, 2012. The licensee identified the direct cause as the integrated effect of moisture content, wind speed, temperature, and duration from the blizzard of 1978, and the root cause as the design specification for construction of the shield building not specifying application of an exterior sealant from moisture. The licensee also identified three contributing causes involving specific design features of the building. The Root Cause Report also identified planned corrective actions as well as associated due dates, and acknowledged that the shield building, although operable, did not conform to the licensing basis in its current condition.

• The NRC completed its inspection of the licensee's root cause efforts and planned corrective actions on May 9, 2012. The NRC inspection team concluded that the licensee had a sufficient basis for the causes of the shield building laminar cracking related to the environmental factors associated with the 1978 blizzard, the lack of an exterior moisture barrier, and the structural design elements of the shield building. Specifically, the weather records, core boring sample results, impulse response testing and shield building analytical modeling provided a sufficient basis to support the causes of the laminar cracking. The team identified minor weaknesses in the Root Cause Analysis Report associated with the level of detail in the documentation provided. These weaknesses did not constitute performance deficiencies or findings because they did not adversely affect the outcome of the root cause process. The team identified two examples for which the corrective actions to address the causes of the shield building cracking appeared too narrow. Specifically, the licensee had not proposed examinations to confirm a lack of subsurface cracking in other safety-related building structures with installed moisture barriers to further substantiate the Direct Cause. In addition, the corrective action for the Root Cause included updating a site procedure for inspections of only the shield building exterior sealant system instead of a broader action to inspect all safety-related buildings with moisture barriers. The licensee entered the team's observations into the corrective action system, and was considering actions to expand the scope of these corrective actions.

• The licensee submitted a revised Root Cause Report (ML12142A053) on May 16, 2012, with changes to address the minor weaknesses identified during in the NRC inspection. The NRC is

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developing a follow-up inspection plan focused on verification and evaluation of licensee corrective action implementation. The NRC will review the changes in the revised Root Cause Report as part of this inspection plan to confirm that the changes, although unlikely, do not invalidate previous NRC conclusions.

• On August 27, 2010, the licensee submitted a license renewal application (ML102450565). The NRC issued an RAI (ML11333A396) regarding the shield building cracking on December 27, 2011. Interveners (Beyond Nuclear, Citizens Environment Alliance of Southwestern Ontario (CEA), Don't Waste Michigan, and the Green Party of Ohio) on January 10, 2012, proposed a new Contention 5 with the NRC's ASLB regarding the shield building cracking. The licensee on April 5, 2012, responded (ML12097A520) to the NRC RAI. The response included a new plant-specific aging management program titled "Shield Building Monitoring Program" to periodically inspect the structure to confirm that there are no changes in the nature of the identified laminar cracks. On June 4, 2012, the interveners filed a motion (ML12156A411) to amend and supplement their proposed Contention 5 to include concerns from their review of the licensee's Root Cause Report and RAI response.

CHALLENGES

Currently identified challenges include:

• We must continue to clarify what is meant by "operable but nonconforming." External stakeholders have tended to impart their own meaning to this term that is not necessarily consistent with NRC's understanding and use of the phrase. We need to be clear and consistent in our communications (written and verbal) that the shield building will continue to meet its safety functions (remain operable), and that determination was made using calculation methods that are different (yet still valid) than those used in the original licensing (nonconforming). Although operability is maintained, the licensee will have to bring the shield building back into conformance, through physical (modifications/repairs) or regulatory (additional testing/evaluation to show licensing basis is met or approved license amendment) means.

•Given the license renewal implications, Region III and NRR/DLR must continue to coordinate closely together to ensure that current license versus renewed license activities are clearly distinguished and communicated in such a manner that they do not invalidate one another.

• With the desire to ensure openness with the public, the public has been provided access to a considerable amount of technical detail including the licensee's Root Cause Report, the root cause vendor's more detailed technical report on which the Root Cause Report is based, and the NRC's own inspection reports which are more detailed than the norm. In addition, a FOIA request is being processed which will possibly result in access to even more technical detail including calculations. Also, intervener's have performed their own review of these documents and submitted information into the license renewal proceedings aimed at discrediting the licensee's root cause efforts. Hence, care must be taken to ensure the public adequately understands the issue and does not become confused.

• Representative Kucinich has claimed that the licensee had not been open to the public regarding the shield building cracking and had attempted to downplay the significance. Along the same theme, the Union of Concerned Scientist in a letter (ML12151A323) dated May 25, 2012, claimed that the licensee revising its Root Cause Report was evidence of a 50.9 violation. Both are tying these claims into historical 50.9 issues involving the reactor pressure vessel

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head. We need to ensure we continue to be responsive to external stakeholders, and respond to their concerns and questions in an expeditious manner

COMMUNICATION TIMELINE

Thursday 6/14	Shield Building Pre-Brief	Cameron / Hills
Friday 6/15	Regional Administrator Briefing	O'Brien
Monday 6/18	Communications Plan (without Qs & As) Ready DB SB Background Info for Chairman Visit to Perry	Cameron / Hills Jandovitz
Wednesday 6/20	Congressional Phone Briefings (Kucinich / Kaptur) Questions and Answers Ready Pre-Brief for Lochbaum Call Lochbaum Letter Re:50.9 Status Call (Casto) E-mail Draft Root Cause Inspection Report to OGC (License Renewal) E-mail Final Communications Plan / Q & As to Davis-Besse Focus Team / EDO Coordinator	Cameron / Hills Cameron / Hills Mitlyng Mitlyng Hills Hills
Thursday 6/21	Issue Root Cause Inspection Report ***<u>*To be performed in order:*</u> 1) Sign Inspection Report [~8:45am] 2) E-mail Final Report to DB Focus team / EDO Coordinator / OGC (license renewal) [~9:30am] 3) Contact OCA [~9:45am] 4) OCA contact Congressman Kucinich/Kaptur [~10:30am] 5) Contact State/Local Officials [~10:45am] 6) Issue Report / Distribute through ListServe [no later than 1:30pm] 7) Chuck Casto Media Interviews [afternoon] 8) Issue Press Release [afternoon] 9) E-mail RA and DRS admin staff to close out EDO Tasking for providing report to Kucinich [by COB]	1) Reynolds 2) Hills 3) Hills 4) Riley (HQ) 5) Barker 6) Admin 7) Public Affairs 8) Public Affairs 9) Sanchez-Santiago
Monday 6/25	Revised Root Cause Report Inspection Plan Ready Shield Building Action Follow Up Plan Ready	Neurauter Neurauter

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Monday 7/2	Revised Root Cause Inspection Entrance Meeting	Neurauter
Wednesday 7/18	Government to Government Meeting Prep Public Meeting Slide Walkthrough & Q&A Practice	Barker Mitlyng
Wednesday 7/25*	Government to Government Meeting	Barker
Thursday 7/26	8/9 Public Meeting Notice Posted (Deadline)	Sanchez-Santiago/Shaikh
Friday 7/27	8/9 Public Meeting Slides Finalized	Hills
Friday 8/3	Revised Root Cause Report Inspection Completed and Exit Meeting Conducted High Level Inspection Summary Prepared	Neurauter Neurauter
Monday 8/6	8/9 Public Meeting Prep / Q&A Practice	Mitlyng
Thursday 8/9	Editorial Board meetings (A.M.) Just-in-Time Q&A Practice (3:00pm - 5:00pm) Public Meeting on Original Root Cause Report Inspection (6:00pm - 10:00pm)	Mitlyng Mitlyng Team
Week of 8/13*	2011 End-of-Cycle Public Meeting	Cameron
Friday 8/31*	Revised Root Cause Report Inspection Report Issued Draft IN Generated Lochbaum Letter Re:50.9 Written Response	Neurauter Neurauter Heck
September*	Confirmatory Action Letter Closure	Cameron

*Tentative

Q&As FOR DAVIS-BESSE SHIELD BUILDING ISSUES

A. DAVIS-BESSE ROOT CAUSE REPORT QUESTIONS

1. **How can you definitively say that these cracks all over the shield building happened because of the 1978 blizzard?**

   As documented in the Root Cause Report, the licensee's Root Cause Team applied the TapRoot Methodology, Problem Solving and Decision Making, Equipment Apparent Cause Evaluation, Event and Causal Factors Charting, Barrier Analysis, Change Analysis, and Fault Tree Analysis methods and techniques in their root cause analysis of the identified shield building laminar cracking. These methods and techniques are

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recognized standards for an effective root cause evaluation. Using these methods and techniques, the licensee's root cause team compiled a comprehensive list of 45 potential failure modes

The licensee further evaluated the comprehensive list of 45 potential failure modes, and only the conditions postulated during of 1978 blizzard resulted in shield building laminar cracking. In addition, the licensee provided a reasonable basis to justify the shield building conditions that resulted in concrete tensile stress of sufficient magnitude to initiate laminar cracking.

The failure mode evaluated by the license that resulted in a prediction of shield building laminar cracking was supported by observations of laminar cracking identified in cylindrical reinforced concrete structures in Ontario, Canada. The licensee evaluated shield building conditions likely created during the blizzard of 1978 that resulted in tensile stress of sufficient magnitude to initiate and propagate laminar cracking in the shield building concrete vertical wall, specifically water penetration at the outer surface due to wind driven rain followed by freezing of trapped water due to a rapid temperature drop resulted in concrete tensile stress of sufficient magnitude. Licensee analyses without effect of freezing penetrated water did not result in tensile stress of sufficient magnitude to predict initiation of laminar cracking.

2. **Isn't it convenient for FE that the root cause isn't some kind of age related degradation?**

The licensee evaluated a comprehensive list of 45 potential failure modes, and only the conditions postulated during of 1978 blizzard resulted in shield building laminar cracking. In addition, the licensee provided a reasonable basis to justify the shield building conditions that resulted in concrete tensile stress of sufficient magnitude to initiate laminar cracking.

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3. **The NRC report is full of details, lists of reviewed documents, etc. Explain to me in plain English how the scope of root causes could have been narrowed to only 45?**

The licensee assembled a team of industry experts to support the investigation and determine the cause(s) and recommended actions. The licensee's team was based upon technical capability in reinforced concrete structures, experience in root cause

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investigation, and previous experience in nuclear containment laminar cracking. The team's effort resulted in a comprehensive list of 45 potential failure modes for further evaluation during the licensee's investigation. NRC engineers independently evaluated and concluded the list of potential failure modes was comprehensive.

4. **How were all the other 44 causes dismissed?**

The licensee's root cause team utilized a combination of engineering judgment (technical basis), testing, and calculational analysis. Although some of the evaluated failure modes were categorized as a "causal factor" [assisted crack propagation within shoulder area or explained why cracking propagated outside shoulder region], concrete tensile stress of magnitude sufficient to initiate and propagate a laminar crack in the shield building vertical wall resulted only when trapped moisture in proximity to the outer reinforcement mat froze rapidly.

5. **Is there anything else cracked? Have they looked at all other structures that could have been damaged?**

Visual examination of the exterior of other safety related structures (such as the auxiliary building and the intake structure) have not identified any symptoms that would signify the presence of concrete laminar cracking. An exterior moisture sealant had been applied to the other structures and therefore they would not be expected to be susceptible to the same degradation mechanism.

6. **How come it took 34 years to discover the cracks?**

The exterior of the shield building has undergone periodic visual examination and, while finding indications of surface cracks, have not found indications of "below surface" laminar cracking. Through wall openings in the shield building, prior to the recent head replacement activities, have been made inside the confines of the original construction opening. No indications of laminar cracking were identified in those openings. This last opening cut included some area outside the confines of the original construction opening. The laminar cracking was identified in that area.

Background information below from the root cause report

A shield building surface visual inspection history is provided in Attachment 3 . The Maintenance Rule Structure Evaluation from June 1999 and November 2005 identified surface cracks, but since they were all less than *1/16* inch, the cracks were found to be acceptable. Since May 1996, the surface visual inspections of the shield building exterior have identified concrete spalling above the original construction opening. The concrete spalling above the original construction opening coincides with the location of the various grout tubes used for closing the blockout as shown on drawing C-112 detail 1.

On August 15, 1976 the Toledo Edison Company construction superintendent documented an examination of the shield building dome parapet that found a cracked and broken architectural flute shoulder corner at approximately 292 degree azimuth.

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There were also other hairline shrinkage cracks in the dome parapet at both corners of each architectural flute shoulder, at mid-width of each flute, and vertical around the periphery of the parapet that should not affect the structural integrity of the shield building dome parapet. One small area of the latex coating at approximately 315 degrees mid-way up the shield building dome was found peeling and chipping from being applied too heavily (-114 inch). That coating was identified for removal with the area reapplied using a thinner layer of the same latex.

None of the inspections of the shield building exterior surface identified any symptoms that would signify the presence of the concrete laminar cracking. None of the inspections of the other safety-related structures such as the auxiliary building or intake structure exterior identified any symptoms that would signify the presence of concrete laminar cracking or waterproof coating degradation.

7.

a. **If the shield building "does not meet the current design and licensing bases," doesn't that mean that if FENOC were applying for its license today, the license would be denied because the shield building did not conform to existing design and licensing criteria?**

Upon identification of shield building laminar cracks near the outer face reinforcement mat, the licensee entered the issue into its corrective action program and evaluated the safety significance of the concern. The licensee and NRC staff both concluded that the Davis Besse shield building is capable of performing its safety function (operable), but does not conform to its existing design and licensing basis. The licensee in its Root Cause Report identified Direct Cause Corrective Action 2 – Engineering plan to re-establish the design and licensing basis for the shield building. Common approaches to addressing non-conforming conditions include repair/modification, developing new information that demonstrates the existing licensing basis is actually met, changing the licensing basis by requesting NRC approval of a license amendment, or some combination thereof. The licensee is currently exploring viable options with the outcome of several actions described in the Root Cause Report likely to factor into the licensee's engineering plan including:

- Direct Cause Corrective Action 1 – Testing program to investigate the steel reinforcement capacity adjacent to structural discontinuities.
- Extent of Condition Corrective Action 1 – Additional examination of the shield building exterior wall.
- Extent of Condition Corrective Action 2 – Issue engineering change package for additional shield building core bores.

While we won't speculate on the outcome of a hypothetical licensing review, the licensing process does allow for proposal and approval of alternate approaches that the NRC staff deems adequate to protect the public health and safety. However, the licensee would need to provide justification acceptable to the NRC staff.

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b. **And doesn't it also mean that FENOC's relicensing application would be denied unless FENOC was able to restore the shield building to a condition that did conform to the existing design and licensing criteria?**

The first principle of license renewal is that with the exception of age-related degradation and possibly a few other issues related to safety only during the extended period of operation of nuclear power plants, the existing regulatory process is adequate to ensure that the licensing bases of all currently operating plants provide and maintain an acceptable level of safety. The second and equally important principle of license renewal holds that the plant-specific licensing basis must be maintained during the renewal period in the same manner and to the same extent as during the original licensing term. This would be accomplished, in part, through a program of age-related degradation management. So while the shield building licensing basis must be maintained under both the current and a renewed license, re-establishing the design and licensee basis would be necessary via existing regulatory requirements versus through the license renewal process. However, NRC evaluation of a shield building monitoring program as part of the aging management program would be pertinent to a license renewal decision.

8. **At the public officials meeting on Jan 5, one of the NRC engineers drew four concentric circles on the board to describe four increasing levels of strength of the shield building wall. Those four circles were described as follows:**

1. **Strength sufficient to support itself and avoid collapsing under its own weight**
2. **Strength enough to withstand anticipated events**
3. **Design and licensing strength**
4. **As-built strength**

Number 3 was described as providing a margin of safety beyond the strength necessary to withstand anticipated events, and Number 4 was described as providing an additional margin of safety beyond that (because the wall, as built, was stronger than the design and licensing requirements).

Am I correct that FENOC's admission, that the shield building wall no longer meets the design and licensing criteria, means that the additional margin of safety provided by Number 4 no longer exists and that the remaining margin of safety has been reduced below Number 3?

The licensee demonstrated through calculations that the shield building retained structural strength (as-built strength) beyond that required by the current design and licensing basis, despite the laminar cracking. Specifically, as documented in NRC inspection report 05000346/2012-007 (ML12128A443), the licensee performed calculations that confirmed the calculated shield building stresses remained within acceptance limits specified in the original design and licensing bases (design and

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licensing strength). The licensee calculations evaluated appropriate loads including design basis earthquake, tornado wind and differential pressure, and tornado generated missile loads (anticipated events). The licensee also identified additional conservatism in the calculations that was not credited and could provide additional safety margin. However, the licensee used a different calculation methodology than specified in the licensing basis. In particular, the licensee used a more modern, sophisticated finite element iterative computational approach compared to the older manual equation approach from the initial licensing review. In doing so, the licensee also made other changes such as using the alternative differential pressure design load from Regulatory Guide 1.76, "Design-Basis tornado and Tornado Missiles for Nuclear Power Plants," Revision 1. We won't make a definitive conclusion regarding the conservativeness of one approach versus the other given that the licensee did not provide us with an analysis of the cracking using the licensing basis approach. However, it is possible that while being more precise, the chosen approach is not as conservative as the licensing basis approach. However, after extensive review, and some resulting revision by the licensee, our structural experts concluded that the chosen methodology overall had sufficient conservatism to provide reasonable confidence that the shield building stresses would remain within their licensing basis acceptance limits and the building would continue to perform its safety functions. Given that the calculational approach for reaching that conclusion was substantially different from that considered in plant licensing and that the licensing basis design codes applicable to the shield building do not specifically address laminar cracking, they also concluded that the shield building with the laminar cracking was not in conformance with its current licensing basis.

9. **Explain how 1978 blizzard conditions can explain cracking in the entire shield building. For example, if blizzard wind was in a single direction, how was water driven into all flute shoulders explained? (this is a question from the NRC)**

   I think I posed the same question in one of my earlier emails, just after I read the original root cause report.

   This was the answer that they provided on page 93:

   2D moisture penetration in the shoulders (due to a high surface area to volume ratio) leads to more differential expansion under the shoulders. The presence of weak planes in the concrete (due to very high rebar density) gives the cracks a "perforated" path to propagate. Damage in the flute shoulders is concentrated on the southwest side of the building, which coincides with the predominant wind direction. Other parts of the building will still get wet. Based on the IR mapping, the laminar cracks that are not on the southwest side of the building are limited to regions with weak planes of concrete (due to high density rebar). Weak planes of concrete will require less force to initiate cracks. Therefore, the observed result is expected.

   I think the sentences I have highlighted are totally wrong. "Damage in the flute shoulders" is NOT "concentrated on the southwest side of the building...." The laminar cracks in the flute shoulder areas exist around the entire circumference of the building. The original root cause report described that the core bores "revealed similar cracking in each flute shoulder inspected."

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Also, "the laminar cracks that are not on the southwest side of the building" are NOT "limited to regions with weak planes of concrete" or "high density rebar." It is the laminar cracks in the upper elevations where the high density rebar exists. Those cracks are greater on the southwest side, but exist around the entire circumference. The original root cause report refers to the southwestern exposure at the upper elevations as having "the most extensive concrete cracking." But the cracking exists around the entire circumference.

I would appreciate it if you would pass my thoughts on to the NRC engineers who are working on this.

On May 9, 2012, the NRC completed an extensive review of the licensee's root cause efforts. The NRC inspection team identified a number of minor weaknesses associated with the level of detail documented in the licensee's Root Cause Report. The NRC team's observations prompted the licensee to revise its Root Cause Report and to develop additional corrective actions. We agree that the description used by the licensee in your referenced portion of the report to characterize the extent of cracking could also have been made clearer. However, we do not believe that revising that portion accordingly would change the conclusions or corrective actions of the licensee's Root Cause Report. Details of the NRC's review and conclusions regarding the licensee's Root Cause Report will be documented in NRC inspection report 05000346/2012-009.

10.

a. Do you know why this language was added by FirstEnergy in its revised Root Cause Report:

"On August 15, 1976 the Toledo Edison Company construction superintendent documented as examination of the shield building dome parapet that found a cracked and broken architectural flute shoulder corner approximately 292 degree azimuth. There were other hairline shrinkage cracks in the dome parapet at both corners of each architectural flute shoulder, at mid-width of each flute, and vertical around the periphery of the parapet that should not affect the structural integrity of the shield building dome parapet..." [page 29]

The NRC's shield building root cause and corrective action inspection was performed with respect to the licensee's original Root Cause Report submitted February 27, 2012. That NRC inspection was completed on May 9, 2012, and an inspection report available to the public will be issued within 45 days of that completion. Any related NRC conclusions are pre-decisional until that report is issued. Subsequent to the completion of the inspection, the licensee revised the Root Cause Report to address several minor weaknesses the NRC team had noted in the original, and submitted it to the NRC on the public docket on May 16, 2012. Since it was just recently submitted, the NRC has not yet completed its review of the revision. Any NRC insights regarding changes provided in the revision are therefore preliminary in nature.

One of the minor weaknesses noted by the NRC inspection team was that the Root Cause Report did not include: A more complete basis for excluding the shield building roof dome in the extent of cause review for the laminar cracking. The

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licensee's root cause team had excluded the shield building roof dome based upon the contributing causes associated with the unique design elements of the shield building exterior wall. Because the shield building dome was coated with a latex based coating, the presence of this moisture resistant coating could have provided a more complete basis for exclusion than just the contributing causes. The licensee has stated that the Root Cause Report change that you referenced was made to address this minor weakness. Specifically,

"The 1976 memo from the Contractor (Bechtel) made reference to the latex coating that was applied to the dome. For completeness, the memo contents on the condition of the concrete was included on page 29 of the root cause. The root cause was revised to include the information concerning the latex coating on the dome. Since the root cause was attributed to the lack of weather sealant, a more appropriate discussion to exclude the dome from consideration would be to discuss the use of the latex coating in lieu of the discussion concerning the absence of stress concentrations found at the inner shoulder interface. The root cause was revised to include this information."

b. **And do you know what "vertical around the periphery of the parapet" is meant to describe? I interpret that to mean cracking that was visible on the top of the parapet, not on the outside of the wall.**

The 1976 memo assessed the broken corner of the flute/ shoulder interface at azimuth 292 degrees (+/-) on the top of the parapet. Bechtel provided a sketch of the area to be repaired. The sketch (FSK-C-799) clearly shows a local damaged area to be repaired. The area was confined to the top 15 inches of the exterior side of the parapet for that flute/shoulder corner. The memo also states: "There are other hairline shrinkage vertical cracks around the periphery of the parapet: they should not affect the structural integrity of the parapet." Since the referenced examination was performed on top of the shield building dome inside the parapet wall, this is interpreted to mean that the hairline shrinkage vertical cracks were visible at the top of the inside wall of the parapet. Note that unlike the recently identified laminar cracking, these cracks noted in 1976 were identifiable through a surface examination of the concrete exterior.

B. AMENDED ROOT CAUSE

In a May 16, 2012 submittal to the NRC, FENOC revised its Feb. 28, 2012 root cause report on the cracks to Davis-Besse's shield containment building to include this statement (found in document ML12142A052 on the NRC website):

"On August 15, 1976 the Toledo Edison Company construction superintendent documented an examination of the shield building dome parapet that found a cracked and broken architectural flute shoulder corner at approximately 292 degree azimuth. There were also other hairline shrinkage cracks in the dome parapet at both corners of each architectural flute shoulder, at mid-width of each flute, and vertical around the periphery of the parapet that should not affect the structural integrity of the shield building dome parapet..." [page 29]

RELEASE IN ENTIRETY

1. **How come FE didn't reveal this information in the original root cause?**

   The shield building concrete conditions identified in1976 were evaluated and dispositioned by the licensee during original construction. The shield building cracking identified at the dome parapet in 1976 was not the laminar cracking identified in October of 2011. Since the licensee's root cause report documented their evaluation of the root cause for the laminar cracking in the shield building, the licensee did not need include this information in its original root cause report

2. **Doesn't the presence of cracking long before the blizzard put in question the entire root cause explanation?**

   The 1976 memo from the licensee's Contractor (Bechtel) made reference to the latex coating that was applied to the dome. For completeness, the memo's description of the concrete condition was included on page 29 of the root cause report. The root cause report was revised to include the information concerning the latex coating on the dome. Since the root cause was attributed to the lack of weather sealant, a more appropriate discussion to exclude the dome from consideration would be to discuss the use of the latex coating in lieu of the discussion concerning the absence of stress concentrations found at the inner shoulder interface. The root cause report was revised to include this information.

   The cracking identified in 1976 at the shield building dome parapet was not laminar cracking like that identified in the shield building vertical wall in 2011. Therefore, the cracking identified in 1976 does not invalidate the root cause explanation for the identified laminar cracking.

3. **How come FE was allowed to submit two versions of the root cause. Isn't it a violation when they don't provide complete and accurate information? Obviously, they failed to do so in this case.**

   During the initial review of the root cause report the NRC identified some areas for improvement and communicated these to the licensee. These observations did not affect the conclusion provided in the report. The licensee submitted a revised report incorporating the NRC's observations and the NRC will be reviewing the revised report and ensuring any questions or concerns regarding those changes are addressed.

4. **If the weaknesses in the first version of the root cause were minor, why did FE have to submit the second version?**

   FE was not required to submit a "second version" of the root cause report. As indicated in their cover letter for the revised root cause following the original submittal, during on-site NRC inspection activities, observations were identified with the content of both the FENOC Root Cause Analysis Report as well as the contractor root cause assessment report used to develop the FENOC Root Cause Analysis Report. While those observations did not affect the overall conclusions or corrective actions being taken, the licensee opted to update the root cause to include consideration of those observations.

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5. **How concerned is the NRC that FE was sloppy in preparing the root cause such that it took the NRC to figure out its deficiencies?**

   The NRC performed a thorough review of the licensee's root cause report and addressed all questions and concerns during the course of the inspection. The inspectors concluded that the root cause report was comprehensive. However, the inspectors identified several minor weaknesses, most involving additional detail that was available and could have been provided in the report. These weaknesses did not affect the outcome of the root cause investigation.

6. **UCS told the NRC that FE submitting an incomplete report is a 50.9 violation. Has the NRC considered this issue?**

   10 CFR 50.9 requires information submitted by licensees to be complete and accurate in all material respects. It also requires licensees to notify the NRC of any non-submitted information that has "significant implication for public health and safety or common defense and security." The NRC will consider the UCS concern as it completes its upcoming inspection review of the revised root cause report, including evaluating whether any of the changes are "material".

7. **Has the NRC reviewed the amended root cause? Does is still have weaknesses?**

   The NRC has not completed its review of the amended/revised root cause report. That activity will be completed in an upcoming inspection. If that inspection results in any changes to the NRC conclusions, then that will be communicated to the public.

8. **Will there have to be another amended root cause because FE can't get it right?**

   If after review of the current amended/revised root cause, the NRC identifies significant unresolved issues, the NRC will seek additional information from the licensee. If some information significantly changes information in the root cause, the licensee may decide to amend the most recent root cause report.

C. PROTECTIVE WEATHER COATING

1. **The fact that DB didn't apply protective weather coating to a vital structure that houses the reactor is outrageous. It is outrageous that it wasn't and still isn't an NRC requirement.**

   The shield building was designed and constructed in accordance with applicable design codes and continues to perform its safety functions including withstanding design basis earthquake, tornado wind and differential pressure, and tornado generated missile loads. The design specification for construction of the shield building and the applicable design codes did not specify application of an exterior sealant.

D. VIOLATIONS

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1. **How come the NRC doesn't consider not applying the protective coating to the shield building as a violation?**

   The shield building was designed and constructed in accordance with applicable design codes, and hence NRC inspectors concluded that there were no associated licensee performance deficiencies.

2. **Isn't the NRC concerned that FE put the weather coating on other buildings and NOT on this vital structure? What does that say about their judgment?**

   The shield building was designed and constructed in accordance with applicable design codes. The design specification for construction of the shield building did not specify application of an exterior sealant from moisture and there was no requirement during the construction of the shield building to apply an exterior sealant. The NRC is evaluating whether there is a potential for generic applicability regarding the absence of a building exterior sealant.

E. CORRECTIVE ACTIONS

1. **How is FE going to make sure the shield building is safe if the NRC relicense the plant?**

   Reviews of licensee investigations and calculations have indicated to the NRC that the shield building remains capable of performing its safety function. The licensee has also proposed additional actions to ensure that the performance of that safety function is not compromised in the future. NRC inspectors have and will continue to monitor the licensee's activities and review results from the licensee's ongoing corrective actions.

2. **They said they would do a bunch of things to make sure the building doesn't fall apart but I don't trust them. How is the NRC going to make sure they do everything they listed in the root cause?**

   NRC inspectors have and will continue to monitor the licensee's activities and review results from the licensee's ongoing corrective actions. On-site NRC resident inspectors regularly review licensee activities. These inspectors are regularly supplemented by inspectors from the regional NRC office.

F. GENERIC ISSUE

1. **Is this lack of protective coating issue relevant to other plants?**

   Other similar reinforced concrete structures may be vulnerable to laminar cracking if exposed to conditions similar to those present at Davis-Besse. The NRC is currently considering a generic communication to ensure the industry is informed of potential for cracking in non-coated, reinforced concrete structures.

2. **What has the NRC done to inform other plants?**

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Davis-Besse issued an operating experience report detailing the occurrence of concrete cracking in uncoated concrete structures. Other utilities are expected to review this operating experience for applicability within their sites. The NRC is currently considering a generic communication to further ensure the industry is informed.

3. **Is the NRC going to require other plants with similar shield buildings to look for cracking?**

The NRC is currently considering issuing a generic communication to address the potential generic concerns regarding concrete cracking. If the NRC identifies an immediate safety concern, they will ensure actions are taken to address this.

4. **How many other plants are similar to Davis-Besse in shield building design?**

According to recent industry literature, there are nine other units that have a shield building with another containment structure (steel vessel) that has space between the shield building and the inner containment structure.

G. LICENSE RENEWAL

1. **How can NRC consider renewing DB license when it continues to have unexpected and undiagnosed problems?**

Using the current regulatory process, the NRC ensures the licensee operates the plant in accordance with the licensing basis and maintains an acceptable level of safety. During the extended period of operation, the NRC would continue to ensure these principals are met and any safety concerns are addressed.

2. **How is the root cause analysis going to be considered in the license renewal review?**

The NRC is reviewing the root cause analysis from a license renewal point of view and ensuring any applicable insights are considered and addressed as part of the licensee's aging management program.

3. **How is FE going to make sure the shield building stands up for the next 40 years?**

The NRC inspection team concluded that the licensee's proposed corrective actions if implemented adequately were sufficient to preclude recurrence of the cracking. Although the inspectors had no issues with the licensee's long term monitoring plans we have deferred any final conclusion there of pending review of the new aging management program, "shield

4. **Is the NRC sure that all possible problems with the shield building have been identified?**

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The NRC has reviewed the licensee's activities and studies to identify issues with the shield building. The NRC from those reviews has concluded that at the present time the shield building can perform its designed safety function.

5. **Are you sure both you and FE aren't missing something again?**

The NRC will continue to monitor and follow the licensee's activities to monitor the status of the shield building.

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COMMUNICATIONS PLAN

Davis-Besse Nuclear Power Plant

This is a shield building addendum to the Reactor Vessel Head Replacement Communication Plan for the previously unidentified cracks discovered in August 2013.

Shield Building Issue

October 2013
POC: Jim Neurauter, RIII
630-829-9828

GOALS

• Be prepared to answer public questions on the cause, extent of condition and actions going forward related to the new cracks identified in the concrete of the shield building.

• Be prepared to answer internal questions on the cause, extent of condition and actions going forward related to the new cracks identified in the concrete of the shield building.

KEY MESSAGES

-The shield building is safe. It can fulfill its safety functions despite the cracking including withstanding earthquakes and tornados.

-The NRC conducted a detailed analysis of the company's proposed actions to ensure shield building safety going forward and concluded that the actions proposed by the company to address the cracking issue would prevent recurrence of the laminar cracking if properly implemented.

-The NRC will continue to make sure the shield building remains safe. NRC staff continues to perform inspections associated with this issue and is developing a longer term inspection plan for continued NRC focus to ensure the licensee implements the corrective actions outlined in its root cause analysis in a thorough and timely manner.

-The NRC's license renewal experts are evaluating the implications of this issue in the context of the NRC's aging management requirements.

TALKING POINTS

• The licensee provided a sufficient basis for the causes of the shield building laminar cracking related to the environmental factors associated with the 1978 blizzard, the lack of an exterior moisture barrier, and the structural design elements of the shield building.

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• Although we had no issues with the licensee's long term monitoring plans, we have deferred any final conclusions thereof pending review of the new aging-management program, "Shield Building Monitoring Program," through the license renewal process.

• The NRC performed two extensive, in-depth inspections with respect to the laminar cracking which resulted in additional actions by the licensee. The first inspection, which evaluated the ability of the shield building to perform its safety functions, resulted in the licensee conducting more extensive testing of the building, more extensive quantitative analyses, and reversing its position regarding the shield building conformance with its licensing basis. The second inspection, which evaluated the licensee's root cause analysis of the shield building cracking, resulted in the licensee revising the Root Cause Report to address minor weaknesses noted by the NRC and broadening of two of the corrective actions outlined in the original report. These minor weaknesses did not affect the final outcome of the root cause evaluation.

• The NRC didn't identify any violations associated with the root cause. The licensee identified the root cause of the cracking to be the absence of protective moisture coating on the shield building. This did not constitute a violation because the original design specifications for construction of the shield building did not require the application of such coating. The building was designed in accordance with applicable design codes and requirements.

• Although the shield building is capable of performing its safety functions (operable), it does not conform to its existing licensing basis in its present condition. Specifically, the licensee performed calculations that confirmed the calculated shield building stresses remained within acceptance limits specified in the original design and licensing bases (design and licensing strength). However, the licensee used a different calculation methodology than specified in the licensing basis. In addition, the concrete codes that are pertinent to the shield building licensing basis do not specifically address laminar crackling. Hence, the continuing need for the licensee to address the licensing basis. The licensee in its Root Cause Report identified Direct Cause Corrective Action 2 – "Engineering plan to re-establish the design and licensing basis for the shield building" and expected to have the plan in place by December 2012.

• The licensee submitted a revised Root Cause Report on May 16, 2012, with changes to address the minor weaknesses identified during the NRC inspection. The NRC will review the revised report in conjunction with future inspection activities. This review will include evaluating the Union of Concerned Scientists concern raised in its May 25, 2012, letter that the revised Root Cause Report is evidence of a 50.9 violation. The NRC is developing a follow-up inspection plan focused on verification and evaluation of licensee corrective action implementation though the NRC's baseline inspection program.

• Due to the high level of public concern about Davis-Besse, the NRC has taken extra steps to ensure communications and openness to the public. The NRC issued a publically available preliminary notification (PN) regarding the licensee's discovery of the cracking. The NRC later issued a confirmatory action letter prior to plant restart which documented NRC conclusions regarding shield building operability. The NRC also conducted a public meeting subsequent to plant restart to provide the licensee the opportunity to communicate details regarding their evaluation of the cracking and for the NRC to describe its related inspection activities. The licensee's Root Cause Report was submitted as publically available. The two NRC inspection reports also contain considerably more detail than the norm including inspection observations. The NRC has released several press releases and blogs regarding the shield building issue, responded to questions from the media and congressional representatives, and conducted

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government to government meetings. The NRC plans to conduct another public meeting to discuss the licensee's root cause evaluation and related NRC inspection activities.

• The NRC is evaluating whether there is a potential for generic applicability regarding the absence of a building exterior sealant and considering whether some type of generic communication would be appropriate.

BACKGROUND

• On October 10, 2011, during shield building hydro-demolition operations to create an opening to replace the reactor pressure vessel head, indications of potential cracks were identified in various sections of the opening in the reinforced concrete shield building (SB). The licensee immediately informed the NRC. Through additional extent of condition activities, the licensee determined that laminar cracking running next to and parallel to the outer rebar mat existed in the SB flute shoulders, around the main steam line penetrations, and in various locations near the top of the building wall.

• The containment system was designed to provide protection for the public from radiological consequences of hypothetical accidents including a break of the largest reactor coolant piping. The containment vessel is made of one and a half inch thick welded steel and sits inside the shield building separated by about four and a half feet of void space. The containment vessel (CV) provides the primary means to contain the post-accident environment and was designed to withstand and hold against accident pressure. The identified cracking did not involve the CV. The design basis of the SB provided: (1) environmental protection of the containment vessel; (2) for a controlled release of the annulus atmosphere during accidents; and (3) shielding from radiation sources within the SB. Specifically, the SB's function was to provide biological shielding and, in case radioactive leakage escapes from the CV during accident conditions, to allow the Emergency Ventilation System to draw a suction from the annulus region and filter that leakage. In addition, the SB protects the CV from external environmental hazards such as tornado winds and tornado driven missiles. The SB must also function to withstand earthquakes.

• After extensive review by Region III and Headquarter's structural experts, and additional resulting efforts by the licensee's staff with respect to extent of condition and technical evaluation, the NRC concluded that the licensee had provided sufficient rationale to demonstrate that the SB remained capable of performing its safety function despite the cracking, but the building was nonconforming with respect to its licensing basis (NRC inspection report 05000346/2012007 (ML12128A443)). In order to provide continued long-term confidence, the NRC issued Confirmatory Action Letter 3-11-001 (ML11336A355) on December 2, 2012, prior to plant restart to document licensee commitments to provide a root cause analysis and corrective actions, a long term monitoring plan, and specific short term monitoring efforts to ensure the cracking doesn't get worse in the interim. Related NRC conclusions and their bases were discussed during a public meeting held on January 5, 2012 (ML12030A141).

• The licensee submitted its Root Cause Report (ML120600056) on the public docket on February 27, 2012. The licensee identified the direct cause as the integrated effect of moisture content, wind speed, temperature, and duration from the blizzard of 1978, and the root cause as the design specification for construction of the shield building not specifying application of an exterior sealant from moisture. The licensee also identified three contributing causes involving specific design features of the building. The Root Cause Report also identified planned

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corrective actions as well as associated due dates, and acknowledged that the shield building, although operable, did not conform to the licensing basis in its current condition.

• The NRC completed its inspection of the licensee's root cause efforts and planned corrective actions on May 9, 2012. The NRC inspection team concluded that the licensee had a sufficient basis for the causes of the shield building laminar cracking related to the environmental factors associated with the 1978 blizzard, the lack of an exterior moisture barrier, and the structural design elements of the shield building. Specifically, the weather records, core boring sample results, impulse response testing and shield building analytical modeling provided a sufficient basis to support the causes of the laminar cracking. The team identified minor weaknesses in the Root Cause Analysis Report associated with the level of detail in the documentation provided. These weaknesses did not constitute performance deficiencies or findings because they did not adversely affect the outcome of the root cause process. The team identified two examples for which the corrective actions to address the causes of the shield building cracking appeared too narrow. Specifically, the licensee had not proposed examinations to confirm a lack of subsurface cracking in other safety-related building structures with installed moisture barriers to further substantiate the Direct Cause. In addition, the corrective action for the Root Cause included updating a site procedure for inspections of only the shield building exterior sealant system instead of a broader action to inspect all safety-related buildings with moisture barriers. The licensee entered the team's observations into the corrective action system, and was considering actions to expand the scope of these corrective actions.

• The licensee submitted a revised Root Cause Report (ML12142A053) on May 16, 2012, with changes to address the minor weaknesses identified during in the NRC inspection. The NRC is developing a follow-up inspection plan focused on verification and evaluation of licensee corrective action implementation. The NRC will review the changes in the revised Root Cause Report as part of this inspection plan to confirm that the changes, although unlikely, do not invalidate previous NRC conclusions.

• On August 27, 2010, the licensee submitted a license renewal application (ML102450565). The NRC issued an RAI (ML11333A396) regarding the shield building cracking on December 27, 2011. Interveners (Beyond Nuclear, Citizens Environment Alliance of Southwestern Ontario (CEA), Don't Waste Michigan, and the Green Party of Ohio) on January 10, 2012, proposed a new Contention 5 with the NRC's ASLB regarding the shield building cracking. The licensee on April 5, 2012, responded (ML12097A520) to the NRC RAI. The response included a new plant-specific aging management program titled "Shield Building Monitoring Program" to periodically inspect the structure to confirm that there are no changes in the nature of the identified laminar cracks. On June 4, 2012, the interveners filed a motion (ML12156A411) to amend and supplement their proposed Contention 5 to include concerns from their review of the licensee's Root Cause Report and RAI response.

• On August 26, 2013, as part of the long term monitoring of the shield building laminar cracking condition as prescribed by procedure, the licensee was performing boroscope inspections of core bores and identified cracks that were not documented previously. The licensee was using a new boroscope that has better resolution and articulation than the one used in previous years. These previously unidentified cracks have widths of 0.005 inches or less, save for one. Some of the previously unidentified cracks coincide with indications observed on the extracted cores while some do not. Out of the 82 total cores, 10 previously unidentified cracks have been found in 9 locations. These previously unidentified cracks do not compromise the safety of the plant, and the shield building remains bounded by the licensee's previous quantitative operability evaluation. The shield building is structurally sound and can continue to fulfill its safety function.

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CHALLENGES

Currently identified challenges include:

• We must continue to clarify what is meant by "operable but nonconforming." External stakeholders have tended to impart their own meaning to this term that is not necessarily consistent with NRC's understanding and use of the phrase. We need to be clear and consistent in our communications (written and verbal) that the shield building will continue to meet its safety functions (remain operable), and that determination was made using calculation methods that are different (yet still valid) than those used in the original licensing (nonconforming). Although operability is maintained, the licensee will have to bring the shield building back into conformance, through physical (modifications/repairs) or regulatory (additional testing/evaluation to show licensing basis is met or approved license amendment) means.

•Given the license renewal implications, Region III and NRR/DLR must continue to coordinate closely together to ensure that current license versus renewed license activities are clearly distinguished and communicated in such a manner that they do not invalidate one another.

• With the desire to ensure openness with the public, the public has been provided access to a considerable amount of technical detail including the licensee's Root Cause Report, the root cause vendor's more detailed technical report on which the Root Cause Report is based, and the NRC's own inspection reports which are more detailed than the norm. In addition, FOIA requests have been processed which will possibly result in access to even more technical detail including calculations. Also, intervener's have performed their own review of these documents and submitted information into the license renewal proceedings aimed at discrediting the licensee's root cause efforts. Hence, care must be taken to ensure the public adequately understands the issue and does not become confused.

COMMUNICATION TIMELINE

Thursday 6/14	Shield Building Pre-Brief	Cameron / Hills
Friday 6/15	Regional Administrator Briefing	O'Brien
Monday 6/18	Communications Plan (without Qs & As) Ready DB SB Background Info for Chairman Visit to Perry	Cameron / Hills Jandovitz
Wednesday 6/20	Congressional Phone Briefings (Kucinich / Kaptur) Questions and Answers Ready Pre-Brief for Lochbaum Call Lochbaum Letter Re:50.9 Status Call (Casto) E-mail Draft Root Cause Inspection Report to	Cameron / Hills Cameron / Hills Mitlyng Mitlyng Hills

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	OGC (License Renewal) E-mail Final Communications Plan / Q & As to Davis-Besse Focus Team / EDO Coordinator	Hills
Thursday 6/21	Issue Root Cause Inspection Report ***<u>*To be performed in order:*</u> 1) Sign Inspection Report [~8:45am] 2) E-mail Final Report to DB Focus team / EDO Coordinator / OGC (license renewal) [~9:30am] 3) Contact OCA [~9:45am] 4) OCA contact Congressman Kucinich/Kaptur [~10:30am] 5) Contact State/Local Officials [~10:45am] 6) Issue Report / Distribute through ListServe [no later than 1:30pm] 7) Chuck Casto Media Interviews [afternoon] 8) Issue Press Release [afternoon] 9) E-mail RA and DRS admin staff to close out EDO Tasking for providing report to Kucinich [by COB]	1) Reynolds 2) Hills 3) Hills 4) Riley (HQ) 5) Barker 6) Admin 7) Public Affairs 8) Public Affairs 9) Sanchez-Santiago
Monday 6/25	Revised Root Cause Report Inspection Plan Ready Shield Building Action Follow Up Plan Ready	Neurauter Neurauter
Monday 7/2	Revised Root Cause Inspection Entrance Meeting	Neurauter
Wednesday 7/18	Government to Government Meeting Prep Public Meeting Slide Walkthrough & Q&A Practice	Barker Mitlyng
Wednesday 7/25*	Government to Government Meeting	Barker
Thursday 7/26	8/9 Public Meeting Notice Posted (Deadline)	Sanchez-Santiago/Shaikh
Friday 7/27	8/9 Public Meeting Slides Finalized	Hills
Friday 8/3	Revised Root Cause Report Inspection Completed and Exit Meeting Conducted High Level Inspection Summary Prepared	Neurauter Neurauter
Monday 8/6	8/9 Public Meeting Prep / Q&A Practice	Mitlyng
Thursday 8/9	Editorial Board meetings (A.M.) Just-in-Time Q&A Practice (3:00pm - 5:00pm) Public Meeting on Original Root Cause Report	Mitlyng Mitlyng

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	Inspection (6:00pm - 10:00pm)	Team
Week of 8/13*	2011 End-of-Cycle Public Meeting	Cameron
Friday 8/31*	Revised Root Cause Report Inspection Report Issued Draft IN Generated Lochbaum Letter Re:50.9 Written Response	Neurauter Neurauter Heck
September*	Confirmatory Action Letter Closure	Cameron

*Tentative

Q&As FOR DAVIS-BESSE SHIELD BUILDING ISSUES

A. DAVIS-BESSE EXTENT OF CONDITION QUESTIONS

Q1. How did the licensee identify the previously undiscovered cracking?

A1. As part of a Confirmatory Action Letter issued by the NRC, the licensee committed to developing and implementing a long term shield building monitoring program. One of the conclusions of the licensee's root cause analysis was that the previously identified cracking was from one severe weather event that occurred in 1978. The licensee also concluded that the discovered cracks were stable, i.e. they would not grow and other cracks would not develop during normal operation. Hence, the long term monitoring program served as an extra check to validate that conclusion and to provide early identification in case of unexpected crack propagation. This year was the third time interval the core bores were inspected.

This inspection this year used a different bore scope than that used in previous inspections. The bore scope used this year had better resolution and magnification than the previously used scope. Additionally the head of the scope (i.e. the tip of the scope) had better articulation capability that the previously used scope. Both properties of the new scope permitted a better examination of the existing bores.

On August 26, 2013, as part of their long term monitoring program for the shield building as established in their commitments to close the CAL, the licensee identified a previously unidentified crack in a bore. As of September 17, 2013, the licensee has inspected 41 bores and found 6 previously unidentified cracks. The licensee has plans to inspect the remaining 41 bores. The last bores need scaffolding or similar equipment to permit personnel to reach the bores. The NRC is closely following the ongoing inspections.

Q2. Are these newly forming cracks?

A2. The licensee believes that three of these newly identified cracks are not new but because of the limitations of the previous bore scope were not previously identified.

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Specifically, these three newly identified cracks correspond to breaks that were observed in the cores that were extracted from the bores when the licensee performed its initial extent of condition inspections. The licensee had previously believed that the breaks were due to the forces associated with withdrawing the core from the bore after initial drilling. These newly discovered cracks are very tight/thin (approximately 0.005 inches) and have less width that the originally discovered cracks and that contributed to not seeing the cracks in previous inspections. With respect to the other three newly identified cracks, the licensee generated a condition report to evaluate whether the laminar cracking condition could be propagating in localized regions. NRC inspectors continue to observe and evaluate licensee plans and actions to address this question.

Q3. What is happening in the Shield Building?

A3. The licensee presently believes that the Shield Building is stable; there are no new cracks forming. However, to further investigate its assumptions and to understand any additional mechanisms that might be occurring, the licensee is planning on additional testing and analyses. The licensee has contracted with Performance Improvement International (PII). PII was involved with the original root cause analysis. The NRC will continue to follow the licensee's efforts to understand the current conditions and, if any new mechanisms are identified, to follow the licensee's efforts to understand the potential impacts of such mechanisms.

Q4. Is the Shield Building operable and capable of doing it safety functions?

A4. With the originally discovered cracking, through quantitative structural analyses the licensee showed that the Shield Building was capable of performing its design safety functions and thus could be considered operable. The analyses included safety conservative assumptions on the load bearing capability of the building's rebar and location of the cracks. The newly discovered cracking remains bounded by the previous analysis, and therefore there is reasonable confidence that the shield building remains capable of performing its design safety functions. In addition, the licensee believes that the results of concrete/rebar bonding capacity testing performed by contract labs and additional structural calculations performed by engineering contractors for the licensee provide additional assurance that additional similar cracking that could exist would not impact structural integrity of the building (the reinforcement can maintain capacity in areas of cracking). NRC inspectors are currently evaluating this additional information.

Q5. If the Shield Building is operable and capable of doing it safety functions, what is the issue?

A5. If this newly discovered cracking is new or the original found cracks are growing, implications for the previous root cause need to be evaluated. The root cause concluded that no new cracks would develop and that existing cracks were stable. While the licensee's root cause conclusions were reasonable based on the evidence and structural analyses performed, the long term monitoring program was intended as an additional conservative measure to provide early identification in case of unexpected

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crack propagation. Hence, the licensee needs to evaluate the new information from that effort and determine whether other actions are needed to ensure the continued long term operability of the building into the future.

The NRC is following and will continue to evaluate the licenses efforts to properly characterize the newly discovered cracks and the licensee's efforts to analyze the impacts of these cracks.

B. CORRECTIVE ACTIONS

1. **How is FE going to make sure the shield building is safe if the NRC relicenses the plant?**

   Reviews of licensee investigations and calculations have indicated to the NRC that the shield building remains capable of performing its safety function. The licensee has also proposed additional actions to ensure that the performance of that safety function is not compromised in the future. NRC inspectors have and will continue to monitor the licensee's activities and review results from the licensee's ongoing corrective actions.

2. **They said they would do a bunch of things to make sure the building doesn't fall apart but I don't trust them. How is the NRC going to make sure they do everything they listed in the root cause?**

   NRC inspectors have and will continue to monitor the licensee's activities and review results from the licensee's ongoing corrective actions. On-site NRC resident inspectors regularly review licensee activities. These inspectors are regularly supplemented by inspectors from the regional NRC office.

C. LICENSE RENEWAL

1. **How can NRC consider renewing DB license when it continues to have unexpected and undiagnosed problems?**

   Using the current regulatory process, the NRC ensures the licensee operates the plant in accordance with the licensing basis and maintains an acceptable level of safety. During the extended period of operation, the NRC would continue to ensure these principals are met and any safety concerns are addressed.

2. **How is the root cause analysis going to be considered in the license renewal review?**

   The NRC is reviewing the root cause analysis from a license renewal point of view and ensuring any applicable insights are considered and addressed as part of the licensee's aging management program.

RELEASE IN ENTIRETY

3. **How is FE going to make sure the shield building stands up for the next 40 years?**

   The NRC inspection team concluded that the licensee's proposed corrective actions if implemented adequately were sufficient to preclude recurrence of the cracking. Although the inspectors had no issues with the licensee's long term monitoring plans we have deferred any final conclusion there of pending review of the new aging management program, "shield

4. **Is the NRC sure that all possible problems with the shield building have been identified?**

   The NRC has reviewed the licensee's activities and studies to identify issues with the shield building. The NRC from those reviews has concluded that at the present time the shield building can perform its designed safety function.

5. **Are you sure both you and FE aren't missing something again?**

   The NRC will continue to monitor and follow the licensee's activities to monitor the status of the shield building.

RELEASE IN ENTIRETY

COMMUNICATIONS PLAN

Davis-Besse Nuclear Power Plant
Steam Generators Replacement Inspection

January 2014
Point Of Contact: Atif Shaikh, RIII
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GOALS

- Be prepared to answer public questions on the steam generators replacement inspection
- Be prepared to answer internal questions on the steam generators replacement inspection

KEY MESSAGES

- The NRC's oversight of the steam generator replacement process at Davis-Besse is comprehensive to ensure the safety of the plant and the public.
- Inspections started on December 2, 2013, and these inspections will continue through the actual replacement installation work beginning in February 2014 the post installation tests performed by the licensee, and the plant's subsequent return to power. The results of this NRC inspection will be documented in a publically available report that will be issued by the NRC within 45 days of the conclusion of this inspection.
- NRC inspectors will conduct direct observations along with reviews of records, calculations, and procedures to provide adequate assurance that the plant modifications associated with the replacement steam generators meet applicable regulatory requirements.
- Inspections will be conducted by a team of inspectors with expertise in metallurgy, structural design, heavy loads, radiation protection, security, and other relevant areas.
- NRC inspectors will review the licensee's evaluation of relevant steam generator replacements operating experience (OpEx) to determine whether the licensee has adequately evaluated the OpEx potentially relevant to the Davis-Besse steam generators replacement.
- NRC inspectors will ensure that any safety concerns identified during the inspection are adequately addressed by the licensee.
- The NRC staff invited the public to listen in via conference call to its initial inspection planning meeting with the licensee during which the licensee provided a presentation and NRC staff answered questions from the public. That presentation remains available to the public in the NRC's ADAMS document system (ML No. 13078A249) via the NRC public web site.

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- NRC staff also discussed inspection plans with the public during the last end-of-cycle meeting near the plant and provided information in a meeting with local government officials. In addition, the NRC staff also plans to conduct a webinar to answer questions from the public related to the replacement steam generators at Davis-Besse.

BACKGROUND

Davis-Besse is a Babcock and Wilcox (B&W) designed plant. It is a two loop plant and has two steam generators. The original steam generators are B&W designed once-through steam generators (OTSGs). The new replacement steam generators are also B&W designed OTSGs.

There are two basic types of steam generators used in the United States: recirculating steam generators (RSGs) and OTSGs. RSGs have tubes that are shaped like an inverted "U" while OTSGs have straight tubes. There are currently 59 units in the U.S. with RSGs and 6 units with OTSGs.

All steam generators are designed to limit the possibility of tube-to-tube contact since such a condition can result in the tubes rubbing against each other and leading to tube thinning. The thinning of the tube wall due to the interaction of two structures (e.g., tube-to-tube or tube-to-support) is commonly referred to as tube wear.

In Early 2012, the licensee for San Onofre Nuclear Generating Station Unit 3, which has recirculating steam generators, detected hundreds of tubes with wear attributed to tube-to-tube contact caused by a fluid-elastic instability. Some of these indications were significant including one that leaked during normal operation and led to the plant shutting down. These indications occurred after approximately 20 months of operation. In total, eight tubes were found that did not meet the structural integrity performance criteria specified in the plant's technical specifications. The steam generators at San Onofre were designed and fabricated by Mitsubishi Heavy Industries (MHI).

In early 2010, Three Mile Island, Unit 1 (TMI-1), completed the replacement of both its original OTSGs with new OTSGs that were fabricated by AREVA (France). The first inservice inspection of the TMI-1 replacement steam generators took place in fall 2011. During these inspections at TMI-1, the licensee detected several tubes with indications. A more detailed investigation led the licensee to conclude that these indications were a result of tube wear due to tube-to-tube contact.

In fall of 2013 the licensee for TMI-1 conducted their second inservice inspection of the replacement steam generators. The licensee reviewed their testing data and concluded that tube-to-tube wear was progressing slowly "as predicted" based on first cycle wear data from fall of 2011.

In spring 2006, Oconee, Unit 3 conducted the first inservice inspection of the replacement OTSGs that were installed in 2004. The inservice inspection results revealed widespread wear degradation of the tubing at tube support plant (TSP) locations. Oconee, Units 1 and 2, have also experienced this widespread tube wear degradation at TSP locations following the first cycle of operation since installation in 2004. In spring of 2012 the licensee for Oconee, Unit 3 also detected wear attributed to tube-to-tube contact in the replacement OTSGs. The Oconee replacement OTSGs were designed and fabricated by B&W Canada and are similar to the design of the Davis-Besse replacement OTSGs.

The licensees for Oconee and TMI evaluated the severity of the tube-to-tube wear indications in their replacement steam generators. These evaluations concluded that the wear indications did not compromise tube integrity (i.e., the tubes could still perform their intended function consistent with their original design and licensing basis). In addition, this tube-to-tube contact did not involve high energy fluid-elastic instability such as that experienced at SONGS. NRC staff reviewed the licensees' evaluations and did not identify any safety issues that would affect plant restart.

Q&As FOR DAVIS-BESSE STEAM GENERATORS REPLACEMENT

1. **Will this be a like for like replacement?**

   No, this will not be a like for like replacement. Although the replacement steam generators (SGs) are manufactured by the same vendor as the original SGs, there are some differences in the design of these replacement SGs. Hence, the licensee is required to perform an evaluation consistent with Section 50.59 of Title 10 to the *Code of Federal Regulations* (10 CFR) for the proposed modifications associated with the replacement SGs.

2. **What are the differences between the old and new steam generators?**

   The differences between the original SGs and the replacement SGs all relate to physical design aspects such as the material, component dimensions, number of tubes per generator, etc. The required design and safety functions of the SG remain the same. The NRC staff will be reviewing the 50.59 analyses supporting the design changes to ensure that plant safety is not impacted by the changes and to evaluate licensee's conclusions regarding whether NRC approval is needed for the changes.

3. **Can you explain the 50.59 process?**

   The 50.59 process involves implementation of the requirements set forth in 10 CFR 50.59, a federal regulation. Essentially, whenever a licensee decides to implement a physical change to its facility or change how the facility is operated, used or controlled, including changes to safety analyses or documentation (e.g., a calculation, evaluation, methodology), then the 50.59 regulation allows a licensee to implement that change without prior NRC approval only if the change meets criteria pertaining to the safety implications of the proposed change. Generally, if a change would place the plant outside of the safety boundaries established by the NRC and reflected in the plant's licensing basis (e.g., NRC regulations, licensing documents, and plant safety analyses report), then prior NRC approval would be needed.

4. **Can you explain the license amendment process?**

   In general, the license amendment application review process has 5 steps: 1) Conducting an acceptance review to determine if there is sufficient technical information for the NRC staff to begin a detailed technical review of the application; 2) Publishing a *Federal Register* notice that describes the application and gives members of the public an opportunity to comment on the proposed determination of No Significant Hazards Consideration (NSHC) and request permission to be a party in a hearing; 3) Conducting a technical review to determine the safety of, and the environmental impacts of, the proposed amendment, including, if needed, sending requests for additional information (RAIs) to obtain additional information needed to make an informed regulatory decision; 4) Completing the NRC staff's safety evaluation (SE), which provides the technical,

safety, and legal basis for the NRC's decision on the amendment application; and 5) If the amendment is approved, issuing the amendment and publishing a *Federal Register* notice that indicates when the amendment issued and whether the NRC staff made a final NSHC determination.

5. **How do 50.59 analyses and license amendments assure safety?**

   Both processes provide assurance that changes at operating reactors are not made until the safety significance of the change is considered. As noted above, the 50.59 process can lead to a determination that a 50.90 license amendment application, and thus prior NRC approval, is required.

6. **What changes would require a license amendment?**

   If a proposed change is not consistent with a technical specification or places the plant outside of the safety boundaries established in the plant's licensing basis, then the change would require a license amendment.

7. **Why not require a license amendment for the whole replacement?**

   NRC inspectors review samples of licensee 50.59 evaluations and decisions during the SG replacement inspections. If the Agency determines that a license amendment is required, the Agency can take appropriate enforcement action.

8. **Are any license amendments needed for the SG replacements at Davis-Besse?**

   Davis-Besse submitted a license amendment request for Technical Specifications (TS) changes related to the replacement steam generators. The NRC staff is currently reviewing this amendment request.

9. **Have any concerns been raised regarding the steam generator replacement?**

   A request for hearing and petition to intervene on the Technical Specification (TS) license amendment request was filed in May 2013. The petitioners challenged the 10 CFR 50.59 analyses on the steam generators replacement, contending that the steam generator replacement activities required an additional license amendment request. On August 12, 2013, the Atomic Safety Licensing Board (ASLB) denied the petition. The ASLB ruled that petitioners cannot challenge 10 CFR 50.59 analyses done to support steam generator replacement activities in a proceeding on a license amendment request to change TS related to operation with the new steam generators replacement. The ASLB also ruled that a challenge to adequacy of 10 CFR 50.59 analyses for replacement of the steam generators can only be made by filing a petition under 10 CFR 2.206.

10. **Will the NRC staff conduct an inspection concerning the steam generator replacement activities?**

    Yes. The NRC staff will inspect the licensee's SG replacement activities during inspections which began on December 2, 2013. During the inspection, the NRC staff will review10 CFR 50.59 analyses done to support the steam generator replacement, as well as monitor steam generator replacement activities. An inspection report will be issued to document the results of the NRC staff's review.

11. Will the NRC's review of the new steam generators/50.59 evaluations be complete before the plant can start up with the new steam generators?

It is the licensee's responsibility to ensure changes associated with the new steam generators are thoroughly evaluated and are safe and implemented appropriately. While the NRC staff will complete its inspection review as expeditiously as possible, we can't guarantee we will reach final conclusions prior to plant restart. The NRC staff will take the time it needs to do a thorough and rigorous inspection and to arrive at supportable conclusions. However, if at any time the NRC staff concludes that the changes are not safe, the NRC would take appropriate enforcement action, including ensuring the plant stays in or is placed in a safe condition.

12. Will there be an NRC inspection report for the DB steam generators? Will the inspection results be publicly available before restart?

The inspection results for the SG replacement inspection will be documented in a publicly available NRC inspection report which will be issued within 45 days after the completion of the inspection. The NRC inspection is extensive and includes evaluation of licensee activities that occur throughout the replacement outage and subsequent startup. Hence, the inspection report will not be available prior to startup.

13. Has the NRC incorporated lessons learned from previous SG replacements in inspections for the Davis-Besse replacements?

Recent operating experience at facilities where SGs have been replaced is being incorporated (or was incorporated) into the inspection effort for the Davis-Besse SG replacements. Region III staff closely coordinates with NRC headquarters to identify areas for a rigorous review of 50.59 evaluations. For the Davis-Besse steam generator replacement inspection, the NRC will be reviewing the licensees' evaluation of previous operating experience, key design differences between original and replacement steam generators, and if they exist, design change challenges discussed between the licensee and its vendor.

14. Has Davis-Besse licensee reviewed the SONGS or other SG replacement operating experience such as at TMI-1 and Oconee Unit 3 in preparation for their steam generator replacements?

Yes, Davis-Besse described in a public meeting how they have considered the SONGS, TMI, and Oconee SG tube degradation operating experience in their steam generator design and replacement activities. The NRC inspectors will review this information and the 50.59 evaluations supporting these design modifications as part of the SG replacement inspection activities.

15. Are these new steam generators considered an experimental design?

No, these new replacement SGs are not considered an experimental design. They are similar in basic design to the original SGs. There is also operating experience available regarding replacement steam generators of a similar design as those being installed at Davis-Besse. The NRC inspectors will be reviewing the licensee's evaluation of the operating experience available as it pertains to the specific design.

16. What are the main differences between the steam generators at Davis-Besse and SONGS?

- The Davis-Besse and SONGS SGs are different designs.
  The steam generators at SONGS are recirculating steam generator design. They are designed for a Combustion Engineering plant which requires larger steam generators, averaging close to 9,000 tubes per steam generator. The SONGS SGs were manufactured by MHI and are one of the largest steam generators used in the industry. The SONGS replacement SGs were modeled for vibration using MHI's proprietary modeling code.

- The Davis-Besse Steam generators are a completely different design from SONGS in that they are once through steam generators (they do not have a U-bend tube region, instead they consist of straight tubes) and were manufactured by B&W Canada. The Davis-Besse replacement SGs were modeled for vibration using an industry accepted EPRI modeling code.

17. Will DB cut a hole in the shield building for these replacement steam generators? What impact will that cutting and opening process have on the existing shield building cracking?

In order to remove the old steam generators and install the new steam generators, the licensee will cut another hole in the reinforced concrete shield building. The hole will be located entirely within the boundaries of a previous hole that was cut for replacement of the reactor pressure vessel closure head, and hence will be in new concrete that was poured in 2012. Thus, the licensee does not expect there to be any impact on previously identified cracking in the older portions of the shield building wall.