UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

December 2, 2019

Mr. Don Moul
Vice President, Nuclear Division and
Chief Nuclear Officer
Florida Power & Light Company
NextEra Energy Seabrook, LLC
Mail Stop: NT3/JW
15430 Endeavaor Drive
Jupiter, FL 33478

SUBJECT: POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2; SEABROOK STATION, UNIT NO. 1; ST. LUCIE PLANT, UNITS 1 AND 2; AND TURKEY POINT NUCLEAR GENERATING UNITS 3 AND 4 – AUDIT REPORT REGARDING GENERIC LETTER 2004-02, "POTENTIAL IMPACT OF DEBRIS BLOCKAGE ON EMERGENCY RECIRCULATION DURING DESIGN BASIS ACCIDENTS AT PRESSURIZED-WATER REACTORS" CLOSURE METHODOLOGY (EPID 2017-LRC-0000)

Dear Mr. Moul:

By letters dated December 20, 2017 (Agencywide Document Access and Management System (ADAMS) Accession No. ML17362A108), December 29, 2017 (two letters) (ADAMS Accession Nos. ML17363A265 and ML17363A253), and January 31, 2018 (ADAMS Accession No. ML18031B248), NextEra Energy Resources LLC/FPL Company LLC (NextEra/FPL) submitted updated final responses to Generic Letter (GL) 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors," (ADAMS Accession No. ML042360586) for Point Beach Nuclear Plant, Units 1 and 2 (Point Beach); Seabrook Station, Unit 1 (Seabrook); St. Lucie Plant, Units 1 and 2 (St. Lucie); and Turkey Point Generating Units 3 and 4 (Turkey Point), respectively. These letters are intended to document NextEra/FPL methodology for closing GL 2004-02 for the respective plants.

By e-mails dated November 26, 2018, and November 29, 2018 (ADAMS Accession Nos. ML18331A033 and ML18337A134, respectively), the NRC staff sent NextEra/FPL an audit plan to support an audit held from January 15, 2019, through January 17, 2019, at Juno Beach,

Florida. The audit focused on the NextEra/FPL methodology for performing evaluations in accordance with the NRC staff approved guidance. Enclosed is our report of that audit.

Sincerely,

/RA/

Justin C. Poole, Project Manager
Plant Licensing Branch I
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-266, 50-301, 50-443,
50-335, 50-389,
50-250, and 50-251

Enclosure:
Site Visit Audit Report

cc: Listserv

AUDIT REPORT BY THE OFFICE OF NUCLEAR REACTOR REGULATION

GENERIC LETTER 2004-02 CLOSURE METHODOLOGY

NEXTERA ENERGY RESOURCE, LLC/FLORIDA POWER AND LIGHT COMPANY, ET AL.

POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2

SEABROOK STATION, UNIT 1

ST. LUCIE PLANT, UNITS 1 AND 2

TURKEY POINT NUCLEAR GENERATING UNITS 3 AND 4

DOCKET NOS. 50-266, 50-301, 50-443, 50-335, 50-389, 50-250, and 50-251

Background

By letters dated December 20, 2017 (Agencywide Document Access and Management System (ADAMS) Accession No. ML17362A108), December 29, 2017 (two letters) (ADAMS Accession Nos. ML17363A265 and ML17363A253), and January 31, 2018 (ADAMS Accession No. ML18031B248), NextEra Energy Resources LLC/Florida Power and Light Company LLC (NextEra/FPL) submitted updated final responses to Generic Letter (GL) 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized- Water Reactors," (ADAMS Accession No. ML042360586) for Point Beach Nuclear Plant, Units 1 and 2 (Point Beach); Seabrook Station, Unit 1 (Seabrook); St. Lucie Plant, Units 1 and 2 (St. Lucie); and Turkey Point Generating Units 3 and 4 (Turkey Point), respectively. These letters are intended to document the NextEra/FPL methodology for closing GL 2004-02 for the respective plants. The U.S. Nuclear Regulatory Commission (NRC) reviews each licensee's response to GL 2004-02 and has performed a review of the subject letters. The NRC staff has several questions regarding NextEra/FPL's implementation of NRC approved methodologies as documented in the closure letters.

During the NRC staff's review of the licensee's submittals, the NRC determined that an audit was needed to review the supporting information that, although not required to be submitted as part of the application, would provide additional information and technical bases for the submitted information. The audit was performed in accordance with the NRC staff's guidance in NRC Office of Nuclear Reactor Regulation, Office Instruction LIC-111, "Regulatory Audits," for the NRC staff to gain a better understanding the of detailed calculations and analyses underlying the formal submittal and to confirm the NRC staff's understanding of the submittal.

By e-mails dated November 26, 2018, and November 29, 2018 (ADAMS Accession Nos. ML18331A033 and ML18337A134, respectively), the NRC staff sent NextEra/FPL an audit plan to support the audit which was held from January 15, 2019, through January 17, 2019, at Juno Beach, Florida. The audit focused on the NextEra/FPL methodology for performing evaluations in accordance with the NRC staff approved guidance.

During the audit, NextEra/FPL and the NRC staff discussed the questions in the audit plan. Some questions were discussed briefly while for others, significant discussions took place. For questions that were discussed briefly, and NextEra/FPL provided clarifications during the audit that allowed the NRC staff to locate and understand information in the respective submittals, those discussions are not discussed in this audit report, and nothing further is expected from NextEra/FPL. For those questions where significant discussion took place, the NRC staff has documented those in this audit report. At the end of each question in this report, the NRC staff

has annotated in **bold** whether the staff expects NextEra/FPL to provide supplemental information or if nothing further is expected from NextEra/FPL at this time. If the supplemental information provided by NextEra/FPL is not adequate for the NRC staff to reach conclusions regarding the function of the emergency core cooling systems (ECCS) and containment spray systems (CSS), the NRC staff will solicit additional information from the licensee.

The report is divided into separate appendices, one for each facility, with the questions numbered the same as they were in the audit plan.

Team Assignments

The audit team consisted of:

- Steve Smith, Technical Specifications Branch Technical Reviewer, Office of Nuclear Reactor Regulation (NRR)
- Paul Klein, Chemical, Corrosion, and Steam Generator Branch Technical Reviewer, NRR
- Matt Yoder, Chemical, Corrosion, and Steam Generator Branch Technical Reviewer, NRR
- Dan Hoang, Structural Engineering Branch Technical Reviewer, NRR
- Victor Cusumano, Chief, Technical Specifications Branch, NRR
- Andrea Russell, Technical Specifications Branch Technical Reviewer, NRR
- Justin Poole, Project Manager, Plant Licensing Branch I, NRR

Logistics and Agenda

The audit was conducted at the NextEra/FPL offices in Juno Beach, Florida, from January 15, 2019, to January 17, 2019. Entrance and exit briefings were held at the beginning and end of this audit, respectively.

Appendix A – St. Lucie Questions for Discussion

Transport

4) The NRC staff requested NextEra/FPL to provide verification that the Calcium-Silicate (Cal-Sil) insulation installed at St. Lucie is of rigid pressed construction to allow the NRC staff to evaluate the erosion rate assumptions provided in the submittal. NextEra/FPL provided information on an electronic portal. NextEra/FPL stated that hard pressed Cal-Sil is used. Specification requires pre-formed construction and tests for compressive and bending stress. Johns Mansville Thermal-12 is the brand used. **No further information is needed at this time.**

Headloss and Vortexing

5) The NRC staff requested NextEra/FPL to provide the assumptions regarding timing associated with correction of the single failure of a low-pressure coolant injection (LPCI) pump to trip. This can affect headloss and transport. NextEra/FPL stated that if the LPCI pump fails to trip, it will be stopped in a short time. Operators will correct the condition if the automatic action from recirculation actuation signal is unsuccessful. NextEra/FPL stated that this action is covered in simulator training. NextEra/FPL and the NRC staff had lengthy discussions on the timing of when operators would open a breaker to stop flow through the pump. NextEra/FPL provided analysis that showed the breaker would be opened within about 6 minutes. **No further information is needed at this time.**

9) The NRC staff requested NextEra/FPL to discuss whether the net positive suction head (NPSH) margin calculation accounts for void fraction at the pump suction below the two percent limit. NPSH required should be adjusted per Regulatory Guide (RG) 1.82, “Water Sources for Long-Term Recirculation Cooling Following a Loss-of-Coolant Accident” (ADAMS Accession No. ML111330278). NextEra/FPL stated that Section 3.f.14 of its submittal shows less than two percent void fraction. NextEra/FPL did not account for void fraction at pump suction and stated that St. Lucie, Unit 1, is not committed to RG 1.82. NextEra/FPL also stated that Unit 2 uses RG 1.82, Revision 0, but is not committed to RG 1.82. In its degasification analysis, NextEra/FPL used 14.7 psia for temperatures below 212 degrees Fahrenheit (°F) 100 degrees Celcius (°C). NextEra/FPL assumed compression of bubbles due to pump submergence. The NRC staff reviewed the information provided and noted that it is acceptable for NextEra/FPL to use a method different from that in RG 1.82 to demonstrate acceptable pump performance. **Additional information is required for this issue.**

Appendix B – Turkey Point Questions for Discussion

Break Selection

1) The NRC staff requested NextEra/FPL to justify that the use of eight angular orientations to evaluate debris generation produces reasonably limiting debris loads for specific break sizes and locations. For Turkey Point, Unit 3, this is not an issue since only double-ended guillotine breaks (DEGBs) are evaluated. For Turkey Point, Unit 4, there is considerable margin between the minimum debris generation break size and the 23-inch size used in the analysis. This may provide adequate conservatism to address this issue. However, all analyses should consider the limiting debris amount from each break location. NextEra/FPL provided additional detail regarding its evaluation of debris generation. The NRC staff reviewed the information discussed during the audit, and other information regarding the appropriate number of break orientations for use in debris generation analyses. Sensitivity studies have shown that the use of eight break orientations captures close to the maximum amounts of debris that may be generated from a partial break. The partial breaks considered in the NextEra evaluation are very large and therefore very unlikely. Using the largest debris generation amount from eight orientations has a very high probability of being conservative with respect to the actual debris generation amount from a given break size. There is a very low probability that a break could generate more debris than that assumed in the analysis, because the occurrence of a large break in a specific orientation is extremely unlikely. The NRC staff will consider this in its evaluation of the Turkey Point submittal. The NRC staff notes that full risk-informed evaluations may have to evaluate the discretization of break orientation and break size differently depending on the methodology being used for evaluating the change in core damage frequency. **No further information is needed at this time.**

Headloss and Vortexing

9) The NRC staff noted that the Turkey Point, Unit 3, strainer vortex evaluation depended on comparisons to St. Lucie testing. The PSL strainer has the plenum at the bottom of the strainer while the Turkey Point, Unit 3, strainer has the plenum on the side. The Turkey Point, Unit 3, strainer configuration would likely result in higher strainer approach velocities near the top of the strainer than the St. Lucie strainer. Vortices are more likely to occur with higher velocities near the surface of the pool. The NRC staff requested that NextEra/FPL discuss how this design difference was considered in the evaluation. NextEra/FPL stated that Turkey Point, Unit 3, has little fiber. NextEra/FPL also stated that most of the flow is at a lower strainer elevation, and for vortexing higher flows will not occur at the surface of strainer but at the suction plenum. The suction from the plenums will be higher where the plenum offtake goes to the ECCS header. NextEra/FPL pointed to a picture on E1-228, Figure 3.n.1-2 of its submittal. NextEra/FPL stated that submergence between St. Lucie and Turkey Point, Unit 3, is comparable. NextEra/FPL also stated that the average approach velocity in testing was about 3 ½ times higher than the plant. The NRC staff stated that the maximum velocity is needed for comparison and Turkey Point, Unit 3, may have higher velocity toward the top part which may be an issue for vortexing. NextEra/FPL provided the clean strainer head loss calculation and the maximum velocity and stated that they compared the Froude number to other units based on submergence of their plenums. NextEra/FPL compared the Turkey Point, Unit 3, Froude number to the front module of Diablo Canyon (0.003 vs 0.009) and stated that vortexing was not an issue. They also performed a comparison to Vogtle (0.003 vs 0.005) which indicated vortexing would not occur. The

NRC staff could not find the information to validate these comparisons. **Additional information is required for this issue.**

10) The NRC staff stated that the Turkey Point, Unit 3, debris laden vortexing evaluation did not appear to address the lower submergence associated with a small-break loss-of-coolant accident (SBLOCA). The St. Lucie, Unit 1, test submergence with debris present was stated to be 6.5 inches. The SBLOCA submergence for Turkey Point, Unit 3, is about half of that value. For breaks above the pressurizer, the submergence was stated to increase quickly, so these breaks may be adequately covered by testing. That is, adequate submergence is attained before significant debris reaches the strainer. The SBLOCA at the hot leg centerline was not addressed. NextEra/FPL stated that for this case, the debris generated is small compared to that, making the strainer response like a clean strainer. NextEra/FPL stated that Turkey Point, Unit 3, has a hard switchover to recirculation during which everything switches from the refueling water storage tank to the sump pool at same time and that this and other aspects of the calculation make the sump level calculation conservative. NextEra/FPL stated that both breaks are bounded by clean strainer testing. The NRC staff will review the submittal and consider whether it is appropriate for NextEra/FPL to use the more realistic value for flashing and deaeration. **No further information is needed at this time.**

13) The NRC staff requested a basis for assuming that use of the Turkey Point, Unit 4, R-I chemical headloss is valid for the higher R-II debris load considering that the chemical head loss is at least partially dependent upon the conventional debris bed to which the precipitates are added. The NRC staff also noted that the Point Beach head loss increased significantly following the final chemical debris addition indicating that it may have increased further had more chemicals been added. NextEra/FPL explained the quantities of chemical used in the tests, the testing methodology, and headloss observations from the tests. NextEra/FPL stated that a multiplier of 1.5 was applied to the R-II total headloss to account for uncertainties. NextEra/FPL also discussed other aspects of the analysis that provide margin for pump NPSH. The NRC staff will evaluate NextEra/FPL's applied margins to determine if the margin accounts for uncertainties created by the lack of a plant specific chemical effects test. **No further information is needed at this time.**

14) The NRC staff noted that the Point Beach testing did not bound the debris loads for Turkey Point, Unit 4, R-II. Several breaks were identified that generated either more fiber or Cal-Sil than was tested. NextEra/FPL stated that the Point Beach testing covered most of the debris loads for Turkey Point, Unit 4, but not all. Therefore, NextEra/FPL applied a 50 percent bump up factor to the highest headloss. NextEra/FPL also noted large NPSH margins if containment accident pressure is credited. Although not all debris were specifically covered, it is expected that the headlosses would be covered by the testing when the 50 percent bump up factor is included. NextEra/FPL stated that if enough excess coating particulate is added to the test it will behave as the Cal-Sil that was not included in the testing. NextEra/FPL did not try to determine how much Cal-Sil is accounted for by a given amount of coatings but used engineering judgement. This issue will be evaluated by the NRC staff in conjunction with Question 13 above. **No further information is needed at this time.**

16 The NRC staff requested a basis for using a flashing evaluation methodology described in Section 6 of NEI 04-07 for a R-II analysis. NextEra/FPL stated that it has shown sufficient margin to flashing just by including dry air partial pressure and that the method

used shows that the margin is significant. The NRC staff indicated that NextEra/FPL should show there is margin to flashing per guidance. NextEra/FPL may show adequate margin to flashing by using conservatively low-pressure calculations and comparing the vapor pressure to a calculation for conservatively high sump temperature. Alternately, margin may be demonstrated by analyzing available design basis and realistic calculations. The NRC staff also stated that a R-II analysis should not be used for any plant unless an exemption or LAR is submitted to assure compliance with regulations. Alternately, NextEra/FPL may perform a 50.59 analysis to ensure that the method being used is within its current licensing basis. **Additional information is required for this issue.**

NPSH

17) The NRC staff requested that NextEra/FPL describe how the potential for void fraction at the pump inlet at less than the two percent limit was evaluated for effect on NPSH margins. It was determined that this was the same issue as that discussed above for St. Lucie Question 9. If the RG 1.82 guidance is not followed, NextEra/FPL should provide assurance that the pumps will operate for the required time considering the void fractions predicted at the pump suction. **Additional information is required for this issue.**

20) The NRC staff requested that NextEra/FPL justify use of containment pressure above that present prior to the postulated loss-of-coolant accident, for calculation of NPSH margins without submitting a license amendment request. **This issue is discussed in the regulatory comments for Question 36.**

Chemical Effects

23) The NRC staff requested a comparison of the tested debris loads to the potential chemical loads in the plants. **Refer to the write-ups for Questions 13 and 14 above.**

24) The NRC staff requested that NextEra/FPL evaluate the potential for increases in headloss from precipitate amounts greater than those tested. (The design basis chemical amount was not added.) **Refer to the write-ups for Questions 13 and 14 above.**

Downstream Effects – Fuel and Vessel

29) The NRC staff requested that NextEra/FPL provide the test conditions for the Diablo Canyon (DCPP) penetration testing because the comparison between the plant conditions may not provide the information necessary to determine if the DCPP test provides an adequate basis for the Turkey Point, Unit 3, penetration estimation. The NRC staff reviewed the DCPP strainer penetration test plan and test results. The DCPP approach velocity was stated to be 0.071 to 0.0103 ft/s for the rear disks and 0.0019 to 0.0062 ft/s for the front disks. These values are consistent with those provided in the Turkey Point submittal. Comparing the Turkey Point, Unit 3, modules closest to the suction plenum to the DCPP entire strainer average should provide an overall conservative comparison. There is one disk on the Turkey Point strainer that has a slightly higher velocity than the highest velocity in the test. The NRC staff will consider this non-conservative aspect of the test as it considers the overall acceptability of the

test for application to Turkey Point, Unit 3. **No further information is needed at this time.**

30) The NRC staff requested that NextEra/FPL provide the date and location of the performance of the referenced DCPP penetration testing. The DCPP penetration testing was performed at Alden Labs in 2016. **No further information is needed at this time.**

31) The NRC staff requested that NextEra/FPL clarify the debris addition sequence for the DCPP strainer penetration testing because of inconsistencies in the Turkey Point submittal. On page E1-227 (233), the submittal states that the first two batches of fiber in the DCPP penetration testing were 100 percent Kaowool fines. On pages E1-232-233 (238-239), the test description states that the first two batches consisted of Nukon, Kaowool, and Temp-Mat in identical quantities for each batch. However, all of the Kaowool was added in the first two batches. This distinction is important because Kaowool is more likely to penetrate than Temp-Mat or Nukon as stated on page E1-227 of the submittal. Nukon and Temp-Mat could deposit on the strainer and prevent some Kaowool from penetrating. The NRC staff reviewed the DCPP strainer penetration test plan and test results. The actual debris additions were like the descriptions on pages E1-232 and E1-233 of the submittal. The first two batches included 181.4 grams of Nukon, 1,148.7 grams of Temp-Mat, and 185.4 grams of Kaowool. The third batch included 362.9 grams of Nukon and 2,297.5 grams of Temp-Mat. The fourth and final batch included 3,137.7 grams of Temp-Mat. **No further information is needed at this time.**

32) The NRC staff requested that NextEra/FPL provide a comparison of the potential fiber source terms arriving at the Turkey Point, Unit 3, strainer and the fiber batches added to the DCPP penetration testing and to justify that the mixture used in the DCPP testing is an acceptable surrogate for Turkey Point, Unit 3. By reviewing the DCPP strainer penetration test report, the NRC staff determined that the Kaowool in the test was about four percent of the total fiber. In the plant, Kaowool is about 88 percent of the total fiber. **No further information is needed at this time.**

33) The configuration of the strainer at Turkey Point, Unit 3, is different from that of DCPP. DCPP has a front and rear module. The front module has the plenum on the side and the rear module has the plenum on the bottom. The Turkey Point, Unit 3, strainer has only a plenum on the side. The NRC staff requested a description of how the difference in strainer configuration was considered when applying the DCPP testing to the Turkey Point, Unit 3, condition. NextEra/FPL did not provide a comparison between the test and plant conditions. Instead, the NRC staff reviewed the DCPP strainer penetration test plan and test report. These documents indicate that neither plant has a large amount of fiber arriving at the strainer considering the strainer areas. The strainers might not be fully covered by the fibrous source term. The fiber amount included in the DCPP testing resulted in a slightly greater maximum fiber bed thickness for Turkey Point. **No further information is needed at this time.**

34) The NRC staff requested that NextEra/FPL provide the batch sizes broken down by material for each of the Turkey Point, Unit 4, penetration test debris additions. The batch masses were provided in the submittal, but not the amount of Nukon and Temp-Mat in each. The NRC staff reviewed the Turkey Point, Unit 4, test report for fiber penetration. The report provided the following regarding the types of fiber in each batch.

Batch 1 was 100 percent Nukon, 435 grams. Batch 2 was 499 grams Nukon and 1,136 grams Temp-Mat, Batch 3 was 1,481 grams Nukon and 656 grams Temp-Mat. Batch 4 was 1,323 grams Nukon and 1,470 grams Temp-Mat. **No further information is needed at this time.**

Regulatory

36) During the audit, the NRC staff and NextEra discussed the need for a R-II analysis for Turkey Point, Unit 4. The NRC staff stated that the use of R-II analyses implies that the most challenging breaks cannot be mitigated using accepted R-I guidance. Typically using alternate methods for showing compliance with the regulations requires a licensing basis change or an exemption. The NRC staff noted that Turkey Point, Unit 4, needs a R-II analysis because R-I analyses could not cover all breaks greater than 23 inches. The NRC staff will review the information from NextEra/FPL's submittal to determine whether the testing used to evaluate Turkey Point, Unit 4, strainer performance is adequate to represent the plant condition. The R-II analysis also appeared to use containment accident pressure (CAP) in its NPSH calculations. The use of CAP for NPSH calculations is discussed below in Question 37. **Additional information is required for this issue.**

37) During the audit, the NRC staff and NextEra discussed Turkey Point, Unit 4, crediting an increase in containment pressure to assure adequate NPSH margins. The NRC staff stated that a license amendment request is required for this credit regardless of whether a R-I or R-II analysis is used. NextEra/FPL stated that it would perform a 50.59 screening/evaluation to determine whether it can credit CAP without prior NRC approval. **Additional information is required for this issue.**

Appendix C – Point Beach Questions for Discussion

Break Selection

1) The NRC staff requested that NextEra/FPL justify that evaluating partial breaks at eight orientations is adequate to capture debris generation amounts for all breaks. This issue is discussed in the section on Turkey Point, Question 1. See that item for a discussion of this issue. **No further information is needed at this time.**

Debris Generation

3) The NRC staff requested that NextEra/FPL verify that the cassettes that contain mineral wool are at least as robust as those tested and found to have the destruction pressure of 114 psi during air jet impact testing for boiling-water reactors. The NRC staff has accepted that cassettes with welded (including spot welded) seams can be credited with a relatively high destruction pressure, but cassettes with riveted seams have a much lower destruction pressure. NextEra/FPL indicated that the cassette information does not specify construction. NextEra/FPL viewed file photos from previous outages. NextEra/FPL stated that Point Beach, Unit 1, cassettes are primarily riveted, and Point Beach, Unit 2, are welded, with riveted repairs for cutouts. The NRC staff's SE on NEI 04-07, accepted 114 psi as the destruction pressure or 2D ZOI (regardless of construction). NextEra/FPL indicated that based on the SONGS submittal, which was reviewed and approved previously, the NRC accepted 114 psi for all Transco and Darmet cassettes, regardless of construction. NextEra/FPL indicated that Point Beach is using a 4D ZOI. NextEra/FPL believes that the lower destruction pressure only applies to Diamond Power and Mirror type reflective metal insulations. Transco is used at Point Beach. The NRC staff reviewed the SONGS audit and found that the SONGS cassettes are welded and that the report stated that welded cassettes are more robust than riveted. The NRC staff also reviewed air jet impact testing and found corroborating evidence. The NRC staff concluded that cassettes that are supplied as riveted should be considered to fail at a much lower pressure than welded cassettes. The NEI 04-07 guidance as accepted by the NRC staff's SE is for RMI, not cassettes with other materials enclosed. Concern with RMI debris is generally much less significant than other insulation types. Lacking additional information, the NRC staff considers only cassettes that are purchased in a welded configuration to be of robust construction such that a reduced ZOI is justified. In cases where the cassettes were purchased as welded, but repaired or modified in the field using rivets, NextEra/FPL should confirm that changes have not significantly affected the structural integrity of the cassette if the smaller ZOI is applied. **Additional information is required for this issue.**

Transport

6) The NRC staff requested that NextEra/FPL confirm that the Cal-Sil installed at Point Beach is not manufactured using a molding process but is the rigid pressed type. NextEra/FPL provided information regarding the Cal-Sil. NextEra/FPL also provided documentation on its electronic portal during and after the audit, which the NRC staff reviewed. The documentation supports NextEra/FPL's claim that the Cal-Sil installed at Point Beach is not of the molded type. **No further information is needed at this time.**

7) The NRC staff requested that NextEra/FPL provide justification for not performing transport cases with two trains in service. For the R-I analysis, it is likely that a single

pump running is conservative from a transport perspective because debris is split if two pumps are running. For R-I, the assumption should be examined to ensure it is valid. For R-II cases that requires both pumps, additional total debris may transport due to higher velocities and turbulence in the pool. NextEra/FPL stated that the recirculation transport cases only modeled a single pump running and that the R-II analysis assumed two pumps were in service for debris distribution. NextEra/FPL stated that the sump level increases 12 inches within the first recirculation (in first 45 minutes after swapover due to CS injection). This would reduce the fluid velocities in the pool. NextEra/FPL stated that the strainers are not co-located and that flowpaths are separate. NextEra/FPL assumed that 100 percent of fines transport and 100 percent of smalls are available to transport. The NRC staff reviewed the computational fluid dynamics plots and was able to determine that it is unlikely for additional small debris to transport even with two pumps running due to the separation of the containment areas. Also, the debris interceptors in Point Beach, Unit 1, appear to be effective for eliminating transport of small fiber pieces. Only smalls that blow or wash to the strainer area will transport. Flow from the other train will not significantly affect the flow in the near strainer areas. Point Beach, Unit 2, has no debris interceptors, but a similar argument applies. The NRC staff will consider this information in its evaluation of NextEra/FPL's transport analysis. **No further information is needed at this time.**

Headloss and Vortexing

14) The NRC staff requested that NextEra/FPL clarify why Figure 3.f.7-3 includes a data point with a fiber value greater than 200 lbs. This value is not shown in Table 3.f.7-4 which lists the bounding fiber break as 97 lbs. The NRC staff asked what the values in Tables 3.f.7-3 and 4, and Figure 3.f.7-3 represent. Figure 3.f.7-4 and Table 3.f.7-5 also indicate that fine fiber amounts greater than those in the table may be produced and transported. NextEra/FPL explained that the figures are total debris transported to a single strainer. NextEra/FPL also explained that the tables are strainer loadings for R-II breaks assuming half of the debris goes to each strainer. The values in the tables should be less than half of the figures because some of the debris penetrates the strainer. NextEra/FPL indicated that there are data points in the figures that are outside are R-II break debris amounts although most of R-II breaks are bounded by the test. The NRC staff reviewed the R-II debris amounts to ensure that the tests bounded the values considering judgement on substitutions. The NRC staff will consider the clarifications when evaluating NextEra/FPL's evaluation of R-II breaks. **No further information is needed at this time.**

15/24) The NRC staff requested that NextEra/FPL provide a justification as to why additional chemical additions were not made after the final addition in Full Debris Load Test 1 that resulted in increased headloss. The NRC staff noted that reactor cavity breaks are not bounded for chemicals. The NRC staff requested an overall discussion of the chemical effects methodology and assumptions used including how aluminum solubility was credited. NextEra/FPL stated that it performed 20 different chemical analysis cases and that the reactor cavity break had the maximum chemical amounts. Because the fiber amount for the reactor cavity break is small NextEra/FPL does not predict a filtering bed for that case. Therefore, for high fiber cases, NextEra/FPL did not add the full chemical amounts. **Additional information is required for this issue. The licensee should explain its rationale for the determination that further chemical additions were not made to bound the total potential chemical source term.**

In response to Audit Plan question 24, NextEra/FPL stated that two pH cases were evaluated. The cases were for low pH and high pH conditions. NextEra/FPL evaluated the change in temperature (see E1-200 of submittal showing table that compares the conditions). NextEra/FPL used only the limiting test results to calculate NPSH margin, which is less than 0.14 feet at > 212 °F (100 °C). This is before chemicals which precipitate at approximately 160 °F (71 °C). As the pool cools, NPSH margins increase. When chemicals precipitate, the margin is much greater. The NRC staff agreed that the amount of chemicals used in the high fiber cases was bounding for those breaks and that only the reactor cavity breaks have more chemicals than the tested amounts, but that those breaks result in very little fiber. The NRC staff will use the clarifications from the audit when evaluating the acceptability of the treatment of chemical effects. **No further information is needed at this time.**

16) The NRC staff requested that NextEra/FPL explain why it is reasonable to use thin-bed test results to determine the head loss for Point Beach, Unit 2, R-II when the test contained less fiber and Cal-Sil than are predicted to transport to the strainer for the limiting breaks. The NRC staff also noted that the test results did not indicate that a thin bed formed, when conversely, a thin bed formed during the confirmatory test that had lesser fiber amounts. NextEra/FPL indicated that the justification is provided in the paragraph below Table 3.f.7-5 of its submittal. The NRC staff will rereview the information in the submittal and determined the acceptability of NextEra/FPL's evaluation of the R-II breaks. This issue is like Question 14 discussed above. **No further information is needed at this time.**

18) The NRC staff requested that NextEra/FPL justify that the R-I breaks have acceptable performance for flashing and deaeration. The methodology in the submittal is intended for R-II breaks. The NRC staff accepted method to evaluate flashing and deaeration for R-I breaks is to show significant margin by maximizing sump temperature and minimizing containment pressure and comparing thermal hydraulic conditions, or showing significant margin using design basis and/or realistic containment analyses. NextEra/FPL stated that it will provide margin to flashing on a single plot by combining data from existing analyses. The NRC staff was unable to locate this information. **Additional information is required for the NRC staff to make a conclusion on this issue.**

19) The NRC staff requested that NextEra/FPL describe how deaeration between 0-2 percent is accounted for in the NPSH analysis as recommended in RG 1.82. If is it is not accounted for NextEra/FPL should justify that the pumps will operate as required with anticipated void fractions for the duration of the recovery period. This question is the same as Turkey Point Question 17 and St. Lucie Question 9 discussed above. **Additional information is required for this issue.**

20) The NRC staff requested that NextEra/FPL discuss the statement on page E1-135 regarding R-II breaks being bounded by tested debris loads because it appears to be inconsistent with the headloss section (Cal-Sil not bounded). The responses to Questions 14 and 16 are relevant to this issue and are discussed above. NextEra/FPL indicated that the test, in general, is bounding of all debris loads. The NRC staff noted that Cal-Sil was not specifically bounded. NextEra/FPL indicated that it believes that

other particulate in the test makes up for this. The NRC staff will consider this information in its evaluation of R-II breaks. **No further information is needed at this time.**

Appendix D – Seabrook Questions for Discussion

Break Selection

1) The NRC staff requested that NextEra/FPL justify that using eight orientations selected for partial break debris generation analyses adequately identifies the limiting debris amounts. Seabrook uses a 17-inch debris generation break size for its transition from R-I to R-II. The response for Seabrook is the same as the response to Turkey Point Question 1. **No further information is needed at this time.**

Debris Generation

2) The submittal states that reactor nozzle break ZOIs were truncated at the primary shield wall and also included a line of sight out the nearest primary shield penetration. The NRC staff requested that NextEra/FPL clarify whether there are other lines of sight through other penetrations that were not included. NextEra/FPL stated that the reactor nozzle breaks are truncated at the shield wall except for the closest penetration. NextEra/FPL stated that all material in the penetration is considered to be debris. NextEra/FPL stated that because of limited piping offset and robust barriers, additional penetrations did not need to be considered and the ZOI did not extend outside the outer boundary of the shield wall. The NRC staff will consider this information when evaluating the debris generation from reactor nozzle breaks. **No further information is needed at this time.**

Transport

5) The NRC staff requested that NextEra/FPL provide details on the design of the debris interceptors (annulus and bioshield) installed at Seabrook including the heights, widths, methods of attachment to the floor and wall, clearances between the floors and walls, and details on the plate, screen, grating, wire mesh cloth, etc. used to capture debris. NextEra/FPL stated that the bioshield debris interceptors do not allow water to go over the top because they extend above the highest level of water that may occur in the pool. They are about six feet high. There are no gaps in the debris interceptors, so debris cannot transport to the strainer without going through a debris interceptor. Annulus debris interceptors are 18 inches high on floor of containment with an 18-inch lip. Some of the annulus interceptors are 14 inches tall if there are obstructions above them. The annulus interceptors are installed across the entire annulus with lengths of about 20 feet. The interceptors are comprised of woven stainless steel mesh (3/8 inch) and grating with 3/8-inch gaps on the vertical surface and lip. Ethylene Propylene Diene Monomer (EPDM) strips are used to seal between the interceptors and the floor and walls. NextEra/FPL stated that water level in containment for SBLOCA is 2.71 feet (low level) and for LBLOCA is 3.1 feet. Testing shows close to 100 percent holdup (nothing can pass through the bioshield interceptors except fines). There is a single flow path out of the bioshield area to the annulus. The strainers are installed in the sump but are 9-10 feet tall and stick up approximately 1.5 to 2 feet above the floor. A robust barrier is installed approximately 2 to 3 feet above the strainers. The clarifications provided by NextEra/FPL will be used by the NRC staff in its evaluation of debris transport. **No further information is needed at this time.**

6) The NRC staff requested that NextEra/FPL provide details of the testing conducted to determine the penetration, bypass, and efficiency characteristics of the debris

interceptors. NextEra/FPL stated that it did not credit the bioshield debris interceptors for anything except flow diversion. NextEra/FPL stated that fines can pass through the interceptors. Modeling the interceptors as flow diverters increases the pool velocities in the annulus. If all fines are assumed to transport, there would be no effect on their predicted transport to the strainer. NextEra/FPL described the interceptor testing. The NRC staff stated that some aspects of the testing may not have been adequately controlled including debris preparation, debris batch sizes, and turbulence. Generally, the NRC staff did not understand how the test methods assured that adequate results were attained. It is possible that NextEra/FPL will perform additional debris interceptor testing. Because the industry and the NRC staff do not have significant experience with debris interceptor testing, any test program should be carefully planned and consider aspects of strainer headloss and strainer penetration testing that may be applicable to interceptor testing, as well as other aspects that may be unique to interceptors. **Therefore, additional information is required for this issue depending on how the debris interceptors are credited in the updated test program and application of those results to the plant.**

7) Figure 3.e.1-4 shows the distribution of small debris in lower containment at the start of recirculation. The NRC staff asked NextEra/FPL to discuss whether the figure shows debris blown to upper containment and washed down to lower containment. The NRC staff stated that it appears that some debris would be washed in other areas not shaded in green in the figure. NextEra/FPL stated that it does not include smalls from upper containment that wash down. This is similar to other plants and the assumptions are typical to transport calculations. The NRC staff agreed that this is like typical transport evaluations. **No further information is needed at this time.**

8) The NRC staff noted that in Figure 3.e.1-6, it is not clear why some areas inside the shield wall do not support transport. The NRC staff noted that the cross hatched area border is clearly drawn through an area of red on the east side of the reactor cavity and that there are other areas that could support transport. NextEra/FPL provided additional information on the figure in question and stated that transport is prevented by the bioshield debris interceptors on the left side of the figure. On the right side, the vectors are pointed away from the area of transport indicating that any suspended debris would be moving away from the strainer. NextEra/FPL indicated that all debris in the hatched areas reach the strainer even though the hatched area does not extend to the strainer. (Only the starting area is hatched.) NextEra/FPL indicated that Figure 3.e.1-4 of its submittal shows the initial debris distribution. **No further information is needed at this time.**

9) The NRC staff requested that NextEra/FPL explain the statement in the pool fill transport section that all debris laden break flow must pass through two interceptors prior to reaching the strainers. The NRC staff expects some washed down debris can reach the strainers without passing through any interceptors. NextEra/FPL confirmed the NRC staff's expectation and stated that the washdown near the strainers is accounted for in the transport analysis. The transport from these regions is small. **No further information is needed at this time.**

Headloss and Vortexing

The NRC staff and licensee discussed the strainer headloss testing that was performed for Seabrook. The testing was performed prior to a time when industry and NRC staff understood the important requirements for assuring that testing is representative of limiting plant conditions. Therefore, NextEra/FPL stated that it would attempt to find existing testing that can be used to evaluate Seabrook's strainer performance or perform additional testing. After the audit NextEra/FPL determined that new headloss testing for Seabrook would be required. The questions related to or dependent on headloss testing discussed in the Seabrook section of the audit report should be considered in the submittal that is anticipated to be based on the updated testing. Many of the issues identified are in the section at the end of this appendix under Audit Discussion.

12) The NRC staff requested that NextEra/FPL provide a discussion of whether the headloss testing simulated the flow and turbulence parameters as shown in Figure 3.e.1-5 or justify that testing bounded the potential range of plant conditions. NextEra/FPL stated that there is a roof over the strainer to prevent water from falling on it and therefore, NextEra/FPL does not expect washdown flows to contribute to turbulence. The NRC staff notes that future testing should account for turbulence or ensure that all debris transports to the strainer. **No further information is needed at this time.**

18) The NRC staff requested that NextEra/FPL provide an evaluation of whether unqualified coatings may fail as chips instead of particulate and whether this should be accounted for with respect to strainer headloss. NextEra/FPL stated that the Point Beach testing showed larger chips would settle and smaller chips would transport as particulate. NextEra/FPL stated that unqualified coatings are treated as particulate, not chips. The NRC staff's guidance is that if a continuous fiber bed is not formed during testing the coatings should be treated as chips unless it is determined that failure as chips will not occur or the chips will not transport. For this case, NextEra/FPL determined via testing that chips will not transport. **Additional information is required for this issue.**

NPSH

26) The NRC staff requested that NextEra/FPL describe how void fraction at the pump suction was accounted for in the calculation of NPSH margin. This issue is the same as Turkey Point Question 17; St. Lucie Question 9; and Point Beach Question 19 discussed above. **Additional information is required for this issue.**

27) The NRC staff questioned the statement in the submittal that no water is trapped in the refueling canal. The NRC staff also asked for the status of the strainers' installation intended to prevent blockage of the refueling canal (RFC) drain lines. The NRC staff also questioned whether the RFC drain lines could be blocked considering that they combine into a single 2-inch header. NextEra/FPL stated that there are three drains in the RFC. The current configuration is that the three 4-inch drains flow into a 2-inch header. NextEra/FPL plans to upgrade the 2-inch header to 4-inch piping. Analysis indicates very little retention of water with the 4-inch drain. NextEra/FPL also plans to add a RFC strainer. NextEra/FPL also stated that there is a curb around the RFC. NextEra/FPL is working on an analysis to determine the potential for larger debris to transport to the RFC. The NRC staff stated that NextEra/FPL needs to demonstrate that the drains will not block due to debris blocking the RFC drains and calculate the holdup

due to flow in the RFC and the drain lines. **Additional information is required for this issue.**

28) The NRC requested that NextEra/FPL clarify the response to item 3.g.8 in the submittal which states that the water available from the refueling water storage tank during swapover to recirculation is considered as a quantity of water diverted from the sump. The NRC staff noted that it seems that this would be an addition to the sump. NextEra/FPL indicated that this is a misprint and that it is crediting that volume rather than assuming it is subtracted from the inventory. **No further information is needed at this time.**

29) The NRC staff noted, based on the response to 3.g.10, that it appears the sump level was recalculated and that the coolant sources and holdups associated with sump level were also determined. The submittal stated that a majority of these holdups would have negligible effect on sump level. The NRC staff noted that for some plants, the holdups considered to be negligible at Seabrook, can have a significant effect on the sump level. For Seabrook, the holdups that are not explicitly accounted for may be small, but not be negligible considering the low NPSH margins calculated for the containment building spray (CBS) pumps. The NRC staff requested that the design assumptions, inputs, and values for strainer submergence and NPSH be clearly developed and stated. NextEra/FPL stated that it will provide the sources and holdups for sump pool level. **Additional information is required for this issue.**

30) The NRC staff requested that NextEra/FPL provide the basis for the response to 3.g.16 for the R-II analysis which states that the partial pressure of air, prior to the accident (equal to 29.76 ft.), may be credited for the NPSH calculation. See regulatory comments for Turkey Point Questions 36 and 37 which cover the same issue. **Additional information is required for this issue.**

<u>Chemical Effects</u>

39) The NRC staff requested that NextEra/FPL provide an overall discussion of the chemical effects methodology and assumptions used including how aluminum solubility was credited. NextEra/FPL stated it used a 116 °F (47 °C) precipitation temperature and used ANL equations to predict solubility. The NRC staff indicated that that the Argon National Laboratory equations could be non-conservative for higher temperature cases and that NextEra/FPL may want to consider using the WCAP-17788 solubility boundary function. NextEra/FPL indicated that it believes the ANL curves are conservative for pH values below 10, but that the WCAP is more conservative above pH 10. While the NRC staff agrees that the ANL equation did not correctly predict precipitation in some tests above pH 10, the NRC staff notes that the relative conservatism of the ANL and WCAP solubility predictions are a function of both pH and temperature. The NRC staff will consider the clarified information in its evaluation of chemical effects. **No further information is needed at this time.**

<u>In-Vessel</u>

43) The NRC staff requested that NextEra/FPL provide several pieces of information regarding the application of St. Lucie penetration testing to the Seabrook strainer. NextEra/FPL discussed the St. Lucie testing and how the test conditions apply to

Seabrook. NextEra/FPL stated that the analysis assumed that two strainers were in service when calculating the penetration amounts and that the penetration was calculated using the ratio of the areas of the test strainer and the Seabrook strainers. NextEra/FPL also stated that Temp-Mat was not added until the last two batches during St. Lucie testing and that the Temp-Mat amount was about five percent of the total fiber. NextEra/FPL also noted that small scale penetration testing showed only a small difference between Temp-Mat and Nukon penetration. NextEra/FPL also stated that operators are instructed not to secure CBS pumps. The pump was assumed secured to maximize the amount of fiber going to the core. The case that resulted in the greatest amount of fiber arriving at the core was the two-train case with one CBS pump secured. The NRC staff will re-review the debris penetration section of the Seabrook submittal considering the clarifications made during the audit. **No further information is needed at this time.**

Licensing Basis

44) The NRC staff requested that NextEra/FPL justify the credit for increase in containment pressure to assure adequate NPSH margins. The NRC staff noted, based on guidance in NEI 04-07 and the associated NRC staff SE, that any credit for CAP is likely to require a license amendment request unless it is already included in the plant licensing basis. The NRC staff also referred to Commission SRM-SECY-11-0014 (ADAMS Accession No. ML110740254) as the latest guidance on application of CAP. NextEra/FPL stated that the 10 CFR 50.59 process would be used to determine whether a license amendment is required prior to crediting CAP. **Additional information is required for this issue.**

45) The NRC staff requested that NextEra/FPL describe how changes to the FSAR and TS Bases will be implemented to describe the changes in single failure criterion for R-II breaks. NextEra/FPL stated that the changes will be completed in the future. **No further information is needed at this time.**

46) The NRC staff stated that the installation of the RFC strainers should be completed prior to the completion of the NRC staff's SE on Seabrook's exemption for GL 2004-02. Alternately, the SE will need to include a license condition that the RFC strainers are installed prior to the SE being valid. NextEra/FPL stated that the planned installation is in May 2020. **NRC staff will need documentation that the strainers have been installed.**

General

47) The NRC staff noted that the statement on page E1-15 that "the defense in depth and safety margin considerations in RG 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," (ADAMS Accession No. ML17317A256) can be implicitly assured by the low probabilities of the events," is not per NRC staff understanding of its guidance. Defense-in-depth and safety margins are separate from risk calculations and must be demonstrated in addition to the risk values. NextEra/FPL explained that the evaluation of defense-in-depth and safety margin are part of the submittal. **No further information is needed at this time.**

Audit Discussion

The discussion at the end of the audit focused on Seabrook. The NRC staff reiterated their concern that the strainer headloss and debris interceptor tests previously performed for Seabrook did not follow accepted guidance. NextEra/FPL indicated that it believes that the testing is adequate but understands it does not meet guidance so it either needs to reperform the tests for Seabrook or find another test representative of Seabrook to use for the strainer evaluation.

The NRC staff notes that the following questions from the audit plan for Seabrook would be eliminated by performing additional testing, that conforms to staff guidance, for the strainer and debris interceptors. The NRC staff also notes that there is no guidance for debris interceptor testing. Therefore, any debris interceptor testing should be carefully planned to ensure that the results are representative of the most limiting plant conditions. Strainer guidance and accepted practices for performing strainer penetration testing likely include a majority of the parameters that will provide an adequate basis for developing debris interceptor testing procedures.

NextEra/FPL can consider the questions discussed below, resolved for Seabrook if future testing is performed in accordance with accepted guidance or an acceptable alternate method is used. These items below should be considered when developing the inputs, assumptions, and methods for testing. An important reference for strainer testing guidance is "NRC Staff Review Guidance Regarding Generic Letter 2004-02 Closure in the Area of Strainer Head Loss and Vortexing," dated March 2008 (ADAMS Accession No. ML080230038). Coatings guidance is contained in "NRC Staff Review Guidance Regarding Generic Letter 2004-02 Closure in the Area of Coatings Evaluation," dated March 2008 (ADAMS Accession No. ML080230462). This was supplemented by letter dated April 6, 2010 (ADAMS Accession No. ML100960495). Chemical Effects guidance is found in "NRC Staff Review Guidance Regarding Generic Letter 2004-02 Closure in the Area of Plant-Specific Chemical Effect Evaluations," dated March 2008 (ADAMS Accession No. ML080380214). Other important information and references regarding the evaluation of strainer performance and the effects of debris on ECCS and CSS operation can be found in RG 1.82.

- Question 6 – Requested details of the interceptor testing. The specific questions in this item may be of use when developing a debris interceptor test program.

- Question 10 – The discussion of the R-II transport evaluation did not provide adequate justification for changes in fine debris transport fractions. Provide the methodology for determining these values along with one or more examples of how the values were calculated. Determination of these fractions is an important input for any testing performed for R-II analyses. The NRC staff's guidance for the R-II analysis indicates that R-I assumptions should be used for debris generation and transport.

- Question 11 – The Seabrook transport evaluation does not follow the guidance in NEI 04-07 and the NRC staff's SE for fine debris transport. Specifically, guidance is that all fine debris in the pool is assumed to transport to the strainer. R-II analyses allow time dependent evaluations, not changes to other aspects of the R-I methodology. Provide an evaluation of fine debris transport that is consistent with guidance in the NRC staff's SE. This is an input to the R-II headloss analysis.

- Question 12 – This question regarding turbulence in the area of the strainer is based on the NRC staff's guidance that an attempt be made to ensure all debris is deposited on the test strainer. This may require agitation that does not disrupt the bed. Alternately, turbulence in the testing may be shown to be equal to that in the plant and to not affect the debris bed non-prototypically. There may be more than one turbulence condition that needs to be considered in the testing. If near-field settling is credited, debris characteristics and debris introduction methods become more important. This is an important aspect of the test that should be considered when designing any test program.

- Question 13 – This question explores how it was determined how each size classification of each debris type predicted to reach the strainer by the transport evaluation actually arrived at the strainer during testing. Testing should ensure that the amounts of debris calculated to reach the strainer in the plant are represented in the testing and reach the test strainer in a manner that is similar or conservative with respect to the plant. For fibrous debris, it is acceptable to use a smaller size classification of debris to represent larger sizes. It is likely non-conservative to use a larger size classification in place of smaller debris.

- Question 14 – This question regarding the amounts of debris included in testing is similar to Question 13. Testing should be designed to ensure that the design basis debris amounts, calculated to transport to the strainer, are represented in testing and have an opportunity to deposit on the strainer. This is true for tests representing both R-I and R-II conditions.

- Question 15 – This question is similar to Questions 13 and 14. Debris predicted to arrive at the strainer should be represented in testing. Conclusions regarding the effects of specific types of debris on headloss should be based on testing. Justification for lack of inclusion of debris in testing may not be acceptable to the NRC staff. If such a justification is used, it should be well developed and consider the potential effects of not including the debris in the test.

- Question 16 – This item requested the amounts of each debris surrogate, broken down by size category, added to each test considered for the design basis and a correlation to what debris type it was assumed to represent. This is basic to development of test inputs. There should be a one to one correspondence between debris types and size distributions calculated to reach the strainer and the surrogates included in the test.

- Question 17 – This item asked for the basis for including less than half of the unqualified coating amounts in the test. This should be self-explanatory.

- Question 18 – This question explored whether coatings should be added to the test in the form of particulate or chips. The NRC staff's guidance is that particulate is generally an acceptable form. However, if chips may be generated and transport to the strainer, and a filtering bed does not form during testing, it may be conservative to add at least a portion of the coatings as chips.

- Question 19 – This question is related to Question 12. The test plan should include steps to document any debris settlement that occurred during the testing in any part of the test facility.

- Question 20 – This question is similar to Question 12, but requests additional details regarding how the flows in the area of the test strainer were determined to be appropriate.

- Question 21 – This question requested a description of post-test inspections of the strainer. The documentation of the debris bed covering the strainer should be rigorous. This may assist NextEra/FPL and the NRC staff with evaluations regarding potential changes in debris load or anomalous test results.

- Question 22 – This question requested justification that the fiber used in the testing was prepared as 100 percent fine fiber. Fine fiber is considered to be individual strands of fiber. It is important that fine fiber be represented adequately in testing. The NRC staff's guidance on fiber preparation was not available at the time of the original Seabrook testing. There now is guidance on fiber preparation that is familiar to facilities that perform strainer testing.

- Question 23 – This question requested information that demonstrates agglomeration of debris did not occur during testing. Following accepted test guidance should prevent agglomeration.

- Question 24 – This item requested justification that the extrapolation method used to determine the head loss expected at the end of the ECCS mission time was performed acceptably. The NRC staff's guidance is that extrapolation of test results should be based on headloss test data.

- Question 25 – This question requested an evaluation of deaeration of the fluid as it passes through the debris bed and strainer. This is an input to NPSH calculations. Excessive voiding downstream of the strainer may result in ECCS or CSS pump failure.

- Question 29 – This question requested detailed information on the sump inventory calculation. This may provide an important input for vortex testing.

- Question 31 – See the discussion regarding Question 18 above.

- Question 32 – See the discussion on Questions 16 and 17.

- Question 33 – This item requested a description of the methodology used to scale from plant coating amounts to tested amounts. Scaling on coating volume is considered appropriate. NextEra/FPL stated that it will use most up-to-date debris amounts and will scale coatings on volume, not mass. This is an important input for testing.

- Questions 27 and 34 – These questions are on the potential for holdup in the refueling canal. As far as testing is concerned, this may affect vortex test assumptions. It is also an important input for calculation of sump level that affects NPSH and deaeration evaluations. The NRC staff has observed that large amounts of inventory may be held up in the RFC. The potential for holdup in the RFC due to debris, flow across the floor, and losses in the drain line should be carefully evaluated.

- Question 35 – This item requested information on the design of the debris interceptors to allow the NRC staff to evaluate their potential effect on debris transport. NextEra/FPL

should consider the design of the debris interceptors and the design of the debris interceptors as a system when developing a test program to determine debris interceptors' effects on transport to the strainer.

- Question 39 – This item requested a description of the chemical effects methodology used to determine the chemical source term. This develops an important input for strainer testing.

- Question 40 – The NRC staff requested a chemical effects analysis for the R-II breaks. Testing for R-II breaks should include chemical effects unless it can be justified that they will not occur for these breaks.

SUBJECT: POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2; SEABROOK STATION, UNIT NO. 1; ST. LUCIE PLANT, UNITS 1 AND 2; AND TURKEY POINT NUCLEAR GENERATING UNITS 3 AND 4 – AUDIT REPORT REGARDING GENERIC LETTER 2004-02, "POTENTIAL IMPACT OF DEBRIS BLOCKAGE ON EMERGENCY RECIRCULATION DURING DESIGN BASIS ACCIDENTS AT PRESSURIZED-WATER REACTORS" CLOSURE METHODOLOGY (EPID 2017-LRC-0000) DATED DECEMBER 2, 2019

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