AUG 1 0 2012

NEXTera ENERGY

L-2012-323

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Re : NextEra Energy Seabrook, LLC
Seabrook Station, Docket No. 50-443

NextEra Energy Point Beach, LLC
Point Beach Nuclear Plant, Units 1 and 2, Docket Nos. 50-266 and 50-301

Florida Power & Light Company
St. Lucie Units 1 and 2, Docket Nos. 50-335 and 50-389
Turkey Point Units 3 and 4, Docket Nos. 50-250 and 50-251

Subject: Strainer Fiber Bypass Test Protocol

By letter dated March 3, 2012 (L-2012-098), Florida Power & Light Company (FPL), on behalf of itself and NextEra Energy Resources, LLC (NextEra), submitted a draft "Strainer Fiber Bypass Test Protocol" (the "Protocol") for NRC staff's review. The Protocol provides for a consistent and uniform set of considerations for the performance of strainer bypass testing that would be incorporated into a vendor-specific strainer test plan. This later testing would determine a maximum mass quantity of fibrous debris bypass that will bound any set of conditions specific to a plant. Finally, the output from strainer bypass testing would be used to perform ex-vessel and in-vessel downstream effects analysis as part of demonstrating compliance with GSI-191, "Experimental Studies of Loss-of-Coolant-Accident-Generated Debris Accumulation and Heat Loss with Emphasis on the Effects of Calcium Silicate Insulation" requirements.

The NRC staff provided FPL with comments and a markup of the draft Protocol. On March 27, 2012, FPL transmitted to the staff, via email, a revised Protocol, which incorporated NRC staff comments received to date. A copy of the draft revised protocol is attached.

The purpose of this letter is to request that the NRC staff acknowledge that there are no additional comments so that the revised Protocol may be incorporated into a strainer fiber bypass test plan as described above.

Timely NRC staff acknowledgement is requested to allow for incorporation of the Protocol into vendor strainer test plans already under review by FPL, so that the companies can proceed with the required testing.

Please contact William A. Cross, Fleet Nuclear Licensing Manager, at (561) 691-2970 if there are any questions.

Sincerely yours,

Paul Freeman
Vice President Organizational Effectiveness

ADD1
NRR

Attachment

cc: Jack R. Davis, NRC
Stewart N. Bailey, NRC
Stephen J. Smith, NRC
Farideh Saba, NRC
Jason C. Paige, NRC

Strainer Fiber Bypass Test Protocol

Revision 0

August 10, 2012

Table of Contents

1. SCOPE

This document provides the minimum considerations necessary for performance of strainer bypass testing using either flume testing or tank testing. This document also provides the steps for either fiber only bypass testing or fiber and particulate (homogeneous) bypass testing, including the methodology for determining the appropriate quantities of particulate to be included in a homogeneous test approach. The steps provided in this guideline are intended to be incorporated into a vendor's strainer bypass test protocol, procedure, or test plan. For the purposes of this document, the detailed strainer bypass test document will be referred to as the test plan, and a flume test arrangement or tank test arrangement will be referred to as the test loop. Additional detail will be included in the vendor's test plan to address vendor specific test configuration, quality requirements, contractual requirements, etc. It is expected that vendor test plans will include the applicable considerations from this guideline. Methods other than those contained in this guideline should be identified in the test plan and sufficient basis provided for the acceptability of the specified approach.

2. PURPOSE

The purpose of this document is to provide a consistent and uniform set of considerations for performance of strainer bypass testing that will be incorporated into a vendor specific strainer test plan. This testing will determine a maximum mass quantity of fibrous debris bypass that will bound any set of conditions specific to a plant. The output from strainer bypass testing is intended to be used for downstream effects analysis, both ex-vessel and in-vessel.

3. DEFINITIONS

3.1 Test Plan – The document developed by the vendor that will be performing the strainer bypass testing that provides the specific details of the testing process including those elements from this document that are determined to be applicable. The document may be referred to as the test protocol, procedure, or test plan.

3.2 Test Loop – The tank, pool, or flume in which the bypass testing will be performed. The test loop will normally include the test strainer, pump(s), metrology, debris capture devices and will have the capability for continuous recirculation of the water.

3.3 Debris Capture Device – Device installed downstream of the strainer to capture bypassed debris, containing removable filter media. This can also be used to clean up the loop prior to a test.

4. GENERAL REQUIREMENTS

1) A test plan shall be developed that includes the applicable methodology and considerations from this document for the applicable testing methodology chosen. This test plan shall be reviewed by the NRC prior to implementation to provide greater assurance that the results will be accepted by the NRC.

2) The test plan shall determine the appropriate scaling factor for the testing to be performed based on consideration of test strainer size and test loop flow rate capability.

3) The test plan shall determine the test loop turnover time and the containment sump pool turnover time.

4) The test plan shall define and provide justification (or reference the justification document) for the worst case operating scenario(s) for strainer bypass, which can be different than that defined for a head loss test. The intent of this step is to ensure that the specific set of plant conditions that could exist that would result in the greatest quantity of fiber bypass be identified. An example of an operating scenario to be considered include:

   - If more than one sump can operate during recirculation (split sump trains), then the total surface area of both sump's strainers and the total sump flow rate should be tested.

5) The test plan should determine, through analysis or sensitivity testing, whether inclusion of the sacrificial strainer area in the determination of available strainer area for bypass testing should be included. There are competing effects associated with this consideration, face velocity at the strainer and face area of the strainer. For those plants that had a relatively small fraction of the total strainer area set aside for sacrificial strainer area, there should be little difference between the effects for which the slightly increased face velocity should be used.

6) Testing should be performed at a temperature of 80°F to 140°F. The test plan shall specify the required temperature and the allowable deviation from the target temperature.

7) The test plan shall include the quantities and types of material to be included in the testing.

8) The fiber required for the testing shall be prepared in accordance with "ZOI Fibrous Debris Preparation: Processing, Storage and Handling" or the vendor document that incorporates the information from that document.

9) The test plan shall provide the steps necessary for introducing the prepared debris into the test loop while minimizing significant agglomeration of the debris.

10) The test plan should also provide for post-test fiber length measurement which could be used as an input for downstream effects evaluations and fuel blockage testing.

11) If used, particulate debris shall be prepared in accordance with the test plan utilizing acceptable materials and sizes as previously reviewed and accepted by the NRC or as specified within NEI 04-07 and its associated SER.

12) All weight measurements shall be performed using calibrated scales with sufficient accuracy for the intended purpose.

13) The weighed debris must be stored and clearly labelled with weight, type, and date. This is done to prevent the possibility of incorrectly identifying the material at the time of its use or following the completion of testing. Documentation of the weighed debris shall be per the requirements of the test plan.

14) All filter media utilized during performance of the test plan shall be carefully controlled and handled to ensure the results obtained are an accurate reflection of

the captured debris and test conditions. These controls should be specified in the applicable sections of the test plan.

15) The debris must be handled in a safe manner to ensure minimal hazard to personnel. Each relevant material safety data sheet (MSDS) must be read before handling debris and each worker must wear appropriate personal protective equipment (PPE).

16) The test plan should contain the data sheets necessary to fully document the relevant information associated with the testing.

5. RESPONSIBILITIES

The Scope of Work will be performed in accordance with the test plan developed for the specified testing.

6. PROCESS

This section identifies the generic requirements for the performance of strainer bypass testing that should be included in a vendor test plan, as applicable for the type of testing to be performed, e.g., flume test with fiber only, tank test with fiber and particulate, etc.

6.1 Safety

Due to their potential negative effect on health, the materials identified for use may require appropriate safety precautions when handling. These requirements shall be detailed in the vendor test plan to ensure operator safety.

6.2 Test Loop Setup

The test loop shall be established per the test plan and will include consideration of the following, as applicable:

1) Strainer type
2) Strainer arrangement
3) Flow rate
4) Flume design for establishing the correct approach velocity and turbulence.
5) An appropriate method for introduction of debris into the test loop that does not disrupt the debris bed developing on the strainer.
6) Bypassed debris capture including the capability to swap debris capture devices during testing without disruption to the debris bed developing on the strainer.
    - These capture devices can be filters or screens and should have the capability of filtering out debris greater in size than approximately 25 microns (0.003 in). This size is less than that used in the Los Alamos screen penetration test, as documented in Reference 7.2 and also provides for minimal capture of any particulates that may be resident in the test loop.

7) A method for obtaining grab samples of the circulating fluid downstream of the strainer if short term incremental changes in bypassed debris are considered to be necessary for the testing.

8) A method for partitioning the flow to the debris capture devices and the bulk recirculation pool of water for those tests that include consideration of debris quantities at the strainer and flow rates through the strainer that result from containment spray flow in addition to ECCS flow.

   - Test loop configuration shall include the capability to monitor the flow rate in the portion of the loop that includes the debris capture device and a method for adjusting the flow rate in that section of the loop to ensure the equivalent ECCS flow rate is maintained through the filter media of the debris capture device.

9) Use of qualified instrumentation for differential pressure, flow rate and temperature measurement.

10) Use of data acquisition devices for capture and retention of the data generated by the instrumentation.

6.3 Test Loop Operation – Pre-Test

The test plan should provide, at a minimum, the following for performance of the pre-test which is the test loop cleanup and equipment checkout portion of the overall bypass test.

1) Prior to performing bypass testing, a 1 micron filter should be installed in the test loop with all flow circulating through these filters (if partition flow is being used, that portion of the test loop also needs to be directed to the filter media).

2) If not already completed, fill the test loop with tap water.

3) Recirculate the test loop for a minimum of 5 pool turnovers, at the maximum calculated test flow rate, to remove all residual debris from the test loop.

4) Ensure the data gathering system is functioning properly.

5) Upon completion of the pre-test filtering, the test loop should be secured, and the loop clean-up filter media removed.

6) Install the filter media to be used for the bypass testing into the debris capture device.

6.4 Test Loop Operation – Bypass Test – Fiber Only

The test plan shall provide the specific steps for this testing based on the plant specific configuration, the applicable general requirements specified in this guideline, the vendor's specific requirements, and the following considerations.

1) The filter media shall be weighed dry and marked or labelled with a unique identifier.

2) The test loop pre-test shall be completed and the test filter media shall be installed.

3) If determined to be necessary, the concentration of total fiber fines that could be introduced to the test loop should be determined based on the concentration that

would exist in the containment sump pool at the initiation of recirculation. The fines that are to be considered for this determination will be those that are generated as a result of the break and those from the latent fibers that are in the active sump volume.

4) The total quantity of fines that are calculated to erode should be added to the fines quantity determined in the previous step, as a function of concentration in the pool. These erosion fines should be added commensurate with the time period during which the erosion occurs, considering the compressed timeline for this testing.

5) The test loop shall be placed in service with the filter media in-line. Clean strainer head loss should be determined during this portion of the sequence.

6) If specified by the test plan, a water sample should be collected after clean strainer head loss is determined to provide a baseline debris concentration in the test loop. This step is only necessary if samples will be collected during the test to establish additional data points for determination of the quantity and rate of debris bypass.

7) Debris additions to the test loop shall consider the total quantity of debris, the debris concentration, the thickness of the developed debris bed, the time necessary to introduce the debris to the test loop, the time to swap filter media and replace filters, and the expected time for the debris to transport to the containment sump strainer(s). A sensitivity study may be needed to determine the detailed debris addition method, including debris amount for each addition and total debris amount.

- If the containment sump pool debris concentration method is being used for testing, this concentration should be established in the test loop prior to initiation of flow. This may require a method of agitation to maintain the readily suspendable fibers available for transport to the strainer prior to initiation of test loop flow. If this method is chosen for testing, supporting basis for the concentration determined shall either be contained in the test plan or a supporting document.
- For non-concentration (batch thickness on strainer) based testing, the table below provides a suggested sequence assuming that the first 8 additions result in less than or equal to an equivalent 1/16 inch debris bed addition to the strainer per batch addition (total of 1/2 inch thickness on strainer).
- If the debris quantity per batch addition results in a calculated bed thickness greater than 1/16 inch, and the debris concentration method is not being used (see Step 3 above), the debris quantity should be reduced by a sufficient quantity to ensure less than 1/16 equivalent bed thickness on the strainer per batch addition. If the total debris addition results in a calculated bed thickness of less than approximately 1/8 inch, then the debris addition should be completed in a minimum of 4 batch additions.
- Following final debris addition, the test loop should be allowed to run for an additional time that depends on plant specific requirements, e.g., at least as long as the hot leg switchover time for the plant, or longer, depending on the plant operating conditions.

Table 6-1 Test Sequence

Step	Batch Size (% of total)	Cumulative (%)	Addition Interval	Filter Change Interval / Sample Collection
1	6.25	6.25	≥5 min. after stable flow in test loop	Within 2 minutes prior to next debris addition
2	6.25	12.5	Greater of 10 min. or 5 test loop pool turnovers	Within 2 minutes prior to next debris addition
3	6.25	18.75	Greater of 10 min. or 5 test loop pool turnovers	Within 2 minutes prior to next debris addition
4	6.25	25	Greater of 10 min. or 5 test loop pool turnovers	Within 2 minutes prior to next debris addition
5	6.25	31.25	Greater of 10 min. or 5 test loop pool turnovers	Within 2 minutes prior to next debris addition
6	6.25	37.5	Greater of 10 min. or 5 test loop pool turnovers	Within 2 minutes prior to next debris addition
7	6.25	43.75	Greater of 10 min. or 5 test loop pool turnovers	Within 2 minutes prior to next debris addition
8	6.25	50	Greater of 10 min. or 5 test loop pool turnovers	Within 2 minutes prior to next debris addition
9	12.5	62.5	Greater of 10 min. or 5 test loop pool turnovers	Within 2 minutes prior to next debris addition
10	12.5	75	Greater of 10 min. or 5 test loop pool turnovers	Within 2 minutes prior to next debris addition
11	12.5	87.5	Greater of 10 min. or 5 test loop pool turnovers	Within 2 minutes prior to next debris addition
12	12.5	100	Greater of 10 min. or 5 test loop pool turnovers	Within 2 minutes prior to next debris addition
13	Following final debris addition, the test loop should be allowed to run for an additional 4 to 12 hours (based on hot leg switchover time for the plant), based on the thickness of the debris bed formed and the continued capture of debris in the filter media, with consideration of the head loss developed across the strainer.			Following the final filter swap, subsequent filter swaps should be performed every 30 minutes for the next 2 hours, and then hourly until completion of the test.

If the testing is to be performed in a tank type test loop, some settling of debris may occur. If agitation is used to force the settled debris onto the strainer, the agitation shall not be used to develop a uniform debris bed across the strainer. Care should also be taken to not disrupt the developing debris bed which could result in a greater quantity of fiber bypass.

8) The specific test termination criteria are as follows:

- The test has been allowed to continue until the maximum time from event initiation until transfer to hot leg recirculation has been realized OR the number of test pool turnovers that are equivalent to the number of sump pool turnovers that would be realized in the plant

AND

- The capture of fibrous debris in the test filter media has been reduced to a minimal value

AND

- Head loss across the developed strainer debris bed has stabilized (i.e. no head loss increase greater than 1% for two consecutive 30 minute intervals) OR, if below the measurement threshold, then termination would be based solely on test time and minimal increase in captured debris downstream of the strainer. This criterion is especially important for those tests where partitioning was employed to represent that portion of the test pool that will continually recirculate without passing through the filter media.

9) The filter media, with debris collected during the test shall be dried and weighed for determination of the debris captured during the test.

10) The total quantity of debris captured compared to the total quantity of debris added to the test loop can be used to establish a strainer percentage bypass, if necessary and appropriate.

11) If necessary to support other testing or analysis, the dried debris can be processed by manual separation to establish lengths of fiber that would be expected for downstream effects analysis and testing.

12) If liquid samples were collected in addition to the debris collected on the filter media, the samples shall be filtered through a porous filter (appropriately sized to ensure accurate weight measurement), dried, then weighed. Note that if the liquid samples are to be shipped, they are not to be filtered or dried until they reach the lab where the analysis will be performed. Processing of the fibers for fiber size determination may also be necessary as previously discussed. Consideration should also be given to whether the total weight of these fibers should be added to weight of the fibers collected on the filter media. This will be dependent on whether partitioning was used for the testing.

13) Debris collected during this testing may be retained for use in future testing such as site specific fuel assembly testing.

6.5 Sensitivity Testing

1) If the intent is to credit mitigative measures for high strainer head loss that results in disruption of the developed debris bed on the strainer, sensitivity bypass tests will need to be performed to account for the potential additional fibrous debris that could bypass the strainer as a result of this disruption. The types of mitigative measures that could cause a disruption include strainer backwash or cessation of flow through the strainer.
2) Sensitivity testing may be required to demonstrate that inclusion or exclusion of sacrificial strainer area will not significantly impact the overall test results.
3) Sensitivity testing may be required for plants that have quickly developing and thicker fiber beds (on the strainer) to demonstrate that smaller breaks will not result in a greater quantity of fibrous debris bypassing the strainer.

6.6 Photographs of Bypass Testing

Photographs of the various steps of the bypass testing may be taken as additional confirmation that the testing did meet the test plan requirements.

6.7 Records

The test plan shall specify the methods to be used for documenting all aspects of the bypass testing.

7. REFERENCES

1) Revised Guidance for Review of Final Licensee Responses to Generic Letter 2004-02, "Potential Impact of Debris Blockage On Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors", March 28, 2008 (ML080230234)
2) LA-UR-04-5416, "Screen Penetration Test Report", November 2004 (ML051020162)
3) EPRI 1011753, "Design Basis Accident Testing of Pressurized Water Reactor Unqualified Original Equipment Manufacturer Coatings", September, 2005 (ML071130069)
4) ZOI Fibrous Debris Preparation: Processing, Storage and Handling, Draft

Appendix A

Safe Handling of Debris Source Materials

Fibrous and other debris source materials can cause irritation due to contact (see MSDS before handling). In addition, some of the debris sources utilized can be inhaled or ingested which represents a personnel risk unless necessary precautions are taken. Personnel handling this material should wear appropriate PPE, including an appropriate air filtration mask, safety glasses, gloves and long-sleeved clothing to prevent skin irritation. If necessary, a shower should be taken after handling to remove fibers or other debris source materials. Care should be taken during processing and handling to minimize airborne debris source materials.