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Comment On: NRC-2017-0003-0001
Applications and Amendments to Facility Operating Licenses and Combined Licenses Involving Proposed No Significant Hazards Considerations and Containing Sensitive Unclassified Non-Safeguards Information and Order Imposing Procedures for Access to Sensitive Unclassified Non-Safeguards Information

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Submitter Information

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General Comment

See attached file(s)

On behalf of the C-10 Research & Education Foundation, thank you for accepting and considering the comments of four members of our board of directors, per attached PDF.

Attachments

C-10 Board Comments, NRC-2017-0003

SUNSI Review Complete
Template = ADM – 013
E-RIDS= ADM-03
Add= L. Ronewicz (LHR3)

March 9, 2017

Ms. Cindy Bladey
Office of Administration
Mail Stop: OWFN-12-H08
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Docket ID NRC-2017-0003
Nuclear Regulatory Commission Docket # 50-443 10 CFR 50.90 SBK-L-16071
RE: *Comments on Seabrook Station Unit 1 - License Amendment Request 16-03 dated August 1, 2016*

Dear Ms. Bladey:

On behalf of the C-10 Research and Education Foundation, Inc. (C-10 Foundation), please accept the following sets of comments relative to NextEra Energy Seabrook Station's License Amendment Request (LAR) 16-03, under the Federal Nuclear Regulatory Commission (NRC) Docket # 50-443. In the LAR, NextEra Energy Seabrook, LLC (NextEra) seeks to "Revise Current Licensing Basis to Adopt a Methodology for the Analysis of Seismic Category I Structures with Concrete Affected by Alkali-Silica Reaction."

By way of background, the C-10 Foundation is a non-profit 501 (c)(3) membership organization whose mission is to protect public health and the environment surrounding the Seabrook Station nuclear power plant in coastal New Hampshire. Our vision is a clean, safe, sustainable energy future.

Named for the citizens within the ten-mile radius of the plant designated as the "Emergency Planning Zone" (EPZ), the C-10 Foundation's core service is to operate a field monitoring network to measure real-time radiological emissions from the plant.

Known and trusted for our integrity and expertise, the C-10 Foundation communicates regularly with key local, state and federal agencies as well as NextEra Energy, the plant's owner. With over twenty years of monitoring data and technical knowledge of plant safety and security issues, we are also an informational resource for the public, partner organizations and the scientific community.

The following comments are offered by members of the C-10 Foundation's board of directors, all of whom have spent many years tracking public health and safety concerns relative to Seabrook station. These individuals have developed significant familiarity with the scientific and regulatory issues surrounding the irreversible concrete degradation known alkali-silica reaction, or "ASR" that is ongoing at Seabrook Station.

It is our understanding that the NRC requested that NextEra submit this License Amendment Request request because NextEra was in violation of its current operating license for not disclosing plant safety concerns surrounding ASR.

This docket pertains to the calculations of the concrete's ability to bear load and withstand a seismic event such as an earthquake. But this LAR is a paper solution. The thousands of tiny cracks and larger ones in the power plant's concrete dome and retaining walls remain, and the concrete continues to degrade. As noted in the following comments, experts have studied this issue, and there is no known solution or remedy.

We appreciate the opportunity to provide these comments, and thank you for carefully considering the points made herein. If you have questions or require further information from any of the commenters, please do not hesitate to contact me.

Sincerely,

Natalie Hildt Treat

Natalie Hildt Treat
Executive Director
C-10 Research & Education Foundation

Attachments: Individual comments of C-10 Foundation board members - Diane Teed, Patricia Skibee, Christopher Nord and Debbie Grinnell.

Comments of Diane Teed: Docket ID NRC-2017-0003

March 7, 2017

Ms. Cindy Bladey
Office of Administration
Mail Stop: OWFN-12-H08
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Docket ID NRC-2017-0003
Nuclear Regulatory Commission Docket # 50-443 10 CFR 50.90
RE: Comments on Seabrook Station Unit 1 – License Amendment Request 16-03, July 2016

Dear Ms. Bladey,

Thank you for accepting my comments on NextEra Energy Seabrook, LLC's-LAR 16-03. I urge the Nuclear Regulatory Commission to consider public health and the welfare of the environment as their premiere concern in your assessment of LAR 16-03. Will you accept "representative conditions" which NextEra deems sufficient to "actual conditions" which the situation warrants and the people deserve. The NRC's Summary of Standards of Employee Conduct Regulations SubPart A-Basic Obligations states that "Public service is a public trust." I urge members of the NRC to honor this oath.

Comments:

NextEra Energy Seabrook, LLC's (NextEra) proposed License Amendment Request 16-03 is seeking approval of changes to the Updated Final Safety Analysis Report (UFSAR) to allow the use of a new method to analyze ASR related loads to verify that affected structures continue to have the capability to withstand all applied loads used in the original design of Seabrook structures. Inherent in NextEra's argument is the major assumption that the testing results from the Ferguson Structural Engineering Laboratory (FESL) provides the basis to support the changes to the UFSAR.

C-10 Research and Education Foundation, Inc. has always contended that testing for ASR and its impact needs to be performed on-site. At the operating location you have the exact composition of concrete, at the exact age, having been subjected to the exact weather conditions, with the exact brackish water infiltration for the currently exact amount of time-all the while having access to the exact staff charged with judging ASR's impact and the plant's operability.

We contend that these variables that were unlikely to be reliably recreated in Texas could have been avoided and that there is a lack of representativeness between test specimens used in FESL and the conditions existing at Seabrook Station.

The validity of FSEL conclusions are only as good as the validity of the test assumptions.

A sample of MPR Associates, Inc. (MPR)/FSEL assumptions are:

"Also, the specimens that were used in" (FESL) "testing were structurally representative of concrete used in constructing Seabrook structures (ML16216A240 3.2)."

"The large-scale test programs included testing of specimens that reflected the characteristics of ASR-affected structures at Seabrook Station." (ML16216A240 3.2.1)

"In support of long-term evaluations , MPR conducted large-scale test programs" (at FESL) " using specimens that were designed and fabricated to represent reinforced concrete at Seabrook Station to the maximum extent practical." (ML16216A241 1.2.2).

"All safety-related structures are supported on competent bedrock or concrete fill over bedrock which fixes the structure bases against translation and rotation."(ML16216A241 3.2.2).

"While most research on ASR has focused on the science and kinetics of ASR, there is a substantial body of knowledge that exists in the literature on structural testing of ASR-affected concrete specimens. However, the application of the conclusions from the literature to structures at Seabrook Station can be challenged by lack of representativeness. As a result, for selected structural limit states, Next Era commissioned MPR to perform large-scale structural testing using specimens that were designed and fabricated to be representative of structures at Seabrook Station." (ML16216A241 4.1).

Anchor Test Program - "Test specimens included seven large-scale blocks that were designed and fabricated to represent the reinforced concrete structures at Seabrook Station...". (ML16216A241 4.3).
Shear Test Program-"Three-point load tests were performed on large-scale beams that were designed and fabricated to represent the reinforced concrete structural components at Seabrook Station." (ML16216A241 4.3).

"The test specimens fabricated for the MPR/FSEL test program were designed to be representative of the structural characteristics of safety-related structures of Seabrook Station. The specimen dimensions and reinforcement configurations were similar to a reference location at Seabrook Station, with minor modifications made to ensure the specimen's failure mode was consistent with test objectives." (ML16216A241 4.3).

"The concrete mixture design for the fabricated test specimens included highly reactive fine aggregate (redacted), which accelerated development of ASR. To the extent practical, concrete constituents were obtained from sources that were consistent with concrete at Seabrook Station (redacted)." (ML16216A242 3.1.1).

A strong assumption has certain characteristics:

I. a. Confidence-how certain we are of the assumption.
b. Lead time-the longer it is before the assumption is proven true or false, the more work will be done based on the assumption.
c. Impact-the amount of rework that will need to be undertaken if the assumption proves to be incorrect.

In the sample assumptions noted above there are some key qualifiers that decidedly impact MPR's conclusions related to both materials and methodology. Obviously the following comments are representative only (not all-inclusive) and hindered by the amount of redacted information in the FSEL report available to the public.

II. a. Structurally representative - to what degree? all critical elements included?
b. Reflected the characteristics - all? some? most critical? and if so which ones are deemed most critical?
c. All safety-related structures supported on competent bedrock-how measured? timing of measurement-when constructed? currently?
d. Designed and fabricated to represent - unclear as to extent of effort to reproduce? criteria? most critical elements replicated? to what degree?
e. To the maximum extent practical - what determined practicality? cost? desired outcome? time element?

With each caveat the reliability of the test comes into question. If the testers are acknowledging that they are limiting components and methods to those they deem "practical" as opposed to logical how can the NRC and the public have any confidence that the results are valid? We would argue that the concept of practical runs along a continuum subject to a host of choices. What exactly is replicated and what is not? The results are skewed based on an immeasurable and unidentified limitation of practicality that the FSEL testers chose to impose.

If the actual materials and conditions at Seabrook Station were tested we would contend that more realistic and quantifiable results would have been developed. As far back as 2012 the ASR concrete degradation was described as extensive and with moderate-to-severe mechanical consequence within the power block buildings.

A sample of conclusions are:

Brackish water - "To simulate the potential presence of groundwater on one side of the reinforced concrete at Seabrook Station, FSEL wetted absorbent fabric that was placed on the top side of each specimen." "Comparison of expansion data from both sides of the test data specimens did not identify a discernible bias in ASR development resulting from the wet fabric." (ML16216A242 4.2.6).

The fact that brackish water has been infiltrating Seabrook Station for more than two decades it is ludicrous that FSEL performed the above test. One would argue that no discernible difference resulted because the method itself is an absurd attempt at replication of conditions.

Concrete - No one argues that the concrete used in the construction of Seabrook Station harbors the flaw that allows for the development of ASR. "The concrete mixture design for the fabricated test specimens included highly reactive fine aggregate (redacted). To the extent practical, concrete constituents were obtained from sources that were consistent with concrete at Seabrook Station. (redacted)." (ML16216A242 3.1.1). With each caveat the reliability of the test results are further eroded.

Reinforcement Steel - "The reinforcement steel at Seabrook Station is not susceptible to brittle fracture due to ASR-induced expansion." MPR states that..."they are not aware of any operating experience in the United States indicating brittle fracture of steel-reinforced design in accordance with ACI 318 had

occurred." MPR cautions that "the addition of any expansive or tensile force on the crack site could result in brittle fracture and strain embrittled bars...Additionally, quality control requirements in effect during original construction of Seabrook Station would have prevented the poor construction practices that resulted in the observed rebar fractures in Japan." (ML 16216A241 6.2.3). We contend that specific testing of rebar at Seabrook Station is the only way to definitively determine its current state and susceptibility to brittle fracture. ASR at Seabrook Station is unique in the industry and we would argue that it may in fact be unique in its susceptibility to embedded rebar corrosion.

Flexure/Reinforcement Anchorage -"Based on MPR/FSEL large-scale test program results, structural evaluations should consider that there has been no adverse impact on fleural capacity and reinforcement anchorage (development length) performance, provided that through-thickness expansion is at or below (redacted) % and expansion behavior is comparable to the test specimens." (ML16216A241 2.1). Similar qualification for shear (ML16216A241 2.1). In other words, these results are valid if in fact what transpires at Seabrook Station is comparable to fabricated test specimens. An added level of uncertainty could have been avoided by using actual samples from Seabrook Station.

MPR acknowledges that the "execution of a multi-year large-scale test program to support evaluation of ASR-affected reinforced concrete structures is unique in the industry in purpose, scale and methodology. Application of the results of the FSEL test program requires that the test specimens be representative of reinforced concrete at Seabrook Station and that expansion behavior of concrete at the plant be similar to that observed in the test specimens." (ML16216A242 sec. vi).

Professor Paul Brown, an expert retained by the Union of Concerned Scientists (UCS), has stated that although NextEra's plan to utilize some non-standard tests may have merit, they are incomplete. In his opinion, NextEra must also systematically evaluate the concrete via petrography and physical testing of cores, and evaluate the expansive capacity of ASR based on ASTM standard tests as promulgated by ASTM Committee C-9 on Concrete and Aggregates (UCS/C10 Letter to NRC dated 9/13/2012).

"Operating experience at Seabrook Station has shown that ASR expansion can result in building deformations, the structural effects of which must be taken into account in a comprehensive structural evaluation. That is, supplementary loads can be generated when ASR-induced expansions in a structural element are restrained by (1) interference with another structure, or a component thereof, or (2) connection to a non-ASR-affected region (e.g. expansion of an ASR affected wall restrained at the foundation mat connection or adjacent ASR-affected and non-ASR affected wall segments). The calculation of supplementary loads due to restraint of expansion can be significant and must be addressed on a case-by-case basis, by taking boundary conditions into account. <u>The approach for performing this assessment is outside the scope of this report and is being addressed by NextEra in a separate effort." (ML16216A241 2.2) and reference in (ML16216A241 6.5).</u>

Under the argument of proprietary information the strategically redacted results are tactically argued to be necessary to protect NextEra's potential for a future monetary windfall should ASR develop in other U.S. nuclear power plants. This is contrary to their own MPR consultants admitting that all should be assessed on a case-by-case basis. Of true importance is that the results are hidden from public review. As is too often the case, we are presented a response that meets the timeline for an RAI response to the Nuclear Regulatory Commission (NRC) but does little or nothing to inform the public as to how NextEra is going to truly mitigate the significant risk caused by ASR. If FESL results truly support NextEra's conclusions why not dispel the uncertainty in the name of public safety? Although we respect the

concept of proprietary information, under these unacceptable daily risks to our health and safety we are yet again compelled to challenge NextEra's position.

Based upon publicly disclosed documents it appears that as of date of these comments the following information is outstanding:

1. The NRC's RAI (ML15251A333) request for proof of representativeness between test specimens and methodology of measurement and correlation of testing program (FESL) to Seabrook structures;

2. Separate results from NextEra's program at Seabrook Station to assess structural deformation at Seabrook Station (beyond scope of FESL) (ML16216A241 6.5);

3. FESL findings have not undergone a full peer review process as previously requested; and

4. NextEra remains out of design basis (more than 8 years after discovery of ASR in 2009).

As a board member of the C-10 Research & Education Foundation, Inc., I urge that the approval of LAR 16-03 be denied. The NRC must fully disclose and categorically defend how NextEra bridged the divide from FESL results to actual conditions at Seabrook Station. In fact, only results based on the latter matters to the citizens living here.

The weight of this issue rests on NRC personnel.

Diane M. Teed
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Board Member
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Ms. Cindy Bladey
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Mail Stop: OWFN-12-H08
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

March 6, 2017

RE: Comments on the Seabrook License Amendment Request 16-03, August 1, 2016
Docket ID NRC-2017-0003
10 CFR 50.90
NRC Docket # 50-443

Dear Ms. Bladey,

Following are my comments on the License Amendment Request issued by NextEra for Seabrook Station.

General comments on Sections 1 and 2

As I see it, there are three overarching factors missing from Next Era's License Amendment Request documents.

First, there is no acknowledgement throughout these documents on the "tipping point" concept. There is acknowledgment of the progressive nature of ASR, the mention of leeway in the design basis for further damage due to ASR, outline of a proposed ongoing SMP (Structure Monitoring Program) to ascertain progress of ASR, redacted percentages within which ASR's damage is judged to not have damaged the structure to the point of failure, but there is not even a mention of the tipping point concept.

The tipping point idea is that all seems to be going along well until a certain "wall" is hit and therefore the situation changes precipitously. This concept is easiest to understand from a mechanical perspective, and, in fact, this is the appropriate perspective from which to look at the ASR situation at the Seabrook Nuclear Power Plant. Progressive ASR will continue to weaken structures presumably gradually over time. Then, one day, there may well be a profound failure because even though the speed of progression of ASR damage did not change, that "tipping point" of failure was reached.

It seems there should be acknowledgement of this concept contained somewhere in NextEra's License Amendment Request, along with the factors that are mentioned.

To illustrate: this phenomenon has occurred in bridge failures (bridges are also susceptible to concrete degradation). For example, in 2005, the I-70 Lakeview Drive Bridge in Pennsylvania collapsed. One

moment cars were driving over it with no indication of any problem and the next moment it collapsed.

Given that the speed of progression of ASR is unknown, and given that it is clear that additional cracking is part of that progression, it seems clear that the speed of concrete degradation may gain momentum; therefore, the tipping point phenomenon should not be ignored in this license extension request.

Second, the possible increase in the speed of progression of ASR damage would result in a situation in which the damaged concrete would be even more prone to further damage due to ever-widening cracking, causing increasing susceptibility to infiltration of moisture and increased gel formation causing the speed of damage to accelerate. While the documents acknowledge the continued progression of ASR damage, they do not mention the likelihood of increased speed of degradation.

Third, the first section, which lays out the requested license amendment requested, does not mention deformation as a fifth factor to be accounted for in measuring changing static/dead load. Four factors are itemized – creep, shrinkage, swelling and ASR-caused cracking. Deformation in and of itself would seem to be a vital fifth factor, since, from a simple mechanical perspective, it changes the static/dead load and therefore acts as an additional self- straining factor. Therefore, it needs to be included in the LAR.

Fourth, a sixth factor, unmentioned and *vital*, is rising sea levels caused by climate change. The Seabrook Nuclear Power Plant is in a seaside location in a part of the world where sea levels are rising faster than in most other areas. This factor should be part of any License Amendment Request/change in design basis.

Section 1

Comments LAR 16-03 ML16216A240: License Amendment Request 16-03 Revise Current Licensing Basis to Adopt a Methodology for the Analysis of Seismic Category/Structures with Concrete Affected by Alkali-Silica Reaction, August 1, 2016

The purpose of the amendment request is to incorporate necessary changes to the methodology of assessing the capacity of the concrete at the Seabrook Nuclear Power Plant to continue to perform safely. The reason for this requested change is the development throughout the plant's structures of damage to the concrete from ASR (alkali silica reaction) which has caused and is continuing to cause cracking in the concrete. When the original design basis documents were written, the possibility of ASR damage was not taken into consideration. In 2009 ASR-induced cracking was first observed at the plant. Therefore, provisions now need to be made to assess and monitor the ongoing damage.

To do this, four new factors are proposed to be added to the UFSAR/Updated Final Safety Analysis Report: ASR cracking, creep, shrinkage and swelling/expansion. In my general comments document on the LAR, I have explained that deformation, occurring as a result of ASR damage, needs to be added as a fifth factor, since it is also a self-straining load/stress. (In some cases, it can be a self-restraining factor. In either case, it needs to be taken into consideration.)

While this document purports to lay out new design basis standards to measure and monitor the effects of ASR degradation, the tone of it is extremely troubling. For example, this wording is typical and repeated: ...the proposed amendment, "will adopt a method to incorporate the material effects and

loads of ASR into the Seabrook design basis to demonstrate that structures with ASR continue to meet the design codes for original construction". (Section 2.1.1) In section 3.2, "the objective of a strength evaluation by analyses is to demonstrate that the buildings will have strength close to or in excess of that envisaged in the original design or as required by code".

These words or those with their same import are repeated throughout the document. It would seem that the additional monitoring/assessments would seek to learn whether the structures continue to meet codes and, therefore, whether they "remain suitable for continued service". To repeatedly word the document to convey that the purpose of the new standards and methodologies is to confirm that the structures are fit for service seems to pre-suppose outcomes in favor of Next Era's continued operation of the plant. It can only be deduced that the percentages of increased ASR damages referred to (but redacted to the public) have been established for this reason.

The document cites a 2012 structural evaluation (Section 2.1.1) in which it was found that Seabrook structures "remain suitable for continued service for an interim period." WHAT interim period? At another point in the document "interim period" is defined as "at least for several years". It has been almost five years since the 2012 structural evaluation, which is more than "several years". AND Next Era is seeking a license extension of 20 years, which would put a plant designed for a license period of 40 years into the 40-60 year framework of operation. Further, the original design basis did not take into consideration the current and ongoing, but originally unforeseen, ASR structural damage.

The document mentions repeatedly that the large-scale testing of ASR-compromised concrete done at the Ferguson Structural Engineering Laboratory at the University of Texas at Austin is the most accurate testing available. It explains that the "representative" samples manufactured for that testing were as close to the Seabrook concrete as could be made. But, they are in fact, NOT the actual concrete from the ASR-affected structures at Seabrook. The document explains repeatedly that taking core samples from the actual plant to test would not be appropriate, since once removed the concrete cores no longer are subject to the compression by the surrounding matrix of that structure. It needs to be pointed out that the manufactured samples also are not subject to that or any compression situation. Further, at least some of the "representative" pieces were tested for periods as short as 48 hours, versus the already in-place 27 years of Seabrook's on-site concrete.

On page 16 it is stated that, "the number of test specimens and nature of testing prohibited testing out to ASR levels where there was a clear change in limit state capacity". (3.2.1.) This sounds like there was no testing to the point of failure, which means that the testing did not establish the percentages of ASR damage that can lead to structural failure. (Again, all percentages are redacted in the document publically available.)

It is stated that the most damaging ASR effect is the through-thickness expansion, which the report states is not discernable by visual walk-down inspection. Yet, visual walk-down continues to be the threshold diagnostic tool. My belief is that this should be changed so that extensometers are installed over an extremely wide range of the plant so that through-thickness damage can be discovered accurately and immediately.

The table in Section 3.5.1. lays out frequencies of inspection for the three levels of observed damage. All structures should be monitored continuously, and it would seem technically possible to install

measuring devices that would measure and real-time report the degrees of damage/change. All of the stated building monitoring frequency periods are too long; for example, they vary from six months to 36 months.

The document states that, "Earthquake effects are not assumed to occur simultaneously with flooding effects since the maximum flood is not associated with an earthquake." (section 3.8.1.3.b) Elementary research into the history of the situation that occurred at Fukushima contradicts this statement. Flooding in that case (and in the case of many other earthquakes around the world) was "associated" with the earthquake. Therefore, the design basis needs to be changed to take into account the situation of combined earthquake and its resultant flooding.

Missing from this document is any reference to sea level rise caused by climate change. The License Amendment Request needs to be modified to take into account this current and ongoing change to Seabrook's seaside location.

Section 2

Comments LAR 16-03 ML16216A241 Seabrook Station: Impact of Alkali-Silica Reaction on Structural Design Evaluations, July 2016

This topic of this section of the LAR is the impact of ASR damage on structural design evaluation. It states that the same material properties that are specified to be taken into consideration in the original design basis are the ones that should be used currently and in the future (compression, elastic modulus and tensile strength). This conclusion, and the report, are based on the results of the study run by the MPR Associates Engineering Company at the Ferguson Structural Engineering Laboratory at the University of Texas at Austin. In addition, a review of the published literature on this topic is included.

While this section says that the same material properties should be monitored, it states that additional loads/stresses due to ASR need to be included in all evaluations. The section focuses on the differential in sustained ASR damage in confined (by rebar mats) and unconfined concrete using the measurements for elastic modulus, tensile strength and compression explaining that reinforcement of the concrete makes it significantly more able to resist ASR. MPR concluded that the Seabrook buildings are operable for an interim period of "at least several years" (Section 1.2.2). Used for testing at the lab were "specimens that were designed and fabricated to represent reinforced concrete at Seabrook Station to the maximum extent practical". (Section 1.2.2) The document states that the structures are operable "provided that through-thickness expansion is at or below X percentage (*redacted*) and expansion behavior is comparable to test specimens." (Section 2.1)

ASR is progressive. How many years will it take for that percentage to exceed X? That is an unknown but vitally relevant fact. Further, how can it be known whether the behavior of the test specimens are comparable to the actual plant structures unless the actual plant structures are tested? In Section 6.4.2 it is stated that at least one of the manufactured samples was tested for 28 days. Even taking into consideration chemical pre-stressing, it is not believable that 28 days in a lab is equivalent to 27 years on site. Furthermore, NextEra's license extension request is for an additional 33 years of operation.

Section 2.2 states that pre-stressing ASR samples results in a self-equililbrating state in that the expansion pressure of the concrete on the rebar is balanced (apparently exactly) by the outward pressure of rebar due to the compressive pressure from the expanding concrete. This seems an unlikely coincidence of forces and I see no proof or testing of this conclusion in the report.

Section 3 says that code limits may be exceeded in the Containment Building for peak, localized and secondary stresses. This may be allowed by code, but does not seem that this should be allowable in an actual nuclear power plant containment building. Part 5 explains that ASR-caused "expansion occurred predominantly in the through thickness direction." (this is the type of ASR damage that is not visually observable).

Section 5.3 states "structural behavior at levels greater than X percentage (*redacted*) may be acceptable. A limit on in-plane expansion is not necessary, as expansion is predominantly in the through-plane direction." (Section 5.3) This conclusion seems far from appropriately conservative, since concrete is three-dimensional and cracking in one direction clearly results in cracking in three dimensions. Therefore, it seems to me that there should be a limit on in-plane expansion fixed in the design basis.

The general tenor and conclusions of this report is that there is no significant effect from the ASR process: compression and shear are, according to the report, either not negatively affected or if they are the degree is inconsequential. Flexural strength may be enhanced through the pressure of the expanding concrete; failure of rebar can't occur at Seabrook Station because the thickness of the rods will not allow that to occur. The structures themselves have a dampening effect on the action of an earthquake. (Section 6.3.3.) Both types of anchors are said not to be affected by through-plane damage and are fine with "in-plane expansion up to X percentage (*redacted*)" (Section 5.6)

Repeatedly, the report states there is no loss of tensile strength up to X percentage (*redacted*) of in-plane expansion. What is not stated is what happens to the various material properties when that (*redacted*) percentage is exceeded.

Thank you for the opportunity to provide comments on this important proceeding. Please accept them in the spirit in which they were intended: to protect the health and safety of the citizens living and working in the communities surrounding Seabrook Station.

Sincerely,

Patricia Lang Skibee
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Retired Director of Research and Board Member
C-10 Research and Education Foundation

Ms. Cindy Bladey
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March 6, 2017

RE: Docket ID NRC-2017-0003
10 CFR 50.90
NRC Docket # 50-443
License Amendment Request 16-03, August 1, 2016

"License Amendment Request 16-03, Revise Current Licensing Basis to Adopt a Methodology for the Analysis of Seismic Category 1 Structures with Concrete Affected by Alkali-Silica Reaction," August 1, 2016.

Dear Ms. Bladey,

Thank you for accepting my comments on the License Amendment Request issued by NextEra for Seabrook Station.

The Nuclear Regulatory Commission's (NRC) approval of NextEra's License Amendment Request 16-03 would "...allow NextEra Energy Seabrook, LLC (NextEra) to proceed in an optimum, safe and effective manner toward a long-term solution for ASR degradation at Seabrook Station" (SBK-L-16071, p.1, par 1).

The C-10 Research and Education Foundation, Inc. (C-10) recognizes that NRC approval of this LAR may indeed be optimal for NextEra's wish to continue operating a structurally compromised reactor facility. However, we must refute the claim that the proposed changes would result in the ability to proceed safely or effectively toward a long-term ASR solution.

This LAR allows NextEra to incorporate loads imposed by ASR into the original design basis which currently has no applicable provisions. ASR is a non-self-limiting phenomenon whose degree, extent, and rate of concrete degradation on safety-related structure at Seabrook remains unknown.

Since the NRC is mandated to protect the public health and safety as a priority of your mission, you must not allow a cherry-picked study to determine ASR's impact, while leaving the actual concrete at Seabrook largely untested.

We are compelled to point out that there already exists a clear and comprehensive set of guidelines for such testing, devised by true experts in the field of concrete structural engineering: American Concrete Institute's ACI 349.3R, and the American Society for Testing and Material's ASTM C 856-11. Furthermore, the protocols provided by these standards call for thorough petrographic analysis of the in-situ concrete—including the removal and testing of core samples—as an essential component in evaluating these structures.

Without testing the actual concrete, NextEra and the NRC are left with a series of inferences concerning the compressive and tensile strength of Seabrook's structures—structures we count on to protect our families from many of the most toxic substances on earth. The need for the greatest assurance of safety imposed by the presence of these toxins requires the most thorough testing that can be devised.

The Union of Concerned Scientists (UCS) and C-10's contracted concrete expert, Paul Brown, Ph.D., Professor of Science and Engineering, Pennsylvania State University, has directly challenged NextEra's claim that core tests are not useful because cores removed from steel reinforced bulk concrete "...are no longer subject to the strains imposed by the steel reinforcing cage..." and may therefore may not reflect the actual extent of damage to a given area. (NRC report, 8/9/13, p.1).

Dr. Brown commented: "It is well understood that drilled cores are extracted from an existing structure and have been subjected to the service environment associated with that structure. This in no way invalidates the result of the testing. The results of core testing are generally understood within the relevant engineering community. The NextEra preposition misuses the cautionary language of ASTM C42 and appears to be an attempt to avoid accumulating data which might be regarded as problematic." (Commentary Dr. P. Brown, "Continuing Problems with Monitoring Concrete Damage at Seabrook, Oct. 29, 2013 p. 3).

In related testimony, Dr. Brown stated: "Compression and splitting tensile tests on cores are routinely done. It is not expensive or exotic to do. It seems to me that this should be done on an ongoing basis as an aspect of conditional assessment" (ACRS Transcript ML122070401 Summary, with commentary by Dr. Paul Brown).

Without the full spectrum of petrographic tools being required for an analysis of the Seabrook reactor's degradation, the methodology proposed by NextEra

may potentially do great harm, by giving the operators and regulators of the reactor an incomplete, and therefore false understanding of the extent of concrete degradation. The impact of such a miscalculation would not be to "reconcile the design basis" of affected structures as NextEra states, but would in fact "lower the bar" that the design basis had originally set in place to protect nearby communities. We are not satisfied with "Degraded but Operable" as the new de facto design basis.

Sincerely,

Christopher S. Nord
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Board Member, C-10 Foundation

Ms. Cindy Bladey
Office of Administration
Mail Stop: OWFN-12-H08
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

March 6, 2017

RE: Comments on the Seabrook License Amendment Request 16-03, August 1, 2016
Docket ID NRC-2017-0003
10 CFR 50.90
NRC Docket # 50-443

Dear Ms. Bladey,

Following are my comments on the License Amendment Request issued by NextEra for Seabrook Station.

In March 2013, the National Institute of Standards and Technology (NIST) published NISTIR 7937 "Alkali-Silica Reaction Degradation of Nuclear Power Plant Concrete Structures: A Scoping Study." The scoping study of ASR was performed to evaluate the effects of ASR on the structural capacity of nuclear plants, and to identify the knowledge gaps as to the extent of ASR occurring in nuclear power facilities. NIST performed a thorough search of academic journals, standards and codes related to ASR.

Unfortunately, there was no standard guide or industry best practice for quantifying the reduction in ASR mechanical properties or quantifying the reduction in the structural capacity of ASR affected concrete.

As ASR degradation expansion occurs it is a form of internal degradation that cannot be visually monitored as the water in the ASR affected concrete will occur in the absence of external water. Visual monitoring is not a reliable means to determine the degree of ASR occurring in existing concrete structures. It is my understanding that the development of ASR could eventually result in structural collapse.

In NISTIR 7937 in 2.9 Summary on page 14, it was stated "Unfortunately, relatively little research has been applied to estimate the remaining capacity of ASR-affected structures over time by relating observable quantities in the field to the mechanical properties of the concrete. Furthermore, there is relatively little technical knowledge or existing data for establishing such relationships." In NISTIR Section 2.3 titled "In-situ Strength of ASR-Affected Concrete" on page 8 it was stated, "To assess the adequacy of the structure, the actual in-situ concrete strength must be known."

As a result of NIST 7937, the Nuclear Regulatory Commission (NRC) in March, 2014 and the National Institute of Standards and Technology (NIST) signed an agreement (NRC-HQ-60-14-I-004). The agreement's regulatory content confirmed that Seabrook Station's construction concrete had known ASR degradation in 2009. Unfortunately, the NRC requested code laboratory testing proved that Seabrook's ASR concrete did not have a "plateau" or endpoint. If not properly addressed, the degradation could continue unabated to eventual collapse.

The objective of the study was to develop a technical basis and regulatory guidance for the NRC to evaluate ASR affected concrete structures. It is my understanding that:

1) The NRC knew that Seabrook Station was the first nuclear plant in the nation to have ASR concrete degradation in violation of their current license;
2) The NRC also knew that Seabrook's ASR was active, progressive, and would eventually lead to collapse; and finally,
3) The NRC knew that no other U.S. nuclear facility had been tested to confirm or deny that ASR concrete degradation was occurring.

Critically, the NRC/NIST's study objective was to develop a technical basis and regulatory guidance for the NRC to evaluate ASR affected concrete structures. To date, in NRC-HQ-60-14-I-004, neither the NRC, NIST or the industry has a proven ASR testing procedure, an ASR database on material and mechanical properties of concrete, a way to estimate the extent or rate of ASR occurring, or a way to quantify seismic response characteristics of ASR affected concrete.

On Feb 7, 2017 in the Federal Register, the NRC accepted NextEra's license amendment for review on seismic methodology as safe, but in the NRC-HQ-60-14-I-004 study it stated, "seismic analysis procedures for nuclear power plant structures subjected to ASR degradation are not available in the open literature." It is my belief that the NRC should have denied NextEra's license amendment. The results of the NRC/NIST study is not due until 2018.

The study's objective on Task 3: Seismic Response Characteristics of ASR-Affected Concrete Structural Members stated: "To avoid sustaining serious damage due to seismic excitation, structures are designed such that the lateral displacement of vertical members (such as columns and walls) and the end rotation of horizontal members (such as beams and girders) should not exceed the specified allowable values. If the stiffness and energy-absorbing capacity are reduced due to ASR, the response of structural members to earthquake excitation may exceed the design limits, thereby making the structure susceptible to serious damage or collapse during the design level earthquake. At the present time, seismic analysis procedures for nuclear power plant structures subjected to ASR degradation are not available in the open literature. NIST will carry out cyclic loading tests of ⅝- scale normal (one) and ASR-affected (three) concrete shear walls to assess the effects of ASR on strength and stiffness. Such tests will yield information on the effects of ASR degradation on the energy absorption properties of concrete shear walls. The cyclic loading protocol for these tests and the reinforcing ratio and details for shear walls will be developed in collaboration with NRC to ensure applicability to NPPs" (HQ-60-14-I-004 page 6).

The NRC/NIST study is not completed nor peer reviewed with a gold standard. As a result, I do not believe that the NRC has the technical or regulatory basis to accept NextEra's license amendment. As a citizen, I appeal the NRC to deny NextEra's Seabrook License Amendment.

Sincerely,

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