February 13, 2019

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
BEFORE THE COMMISSION

In the Matter of	)	
NextEra Energy Seabrook, LLC	)	Docket No. 50-443
(Seabrook Station, Unit 1)	)	

EMERGENCY PETITION BY C-10 RESEARCH AND EDUCATION FOUNDATION FOR EXERCISE OF COMMISSION'S SUPERVISORY AUTHORITY TO REVERSE NO SIGNIFICANT HAZARDS DETERMINATION AND IMMEDIATELY SUSPEND LICENSE AMENDMENT AND LICENSE RENEWAL DECISIONS

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February 13, 2019

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GLOSSARY OF TERMS

ACI	American Concrete Institute
AMP	aging management program
ARS	alkali-silica reaction
ASLB	Atomic Safety and Licensing Board
C-10	C-10 Research and Education Foundation
CLB	current licensing basis
FSEL	Ferguson Structural Engineering Laboratory
GDC	General Design Criterion
LAR	license amendment request
LRA	license renewal application
NRC	Nuclear Regulatory Commission
NSH	No Significant Hazards
SER	Safety Evaluation Report
SGH	Simpson,Gumpertz, & Heger

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I. INTRODUCTION

C-10 Research and Education Foundation ("C-10") hereby petitions the Commissioners of the U.S. Nuclear Regulatory Commission ("NRC" or "Commission") to exercise their inherent supervisory authority to reverse the NRC Staff's No Significant Hazards ("NSH") Determination for NextEra Energy Seabrook's ("NextEra's") license amendment request ("LAR").[1] C-10 also requests the Commission to take other appropriate actions in this proceeding to ensure adequate consideration and resolution of the seismic risk implications of ongoing and increasing Alkali-Silica Reaction ("ASR")-related degradation in the Seabrook containment and other concrete

[1] In this proceeding, C-10 has five admitted contentions challenging the adequacy of NextEra's LAR to address the health and safety risks posed by ASR. *NextEra Energy Seabrook, L.L.C.* (Seabrook Station, Unit 1), LBP-17-7, 86 N.R.C. 59, 78 (2017). As consolidated by the ASLB, the contentions charge that NextEra's large-scale test program for ASR has yielded data that are not representative of the progression of ASR at Seabrook; and that as a result, the proposed monitoring, acceptance criteria, and inspection intervals are not adequate. A hearing is scheduled to take place within approximately six months of the issuance of the Final Safety Evaluation Report ("SER").

safety structures, including immediate suspension of the Staff's proposed LAR decision and its proposed decision to issue a twenty-year renewed license for operation of Seabrook until 2050.[2]

C-10 seeks Commission action on four related NRC Staff decisions, previously made or about-to-be-made in this proceeding and related proceedings, that are supported by the same seriously deficient technical studies by NextEra and its consultants. License Amendment Request 16-03 - Revise Current Licensing Basis to Adopt a Methodology for the Analysis of Seismic Category I Structures with Concrete Affected by Alkali-Silica Reaction (Aug. 1, 2016) ("NextEra Methodology") (ML16216A240). These decisions are: the NSH Determination (made but not yet published); the proposed approval of NextEra's LAR (imminent), the proposed approval of NextEra's LRA (imminent); and the Staff's determination that Seabrook can be operated safely on a day-to-day basis despite the presence of ASR (formally announced in 2012 and continually renewed as a matter of enforcement oversight).

These decisions require immediate Commission review and action because the NextEra Methodology is seriously inadequate in multiple significant respects, including: failure to test representative samples, misapplication of data, and use of outdated and simplistic finite element analysis methods that are inadequate for modeling the complexities of ASR-affected containment behavior in seismic events. Declaration of Victor E. Saouma (Feb. 12, 2019) ("Saouma Declaration") (Attachment 1); *Concerns Regarding Structural Evaluation of Seabrook Nuclear*

[2] While it has not been published, the NRC Staff has already made a NSH Determination regarding the LAR. *See* Notification of Significant Licensing Action (Jan. 11, 2019), submitted to the Atomic Safety and Licensing Board ("ASLB") under cover of a letter from Jeremy Wachutka, NRC Staff Counsel (Jan. 11, 2019). The Staff plans to publish the NSH Determination in the near future, along with its proposed decision approving the LAR. And the Staff plans to approve NextEra's license renewal application ("LRA") in the near future. *Id.*

Power Plant (Feb. 12, 2019) ("Saouma Report").[3] Dr. Saouma is an internationally recognized expert on ASR who has researched and written extensively on the subject, including research on behalf of the NRC. Saouma Declaration, ¶ 13. Based on Dr. Saouma's review of NextEra's testing and analytical reports (including proprietary information provided by NextEra in this proceeding), he has concluded that both the test program and the analyses used to justify the safe operation of Seabrook despite the presence of ASR "are substandard and inadequate to support any conclusion that the ability of the Seabrook containment to withstand a design basis earthquake has not been unduly compromised by the presence of ASR." Saouma Report, Exhibit 4a. Moreover, Dr. Saouma's own independent research, conducted on behalf of the NRC between 2014 and 2017, "confirms that probabilistic analysis of ASR yields more credible results than the type of linear and deterministic analysis used by [NextEra's consultant, [Simpson,Gumpertz, & Heger ("SGH")]." *Id.*

C-10 respectfully submits that as a result, NextEra's studies cannot lawfully be relied on by the NRC Staff to establish NextEra's satisfaction of NRC safety requirements for the amendment or renewal of its license, or for continuing safe operation.

Accordingly, C-10 requests the Commission to take the following actions:

- Review and reverse the Staff's NSH Determination to allow the prior completion of an adjudicatory hearing on C-10's admitted ASR-related contentions before the Atomic Safety and Licensing Board ("ASLB");

[3] C-10 relies on Dr. Saouma's Declaration and expert report for this petition. Dr. Saouma's expert report, attached to his declaration as Exhibit 4, contains proprietary information. Therefore, it has been submitted on this docket as a non-public document, available only to the Commission, the ASLB, and the parties to this proceeding. To assist the public's understanding of C-10's concerns, a non-proprietary summary of Dr. Saouma's conclusions is attached to his declaration as Exhibit 4a.

- To ensure that licensing actions do not take place while it is reviewing the NSH Determination, immediately order the suspension of both the Staff's LAR decision and its LRA decision;
- Give due recognition to the significance, complexity, and lack of adequately rigorous study of ASR by opening an in-depth inquiry into best practices for assessing ASR, including consideration of all relevant research and use of peer review by an internationally recognized independent panel; and
- Provide guidance and instruction to the Staff for establishment of significantly more rigorous and sophisticated state-of-the-art methods and criteria for evaluating safety risks posed by ASR at Seabrook and other reactors.

II. UNIQUE CIRCUMSTANCES WARRANTING EXERCISE OF THE COMMISSION'S INHERENT SUPERVISORY AUTHORITY

The Commission's inherent supervisory jurisdiction over all parts of the agency and its actions is well-established. *Yankee Atomic Electric Co.* (Yankee Atomic Electric Co.), CLI-91-10, 34 NRC 3 (1991); *Petition for Emergency and Remedial Action,* CLI-80-21, 11 N.R.C. 700 (1980); *Petition for Emergency and Remedial Action,* CLI-78-6, 7 N.R.C. 400, 405 (1978). *Public Service Co. of New Hampshire* (Seabrook Nuclear Power Station, Units 1 and 2), CLI-77-8, 5 N.R.C. 503, 515-517 (1977); *U.S. Energy Research and Devel. Admin.* (Clinch River Breeder Reactor Project), CLI-76-l3, 4 N.R.C. 67, 75-76 (1976); *Consol. Edison Co. of N.Y., Inc.* (Indian Point, Units 1, 2 and 3), CLI-75-8, 2 N.R.C. 173 (1975); and *Consumers Power Co.* (Midland Units 1 and 2), CLI-73- 38, 6 A.E.C. 1084 (1973).

In *Yankee Atomic Electric. Co.,* the Commission exercised its inherent supervisory authority to review NRC Staff regulatory decisions regarding reactor pressure vessel thermal

shock ("PTS") at a reactor for which license renewal was planned. As the Commission explained, the following "unique" circumstances warranted its intervention:

> The Commission has chosen to participate directly in this decision on Yankee Rowe, in part, because it concerns the embrittlement of the pressure vessel, one of the key components of a reactor. Indeed, while the Commission must ensure that such concerns are addressed in the near term in the context of Yankee Rowe, the satisfactory resolution of this matter has implications in terms of age-related degradation considerations in the context of the ongoing reactor operating license renewal rulemaking and subsequent renewal applications. But the Commission also believes that its involvement in this matter is appropriate because the unique circumstances of the Yankee Rowe case have presented a situation that was not directly contemplated when the [applicable] rule and the steps to be followed when concerns arose were developed.

34 NRC at 12. This petition raises similar concerns. As in *Yankee Atomic Electric Co.,* C-10's petition invokes the Commission's "ultimate responsibility" over one of the "key components of a reactor," in this case the containment. And the Staff's evaluation of safety risks posed by ASR has far-reaching implications, affecting not only the safety of Seabrook's current operation, but its future operation in a license renewal term.

This case also presents the "unique circumstances" that ASR was not contemplated in the NRC's original regulatory scheme, and no regulations or guidance have been developed to address it. The phenomenon of ASR – which was discovered ten years ago at Seabrook -- is only now being addressed in the context of enforcement and licensing, and Seabrook is a test case.

Another "unique circumstance" presented by this case, and warranting the exercise of the Commission's supervisory jurisdiction, is the entwined relationship between the LAR and LRA proceedings. Approval of the LAR is a predicate to license renewal because it establishes the current licensing basis ("CLB") for ASR, on which NextEra's Aging Management Program ("AMP") relies. Thus, while the SER for the LRA was finished in September, the NRC Staff delayed issuance of the renewed license until it was ready to approve the LAR. *See* Board Notification, referenced above in note 2. C-10 intervened in the LAR proceeding with the

understanding that its concerns about the long-term risks of ASR during the license renewal term should be raised in the LRA proceeding in order to have an effect on the license renewal decision.

C-10 reasonably expected that the NRC Staff would not approve license renewal unless and until C-10's concerns affecting license renewal were resolved in the LAR hearing. But the Staff proposes to exercise the NSH exception to the prior hearing requirement by approving the LRA before completion of the hearing, thereby opening the door to approval of the LRA without a prior hearing on safety issues that are admittedly implicated in the LRA decision. Only the Commission can resolve the unfair application of the NSH exception in these circumstances.

In addition, Commission oversight is warranted because only the Commission has full authority over the range of licensing and enforcement decisions that address the risk posed by ASR. Only the Commission has the authority to reverse the Staff's NSH Determination, which does not lie within the jurisdiction of the ASLB. 10 C.F.R. § 51.91(a)(4). Only the Commission can suspend the Staff's license renewal decision. Only the Commission can exercise supervision over the NRC Staff's review of the ARS issue.

And finally, only the Commission – not the ASLB or the agency staff – "has the ultimate responsibility" to protect the public from the health and safety risk posed by operation of Seabrook in the absence of an adequate analysis of the containment's ability to withstand a design basis earthquake. *Yankee Atomic Electric Co.*, 34 NRC at 12. Therefore, it is necessary and appropriate for the Commission to exercise its jurisdiction here.

III. BACKGROUND

A. Regulatory Framework

The regulatory health and safety issues raised by this petition concern the integrity and regulatory compliance of the Seabrook containment, whose purpose "is to confine radiation and fission products that might otherwise be released to the atmosphere in the event of an accident." LBP-17-7, 86 NRC at 78. The containment is a Seismic Category I structure, and therefore must "be able to withstand an earthquake and other natural disasters, within the design basis of the plant." *Id. See* General Design Criterion ("GDC") 2, "Design Bases for Protection Against Natural Phenomena," which requires, *inter alia,* that: "Structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches without loss of capability to perform their safety functions." Other regulatory requirements for containment integrity are set forth in GDC 1, 4, 16, and 50; and Appendix B to 10 C.F.R. Part 50. *See* Non-Proprietary Draft Safety Evaluation, NextEra Energy Seabrook, LLC, Seabrook Station, Unit No. 1, Docket No. 50-443 at 2-4 (Sept. 28, 2018) (ML18226A205).

NRC's procedural hearing regulations are also implicated by this petition. Ordinarily, the Atomic Energy Act and NRC regulations require that adjudicatory hearings must be completed *before* licensing action is taken. 42 U.S.C. § 2239(a)(1)(A). However, an exception in the Atomic Energy Act in 42 U.S.C. § 2239(a)(2)(A), as implemented by 10 C.F.R. §§ 50.91 and 50.92, allows the Staff to issue a license amendment before completion of an adjudicatory hearing if it would pose "no significant hazards considerations."[4] This determination is made by

[4] To satisfy this test, a proposed license amendment may not (1) involve a significant increase in the probability or consequences of an accident previously evaluated, or (2) create the possibility

the NRC Staff, and is not reviewable by the ASLB in the course of an adjudicatory proceeding. 10 C.F.R. § 51.91(a)(4). Only license amendments are subject to the NSH exception, and thus it does not apply to license renewal decisions.

Finally, this petition relates to the legal relationship between the Staff's LAR decision and LRA decision, *i.e.,* between the CLB for an operating license and the AMP for license renewal. As discussed in the NRC's 1991 license renewal rule, the CLB is not subject to review in a license renewal proceeding, and yet it undergirds the renewed license, including the AMP:

> By stating that the current licensing basis is maintained for the renewal term, the Commission intends to ensure the continuation of an acceptable level of safety for that plant. Through its review and oversight programs, the Commission will ensure that the operation of the plant will remain within previously established limits. The Commission included § 54.33(e) to specifically state that the status of commitment. on the existing 10 CFR part 50 docket would remain unchanged by the renewed license. However, if a licensee's previous commitments are relied upon in the renewal application as an effective program to manage age-related degradation during the renewal term, these commitments will become part of the licensing basis for the renewal term *since they would form part of the bases for the Commission's finding that age-related degradation unique to license renewal will be effectively managed during the renewal term.*

56 Fed. Reg. 64,943, 64,953 (Dec. 13, 1991) (emphasis added). This interdependent relationship between the CLB approved in the LAR proceeding and the AMP approved in the LRA proceeding is demonstrated in a recent letter from the Chairman of the NRC's Advisory Committee on Reactor Safeguards to the NRC Chair:

> Because ASR affects concrete properties and imposes structural loadings that were not originally addressed in Seabrook's operating license basis assessments, NextEra submitted LAR 16-03 to revise the Seabrook Updated Final Safety Analysis Report to include methods for analyzing Seismic Category I concrete structures affected by ASR. The LAR is based on testing and analyses that established appropriate concrete properties and analytical methods to demonstrate the acceptability of structures considering the effects of ASR. *The LAR methodology has been used to analyze all Seismic Category I structures at Seabrook in their current, ASR-degraded condition, as well as to develop plant specific Aging Management Programs (AMPs) in the LRA to demonstrate that the*

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of a new or different kind of accident from any accident previously evaluated, or (3) involve a significant reduction in a margin of safety. 10 C.F.R. § 50.92(c)(1)-(3).

> *structures affected by ASR will be acceptable for the proposed period of extended operation (PEO). The staff has completed their reviews of the LAR and ASR-related AMPs in the LRA, and documented their findings in its safety evaluations.*

Letter from Michael Corradini to Hon. Kristine L. Svinicki, re: Seabrook Station Unit 1 License Renewal Application: Review of Licensee Program Addressing Alkali-Silica Reaction (Dec. 14, 2018) (ML18348A951) ("Corradini Letter") (emphasis added). Similarly, in a January 10 memorandum to the Commissioners, the NRC's Director of the Office of Nuclear Reactor Regulations stated that:

> Four of the Seabrook license renewal aging management programs (i.e., the plant-specific Alkali-Silica Reaction (ASR) Monitoring Program, the plant-specific Building Deformation Monitoring Program, the Structures Monitoring Program, and the ASME Section XI, Subsection IWL aging management program) are based, in whole or in part, on the methodology submitted in the license amendment request.

Memorandum from Ho K. Nieh to NRC Commissioners re: Renewal of Full-Power Operating License for Seabrook Station, Unit No. 1 (Jan. 10, 2019) (Enclosure to Board Notification referenced in note 2).

B. ASR at Seabrook

As described by the ASLB:

> ASR is a chemical reaction in susceptible concrete that causes the concrete to expand in volume and potentially reduces the structural capacity of concrete structures. The presence of water promotes ASR. The reaction produces an alkali-silicate gel that expands as it absorbs moisture. The expansion exerts stress on the surrounding concrete and results in cracking.

LBP-17-7, 86 NRC at 68. ASR was discovered for the first time in a U.S. reactor in 2009, at Seabrook. 86 NRC at 69. *See also* Summary of Meeting Held on February 12, 201, Between the U.S. Nuclear Regulatory Commission and NexEra Energy Seabrook, LLC., Regarding the Seabrok Nuclear Power Station License Renewal Application (TAC No. ME4028) (Mar. 21, 2013 (ML130668A488.) ("The occurrence of ASR at Seabrook is a first-of-kind occurrence at a

U.S. nuclear power plant."). ASR raises significant safety concerns because it "can potentially impact both the material properties of a concrete structure and the load-bearing capacity of the structure." *Id.* "The expansion of concrete from ASR increases the compressive stress in the concrete, and the additional compressive stress reduces the capacity of compression elements to react to external loads." *Id.* at 70. As noted by Dr. Saouma, "ASR will reduce the tensile and shear strength of concrete while increasing its propensity to larger deformation. This in turn increases the likelihood of cracking and reduces the ability of a structure to resist lateral seismic load." Saouma Report at 13. Thus, ASR may compromise the ability of a reactor containment to withstand external stresses, such as earthquakes.

C. NextEra Response to ASR Discovery

In 2012, NextEra conducted an interim assessment of ASR at Seabrook which "determined that the structures at Seabrook remain suitable for service for an interim period, given the extent and rate of ASR identified." Draft SER at 5-6. But the assessment also found that "additional work needed to be done to verify that the structures satisfy the ACI 318-71 (Seabrook's design code) requirements." *Id.* In response, NextEra retained a consultant, MPR Associates, to conduct "a large-scale testing program (LSTP) at the Ferguson Structural Engineering Laboratory (FSEL) of the University of Texas at Austin." *Id.* The testing was completed in 2016. *Id.* Subsequently, "using the results from the test program and literature, NextEra developed a method for evaluating and monitoring ASR-affected concrete structures." *Id. See also* LPB-17-7, 86 NRC at 69.

As noted by the ASLB, NextEra and its consultants were venturing into uncharted territory with respect to ASR at nuclear reactors, because applicable codes for the design of reactor containments do not contain "methods to address the effects of ASR on the structural

properties used in the design of concrete structures, and publicly available test data related to ASR effects on structures focus primarily on the science of ASR rather than the structural implications." 86 NRC at 70 (footnote omitted). NextEra therefore devised its own methodology," based on "large-scale test programs" and NextEra's "review of the existing technical literature." *Id.* NextEra's analytical consultant, SGH, then analyzed the test results, using a deterministic method.

D. NRC Staff Response to ASR at Seabrook

The NRC Staff also took steps to study the phenomenon of ASR. NextEra's commitment to undertake the testing and analysis was confirmed by the Staff in Confirmatory Action Letter No. 1-2012-002, Confirmatory Action Letter, Seabrook Station, Unit 1 – Information Related to Concrete Degradation Issues (May 16, 2012) (ML12125A172). In the summer of 2012, the NRC also Staff chartered a "Seabrook ASR Issue Technical Team" that was "envisioned to shape the long term resolution and corrective actions of this issue at [Seabrook]." Charter at 1, attached to Memorandum from Eric J. Leeds, Office of Nuclear Reactor Regulation, to Those on Attached List, re: Seabrook Alkali-Silica Reaction Issue Technical Team Charter (July 9, 2012) (ML12270A060).

And in the fall of 2012, the Regional Administrator of Region 1 requested approval by the NRC's Executive Director of Operations to "conduct additional inspections and assessments associated with the degradation of concrete due to [ASR] in safety-related structures at Seabrook." Memorandum from William M. Dean to R.W. Borchardt, re: Request for Deviation from the Reactor Oversight Process Action Matrix to Provide Increased Oversight of the Alkali-Silica Reaction Issue at Seabrook (Sept. 5, 2012) (ML12242A370).

Finally, in 2014, the NRC contracted for independent research on ASR, including a grant to Dr. Saouma for "Experimental and Numerical Investigations of Alkali Silica Reaction at Nuclear Reactors." Letter from Erika Eam to Dr. Victor Saouma, Ph.D, re: Grant No. NRC-HQ-60-14-G-0010. *See* Saouma Declaration, ¶¶ 13 and 14.[5]

E. NextEra's LRA and LAR

In 2010, within a year after discovering ASR at Seabrook, NextEra applied for renewal of its operating license, from 2030 to 2050. NextEra subsequently amended its application to address ASR. The NRC Staff issued a SER for license renewal in September 2018, concluding that ASR had been adequately addressed in NextEra's AMP. Safety Evaluation Report Related to the License Renewal of Seabrook Station (Sept. 28, 2018) (ML18253A294). In 2016, NextEra applied for a license amendment that would "revise the Seabrook Station Updated Final Safety Analysis Report to include methods for analyzing seismic Category I structures with concrete affected by an alkali-silica reaction." 82 Fed. Re. 9,604 (Feb. 7, 2017). The hearing notice included a proposed NSH Determination.

F. C-10's Hearing Request

C-10 submitted a hearing request *pro se,* and was admitted as an intervenor in LBP-17-7. While C-10 did not submit comments on the NSH Determination, its hearing request raised significant safety issues regarding the adequacy of NextEra's Methodology to address the relatively unknown phenomenon of ASR. *See* C-10 Research and Education Foundation, Inc. Petition for leave to intervene: Nuclear Regulatory Commission Docket No. 50-443 (April 10, 2017). *See also* LBP-17-7 (noting "the uncertainty about the speed of ASR degradation, the

[5] The grant letter and the Summary Report of Dr. Saouma's research results under the grant are attached to his declaration. NRC also awarded a grant to the National Institute of Science and Technology. ML1414/ML147A221.

timing of an abrupt concrete failure, and whether the large-scale test program accurately assesses the rate of concrete degradation at Seabrook.").

IV. GROUNDS FOR REQUESTED COMMISSION ACTIONS

In support of their request for relief, Petitioners respectfully submit the following:

- At the outset, the Staff's NSH Determination cannot be squared with the acknowledged lack of standards for or long-term knowledge of ASR. *See* LBP-17-7 at 69-70 ("Neither [American Concrete Institute Standard 318, *Building Code Requirements for Reinforced Concrete* (ACI 318-71) (1971)] nor [American Society of Mechanical Engineers, Boiler and Pressure Vessel Code Sec. III, Div. 2, Subsec. CC] contains methods to address the effects of ASR on the structural properties used in the design of concrete structures, and publicly available test data related to ASR effects on structures focus primarily on the science of ASR rather than the structural implications.") *See also* Saouma Report at 1 (and Saouma Declaration, Ex. 4a) (ASR is a "complex issue" addressed by NRC in these circumstances "for the first time.") Under the circumstances, the Staff has no rational basis to rule out "a significant reduction in a margin of safety." 10 C.F.R. § 50.92(c)(3).
- Even the well-accepted building codes cited in the previous paragraph have limited applicability in these circumstances because they were written for new designs, not reactors that have been operating for a significant period of time under stresses like ASR. *See* Saouma Report, § 5.2.4 at 11.
- Dr. Saouma conclusion, reached after conducting an extensive review of NextEra's Methodology and related documents in preparation for the hearing in this proceeding, also shows that an NSH Determination by the NRC Staff could not be supported. As stated in his expert report, both the test program and the methodology used in the LAR to

justify the safe operation of Seabrook "are substandard and inadequate to support any conclusion that the ability of the Seabrook containment to withstand a design basis earthquake has not been unduly compromised by the presence of ASR." Saouma Report at 1; Saouma Declaration, Exhibit 4a. *See also* Saouma Declaration, ¶ 16.

- In particular, Dr. Saouma notes "three major conclusions" about the FSEL tests:

> First, as discussed in Section 2.3 [of Dr. Saouma's report], concrete used in the FSEL tests is not representative of the concrete at Seabrook. This lack of representativeness cuts across virtually every level of the test, including characteristics of the materials tested, test conditions, and assumptions about the behavior of concrete under finite element simulations.
>
> Second, as discussed in Section 3.3 [of Dr. Saouma's report], the Shear tests do not have the proper boundary conditions. They are also limited to out-of-plane shear, and some large unexplained cracks may have corrupted the test results. In addition, there is no evidence that the limit state (i.e. failure shear force) was captured and thus there is no evidence that shear failure was indeed captured as claimed.
>
> Finally, as discussed in Section 4.3 [of Dr. Saouma's report], the crack index measurements relied on by the author cannot provide a reliable assessment of the *in-situ* ASR expansion, because a crack index measured on the surface (where the concrete is relatively dry) is not representative of what is happening inside the specimen where the relative humidity (essential for ASR) is much higher.

Saouma Report at 1; Saouma Declaration, Ex. 4a. Dr. Saouma's criticisms of the finite element assessment performed by NextEra's contractor SGH are "[o]f equal – if not greater – concern." *Id.* In particular:

> The numerical technique followed by SGH is a deterministic, linear and simplistic method that is used for the design of new structures. It is very regretful that SGH did not employ in addition to their minimalist analysis the probabilistic risk assessment method pioneered by the NRC. Whereeas [sic] this would have required a nonlinear static and seismic analyses, SGH could have obtained a much more accurate assessment commensurate with the needs for such a critical structure. This probabilistic method was pioneered by the NRC and is well-accepted as a useful tool for analyzing the complex interactions of phenomena in nuclear safety analyses.

Saouma Report at 1; Saouma Declaration, Ex. 4a.

- Dr. Saouma also asserts that his own independent research, conducted on behalf of the NRC between 2014 and 2017, "confirms that probabilistic analysis of ASR yields more credible results than the type of linear and deterministic analysis used by SGH." *Id.* Dr. Saouma discusses the advantage of a probabilistic method in greater detail in Section 5 of his expert report.
- As Dr. Saouma points out, there are "many published papers properly addressing the modeling of ASR in a scientific approach reflecting the state of the art." Saouma Report at 15, ¶ 6. Dr. Saouma's research between 2014 and 2017 under contract to the NRC is included among these. Yet, in claiming to thoroughly address the issue of ASR at Seabrook, the NRC Staff did not consult this body of research. And while the Staff did broaden the number of people working on the Seabrook ASR issue within the agency, it did not seek independent review of NextEra's work through establishment of an independent peer review panel.
- C-10 has raised admissible and significant safety concerns regarding the adequacy of NextEra's Methodology that implicate the adequacy of NextEra's AMP, *See* LBP-17-17. Holding a hearing on those concerns *prior* to a decision on license renewal is essential to maintain the integrity and accountability of the NRC's regulatory scheme for license renewal, and to be fair to C-10 as an interested member of the public.
- It has now been ten years since ASR was discovered at Seabrook. The NRC Staff has spent the intervening years preparing for licensing decisions that will affect the next thirty years of operation (*i.e.*, the remaining ten years of the original license plus a twenty-year renewal term). The Commission should take immediate steps to ensure that the substandard work done by NextEra on the ASR issue, is not used to justify another

thirty years of operation that fails to demonstrate compliance with NRC safety regulations or adequately protect public health and safety from the effects of a design basis earthquake at Seabrook.

V. REQUEST FOR RELIEF

For the foregoing reasons, C-10 requests the Commission to:

- Review and reverse the Staff's NSH Determination to allow the prior completion of an adjudicatory hearing on C-10's admitted ASR-related contentions before the ASLB;
- To ensure that the Staff does not take licensing actions during Commission review of the NSH Determination, immediately order the suspension of the LAR and LRA decisions.
- Give due recognition to the significance, complexity, and lack of adequately rigorous study of ASR by opening an in-depth inquiry into best practices for assessing ASR, including consideration of all relevant research and use of peer review by an internationally recognized independent panel; and
- Provide guidance and instruction to the Staff for establishment of significantly more rigorous and sophisticated state-of-the-art methods and criteria for evaluating safety risks posed by ASR at Seabrook and other reactors.

Respectfully submitted,

___/signed electronically by/__
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February 13, 2019

CERTIFICATE OF COUNSEL

Pursuant to 10 C.F.R. § 2.323(b), I certify that on February 12, 2019, I consulted counsel for NextEra and the NRC Staff in a sincere effort to resolve the issues raised by this petition. Counsel for both NextEra and the Staff stated that they oppose the petition and plan to file an answer.

[Electronically signed by]
Diane Curran

CERTIFICATE OF SERVICE

I certify that on February 13, 2019, I posted the following documents to the NRC's EIE Adjudicatory Submissions Portal:

EMERGENCY PETITION BY C-10 RESEARCH AND EDUCATION FOUNDATION FOR EXERCISE OF COMMISSION'S SUPERVISORY AUTHORITY TO REVERSE NO SIGNIFICANT HAZARDS DETERMINATION AND IMMEDIATELY SUSPEND LICENSE AMENDMENT AND LICENSE RENEWAL DECISIONS

Attachment 1: Declaration of Victor E. Saouma (Feb. 12, 2019) ("Saouma Declaration") (Attachment 1); *Concerns Regarding Structural Evaluation of Seabrook Nuclear Power Plant* (Feb. 12, 2019)

Exhibit 1 to Saouma Declaration: Curriculum Vitae for Dr. Victor E. Saouma

Exhibit 2 to Sauoma Declaration: NRC grant award letter

Exhibit 3 to Saoma Declaration: Sauoma, Final Summary Report

Exhibit 4 to Saouma Declaration: Sauoma, *Review of Selected Documents Pertaining to the Structural Evaluation of Seabrook Nuclear Power Plant* (Feb. 12, 2019) **Submitted on NRC portal for documents containing proprietary information in accordance with Protective Order**

Exhibit 4a to Saoma Declaration: Introduction and Executive Summary

[Electronically signed by]
Diane Curran