October 28, 2019

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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

C-10 RESEARCH AND EDUCATION FOUNDATION'S RESPONSE TO ASLB MEMORANDUM AND MOTION TO SUBMIT ADDITIONAL EXHIBITS REGARDING PETROGRAPHIC OBSERVATIONS AND ANALYSES OF ASR AT SEABROOK

I. INTRODUCTION

Intervenor C-10 Research and Education Foundation ("C-10") hereby responds to questions raised by the Atomic Safety and Licensing Board ("ASLB") in its October 16, 2019 Memorandum (Request for Clarification) ("Memorandum"). The questions relate to whether C-10 received, during the document disclosure process, six documents identified by NextEra Energy Seabrook, LLC ("NextEra") as containing data regarding the mineralogical characteristics of Seabrook aggregate and the aggregate used by NextEra in the Large Scale Testing Program ("LSTP") at Ferguson Engineering Laboratories ("FSEL").[1] C-10's answers to

[1] *See* Memorandum at 2; NextEra Answer Opposing C-10's Motions to Compel Production of Mineralogical Data and to Submit Additional Post-Hearing Testimony at 3-4 (Oct. 9, 2019) ("NextEra's Opposition")The six documents are:

- Simpson Gumpertz & Heger Inc., Document No. 120109-RPT-01 (Apr. 2012);
- Simpson Gumpertz & Heger Inc., Document No. RPT-100502.02-7 (July 2011);
- Simpson Gumpertz & Heger Inc., Document No. 110594-RPT-02 (Jan. 2012);
- Simpson Gumpertz & Heger Inc., Document No. RPT-100502-2 (Aug. 2010);
- Simpson Gumpertz & Heger Inc., Document No. RPT-100502-4 (Aug. 2010); and
- Simpson Gumpertz & Heger Inc., Project No. 130064 (Mar. 2013).

the ASLB's questions are provided in Section II below and in proposed Exhibit INT049, Supplemental Testimony of Victor E. Saouma, Ph.D, Regarding Petrographic Documents.

In addition, and of even greater importance, in the course of reviewing the six disclosure documents and other petrographic studies performed by NextEra between 2010 and 2016, C-10 has identified another significant petrographic study: WJE Report No. 2014-3453.2 (May 26, 2016) (proposed Exhibit INT050) ("WJE Report"). This report, prepared by one of NextEra's consultants, Wiss, Janney, Elstner ("WJE"), documents the observation of alkali silica reaction ("ASR") in at least one core sample taken from Seabrook, that was more severe in the interior of concrete structures than at the surface. WJE also concluded that the ASR was likely caused by factors in the interior of the concrete, not the surface.

C-10 seeks admission of the WJE Report into the evidentiary record as Exhibit INT050, as well as Dr. Saouma's explanation of the significance of the WJE Report in Exhibit INT049, on the grounds that the report: (a) constitutes evidence, prepared by NextEra's own consultant, that contradicts NextEra's testimony in this proceeding that ASR is always more severe at the surface of concrete structures; (b) supports Dr. Saouma's testimony that surface ASR conditions are not reliable indicators of interior conditions at Seabrook due to the higher level of humidity on the interior of concrete structures; (c) undermines a key assumption underlying the NRC Staff's safety findings regarding NextEra's monitoring and assessment program for ASR at Seabrook; and (d) is responsive to the ASLB's request to C-10's expert witness, Dr. Victor E. Saouma, for documentation of his expert opinion that ASR may be more severe inside of concrete structures than at the surface. In addition, while C-10 received the WJE Report in early 2018, Dr. Saouma did not come into the case until late that year; and as a *pro bono* expert employed full-time in research and teaching, did not have sufficient time to review all 350-plus

documents disclosed by NextEra during the discovery process and therefore reasonably focused his hearing preparation on the principal consultants' reports prepared by NextEra's consultants MPR and SGH. C-10 respectfully submits that these factors establish good cause for admitting the additional exhibits after the close of the September 24-27 hearing.

II. RESPONSE TO ASLB'S QUESTIONS

In its Memorandum, the ASLB asked whether C-10 previously had received six documents described by NextEra as containing "relevant mineralogical and petrographic information.'" Memorandum at 2 (quoting NextEra Opposition at 3-4). C-10 hereby confirms that during the document disclosure process, it did receive the documents. However, Dr. Saouma did not have a sufficient opportunity to review the six documents until recently. Dr. Saouma did not come into this case until late 2018, when he was retained by C-10 as a *pro bono* expert witness. During Dr. Saouma's document review and preparation of his testimony, he was also teaching and conducting research full-time at the University of Colorado. Presented with a very large number of discovery documents (approximately 350), he focused his review for preparation of his testimony on the key consultant reports prepared by MPR and SGH. In the last week, following completion of transcript corrections (a process which took over a week), Dr. Saouma has reviewed the documents identified in the Memorandum as well as several other petrographic documents provided by NextEra to C-1 in the disclosure process.

The ASLB also asked whether the six documents, in addition to Appendix K to Exhibit NER022-R (MPR-4262, "Shear and Reinforcement Anchorage Testing of Concrete Affected by Alkali Silica Reaction," Vol. I, Rev. 1 (July 2016) & Vol. II, Rev. 0 (Jan. 2016)) are sufficient to allow a mineralogical comparison between Seabrook concrete and the concrete used in the LSTP. As discussed in C-10's proposed Exhibit INT049, the data provided in NextEra's reports

are sufficient to support a comparison of the *physical* characteristics of the aggregates in the Seabrook concrete and the LSTP specimens, *i.e.*, shape, hardness, strength, and size distribution of aggregate components. However, they are not adequate to support a *mineralogical* comparison, because they lack information about the gel type that will be produced, and consequentially the crack widths and patterns, that are needed to ensure adequate ASR representativeness. Tr. 981-82 (Saouma). *See* proposed Exhibit INT049, par.4, in which Dr. Saouma makes a short statement on the issue.

III. C-10 HAS GOOD CAUSE TO SEEK ADMISSION OF PROPOSED EXHIBIT INT050, THE WJE REPORT, AND SUPPLEMENTAL TESTMONY BY DR. SAOUMA REGARDING THAT REPORT.

In the course of reviewing petrographic analyses conducted by NextEra's consultants between 2010 and 2016, C-10 has identified an additional consultant's report which has very high significance for this proceeding: WJE Report No. 2014-3453.2 (proposed Exhibit INT050). In that document, WJE reports that microcracking was found in petrographic examinations of eight concrete cores taken from the residual heat removal ("RHR") and containment spray ("CS") equipment vault. *Id.* at 13. WJE also found that out of the eight cores taken, only one had the most severe ASR at the surface. *Id.* All of the rest of the cores showed ASR that was the same throughout, or "significantly less" at the surface than at deeper portions:

> All eight cores with ASR were drilled from the exterior walls of the Equipment Vault. While some voids in these cores were coated or filled with alkali-silica gel, due to ASR, the majority of the air voids in these cores were coated with secondary ettringite deposits, suggesting that the concrete bad been exposed to internal moisture movement.
>
> Within each core, the extent of ASR was also different depending on the locations of the cores. Of the eight cores with ASR, Core 2 was the only one that exhibited the most severe ASR in the top portion of the core. *All other cores either exhibited significantly less ASR in the top portions than the deeper portions or a similar extent of ASR between the top portions and deeper portions. This observation suggests that ASR in the concrete was likely initiated and controlled by a factor from deep inside the concrete, rather than from the top surface of the concrete.*

Id. (emphasis added).

NextEra has good cause to seek admission of proposed Exhibit INT050 on multiple grounds. First, WJE's observation of ASR that was more severe in the interior of core samples contradicts NextEra's testimony that it has consistently found ASR at the surface of Seabrook core samples to be more severe than at depth within the cores. For instance, NextEra witness Matthew Sherman testified that:

> ASR is a geological phenomenon, even at the large-scale testing program where there was high temperature, extra-high humidity, where it was high alkali content, extra added reactivity, it still took on average a year to get to the point where we were within the LSTP. So in the plant environment, it doesn't occur that quickly. *We have never found a spot at the plant, and we've done cores, you know, tested different depths. It is never worse at depth within the core concrete than what is indicated at the surface.*

Tr. 397 (emphasis added). Similarly, Mr. Sherman stated that in previous petrographic studies, NextEra "found no substantial difference between near surface and what would be below the level of the reinforcing steel within the core of the structure." Tr. 456. NextEra witness Edward Carley also testified that "we have done petrographic examination, those cores are similar across the plant . . . and through the depth." Tr. 532. And Dr. Bayrak testified that on visual examination of 200 extensometer core samples, no delamination was found:

> That expansion causing a hidden crack on the inside is directly refuted by 200 cores that have been taken by the plant and zero such observations have been reported.
>
> So, once again, as an experimentalist I am going with data that I have in my hands, 200 cores -- cores, no delamination. I can bring in outside of Seabrook ASR experience, but perhaps that's not directly relevant. And those facts lead me to believe that the postulation that a big delamination is going to take place without going noticed is something I cannot wrap my head around.

Tr. 705. Proposed Exhibit INT050 shows that in fact, NextEra's own petrographic consultant, WJE, observed ASR that was more significant at depth in Seabrook core samples.

Second, the WJE Report supports Dr. Saouma's testimony that surface ASR conditions are not reliable indicators of the severity of ASR within Seabrook structures, because the surface is drier than the interior of the concrete. *See* Proposed Exhibit INT049, pars. 8 and 9.

Third, proposed Exhibit INT050 shows that a key linchpin for the Staff's conclusion about the adequacy of NextEra's monitoring and assessment program for ASR is undermined by one of NextEra's own consultant's reports. As testified by the NRC Staff during the hearing:

> [O]ur position in this review is if [ASR is] not, if it's not able to be identified at the surface, it's not causing damage that is going to challenge the licensing basis of the structures.

Tr. 693 (Buford). Proposed Exhibit INT050 contradicts the Staff's assumption that cracks inside the concrete could not be worse than cracks found at the surface.

Fourth, admission of proposed Exhibit INT050 is warranted in order to provide a complete and meaningful response to the ASLB's request to Dr. Saouma for documentation of his expert opinion that the effects of ASR are likely to be more severe internally than at the surface of concrete structures at Seabrook. During the hearing, Judge Trikouros observed:

> The testimony has been on this that of all the core samples that were investigated by NextEra, they didn't see any evidence of this asymmetric effect that you're talking about, where the effects were much more severe internally than would be indicated by surface cracking.

Tr. 450. Judge Trikouros then asked Dr. Saouma to provide documentation of his opinion that ASR effects at Seabrook would be more severe internally than on the surface of concrete structures, because "as far as I know, we have no basis to believe that this is happening at Seabrook or could happen at Seabrook." Tr. 451. While Dr. Saouma provided a citation to an academic paper regarding the likelihood of higher levels of ASR inside of concrete structures than on the surface (*see* proposed Exhibit 0049, par. 9), only the WJE Report documents the observation of a higher level of internal ASR in a structure at the Seabrook plant itself.

Finally, while C-10 received the WJE Report in early 2018, Dr. Saouma did not come into the case until late that year; and as a *pro bono* expert employed full-time in research and teaching, did not have sufficient time to review all 350-plus documents disclosed by NextEra during the discovery process and therefore reasonably focused his hearing preparation on the principal consultants' reports prepared by NextEra's consultants MPR and SGH. C-10 respectfully submits that these factors establish good cause for admitting the additional exhibits after the close of the September 24-27 hearing. *See* proposed Exhibit INT049, par. 3.

Accordingly, C-10 respectfully submits that it has good cause to seek the admission of proposed Exhibit INT050 and an explanation by Dr. Saouma of its significance in Exhibit INT049.

IV. CONCLUSION

For the foregoing reasons, the ASLB admit into the record proposed Exhibits INT049 and INT050.

Respectfully submitted,

__/signed electronically by/___

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October 28, 2019

CERTIFICATE OF COUNSEL

Pursuant to 10 C.F.R. § 2.323(b), I certify that on October 25, 2019, I contacted counsel for NextEra and the NRC Staff in a sincere effort to resolve the issues raised by this motion. Counsel for both NextEra and the NRC Staff stated that they oppose the motion. Each party also reserved the right to file an answer.

___[Signed electronically by]__

Diane Curran

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CERTIFICATE OF SERVICE

I certify that on October 18, 2019, I posted the following documents on the NRC's electronic hearing docket:

- C-10 RESEARCH AND EDUCATION FOUNDATION'S RESPONSE TO ASLB MEMORANDUM AND MOTION TO SUBMIT ADDITIONAL EXHIBITS REGARDING PETROGRAPHIC OBSERVATIONS AND ANALYSES OF ASR AT SEABROOK

- SUPPLEMENTAL TESTIMONY AND OTHER SUPPLEMENTAL EXHIBITS REGARDING SIGNIFICANCE OF SEABROOK PETROGRAPHIC DOCUMENTS;

- Proposed Exhibit INT049, Supplemental Testimony of Victor E. Saouma, Ph.D, Regarding Petrographic Documents; and

- Proposed Exhibit INT050, WJE Report No. 2014-3453.2 (May 26, 2016).

/signed electronically by/
Diane Curran