



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

In the Matter of

NEXTERA ENERGY SEABROOK, LLC

(Seabrook Station, Unit 1)

Docket No. 50-443-LA-2

ASLBP No. 17-953-02-LA-BD01

Revised Hearing Exhibit

Revised Exhibit Number: NER005-R4

Exhibit Revision Date: January 10, 2010

Revised Exhibit Title: NextEra Exhibit List

NextEra Energy Seabrook, LLC, Docket No. 50-443-LA-2
September 2019 Evidentiary Hearing Exhibits

| NextEra Exh. No. | Witness/ Panel | Exhibit Title/Description | ADAMS Accession No. |
|---------------------------------|---------------------------|--|------------------------------------|
| NER001 | MPR/NextEra | Testimony of NextEra Witnesses Michael Collins, John Simons, Christopher Bagley, Oguzhan Bayrak, and Edward Carley ("MPR Testimony") | |
| NER002 | MPR/NextEra | MPR Testimony – Attachment 1 – Glossary | |
| NER003 [PROPRIETARY] | MPR/NextEra | MPR Testimony – Attachment 2 – Proprietary Appendix | |
| NER004 | MPR/NextEra | Testimony of NextEra Witnesses Said Bolourchi, Glenn Bell, and Matthew Sherman ("SGH Testimony") | |
| NER005-R3 | MPR/NextEra; SGH | NextEra Exhibit List | |
| NER006 | MPR/NextEra | Michael Collins Biography | |
| NER007 [PROPRIETARY] | MPR/NextEra | Seabrook Structures Monitoring Program Manual, Rev. 7 | |
| NER008 | MPR/NextEra | John Simons <i>Curriculum Vitae</i> | |
| NER009 | MPR/NextEra | Chris Bagley <i>Curriculum Vitae</i> | |

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|---------------------------------|-----------------------------|--|------------------------------------|
| NER010 | MPR/NextEra | Dr. Oguzhan Bayrak <i>Curriculum Vitae</i> | |
| NER011 | MPR/NextEra | Edward Carley Resume | |
| NER012 [Copyright] | MPR/NextEra; SGH | The Institution of Structural Engineers, “Structural Effects of Alkali-Silica Reaction” (July 1992) | |
| NER013 | MPR/NextEra; SGH | U.S. Department of Transportation, Federal Highway Administration, “Report on the Diagnosis, Prognosis, and Mitigation of Alkali-Silica Reaction (ASR) in Transportation Structures” (FHWA-HIF-09-004) (Jan. 2010) | |
| NER014 | MPR/NextEra | NUREG-2191, “Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report,” Vol. 2 (July 2017) [Cover and Section X.M1] | ML17187A204 |
| NER015 [PROPRIETARY] | MPR/NextEra | MPR-3848, Rev. 0 “Seabrook Station, Approach for Shear and Reinforcement Anchorage Testing of Concrete Affected by Alkali-Silica Reaction” (Apr. 2013) (FP100818) | |
| NER016 [Copyright] | MPR/NextEra | Allford, M., “Expansion Behavior of Reinforced Concrete Elements Due to Alkali-Silica Reaction” (Aug. 2016) | |

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| NER017 [Copyright] | MPR/NextEra | EPRI Report 3002013192, “Evaluation of Laboratory Tests to Detect Up-to-Date Expansion and Remaining Expansion in Concrete Structures Affected by Alkali-Silica Reaction” (Oct. 15, 2018) | |
| NER018 | MPR/NextEra | MPR-3727, Rev. 1, “Seabrook Station: Impact of Alkali-Silica Reaction on Concrete Structures and Attachments” (Jan. 2014) and NextEra Supplements I-V Thereto (FP100716, Rev. 4) | |
| NER019 [PROPRIETARY] | MPR/NextEra | Bayrak, O., “Structural Implications of ASR; State of the Art” (Feb. 2, 2012) (FP100697) | |
| NER020 [PROPRIETARY] | MPR/NextEra | MPR 0326-0062-88, Rev. 2, “Initial Expansion Assessment of ASR- Affected Reinforced Concrete Structures at Seabrook Station” (Mar. 2018) (FP101070, Rev. 1) | |
| NER021 [PROPRIETARY] | MPR/NextEra | MPR-4231, Rev. 0, “Instrumentation for Measuring Expansion in Concrete Affected by Alkali-Silica Reaction” (Oct. 2015) (FP100972) | |
| NER022 [PROPRIETARY] | MPR/NextEra | 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) (FP100994) | |

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| NER023 [PROPRIETARY] | MPR/NextEra | MPR-3722, Rev. 2, “Strength Testing of Anchors in Concrete Affected by Alkali-Silica Reaction” (Jan. 2016) (FP100718, Rev. 1) [Main Report & App. A] | |
| NER024 [PROPRIETARY] | MPR/NextEra | MPR-4247, Rev. 0 “Commercial Grade Dedication Report for Seabrook ASR Anchor Testing (Block Series and Girder Series Phase 2)” (Dec. 2015) (FP100986) [Main Report & Apps. A & B] | |
| NER025 [PROPRIETARY] | MPR/NextEra | MPR-4259, “Commercial Grade Dedication Report of Seabrook ASR Shear, Reinforcement Anchorage and Instrumentation Testing” (Jan. 2016) [Main Report, App. B, & Pages D-1745, D-2615 to 16, F-6129, F-9474, F-9596, G-14, and G-18 to 19] | |
| NER026 [PROPRIETARY] | MPR/NextEra | MPR-3757, Rev. 4, “Shear and Reinforcement Anchorage Test Specimen Technical Evaluation” (May 2014) (FP100760) | |
| NER027 | MPR/NextEra | Saouma, V., “Benchmark Problems for AAR FEA Code Validation” (Aug. 4, 2017) | |
| NER028 | MPR/NextEra; SGH | SG&H Report 110594-RPT-02, Rev. 1, “Damage Rating Index and ASR Rating” (Feb. 10, 2012) (FP100702) | |

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| NER029 [Copyright] | MPR/NextEra | EPRI Report 3002013190, “Modeling Concrete Structures Affected by Alkali Silica Reaction: Hydro-Quebec Approach for Hydraulic and Nuclear Power Plants” (Oct. 15, 2018) | |
| NER030 [Copyright] | MPR/NextEra | Giannini, E., “Evaluation of Concrete Structures Affected by Alkali-Silica Reaction and Delayed Ettringite Formation” (2012) | |
| NER031 | SGH | Said Bolourchi <i>Curriculum Vitae</i> | |
| NER032 | SGH | Glenn Bell <i>Curriculum Vitae</i> | |
| NER033 | SGH | Matthew Sherman <i>Curriculum Vitae</i> | |
| NER034 [Copyright] | SGH | ASCE Standard ASCE/SEI 7-16, “Minimum Design Loads and Associated Criteria for Buildings and Other Structures” (2016) [Cover & Page 1] | |
| NER035 | SGH | U.S. Department of Commerce, National Bureau of Standards, NBS Special Publication 577, “Development of a Probability Based Load Criterion for American National Standard A58” (1980) | |

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| NER036 [Copyright] | SGH | ASCE Standard ASCE/SEI 4-16, “Seismic Analysis of Safety-Related Nuclear Structures” (2016) [Cover & Pages 9-11, 23] | |
| NER037 [Copyright] | MPR/NextEra; SGH | Esposito, R., and Hendriks, M.A.N., “Literature Review of Modelling Approaches for ASR in Concrete: A New Perspective,” EUROPEAN JOURNAL OF ENVTL. & CIVIL ENG’G (2017) | |
| NER038 | SGH | Gocevski, V., “Pathologies/Degradation Mechanisms Experienced by Hydro- Quebec During the Evaluation of Gentilly-2 NPP,” Report Submitted to ASCET, (June 2015) | |
| NER039 [Copyright] | SGH | Neville, A.M., “Properties of Concrete,’ 5th Edition, Pearson Education Limited; Harlow, Essex, England, 2012 [Cover Pages & Pages 426-27, 436-37, 444-45] | |
| NER040 [Copyright] | SGH | J.J. Brooks, <i>Accuracy of Estimating Long-Term Strains in Concrete</i>, 36 Magazine of Concrete Research 127, 131-45 (June 1984) | |
| NER041 [Copyright] | SGH | Mijnsbergen, J. and Reinhardt, H. W., “Long-Time Creep and Expansion Behavior of Concrete in a Marine Environment,” 109 American Concrete Institute Special Publication 599-624 (SP 109-27) (1994) | |

| NextEra Exh. No. | Witness/ Panel | Exhibit Title/Description | ADAMS Accession No. |
|---------------------------------------|---------------------------|--|------------------------------------|
| NER042 [Copyright] | SGH | G.E. Troxell, et al., <i>Long-Time Creep and Shrinkage Tests of Plain and Reinforced Concrete</i>, 1958 Proceeding of the American Society for Testing and Materials 1101-20 | |
| NER043 | SGH | NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition," Chapter 3 – Design of Structures and Components, Equipment, and Systems § 3.7.2, Rev. 4 (Sept. 2013) | ML13198A223 |
| NER044 | SGH | Seabrook Station Unit 1, Updated Final Safety Analysis Report (UFSAR) (Rev. 19) [§ 2.5.2.5 only] | |
| NER045 [PROPRIETARY] | MPR/NextEra | MPR-4286, Rev. 0, "Supplemental Commercial Grade Dedication Report for Seabrook ASR Test Programs" (Mar. 2016) (FP101003) | |
| NER046 | MPR/NextEra | Seabrook Mechanical Maintenance Procedure MS0517.51, "Installation of Geokon Snap-Ring Borehole Extensometers," Rev. 0 (Feb. 2016) [Cover & Pages 13-19] | |
| NER047 | MPR/NextEra | N. Ezell et al., "Experimental Collaboration for Thick Concrete Structures with Alkali-Silica Reaction" (2018) | |

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| NER048 | MPR/NextEra | L. Phan, "Structural Performance of NPP Concrete Structures Affected by Alkali-Silica Reaction (ASR)," Slides for NRC Regulatory Information Conference Session TH27 (2018) | |
| NER049 [Copyright] | MPR/NextEra; SGH | EPRI Report 3002007777, "Modeling Existing Concrete Containment Structures" (Aug. 2017) | |
| NER050 | MPR/NextEra | Reineck et al., "Research Report: Extended Databases with Shear Tests on Structural Concrete Beams without and with Stirrups for the Assessment of Shear Design Procedures"(Mar. 2010) | |
| NER051 [Copyright] | MPR/NextEra | Reineck et al., "ACI-DAfStb Database of Shear Tests on Slender Reinforced Concrete Beams without Stirrups," 110-5 ACI Structural Journal 867 (Sept.-Oct. 2013) | |
| NER052 | MPR/NextEra | Clayton et al., "The Effects of Alkali-Silica Reaction on the Strength of Prestressed Concrete Beams," 68-15 The Structural Engineer 287 (Aug. 1990) | |
| NER053 | MPR/NextEra | Richart et al., "The Failure of Plain and Spirally Reinforced Concrete in Compression," University of Illinois Engineering Experiment Station, Bulletin No. 190 (Apr. 1929) | |

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| NER054 [Copyright] | MPR/NextEra | Chana and Korobokis, “Structural Performance of Reinforced Concrete Affected by Alkali Silica Reaction: Phase 1” (Oct. 1990) [Cover Pages & § 7.2] | |
| NER055 [PROPRIETARY] | MPR/NextEra | MPR Document 0326-0058-157, “Overview of Anchor Testing Program in Concrete Affected by Alkali-Silica Reaction,” (Feb. 26, 2013) | |
| NER056 | MPR/NextEra | NUREG-1800, Rev. 2, “Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants” (Dec. 2010) [Cover Pages & App. A § A.1] | ML103490036 |
| NER057 | MPR/NextEra | Oak Ridge National Laboratory, “In-Service Inspection Guidelines for Concrete Structures in Nuclear Power Plants” (Dec. 1995) | |
| NER058 [Copyright] | MPR/NextEra; SGH | D. Wald, “ASR Expansion Behavior in Reinforced Concrete – Experimentation and Nuclear Modeling for Practical Application” (Aug. 2017) | |
| NER059 | MPR/NextEra | RILEM Technical Committee 259-ISR, “Benchmark Problems for AAR FEA Code Validation” (Aug. 4, 2017) | |
| NER060 [Copyright] | MPR/NextEra | Manabe et al., “Maintenance Management of Turbine Generator Foundation Affected by Alkali-Silica Reaction,” 14 Journal of Advanced Concrete Technology 590 (Sept. 2016) | |

| NextEra Exh. No. | Witness/ Panel | Exhibit Title/Description | ADAMS Accession No. |
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| NER061 [Copyright] | SGH | Somerville, Management of Deteriorating Concrete Structures (2008) [Cover & Pages 111, 155-164, 206-208] | |
| NER062 | SGH | Transcript, Advisory Committee on Reactor Safeguards, License Renewal Subcommittee (Oct. 31, 2018) [Cover & Pages 101-102] | ML18348B117 |
| NER063 [Copyright] | SGH | Mohammed et al., “Alkali-Silica Reaction-Induced Strains over Concrete Surface and Steel Bars in Concrete,” 100 ACI Materials Journal 133 (Mar.-Apr. 2003) | |
| NER064 | SGH | Mohammed et al., “ASR Expansion of Concrete Beams with Various Restrained Conditions—612 Days of Accelerated Marine Exposure,” Proceedings of the 12th International Conference on Alkali-Aggregate Reaction in Concrete 1169 (2004) | |
| NER065 [Copyright] | SGH | Bazant and Steffens, “Mathematical Model for Kinetics of Alkali-Silica Reaction in Concrete,” 30 Cement and Concrete Research 419 (2000) | |
| NER066 | SGH | Dunant and Scrivener, “Micro-Mechanical Modelling of Alkali-Silica-Reaction-Induced Degradation Using The AMIE Framework,” 40 Cement and Concrete Research 4, 517-25 (2010) | |

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| NER067 | SGH | Charlwood, "A Review of Alkali Aggregate Reaction in Hydro Plants and Dams," 1 Int'l Journal on Hydropower & Dams 3, 73-80 (May 1994) | |
| NER068 [Copyright] | SGH | Cope et al., "Prediction of Stress Distributions in Reinforced Concrete Members Affected by Alkali Aggregate Reaction" (1994) | |
| NER069 [Copyright] | SGH | Fairbarin et al., "Modeling the Structural Behavior of a Dam Affected by Alkali-Silica Reaction," 22 Communications in Numerical Methods of Eng'g 1 (July 14, 2005) | |
| NER070 [Copyright] | SGH | Grimal et al., "Creep, Shrinkage, and Anisotropic Damage in Alkali-Aggregate Reaction Swelling Mechanism Part I: A Constitutive Model," 105-3 ACI Materials Journal 227 (May-June 2008) | |
| NER071 [Copyright] | SGH | Comi and Perego, "Anisotropic Damage Model for Concrete Affected by Alkali-Aggregate Reaction," 20 Int'l Journal of Damage Mechanics 598 (May 2011) | |
| NER072 [Copyright] | SGH | Saouma and Perotti, "Constitutive Model for Alkali-Aggregate Reactions," 103 ACI Materials Journal 194 (May-June 2006) | |
| NER073 [Copyright] | SGH | Pan et al., "Modeling of alkali-silica reaction in concrete: a review," 6 Frontiers of Structural and Civil Eng'g 1 (2012) | |

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|---------------------------------------|---------------------------|--|------------------------------------|
| NER074 [Copyright] | SGH | Jurcut, “Modelling of Alkali-Aggregate Reaction Effects in Reinforced Concrete Structures” (2015) | |
| NER075 | MPR/NextEra; SGH | Swiss Committee on Dams, “Concrete Swelling of Dams in Switzerland” (May 8, 2017) | |
| NER076 [PROPRIETARY] | MPR/NextEra | Testimony of NextEra Witnesses John Simons, Christopher Bagley, Oguzhan Bayrak, and Edward Carley in Response to Exhibit INT030 | |
| NER077 | MPR/NextEra; SGH | Testimony of NextEra Witnesses John Simons, Christopher Bagley, Oguzhan Bayrak, Matthew Sherman, and Edward Carley in Response to Exhibit INT051-R | |

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