



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

Hearing Exhibit

Exhibit Number:

Exhibit Title:

**Statement of Professional Qualifications
Dr. George Thomas, Senior Structural Engineer
Office of Nuclear Reactor Regulation (NRR), Division of Engineering
Structural Engineering Branch
U.S. Nuclear Regulatory Commission**

Dr. Thomas is a Senior Structural Engineer with over thirty years of diverse experience as an expert structural engineer in regulatory work, industry, and research. Over 23 years of this experience is in the US nuclear power industry with the U.S. Nuclear Regulatory Commission (NRC) and Bechtel Power Corporation. At the NRC and Bechtel Power, Dr. Thomas' assignments have included analysis, design, construction support, testing, licensing safety reviews, inspection, audit, consensus codes and standards, rulemaking, regulatory guidance development, and aging management of reinforced and pre-stressed concrete safety-related structures and containments at nuclear power plants. At the NRC, Dr. Thomas has provided significant technical expertise in the regulatory oversight and licensing safety reviews of complex, first-of-a-kind, concrete degradation issues in operating reactors, including the alkali-silica reaction (ASR) concrete degradation issue at Seabrook, concrete shield building laminar cracking issue at Davis-Besse, and pre-stressed concrete containment wall delamination issue at Crystal River, Unit 3. Dr. Thomas participates in consensus codes and standards activities and serves as the NRC voting member on the Joint American Society of Mechanical Engineers-American Concrete Institute (ASME-ACI) Code Committee for Concrete Containments.

EDUCATION AND PROFESSIONAL MEMBERSHIPS

B.E., Civil Engineering, Bangalore University, India, 1985

M.E., Structural Engineering, Anna University, India, 1988

Ph.D., Civil/Structural Engineering, Texas Tech University, 1996

P.E., State of Maryland

Voting Member, Joint ASME-ACI Committee on Concrete Components for Nuclear Service, (ASME Section III, Division 2 (ACI 359), Code for Concrete Containments)

Former Voting Member, ASME Section XI, Code for Inservice Inspection of Nuclear Power Plant Components – Working Group Containment

Member, American Society of Civil Engineers

EXPERIENCE

2006 – present: US Nuclear Regulatory Commission, Rockville, MD

12/2013 – present: Senior Structural Engineer, Office of Nuclear Reactor Regulation (NRR) / Division of Engineering, Division of License Renewal

4/2007 – 4/2013: Structural Engineer, NRR/Division of Engineering

As a recognized technical specialist in the area of structural engineering, Dr. Thomas has vast regulatory experience performing complex technical reviews and safety evaluations involving a wide range of regulatory processes such as aging management of structures and components for license renewal and subsequent license renewal applications, license amendment requests, risk-informed licensing actions involving probabilistic risk analyses, relief requests, topical reports, codes and standards, regulatory guidance development, rulemaking, allegations and petitions, user-need research oversight, and reactor oversight inspections support to the NRC Regional offices.

Dr. Thomas has been involved in the aging management safety reviews of all three of the currently ongoing subsequent license renewal applications as well as several first license renewal applications. Specifically, Dr. Thomas's involvement in these reviews focused on aging effects of several concrete and structural degradation issues such as alkali-silica reaction of concrete, irradiation effects of concrete and reactor vessel support steel, the long-term impact of spent fuel pool and reactor cavity leakage on reinforced concrete, ground water in-leakage issues, containment liner corrosion, and post-tensioning system issues.

Dr. Thomas has provided significant technical expertise in the regulatory oversight and licensing safety reviews addressing several technically complex, first-of-a-kind, concrete degradation and structural issues in nuclear power reactors, including:

- Alkali-Silica Reaction (ASR) Concrete Degradation issue at Seabrook (structural performance and aging management programs);
- Concrete Shield Building Laminar Cracking issue at Davis-Besse (structural performance and aging management);
- Post-Tensioned Concrete Containment Wall Delamination issue at Crystal River, Unit 3;
- North Anna post-earthquake inspections and assessment activities, where ground motions exceeded the design basis; and
- Served on an expert working group that evaluated, using the reasonableness test, and provided insights to the decision-maker on the appeal of a differing professional opinion decision regarding the structural design adequacy of the AP-1000 Certified Design Shield Building as it relates to seismic margin/design and aircraft impact assessment, which used first-of-a-kind steel-plate concrete (SC) composite construction techniques for which a consensus standard did not then exist.

Dr. Thomas has made significant contributions to the NRC's codes and standards activities, as well as regulatory guidance development related to analysis, design, inservice inspection, and aging management of nuclear safety-related reinforced concrete structures. Dr. Thomas was a key technical member on all structural expert panels that addressed public comments on and revised the NRC guidance documents for Subsequent License Renewal (SLR) to 80 years, namely, the Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report and the Standard Review Plan for Review of for Subsequent License Renewal Applications for Nuclear Power Plants (SRP-SLR). Dr. Thomas's input on these documents focused specifically on aging management of degradation issues in safety-related concrete and steel structures. Dr. Thomas authored the new further evaluation guidance in the GALL-SLR and the SRP-SLR for evaluating irradiation effects on concrete structures near the reactor vessel. He contributed to the revision of the further evaluation guidance for ASR, as well as the NRC Information Notice (IN) 2011-20 issued to industry, based on the operating experience at Seabrook. Dr. Thomas participated in the development of Draft Regulatory Guide (DG)-1283 (Revision 3 to Regulatory Guide (RG) 1.142), "Safety-Related Concrete Structures for Nuclear Power Plants (Other than Reactor Vessels and Containments)," and DG-1284 (Revision 1 to RG 1.199), "Anchoring Components and Structural Supports in Concrete," which endorse, with regulatory positions, ACI 349-13, "Code Requirements for Nuclear Safety-Related Concrete Structures and Commentary."

Dr. Thomas interfaces with the NRC/Office of Research (RES) staff and keeps abreast of ongoing research and development activities and operating experience related to ASR concrete degradation. Dr. Thomas is the NRR lead for technical oversight of the ongoing NRC-sponsored research project "Structural Performance of Nuclear Power Plant Concrete

Structures Affected by ASR,” at the National Institute of Standards and Technology (NIST). He provided constructive feedback on critical issues and decision points during the design of experiments for multiple tasks, the concrete mix design and pour phase, and progress reports to ensure successful research outcome consistent with objectives. Dr Thomas also participated in periodic Joint NRC/DOE/EPRI Research Roadmap meetings of collaborative research in the areas of concrete degradation issues such as ASR and irradiation effects. Dr Thomas attended the 14th International Conference on Alkali-Aggregate Reaction hosted by the University of Texas at Austin in May 2012. He also participated in the NEA/CSNI Workshop on Assessment of Nuclear Structures Subject to Concrete Pathologies (ASCET) hosted by NIST in June 2015. Dr Thomas co-chaired technical sessions on “Alkali-Silica Reaction Degradation in Nuclear Concrete Structures” at the Regulatory Information Conference (RIC) in 2016 and 2018, with an eminent and diverse international panel of expert speakers. Dr Thomas serves as the co-lead for the NRC’s Technical Review Group (TRG) in the structural discipline, which tracks and evaluates national and international operating experience of structural issues (including concrete) in operating reactors and makes action recommendations (e.g., generic communications) for issues of safety significance.

5/2013 – 12/2013: Structural Engineer, Office of New Reactors (NRO)/Division of Engineering

Dr Thomas was the structural lead for the safety review of the US EPR design certification application in the areas related to analysis (including soil-structure interaction) and design of seismic category 1 reinforced and pre-stressed concrete structures, seismic margins assessment, and aircraft impact assessment and inspection. He was also involved with pre-application work related to the development of, and addressing public comments on, the design-specific review standard for the mPower small modular reactor that proposed to use steel-plate concrete composite construction for safety-related structures.

11/2006 – 3/2007: Structural Engineer, Office of Nuclear Regulatory Research (RES)

Dr. Thomas conducted confirmatory finite element analyses, using the LS-DYNA computer code, for qualification of spent fuel transportation casks for accidental drop.

1996 – 2006: Deputy Engineering Group Supervisor/Senior Civil Engineer, Bechtel Power Corporation, Frederick, MD

At Bechtel, Dr. Thomas worked on a variety of specialized assignments for the structural design, resident engineering/construction support, and modifications related primarily to nuclear power projects. Dr. Thomas conducted complex engineering activities related to steam generator replacement and reactor vessel head replacement projects, including design evaluations for creation and restoration of construction openings through concrete containments and shield buildings for numerous projects at operating nuclear power plants (e.g., Watts Bar, Sequoyah, Arkansas Nuclear One, Beaver Valley, Fort Calhoun, Byron, Braidwood, South Texas Project, Farley).

1992 – 1996: Research Assistant and Doctoral Candidate, Wind Engineering Research Center, Department of Civil Engineering, Texas Tech University, Lubbock, TX

Dr. Thomas provided technical assistance and conducted research, development, and consulting activities related to wind effects on buildings and structures (steel and concrete). He directed and coordinated the processing, validation, quality assurance, and archiving of the wind field data collected at the unique full-scale Wind Engineering Research Field Laboratory and made publicly available, upon request, for use in research.

1988 – 1991: Engineer, Engineers India Ltd, New Delhi, India

Dr. Thomas performed specialist tasks in analysis, design, development, and trouble-shooting of structural and mechanical systems related to oil and gas processing, and ocean engineering projects (e.g., analyses and design evaluation for life extension of tall concrete/steel refinery process columns; analysis/design of marine risers for offshore platforms, developed design standard for steel roof structures of oil storage tanks, 2-phase flow piping vibration mitigation).

1/1988 – 8/1988: Structural Engineer, Dept. of Structural Engineering, Anna University, and Engineering Services Ltd, Madras, India

Dr. Thomas performed seismic response spectrum analysis (using SAP 6) and design of dryer-separator pool gate in the reactor building of a power reactor; designed 7-span welded truss-girder railway bridge; designed a leaf-shaped concrete grid roof system for a conference center.

1985 – 1986: Engineer Trainee, Tata Consulting Engineers, Bangalore, India

Dr. Thomas assisted with the structural design of concrete structures and foundations (e.g., 225 meters tall reinforced concrete chimney, ash slurry pump house) for fossil power plants.