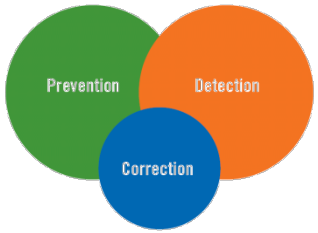


# Containment Dome Truss Seismic Analysis Methodology

## License Amendment Request

## Point Beach Nuclear Plant Units 1 & 2

## July 2015

# Agenda

- Introductions
- Purpose
- Overview
- History
- Current Status
- License Amendment Request
- Planned Modifications
- Summary
- Questions



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# Purpose

- **To provide a summary of the License Amendment Request being developed by NextEra Energy Point Beach**
  - The License Amendment Request addresses:
    - The seismic analysis methodology used to evaluate the containment dome truss and supported components
    - The structural analysis methodology used to evaluate dome truss components



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# Overview

**Unit 1 & 2 Containment Dome Truss Configuration**

**Unit 1 & 2 Containment Dome Truss Structures and Containment Spray piping ring headers have been reviewed and are currently:**

- Operable-but-Nonconforming to the design code of record (seismic loads)
  - AISC Steel Construction Manual, 6th Edition
  - USAS B31.1 – ’67 Ed. / ASME B&PV Sec. III ‘77 thru Winter of ’78
- Meets the NRC criteria for treatment as a legacy (i.e. old design) issue

**Unit 1 & 2 Containment structures are:**

- Operable-but-Nonconforming for post-accident thermal clearance

**License Amendment Request is for revised seismic and structural analysis methodology for the dome truss structures and attached components**

**Modifications are being developed to resolve the seismic and thermal nonconformance**



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# History

- Dome trusses were originally a construction aid for the containment dome
  - Subsequently, the Dome Trusses were used to support the Containment Spray ring headers and Containment Air Recirculation Cooling System ductwork
- 5/17/68 (pre-operation) document from Westinghouse indicated the trusses would be evaluated to meet the site seismic criteria
- 7/15/70 Bechtel letter reiterated a seismic analysis of the trusses with attached piping had been completed
- 10/18/89 Bechtel letter contained a dome truss evaluation for resisting dead loads during construction (concrete, liner plate, construction loads)
- 12/6/90 calculation by Sargent & Lundy (S&L) evaluated the trusses for seismic and deadweight loads without attached pipe loads
- 2/14/94 calculation by S&L analyzed containment spray piping and contained an open item to evaluate the dome truss with applied pipe loads



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# History

- August 2011 CDBI Inspection questioned resolution of open item in the 2/14/94 calculation (CR01677914 issued)
- August 2011 Stevenson & Associates (S&A) hired to perform preliminary review of 12/6/90 S&L calculation and containment spray piping calculations; concluded the trusses with attached piping loads were acceptable
- During CR01677914 resolution, 1990 S&L computer model could not be retrieved; new model created by S&A
- March 2012 During development of S&A model identified as-built configuration not in accordance with the Bechtel design drawing which was the basis for the S&L model; identified structural (seismic load) nonconformance
  - OBN classification (CR01750123 tracks resolution)
- 2012 and 2013 refueling outage walkdowns conducted to support modification development to correct structural (seismic load) nonconformance
  - Engineering Changes (EC) 276584, 276585 developed



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# History

- March 2014 RFO walkdown for modification planning, Unit 2 dome truss bearing box housing bolts found not centered as analyzed
  - EC 281403 implemented prior to Unit 2 startup to correct centering
- April 2014 Unit 1 electively taken offline; similar bearing box nonconformance identified
  - EC 281440 implemented prior to Unit 1 startup to correct centering
- April 2014, during Unit 1 repair, identified inadequate thermal growth clearance
  - POD 1962836-01 concludes Unit 1 is Operable-but-Nonconforming
  - POD 1962836-04 performed for extent-of-condition (Unit 2)
- August 2014, elective U2 outage, walkdowns were performed to assess thermal clearances
  - Unit 2 clearances identified as bounded by Unit 1 condition/evaluation

**Modifications Needed to Address Thermal Clearance and Seismic**



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# Current Status

## Seismic Modifications Developed (EC 276584, 276585)

- Involves the dome truss structures, spray piping supports, reroute ductwork and lighting
  - *Seismic modifications as currently developed do not address thermal clearance*

## Thermal Modifications Developed (EC 282198, 283096)

- Alter the truss structures to increase available clearance
  - *Implementation of the thermal clearance modifications using the existing current license basis results in adverse impact on seismic margins*

**Seismic and Thermal Modifications Developed to Address Nonconformance**



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# License Amendment Request

- **Overall Scope**
  - Revise seismic analysis methodology
    - Revise the in-structure response spectra and structural damping
    - Application limited to dome truss structures and supported equipment
  - Revise structural analysis methodology
    - Application limited to dome truss
    - Supplement the current code of record
  - Impacts the scope of seismic and thermal modifications

# License Amendment Request

- **Ground Motion Response Spectra (GMRS) developed by EPRI for Fukushima Near Term Task Force Recommendation 2.1**
  - Utilized to develop ground motion time-history
  - GMRS developed following the guidelines of Reg. Guide 1.208
- **Revise in-structure response spectra at dome truss elevation**
  - Soil structure interaction analysis performed
  - NUREG-0800 SRP 3.7.1 and 3.7.2 used as guidance
- **Revise damping values following the guidance of RG 1.61, Rev. 1:**

| | OBE | SSE |
|---|---|---|
| Dome Truss Bolted Steel w/bearing connections | 5% | 7% |
| Pre-stressed Concrete Containment | 3% | 5% |
| Containment Spray Lines | 3% | 4% |

**Use of EPRI GMRS Developed for NTTF Recommendation 2.1**

# License Amendment Request

- **Use ASME Section III Appendix F acceptance criteria to supplement the structural code of record**
  - Supplements structural code of record (AISC Steel Construction Manual, 6th Ed.)

- **Development of New Seismic/Temperature Limits for the dome truss**

**New Seismic/Temperature Limits for Dome Trusses**



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# Planned Modifications (in Conjunction with License Amendment Request)

- Provide additional restraint to the dome truss structures at six (6) support locations (seismic)
- Reinforce two (2) containment spray pipe supports (seismic)
- Modify the dome truss structures to increase clearance (thermal)
- Implementation anticipated to occur over two Refueling Outages for each Unit

**Seismic and Thermal Modifications**



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# Summary

## License Amendment Request for seismic and structural analysis methodology

- Ground Motion Response Spectra, damping, and soil structure interaction analysis
- Use of ASME Section III Appendix F and New Seismic/Temperature Limits
- Methodology limited in use to the dome truss structures and attached components

## Modifications to the truss structures and containment spray pipe supports to resolve seismic and thermal nonconformance

- License Amendment defines the scope of seismic and thermal modifications
- License Amendment required prior to implementing thermal modifications

**License Amendment for Seismic and Structural Analysis Methodology Modifications Correct Nonconformance**



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# Questions



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