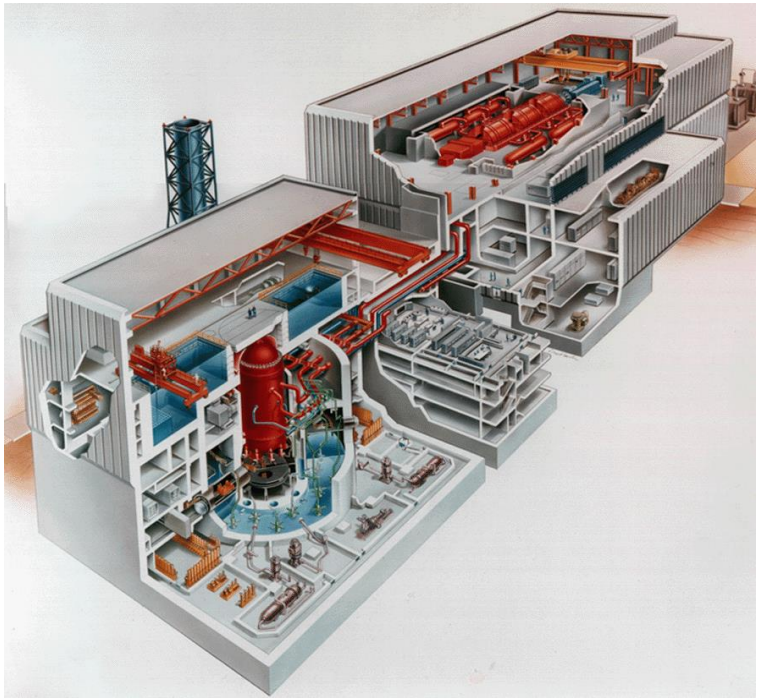
GE Hitachi
Nuclear Energy

ABWR Certification Renewal

NRC Public Meeting

March 2, 2017



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Purpose of Meeting

- Purpose of meeting is to:
  - Discuss DCD Changes made to Section 3.3.1.2 in response to RAI 02-1 (Supplement 2)
  - Propose clarifying changes
  - Address questions

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Background

GEH Response to RAI 02-1 (MFN 14-075 through Supplement 4):

- ABWR design basis code for structural design was not changed and is the ASCE/SEI 7-88/90 (see Reference 3.3-1 and Table 1.8-21).
- ABWR DCD was changed to address RG 1.221 design-basis hurricane wind speed and hurricane-generated missile velocities under extreme wind events corresponding to exceedance frequency of 10-7 per year.
- ABWR design-basis wind speeds are converted to velocity pressure loading (“qz” in Section 3.3.1.2) using the method and procedures prescribed in ASCE 7-88 /90.

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Discussion

- Response to RAI 02-1 modified Section 3.3.1.2 in response to NRC suggestion (1) in supplemental information (MFN-14-075, Supplement 2):

Page 3.3-1: 1st line in Sec. 3.3, delete "tornado and." Also, the formula listed in Sec. 3.3.1.2 is based on ASCE/SEI 7-90, suggest to update to ASCE/SEI 7-05 adopted in SRP 3.3.1 (the current 2007 version).

  - In response Supplement 2, GEH modified Section 3.3.1.2 to note that the formula for "qz" "given in Reference 3.3.1, which is consistent with that of ASCE/SEI 7-05." GEH did not update the design basis to ASCE/SEI 7-05.
  - GEH did not update to the 03/2007 version of SRP 3.3.1 (see Table 1.8-19).
  - In the original response, GEH updated Table 1.8-20 to reference RG 1.76 Revision 1 (03/2007) and RG 1.221 Rev. 0 (10/2011).

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Discussion

NUREG 1503, FSER, Section 3.3.1, Wind Design Criteria (page 3-14):

The procedures used to determine the loadings on structures induced by the design basis wind are acceptable because they have been used in the design of conventional structures and have been proven to provide a conservative basis that ensures that the structures will withstand such environmental forces. *(Emphasis added.)*

As explained below, GEH elected to remain with the ASCE 7-88 version, which was used for the original design certification wind loadings.

- Remains consistent with structural analyses for SC I R/B, C/B, and RWB.
- It continues to provide a conservative approach as compared to NRC SRP 3.3.1 (03/2007).
- It is not necessary to change to a later version to address hurricane wind and missiles under RG 1.221.

A COL Applicant may later elect to use a later ASCE 7 and SRP 3.3.1 under a departure.

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Discussion

- Additional Information:
  - ASCE 7-88/90 is a more conservative approach than that set forth in SRP 3.3.1 (03/2007).
  - Further review of RG 1.221 and NUREG/CR-7005 indicate that:
    - RG 1.221 does not require use of ASCE 7-05 as the design code, but rather uses ASCE 7-05 only as a basis for its simulation model (RG 1.221 makes multiple adjustments to that model to account for modeling inaccuracies such as asymmetries in model pressure fields and inability of the model to capture small-scale features such as extreme convective gusts).
    - The RG 1.221 model was also extended to cover the 10-million year event set.
    - Additionally, the wind contour plots for determining design-basis hurricane wind speeds in RG 1.221 and ASCE 7-05 are not consistent. The contour plots in RG 1.221 are larger by an order of magnitude of a minimum of 1.7.

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Discussion

- Conclusion:
  - ABWR design complies with RG 1.221 and ASCE 7-88/90.
  - GEH proposes to remove the change in response to RAI 02-1, Supplement 2, that creates confusion regarding the ASCE code:
    - Delete “which is consistent with that of ASCE/SEI 7-05” based on the information on previous slides.
      - DCD Section 3.3.1.2 would state the following:
      - The design wind velocity is converted to velocity pressure using the formula given in Reference 3.3-1:
    - Reference 3.3-1 is as follows (no change):

      3.3.4 References

      3.3-1 ANSI/ASCE 7, “Minimum Design Loads for Buildings and Other Structures”, November 27, 1990.

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Backup Slides – ABWR DCD Rev. 6

3.3.1.2 Determination of Applied Forces

The design wind velocity is converted to velocity pressure using the formula given in Reference 3.3.1 which is consistent with that of ASCE/SEI 7-05:

$q_z = 4.94 \times 10^{-5} K_z (IV)^2$

where K_z = The velocity pressure exposure coefficient which depends upon the type of exposure and height (z) above ground per Table 6 of Reference 3.3-1

I = The importance factor which depends on the type of structure; appropriate values of I are listed in Table 3.3-1

V = Design wind velocity with a recurrence interval of 50 years, in km/h, and

q_z = Velocity pressure in kPa

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Backup Slides – ABWR DCD Rev. 6

3.3.4 References

3.3-1 ANSI/ASCE 7, "Minimum Design Loads for Buildings and Other Structures", November 27, 1990.

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Backup Slides – ABWR DCD Rev. 6

Table 3.3-1 Importance Factor (I) for Wind Loads

Non-Safety-Related	Safety-Related
1.00	1.11

Notes:

(1) These values of (I) are based on Table 5 of Reference 3.3-1.

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Backup Slides – SRP 3.3.1 (03/2007)

3. The procedures used to transform the wind speed into an equivalent pressure to be applied to structures and parts, or portions of structures, as delineated in American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI) 7-05, "Minimum Design Loads for Buildings and Other Structures," are acceptable. In particular, the procedures used are acceptable if found in accordance with the following:

   A. For a design wind speed, V, the velocity pressure, q_z, evaluated at height, z, is given by:

$$q_z = 0.00256\, K_z K_{dt} K_d V^2 I \ (lb/ft^2)$$

   where:

   K_z = velocity pressure exposure coefficient evaluated at height, z, as defined in ASCE/SEI 7-05, Table 6-3, but not less than 0.87

   K_{dt} = topographic factor equal to 1.0

   K_d = wind directionality factor equal to 1.0

   V = design wind speed in miles per hour (mi/h) as stated in SRP Section 2.3.1

   I = importance factor equal to 1.15

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