ENCLOSURE 4

APP-GW-GLY-116 Revision 0,
"Responses to NRC Request for Addition Information (RAI) Letter No. 01 for WCAP-17938 - Subset 3,"

(Non-Proprietary)

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☐ Only the following plants:

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Description of Supplemental RAI Responses:

The supplemental RAI responses in this document are being issued as revisions to selected responses that are contained in the documents "Responses to NRC Request for Addition Information (RAI) Letter No. 01 for WCAP-17938 – Subset 1" (Westinghouse document numbers APP-GW-GLY-111 & -112) and "Responses to NRC Request for Addition Information (RAI) Letter No. 01 for WCAP-17938 – Subset 2" (Westinghouse document numbers APP-GW-GLY-113 & -114). The responses are being revised based on two Clarification Calls that were held with the NRC (dated August 4, 2016 and August 11, 2016).

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RAI Response Number: RAI - ICC&NMI – 013
Revision: A

Question:

The applicant is to explain/define the jet surface characteristics referred on the top of page 3-57 of the WCAP.

Westinghouse Response:

The discussion of the surface characteristics of an impinging jet were taken from Reference 3-15 of the WCAP.

Reference 3-15 used certain physical parameters to define the surface characteristics of the jet. The included dividing the jet into distinct regions

a. Region I was referred to as the region of flow establishment

b. Region II was referred to as the region of established flow

Regions I and II are shown below in Figure 1 taken from Reference 3-15:

a,c

These regions are primarily characterized by the development of the jet core and the rate of diffusion/mixing of the jet boundary layer with the atmosphere. The inviscid core (where no mixing occurs) and the area external to the core effect the jet surface characteristics, or more pertinent the size and velocity of the jet downstream of the nozzle.

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c. Region III is characterized as the region of flow deflection
d. Region IV is characterized as the wall jet region

Region III surface characteristics are affected by the rate of deceleration as the jet approaches the impingement surface. The decrease in local velocity results in an increase in local static pressure. Region IV is the developing wall jet region. The jet surface characteristics are primarily affected by the velocity profile which is coupled to the development of the inertial boundary layer.

Figure 2 below is also in the topical but is reproduced below for ease of review and shows all 4 jet regions:

a,c

Figure 2: All 4 regions of the jet from Reference 3-15

The bullet point in the topical referring to the jet surface characteristics stated that the jet spreading rate, velocity profile, and pressure distribution were not impacted when the plate was spaced ≥ 2D from the jet source for circular jets. It also went on to state:

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In a theoretical study reported by Levey (ref. 9) the effect of the impingement surface on the jet was not felt by the jet as close as only 1 slot width away from the surface; this study was for an idealized case (incompressible flow) with no account for viscous effects or turbulent mixing. An experimental study reported in reference 10 confirms the theoretical results; no surface effect on the jet was observed beyond about 2 jet diameters from the plate. Consequently, an impinging jet can be considered to behave like a free jet except in the immediate vicinity of the impingement surface.

The statement in Reference 3-15 referenced empirical data taken from:

10. Tani, I.; and Komatsu, Y.: Impingement of a Round Jet on a Flat Surface. Proceedings of the Eleventh International Congress of Applied Mechanics. Henry Görtler, ed., Springer-Verlag, 1966, pp. 672-676.

The statement regarding the behavior of the jet being analogous to the free jet except in the immediate vicinity of the impingement surface is referring to the ~~formation of the stationary shockwave that forms as a result of the rapid deceleration of the jet in the impingement region (Region III). This behavior is also addressed in the topical.~~ impinging jet described by Region III in the NASA Technical Paper. In this region as a result of jet impingement the jet flow rapidly decelerates and impinges on the surface. Since the jet is impinging on a surface in Region III it is not freely expanding and thus it is not behaving like a free jet, but an impinging jet. NUREG/CR-2913 and ANS 58.2 calculations of impingement pressure correspond to Region III of the jet model described in the NASA technical paper referenced in the topical. Therefore, there would be no impact in calculation of impingement pressure using ANS 58.2 or NUREG/CR-2913 in Region III as this is the express purpose of these models.

The NASA technical paper extended the jet model to Region IV which is the region of the jet post-impingement. NUREG/CR-2913 and ANS 58.2 models were silent regarding the jet behavior post-impingement. However, the NASA work substantiated with empirical data that after impingement the jet has released much of its energy and the Region IV jet is just not as destructive as the jet regions prior to impingement.

Design Control Document (DCD) Revision:

None

Topical Report (TR) Revision:

None

Supporting Reference Revision:

None

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RAI Response Number: RAI - ICC&NMI – 020
Revision: A

Question:

The applicant is to explain/clarify the second sentence in the 1st paragraph on page 3-72. It states that the NMI would probably experience [ ]a,c The staff noted that Figure 3-77 in the WCAP shows the ratio of the velocity profile of a Region IV jet and a free jet emitting radially from a jet source. Based on the comparison, the applicant concluded [ ]a,c Furthermore, the applicant is to explain/clarify Figure 3-77 including the definition of the terms in the equations included in the figure, the assumptions used, the application of NUREG/CR-2913, and how they are relevant to the AP1000 plant condition/configuration.

Westinghouse Response:

This sentence should be revised. The following evaluation will substantiate the region of the jet impacting the NMI.

To determine which region of the jet the NMI will experience a simplified calculation is presented. For the AP1000 RV confinement ratio of [ ]a,c the jet can potentially experience the core region emanating from the break source [ ]a,c or it could experience the developing wall jet after impinging on the reactor vessel. In order to determine which the jet area just prior to impinging on the RV will be determined.

From ANS 58.2 the jet area can be determined from Eq. C-6:

$$\frac{A_j}{A_{je}} = \left[1 + \frac{L}{L_a}\left(\frac{A_a}{A_{je}} - 1\right)\right]$$

Where:

A_j = Area of the jet from the break plane to the axial distance L

[

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]a,c–H/D = 2.57; H = 4.71 ft and the core length as communicated in the topical (L_c/D=1.78; L_c= 3.26ft) this would correspond to Region I of the jet (L_c>L), but outside of the core region.]a,c This is because as depicted in the Figure below the jet core diameter decreases with increasing distance from the break plane due to mixing of the jet boundary with the atmosphere.

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a,c

It is known and understood from the Two Phase Model Review performed by Graham Wallis (ML050830344), that ANS 58.2 tends to over-predict the location of the asymptotic plane. Since this could also result in an over-prediction of the jet spreading rate it is important to understand the impacts if the jet were located in Region IV as indicated in the figure above. The topical provides Region IV velocities in the specific location of the NMI and shows if the jet impacts the NMI after impinging on the reactor vessel the impingement pressure would be much lower. This is understood as the Region IV velocity is about 20% of the velocity prior to impinging on the reactor vessel and the impingement is essentially the stagnation pressure which is given as:

$$P_0 = P_s + \frac{1}{2}\rho V^2$$

The velocity is a 2nd order variable in the stagnation pressure equation, so if the NMI were impacted by a Region IV jet it would be expected that the impingement pressure would be much less than if impacted by a Region I or II jet. This makes sense as much of the jet energy will be transmitted to the impingement surface and will not be available to impinge on the NMI.

Figure 3-77 in the topical taken from Reference 3-15 was provided to show the actual values of the jet velocity after impinging on the RV surface. This corresponds to the jet velocity in the developing wall jet or Region IV as described in Reference 3-15. Figure 3-77 is reproduced below to facilitate review:

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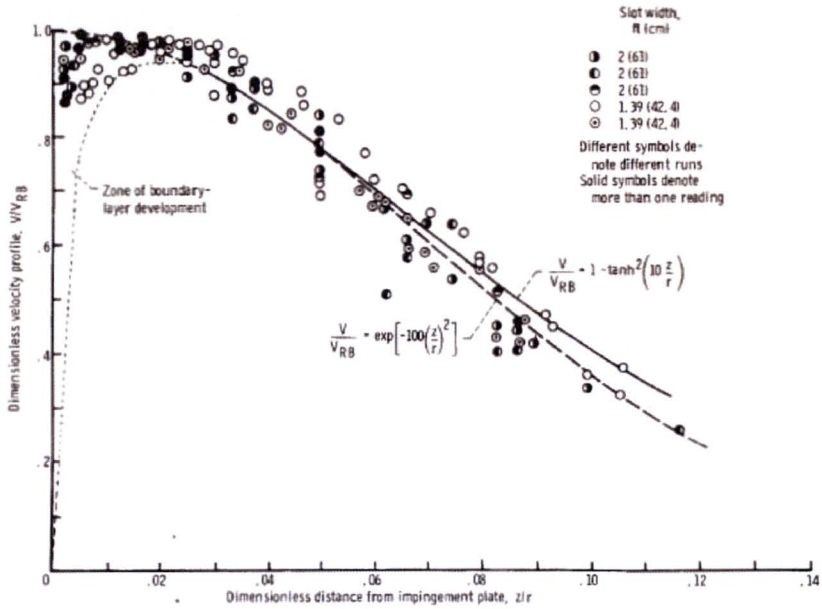

Figure 10. - Velocity distribution in region of radial flow (region IV). (From ref. 1.)

Figure 3-63 is also needed to interpret the information in Figure 3-77. Figure 3-63 is reproduced below for ease of review.

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a,c

[ ]

The abscissa in Figure 3-77 represents the axial distance from the impingement plate divided by the radial distance from the jet centerline. The ordinate in Figure 3-77 represents the Region IV wall jet velocity profile. The following provides a definition of symbols and equations in Figure 3-77:

V = actual velocity of the Region IV wall jet based on radial distance from jet stagnation point and axial distance from the impingement plate. For the AP1000 this is the RV.

V_{RB} = is the centerline velocity at r of a hypothetical free jet issuing radially from the stagnation point. Note at z=0 and r=0 this corresponds to the free jet impingement velocity at the centerline stagnation point.

The equations on Figure 3-77 are different theoretical models developed to predict the jet velocity distribution. They were plotted with the data to show how the theoretical predictions compared to the experiments (data points). For the topical submittal the theoretical models were not employed, only the data was used when determining the jet velocity at the NMI location via visual approximation.

So, for the AP1000 configuration [

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as shown in Figure 3-77.]^{a,c} This means the actual jet velocity at the NMI location is about 20% of the velocity at the centerline stagnation point on the RV.

a,c

[ ]

Using the theoretical equations from Figure 3-77 for the AP1000 z/r would obtain:

For Solid Line in Figure 3-77

[

]^{a,c}

From looking at Figure 3-77 it appears for predicting the velocity ratio in the wall jet the dashed line gives accurate answers for increasing values of z/r. Therefore the value in the WCAP of [ ]^{a,c} is valid.

In summary, according to ANS 58.2 predictions the jet will impinge on the NMI in Region I outside the jet core. The predictions for jet impingement pressure from NUREG/CR-2913 are valid because this methodology is for predicting the jet impingement pressure prior to impingement on a surface. However, if due to conservatisms in ANS 58.2 the jet doesn't result in a Region I impingement but a Region IV impingement then the jet impingement pressure would be much lower than that developed for a Region I assessment. This is based on the discussion above which showed through experimental data that the NMI location in a Region IV jet would result in at least an 80% decrease in velocity. The decrease in velocity and its

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contribution to the stagnation pressure ensure the Region IV jet impingement would be less severe than the Region I jet impingement.

The topical substantiates for the AP1000 confinement ratio of [ ]^{a,c} that there is no difference in the jet pressure as compared to a free jet. This confirms the applicability of ANS 58.2 and NUREG/CR-2913 for jet impingement pressure predictions.

Design Control Document (DCD) Revision:

None

Topical Report (TR) Revision:

WCAP-17938 Revision 2 "AP1000 In-Containment Cables and Non-Metallic Insulation Debris Integrated Assessment" will be revised with the following text in Section 3.5.4.5, pg 3-72, first paragraph:

The following changes to the topical will be implemented.

Reference 3-16 was developed to predict the direct jet impingement on a target resulting from a jet emanating from a jet source. ~~The NMI would probably experience [~~]^{a,c} Using Equation C-6 in ANS 58.2 confirms that the jet region which impacts the NMI is Region I outside the jet core. This confirms the applicability of the jet impingement prediction using Reference 3-16. However, it is known that ANS 58.2 conservatively overpredicts the asymptotic plane and jet area. [ ]^{a,c} ~~So, the application of Reference 3-17 is conservative as it assumes the velocity is the reference velocity V_{RB}.~~ What this means physically is that placing the NMI at the jet centerline stagnation point of the test facility resulted in a conservative test condition as compared to what the jet would actually experience in the plant configuration.

Supporting Reference Revision:

None

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RAI Response Number: RAI - ICC&NMI – 022
Revision: 0

Question:

Section 4.3 of the WCAP states that if no piping analyses have been performed for the RCS main loop piping application, then a doubled-ended guillotine break (DEGB) assuming the full hot leg or cold leg pipe inner diameter must be evaluated; however, other reasonable best estimate assumptions may still be employed in the analysis (page 4-5 of the WCAP). The applicant is to explain/identify other reasonable best estimate assumptions which may be employed in the analysis.

Westinghouse Response:

~~As stated earlier in the 2nd paragraph of Section 4.3, the Region II analyses allow credit for more realistic analytical methods and assumptions including credit for limited pipe displacement; operation of non-safety systems, structures, and components; and operator actions where applicable. If a limited pipe displacement analysis is not performed, credit can still be taken for operation of non-safety systems, structures, and components; and operator actions where applicable in any Region II analysis. In addition, best estimate assumptions which may be made include credit for robust intervening structures other than floors, ceilings, or module walls to truncate the ZOI, as well as credit for nominal coating dry film thickness rather than design maximum dry film thickness should the Region II analyses be applied to an evaluation of coating debris.~~

~~Additional text is required to reiterate allowable realistic analytical methods and assumptions in Region II analyses.~~

~~If no piping analyses have been performed for the RCS main loop piping application, then a DEGB assuming the full hot leg or cold leg pipe inner diameter must be evaluated; however, other reasonable best estimate assumptions including operation of non-safety systems, structures, and components; operator actions where applicable; may still be employed in the Region II analysis.~~

At this time no credit for better estimate assumptions or operator actions were assumed in the Region II assessment. Credit for better estimate assumptions or operator actions is not part of the scope of the review of the topical submittal.

Design Control Document (DCD) Revision:

None

Topical Report (TR) Revision:

WCAP-17938 Revision 2 "AP1000 In-Containment Cables and Non-Metallic Insulation Debris

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Integrated Assessment"

The following statement will be added to Section 4.3 to specify the limitations of any best estimate assumptions:

~~"The Westinghouse application of best estimate assumptions permitted by the Region II analysis shall be limited to the following: [~~

~~]a,c, should the Region II analyses be applied to an evaluation of coating debris."~~

The Region II analysis includes evaluations of break sizes in the RCS main loop piping (hot and cold) greater than the debris generation break size defined in the Region I analysis (approximately 11.188 inches in equivalent diameter), and up to a DEGB of the largest pipe in the RCS. The Region II analysis considers only RCS main loop piping because all primary-side attached auxiliary piping is fully addressed as part of the Region I analysis.

The Region II analysis is performed in the same manner and with the same methods used in the baseline analyses with respect to ZOI models and assumptions; however, the Region II analysis allows for more realistic analytical methods and assumptions: credit can be taken for limited pipe displacement; operation of non-safety systems, structures, and components; and operator actions where applicable. Crediting a limited pipe displacement requires the application of results from pipe break analyses and/or pipe stiffness analyses that may be utilized to limit the maximum break size to be evaluated. If no piping analyses have been performed for the RCS main loop piping application, then a DEGB assuming the full hot leg or cold leg pipe inner diameter must be evaluated; however, other reasonable best estimate assumptions may still be employed in the analysis. If structural analyses have been performed for the RCS main loop piping showing that limited pipe displacement, also referred to as a limited separation break, will occur, then an equivalent break diameter as determined for the limited separation break may be used to determine the ZOI for the Region II analysis.

For the Region II assessment Region I assumptions were employed. No credit was taken for better estimate assumptions, or operator actions. For the purposes of this topical it is assumed the Region II analysis employs Region I assumptions. Credit for best estimate assumptions or operator actions beyond that explicitly allowed for the Region I assessment is beyond the scope of this topical report.

Supporting Reference Revision:

None

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RAI Response Number: RAI - ICC&NMI – 023
Revision: A

Question:

As indicated in Section 4.3.2 of the WCAP, the geometry of a limited separation break is discussed in ANSI/ANS 58.2-1988 (Reference 4-4 of the WCAP). The jet geometry of circumferential break with limited separation is shown in Figures 4-1 and 4-2 of the WCAP. It should be noted that Reference 4-4 defines a limited separation break as having an axial displacement of less than or equal to 0.5 diameter and a lateral displacement of less than or equal to the pipe wall thickness. However, the applicant indicates that this definition is extended for the purpose of AP1000 Region II analyses to include lateral displacements greater than the pipe wall thickness and up to 1 diameter. The staff also noted that Section 4.3.2.2 of the WCAP provides an equation for the equivalent diameter of such a limited separation break, [

]^{a,c} The applicant is to explain/justify the extension of Reference 4-4 definition of a limited separation break, the jet geometry for such a limited separation break, and the basis of the equations provided in Section 4.3.2.2 of the WCAP.

Westinghouse Response:

ANSI/ANS 58.2-1988 defines a limited separation break as having an axial displacement less than or equal to 0.5 diameter and a lateral displacement less than or equal to the pipe wall thickness. This is to ensure that the break flow area for the limited separation break is less than or equal to the break flow area for the double ended guillotine break (DEGB);

$A_{DEGB} = 2*(\pi*(D_e)^2/4) = \pi*D_e^2/2.$

$_{ALimited_Max} = \pi *D_e*W_f$, where $W_f = D_e/2$;

therefore, $A_{Limited_Max} = \pi *D_e^2/2$,

so $A_{DEBG} = A_{Limited_Max}$.

For all instances where $W_f > D_e/2$, the ANSI/ANS 58.2-1998 methodology considers the break to be equivalent to a DEGB.

The Staff Evaluation on NEI 04-07 discusses the Region II Analysis and defines a limited separation break as a break of up to 1 diameter in lateral separation, "The Region II analysis methods described in Section 6.4 are applicable for any breaks in the RCS main loop piping (hot, cold, and crossover piping) greater than the DGBS specified in Section 6.2 (approximately 196.6 square inches) and up to a DEGB of the largest pipe in the RCS" and "Additionally, considering piping restraints and supports or other plant structural members that can be shown through analysis to limit pipe movement to less than 1-diameter lateral displacement may be acceptable to the staff; however, because the limiting break location must be evaluated, these locations may not produce the limiting conditions for sump analyses."

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Regardless of specific jet shape the centerline pressure, which is the key parameter of focus for practical application of the bounding spherical ZOI, of both the limited separation break and the double ended guillotine break are proportional to the characteristic lengths, W_f and D_e, and not necessarily the break flow area. This is discussed in the paragraphs prior to Section 4.~~2.3.1~~3.2.1. As a result, the centerline pressure at a given distance from the break, L, would actually be lower for a limited separation break of $W_f = D_e/2$ than for a DEGB with diameter D_e. This is discussed further in Section 4.4.3. A simple comparison of the location of the asymptotic plane for a 22" full-separation DEGB and a limited separation circumferential break in a 22" pipe with W_f = 11" shows that the asymptotic plane is located at a distance from the break of approximately 10.3D while the distance is reduced to approximately 7.3D for the circumferential break with the same flow area.

While the industry has guidance for limited separation breaks with no axial displacement and limited separation breaks with very limited lateral displacement, no guidance exists for break scenarios featuring both break types, up to a full DEGB. The method proposed in this WCAP to fill this gap by scaling the spherical ZOI based on a sum of the characteristic diameters of both break types is believed to be conservative for the purpose of generating a sphere that will envelop the centerline destruction pressure for a given material. ~~It should also be noted that the application of the circumferential break model beyond its recommended bounds of application, while understood to not be a true representation of the postulated jet, tends to predict a larger volume and longer centerline jet reach than the DEGB model when considering the proposed characteristic length methodology. For example, a circumferential break in a 22" pipe with W_f = 11" has half the characteristic length of a DEGB in the same pipe; however, the reach of the asymptotic plane is greater than half the distance (7.3D as compared to 10.3D from the example given above). Similarly, the volume of this jet up to the asymptotic plane is approximately 2/3 that of the DEGB jet volume up to the asymptotic plane. Thus, the circumferential break geometry was favored in the comparison to the spherical ZOI where possible.~~ The justification for this conservatism is found in Table 4-1 of the topical which is reproduced below for ease of review.

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Table 1: Table 4-1 from the topical submittal.

a,c

[ ]

Column 3 in the above table shows the ZOI radius for a 4D ZOI based on the methodology outlined in the topical. Column 4 shows what the ZOI radius would be if the approved ZOI model approved for use per NEI-04-07 were employed. What this shows is that the ZOI radius would be about two times that of the approved methodology.

Also it is of importance to note that the ZOI volume in Column 6 for the fully separated 14 inch Schedule 160 pipe is greater than that in Column 9 for the fully separated 22 inch CL pipe. What this means is that the methodology employed in the topical submittal for the 14 inch Sch. 160 fully separable break configuration **yielded a larger ZOI volume at 4D than that of a fully separable DECLG break configuration at 4D.** This justifies that the method for extending the applicability of the jet model is applicable and sufficiently conservative.

In addition to the discussion provided above, the method used by Westinghouse to define the Region II break diameter is conservative to the method presented in ANSI/ANS 58.2-1998 methodology for limited displacement / limited separation breaks as discussed in Section 4.3.2. Whereas the ANSI/ANS 58.2-1998 methodology defines a limited separation break as having an axial displacement of less than or equal to 0.5 diameter and a lateral displacement of less than or equal to the pipe wall thickness, the Westinghouse approach extends the ANSI/ANS 58.2-1988 methodology to include an axial displacements (W_f) of less than or equal to 0.5 pipe inner diameter and a lateral displacements (d) greater than the pipe wall thickness and up to 1 pipe inner diameter. Using this extended method, the equivalent diameter, $D_{equivalent}$, of such a limited separation break can actually be larger than the limiting DGBS diameter but less than the DEGB diameter because both the axial and lateral displacements are considered in the equivalent break diameter.

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$$D_{equivalent}=W_f + D_{Lateral}$$

As shown in Section 4.4.3 of the WCAP, the use of the extended methodology can result in a larger and more conservative break diameter than if the ANSI restrictions were maintained. The application of this method is discussed and presented in Section 4.4.2 in conjunction with the hot leg and cold leg displacement results from the ANSYS LS-DYNA analysis presented in Table 4-3. The five cases presented in Section 4.4.3 show the conservative nature of this method. For example, the total lateral flow area of Case 3 is larger than the DGBS flow area resulting in the use of a spherical ZOI based on a full cold leg break diameter of 22.00 inches (Section 4.4.3.2.1) for breaks in the nozzle gallery. Case 4 has a total lateral flow area smaller than the DGBS flow area but results in the use of larger break diameter (12.05 inches versus 11.188 inches) at the reactor coolant pump because $D_{equivalent}$ was found to be greater than the inner diameter of the 14-inch Schedule 160 pipe (11.188 inches) as described in Section 4.4.3.2.2.

Design Control Document (DCD) Revision:

None

Topical Report (TR) Revision:

~~The following report will be revised as a result of this RAI:~~

~~WCAP-17938 Revision 2 (APP-GW-GSR-012 Revision 2) "AP1000 In-Containment Cables and Non-Metallic Insulation Debris Integrated Assessment"~~

~~Section 4.4.3 will be edited as follows:~~

~~As a qualitative method of comparing the circumferential break jet expansion geometries with limited separation to the full separation DEGB jet expansion geometry, a simplified volumetric comparison was proposed. Using the methodology outlined in Appendix C of Reference 4-4, the volume of the expanding jet for each of the five DEGB scenarios with limited separation would be determined up to the asymptotic plane. This jet volume accounts for the entirety of jet Regions I and II, rather than specific isobars. The Region I and II volumes for each limited separation DEGB scenario would be compared to the volume of Regions I and II of the expanding jet, up to the asymptotic plane, for both ends of a DEGB with full separation for a 14-inch Schedule 160 pipe. The Region I and II volumes were selected for comparison because the pressure at the asymptotic plane, which serves as the end plane of jet Region II in both models, is assumed to reach absolute ambient pressure; therefore, the pressure is the same at the end of each jet model. This method was chosen as a simplified alternative to the calculation and comparison of jet isobars using the circumferential limited separation jet model and the full separation jet model. The described comparison is intended to provide reasonable assurance that, for instances where $D_{equivalent}$ is less than the 14-inch Schedule 160 break diameter, the axial component of the limited separation break is bounded by the spherical ZOI for a 14-inch Schedule 160 break. The jet geometries described above are shown in Figure 4-8.~~

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~~While the industry has guidance for limited separation breaks with no axial displacement and limited separation breaks with very limited lateral displacement, no guidance exists for break scenarios featuring both break types, up to a full DEGB. The method proposed in Section 4.3.2 to fill this gap by scaling the spherical ZOI based on a sum of the characteristic diameters of both break types is believed to be conservative for the purpose of generating a sphere that will envelop the centerline destruction pressure for a given material based on the discussion of the spherical model in Section 4.2. It should also be noted that the application of the circumferential break model beyond its recommended bounds of application, while understood to not be a true representation of the postulated jet geometry, tends to predict a larger volume and longer centerline jet reach than the DEGB model when considering the proposed characteristic length methodology. For example, a circumferential break in a 22 inch pipe with W_f = 11 inches has half the characteristic length of a DEGB in the same pipe; however, the reach of the asymptotic plane is greater than half the distance (7.3D as compared to 10.3D from the example given above). Similarly, the volume of this jet up to the asymptotic plane is approximately two thirds of that of the DEGB jet volume up to the asymptotic plane. Thus, the circumferential break geometry is favored in the comparison the spherical ZOI where possible.~~

Based on the above description and the fact that Table 4-1 is contained within the submittal it is recommended no additional changes to the topical need be made.

Section 4.4.2, identifies **Table 4-1** for the results of five postulated break locations. This will be changed to **Table 4-3.**

Sections 4.4.3, 4.4.3.1.1, 4.4.3.1.2, 4.4.3.2.1, 4.4.3.2.2, 4.4.3.2.3 identify **Table 4-1** for the results of LS-DYNA evaluation. This will be changed to **Table 4-3.**

Supporting Reference Revision:

None

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RAI Response Number: RAI - ICC&NMI – 026
Revision: 0

Question:

Section 4.4.3.1.2 of the WCAP states that [

]a,c. The applicant is to clarify the discrepancy [
]a,c.

Westinghouse Response:

Section 4.4.3.1.2 states, [

]a,c

This statement is unclear due to a typographical error and inadequate explanation. The statement is intended to describe [

]a,c

Design Control Document (DCD) Revision:

None

Topical Report (TR) Revision:

WCAP-17938 Revision 2 "AP1000 In-Containment Cables and Non-Metallic Insulation Debris Integrated Assessment" will be revised to include the following text in Section 4.4.3.1.2, ~pg 4-17:

"[

]a,c"

Along with the following text revision in Section 4.4.3.1.2:

[

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]a,c

And revision to 4.4.3.2.2:

[

]a,c

And revision to 4.4.3.2.3:

[

]a,c

Supporting Reference Revision:

None

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RAI Response Number: RAI - ICC&NMI – 031
Revision: 0

Question:

Clarify the discussion in the last paragraph in Subsection 3.6.2.4 regarding [

]a,b,c, please clarify this in the discussion.

Westinghouse Response:

The last paragraph in Subsection 3.6.2.4 indicating [

]a,b,c

Based on these statements from the test report, the final paragraph in Section 3.6.2.4 should be deleted and replaced with new text.

Design Control Document (DCD) Revision:

None

Topical Report (TR) Revision:

WCAP-17938 Revision 2 "AP1000 In-Containment Cables and Non-Metallic Insulation Debris

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Integrated Assessment" Section 3.6.2.4 last paragraphs, ~pg 3-80 will be revised with the following text:

~~Sample 2 [~~

~~]a,b,c~~

~~Sample 6 [~~

~~]a,b,c~~

[

]a,b,c

Supporting Reference Revision:

None

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RAI Response Number: RAI - ICC&NMI – 034
Revision: A

Question:

As discussed in Section 5.1.2, aging effects of [

]a,c

Westinghouse Response:

Question RAI - ICC&NMI – 034A: [

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]a,c

Calculations:

[

]a,c

Question RAI - ICC&NMI – 034B: [
adequately in the proposed design.

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]a,c

Design Control Document (DCD) Revision:

None

Topical Report (TR) Revision:

None

Supporting Reference Revision:

None