ArevaEPRDCPEm Resource

From: WILLIFORD Dennis (AREVA) [Dennis.Williford@areva.com]
Sent: Wednesday, May 29, 2013 5:40 PM
To: Snyder, Amy
Cc: Gleaves, Bill; ANDERSON Katherine (EXTERNAL AREVA); DELANO Karen (AREVA); HONMA George (EXTERNAL AREVA); LEIGHLITER John (AREVA); LEWIS Ray (EXTERNAL AREVA); ROMINE Judy (AREVA); RYAN Tom (AREVA); SHEPHERD Tracey (AREVA); VANCE Brian (AREVA); KOWALSKI David (AREVA); WADKINS George (EXTERNAL AREVA); BALLARD Bob (AREVA)
Subject: Advanced Response to U.S. EPR Design Certification Application RAI No. 473 (5531), FSAR Ch. 6, Question 06.02.05-24
Attachments: Advanced Response to RAI 473 Question 06 02 05-24 US EPR DC.pdf

Amy,

Attached is an Advanced Response for RAI 473, Question 06.02.05-24 in advance of the June 28, 2013 final date.

To keep our commitment to send a final response to this question by the commitment date, we need to receive all NRC staff feedback and comments no later than **June 20, 2013**.

Please let me know if NRC staff has any questions or if the response to this question can be sent as final.

Sincerely,

Dennis Williford, P.E.
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
7207 IBM Drive, Mail Code CLT 2B
Charlotte, NC 28262
Phone: 704-805-2223
Email: Dennis.Williford@areva.com

From: WILLIFORD Dennis (RS/NB)
Sent: Tuesday, May 14, 2013 5:05 PM
To: Amy.Snyder@nrc.gov
Cc: bill.gleaves@nrc.gov; ANDERSON Katherine (External AREVA NP INC.); DELANO Karen (RS/NB); HONMA George (EXT); LEIGHLITER John (RS/NB); LEWIS Ray (External RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); SHEPHERD Tracey (RS/NB); VANCE Brian (RS/NB); KOWALSKI David (RS/NB); BALLARD Bob (EP/PE); KLEIN Daniel (EP/PE)
Subject: Response to U.S. EPR Design Certification Application RAI No. 473 (5531), FSAR Ch. 6, Question 06.02.05-24 - STATUS

Amy,

AREVA provided a schedule for an Advanced Response to RAI 473, Question 06.02.05-24 in letter NRC:13:012 (dated April 12, 2013) of May 14, 2013 with a final response date of June 28, 2013. A revised schedule for the Advanced Response to this RAI 473 question is provided below:

Question #	Advanced Response Date

RAI 473 — 06.02.05-24	**May 28, 2013**

The final response date for this question remains unchanged.

Sincerely,

Dennis Williford, P.E.
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
7207 IBM Drive, Mail Code CLT 2B
Charlotte, NC 28262
Phone: 704-805-2223
Email: Dennis.Williford@areva.com

From: WILLIFORD Dennis (RS/NB)
Sent: Friday, February 24, 2012 3:10 PM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); GUCWA Len (External RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 473 (5531), FSAR Ch. 6, Supplement 5

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to the single question in RAI 473 on April 7, 2011. Supplement 1, Supplement 2, Supplement 3 and Supplement 4 responses to RAI 473 were provided on June 10, 2011, October 7, 2011, January 6, 2012 and January 19, 2012, respectively, to revise the schedule for responding to Question 06.02.05-24.

The schedule for a technically correct and complete response to the remaining question has been changed, as provided below. This schedule was transmitted to the NRC in AREVA NP letter NRC:12:008 dated February 21, 2012.

Question #	Response Date
RAI 473 — 06.02.05-24	**June 28, 2013**

Sincerely,

Dennis Williford, P.E.
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
7207 IBM Drive, Mail Code CLT 2B
Charlotte, NC 28262
Phone: 704-805-2223
Email: Dennis.Williford@areva.com

From: WILLIFORD Dennis (RS/NB)
Sent: Thursday, January 19, 2012 3:37 PM
To: Getachew.Tesfaye@nrc.gov

Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); GUCWA Len (External RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 473 (5531), FSAR Ch. 6, Supplement 4

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to the single question in RAI 473 on April 7, 2011. Supplement 1and Supplement 2 responses to RAI 473 were provided on June 10, 2011 and October 7, respectively, to revise the schedule for responding to Question 06.02.05-24. Supplement 3 response sent on January 6, 2012 provided a preliminary revised schedule for a response to this question.

The preliminary schedule for a technically correct and complete response to the single question has been revised as provided below. This schedule is being reevaluated and a new supplement with a revised schedule will be transmitted by February 21, 2012.

Question #	Response Date
RAI 473 — 06.02.05-24	**February 21, 2012**

Sincerely,

Dennis Williford, P.E.
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
7207 IBM Drive, Mail Code CLT 2B
Charlotte, NC 28262
Phone: 704-805-2223
Email: Dennis.Williford@areva.com

From: WILLIFORD Dennis (RS/NB)
Sent: Friday, January 06, 2012 11:30 AM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); GUCWA Len (External RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 473 (5531), FSAR Ch. 6, Supplement 3

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to the single question in RAI 473 on April 7, 2011. Supplement 1 and Supplement 2 responses to RAI 473 were provided on June 10, 2011 and October 7, 2011, respectively, to revise the schedule for responding to Question 06.02.05-24.

A preliminary revised schedule for a technically correct and complete response to the single question is provided below. This schedule is being reevaluated and a new supplement with a revised schedule will be transmitted by January 25, 2012.

Question #	Response Date
RAI 473 — 06.02.05-24	**January 25, 2012**

Sincerely,

Dennis Williford, P.E.
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
7207 IBM Drive, Mail Code CLT 2B
Charlotte, NC 28262
Phone: 704-805-2223
Email: Dennis.Williford@areva.com

From: WILLIFORD Dennis (RS/NB)
Sent: Friday, October 07, 2011 4:39 PM
To: Getachew.Tesfaye@nrc.gov
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); GUCWA Len (External RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 473 (5531), FSAR Ch. 6, Supplement 2

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to the single question in RAI 473 on April 7, 2011. Supplement 1 response to RAI 473 was provided on June 10, 2011 to revise the schedule for responding to Question 06.02.05-24.

The schedule has been has been changed as provided below:

Question #	Response Date
RAI 473 — 06.02.05-24	**January 11, 2012**

Sincerely,

Dennis Williford, P.E.
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
7207 IBM Drive, Mail Code CLT 2B
Charlotte, NC 28262
Phone: 704-805-2223
Email: Dennis.Williford@areva.com

From: WILLIFORD Dennis (RS/NB)
Sent: Friday, June 10, 2011 5:21 PM
To: Tesfaye, Getachew
Cc: BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB); GUCWA Len (External RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 473 (5531), FSAR Ch. 6, Supplement 1

Getachew,

AREVA NP Inc. (AREVA NP) provided a schedule for a technically correct and complete response to the single question in RAI 473 on April 7, 2011.

The schedule has been has been changed as provided below:

Question #	Response Date
RAI 473 — 06.02.05-24	October 12, 2011

Sincerely,

Dennis Williford, P.E.
U.S. EPR Design Certification Licensing Manager
AREVA NP Inc.
7207 IBM Drive, Mail Code CLT 2B
Charlotte, NC 28262
Phone: 704-805-2223
Email: Dennis.Williford@areva.com

From: WELLS Russell (RS/NB)
Sent: Thursday, April 07, 2011 8:10 AM
To: Tesfaye, Getachew
Cc: GUCWA Len (External RS/NB); Miernicki, Michael; BENNETT Kathy (RS/NB); DELANO Karen (RS/NB); ROMINE Judy (RS/NB); RYAN Tom (RS/NB)
Subject: Response to U.S. EPR Design Certification Application RAI No. 473 (5531), FSARCh. 6

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 473 Response US EPR DC.pdf" provides a schedule since a technically correct and complete response to the 1 question is not provided.

The following table indicates the respective page in the response document, "RAI 473 Response US EPR DC.pdf," that contains AREVA NP's response to the subject question.

Question #	Start Page	End Page
RAI 473 — 06.02.05-24	2	2

A complete answer is not provided for 1 of the 1 question. The schedule for a technically correct and complete response to this question is provided below.

Question #	Response Date
RAI 473 — 06.02.05-24	June 15, 2011

Sincerely,

Russ Wells
U.S. EPR Design Certification Licensing Manager
AREVA NP, Inc.
3315 Old Forest Road, P.O. Box 10935
Mail Stop OF-57
Lynchburg, VA 24506-0935
Phone: 434-832-3884 (work)
434-942-6375 (cell)
Fax: 434-382-3884
Russell.Wells@Areva.com

From: Tesfaye, Getachew [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Monday, March 07, 2011 7:48 PM
To: ZZ-DL-A-USEPR-DL
Cc: Grady, Anne-Marie; Jackson, Christopher; McKirgan, John; Carneal, Jason; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 473 (5531), FSARCh. 6

Attached please find the subject request for additional information (RAI). A draft of the RAI was provided to you on February 15, 2011, and on March 4, 2011, you informed us that the RAI is clear and no further clarification is needed. As a result, no change is made to the draft RAI. The schedule we have established for review of your application assumes technically correct and complete responses within 30 days of receipt of RAIs. For any RAIs that cannot be answered within 30 days, it is expected that a date for receipt of this information will be provided to the staff within the 30 day period so that the staff can assess how this information will impact the published schedule.

Thanks,
Getachew Tesfaye
Sr. Project Manager
NRO/DNRL/NARP
(301) 415-3361

Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 4516

Mail Envelope Properties (554210743EFE354B8D5741BEB695E65617B319)

Subject: Advanced Response to U.S. EPR Design Certification Application RAI No. 473 (5531), FSAR Ch. 6, Question 06.02.05-24
Sent Date: 5/29/2013 5:39:51 PM
Received Date: 5/29/2013 5:40:12 PM
From: WILLIFORD Dennis (AREVA)

Created By: Dennis.Williford@areva.com

Recipients:
"Gleaves, Bill" <Bill.Gleaves@nrc.gov>
Tracking Status: None
"ANDERSON Katherine (EXTERNAL AREVA)" <katherine.anderson.ext@areva.com>
Tracking Status: None
"DELANO Karen (AREVA)" <Karen.Delano@areva.com>
Tracking Status: None
"HONMA George (EXTERNAL AREVA)" <George.Honma.ext@areva.com>
Tracking Status: None
"LEIGHLITER John (AREVA)" <John.Leighliter@areva.com>
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Tracking Status: None
"ROMINE Judy (AREVA)" <Judy.Romine@areva.com>
Tracking Status: None
"RYAN Tom (AREVA)" <Tom.Ryan@areva.com>
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Tracking Status: None
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Tracking Status: None
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Tracking Status: None
"BALLARD Bob (AREVA)" <Robert.Ballard@areva.com>
Tracking Status: None
"Snyder, Amy" <Amy.Snyder@nrc.gov>
Tracking Status: None

Post Office: FUSLYNCMX03.fdom.ad.corp

Files	**Size**	**Date & Time**	
MESSAGE	10997	5/29/2013 5:40:12 PM	
Advanced Response to RAI 473 Question 06 02 05-24 US EPR DC.pdf			1792071

Options
Priority: Standard
Return Notification: No
Reply Requested: No
Sensitivity: Normal

Expiration Date:
Recipients Received:

Advanced Response to

Request for Additional Information No. 473(5531), Question 06.02.05-24

03/07/2011

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 06.02.05 - Combustible Gas Control in Containment
Application Section: 6.2.5

QUESTIONS for Containment and Ventilation Branch 1 (AP1000/EPR Projects)
(SPCV)

Question 06.02.05-24:

OPEN ITEM

Follow-up to RAI 372, Question 06.02.05-15

In the US EPR FSAR, chapter 19.2.4.4.5.2, the applicant lists the equipment and instrumentation in containment which must withstand the conditions expected to occur during a severe accident. This equipment is also identified in Table 19.2-2, "SAHRS Design and Operating Parameters" and in Table 19.2-3, "Severe Accident Instrumentation and Equipment", (in containment equipment and instrumentation only).

In the response to RAI 372, Question 06.02.05-15 (supplement 4), AREVA has indicated that their primary source for performance expectations of equipment similar to that described above can be found in EPRI NP-4354, "Large-Scale Hydrogen Burn Equipment Experiments," December 1985. In this report, equipment types including pressure transmitters, MOV valve operators, limit switches, containment penetrations, RTDs and electric cables were tested in the presence of hydrogen burns. The increase in temperature of the tested equipment was noted and the operability post burn was noted. The relevance of the EPRI test results depends on two factors – the similarity of the design between the AREVA specified equipment and the devices tested by EPRI, and the equivalence of the EPRI burn conditions with those of the US EPR containment temperature and pressure during hydrogen burning.

The staff asks the applicant to:

a. provide a justification, item by item, that the equipment identified above as requiring a survivability assessment is sufficiently similar to the equipment tested by EPRI in 1985, and;

b. to provide the temperature and pressure vs. time throughout the containment during a hydrogen burn in an amount equivalent to that generated from a fuel clad-coolant reaction involving 100% of the fuel cladding. Provide a description of the scenario modeled, and address whether or not the PARs were credited as functioning.

Response to Question 06.02.05-24:

Item a:

In the Response to RAI 372, Supplement 4, Question 06.02.05-15, a detailed discussion was presented regarding the performance of similar equipment and instrumentation in containment at the environmental conditions created by hydrogen burning. Technical justification for each type of equipment was provided based on engineering principles as to how the equipment would be affected by a hydrogen burn from both the increased temperature and pressure. The impact on its required severe accident function and operability was evaluated and assessed against its primary performance criteria required during a severe accident.

The EPRI report, EPRI NP-4354, "Large-Scale Hydrogen Burn Equipment Experiments," December 1985, describes one method of demonstrating reasonable assurance that severe accident equipment can perform their functions during and following a severe accident. Suppliers of severe accident equipment will be required to provide reasonable assurance e that their equipment will survive the likely environs specified in the equipment specifications.

Vendors can also provide their own environmental testing results for their equipment, calculations and analysis, operational experience, and other applicable data, or a combination thereof. The vendor could therefore use the EPRI report test results as an option to show and provide documentation demonstrating that their equipment is sufficiently similar to the equipment that was tested.

Consequently, an item by item justification, showing the equipment identified in the Response to RAI 372, Question 06.02.05-15 is sufficiently similar to the equipment tested by EPRI, is not possible at this time because this information is vendor-specific and is not available until after the procurement phase is completed.

U.S. EPR FSAR Tier 2, Section 19.2.4.4.5.2 will be revised to clarify that the testing described in EPRI NP-4354 represents only one method of demonstrating reasonable assurance of equipment survivability during a hydrogen burn.

Item b:

Part (b) of Question 06.02.05-24 refers to the equivalence of the EPRI burn conditions with those of the U.S. EPR containment temperature and pressure vs. time during a hydrogen burn.

The Response to Part (a) of Question 06.02.05-24 states that the EPRI NP-4354 report test methodology and results are only one option to demonstrate reasonable assurance that the component withstands the conditions expected to occur during a hydrogen burn. Other representative methods are environmental test results, calculations and analysis or operational experience. The component specific mission time and expected environmental conditions, including the duration, pressure and temperature of a hydrogen burn, will be described in the applicable equipment specification for the component as part of the procurement process.

A general comparison between the EPRI test conditions and the expected hydrogen burn condition in the U.S. EPR containment is therefore not practical for the equipment listed in U.S. EPR FSAR Tier 2, Table 19.2-2—SAHRS Design and Operating Parameters and U.S. EPR FSAR Tier 2, Table 19.2-3—Severe Accident Instrumentation and Equipment. A comparison will only be required if a vendor decides to directly credit the EPRI report as a basis for the equipment survivability of a dedicated component.

The adiabatic isochoric complete combustion (AICC) pressure and global containment pressure are given in U.S. EPR FSAR Tier 2, Figure 6.2.5-14—AICC Global Pressure and Containment Pressure for Most Limiting Severe Accident Scenario.

The containment dome temperature and global AICC temperature are presented in a new U.S. EPR FSAR Tier 2, Figure 6.2.5-15—Global AICC Temperature and Dome Temperature from a Realistic Burn.

The AICC pressure and temperature are based on 100 percent fuel cladding oxidation and 100 percent passive autocatalytic recombiner (PAR) efficiency. A theoretical scenario of 100 percent fuel cladding oxidation and only 50 percent PAR efficiency would result in a slightly higher maximum AICC pressure of around 100 psia (compared to about 85 psia at 100 percent PAR efficiency) and a maximum global AICC temperature of around 1450°F (compared to about 1350°F at 100 percent PAR efficiency). The theoretical maximum expected burn temperature can be higher in certain compartments with a locally increased hydrogen concentration. All

given AICC pressures and temperatures are based on the LOOP_TR scenario which models a Loss of Offsite Power with a high pressure end state.

The highest predicted global AICC pressure and local temperature is also based on the MAAP4 LOOP_TR scenario. The maximum temperature is predicted in the upper equipment rooms of Loop 1 which reach a theoretical spike temperature of 2518°F, for 100 percent PAR efficiency, that last only for seconds. A slightly higher local temperature spike could occur in case of a PAR efficiency of less than 100 percent. The discussion above compared the global AICC temperature of about 1450°F at 50 percent PAR efficiency compared to about 1350°F at 100 percent PAR efficiency. The delta in the global temperature for the above cases is ~100°F.

The limiting pressure and temperature loads based on global AICC for the hydrogen combustion analysis are equivalent to those predicted for the U.S. EPR containment dome given in U.S. EPR FSAR Tier 2, Figure 6.2.5-14 and Figure 6.2.5-15.

With respect to AICC pressure and temperatures, the following two points must be considered.

- The AICC pressure and temperatures are theoretical values only that cannot be reached because actual combustion is not adiabatic, isochoric, or complete. U.S. EPR FSAR Tier 2, Figure 6.2.5-15 depicts containment dome temperature of about 700°F, which is a realistic hydrogen burn temperature, whereas the AICC temperature of around 1350°F is a theoretical value.
- A hydrogen combustion load is relatively brief (on the order of seconds) and does not result in a significant increase in equipment temperature.

U.S. EPR FSAR Tier 2, Section 6.2.5.3.2, will be revised to reflect this information.

References:

1. AREVA NP Document 32-9106202-004, “U.S. EPR Containment Combustion and Severe Accident Loads.”
2. AREVA NP Document 126-9049988-002, “Uncertainty Analysis of Severe Accident Scenarios for U.S. EPR Ex-vessel Safety Issues.”
3. AREVA NP Document 51-7014129-000, “Severe Accident Equipment Conditions: 100% In-Vessel Hydrogen Production, Supporting Chapter 6.2.5.”

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 6.2.5.3.2 will be revised, and a new Figure 6.2.5-15 added, as described in the response and indicated on the enclosed markup.

U.S. EPR FSAR Tier 2, Section 19.2.4.4.5.2 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR Final Safety Analysis Report Markups

In Figure 6.2.5-11, the hydrogen release through the cycling of the pressurizer relief valves can be clearly observed. This cycling continues for approximately five hours; at which point, the depressurization valves are opened. Upon opening the flow path between the primary system and the lower containment volumes, the steam and hydrogen quickly fills these compartments with a hydrogen and steam mixture, allowing for rapid depressurization of the primary system.

Since this is a rapid depressurization from a full pressure state, the accumulators will also start to inject, pushing more hydrogen and steam out of the primary system into containment. This water also causes a slight increase in the oxidization prior to quenching the core debris.

Because of these factors, the hydrogen concentration in a few containment nodes, exceed the 10 percent criteria as anticipated. Because of the short nature of these peaks, the hydrogen and steam concentrations for these nodes were plotted separately in Figure 6.2.5-13. From this figure, it can be concluded that:

- The peak is extremely short in duration.
- The volumes contain a large amount of steam.

Based on Figure 3.3.5.4-1 of Reference 32, the plot of hydrogen and steam concentrations show that the hydrogen concentration remains significantly below the hydrogen concentration required to support deflagration to detonation transition (DDT). It is therefore concluded that the U.S. EPR containment's hydrogen mitigation system is sufficient to reduce the hydrogen from 100 percent active fuel cladding to a value that will prevent a detonation within containment, (i.e., the 10 percent regulatory requirement).

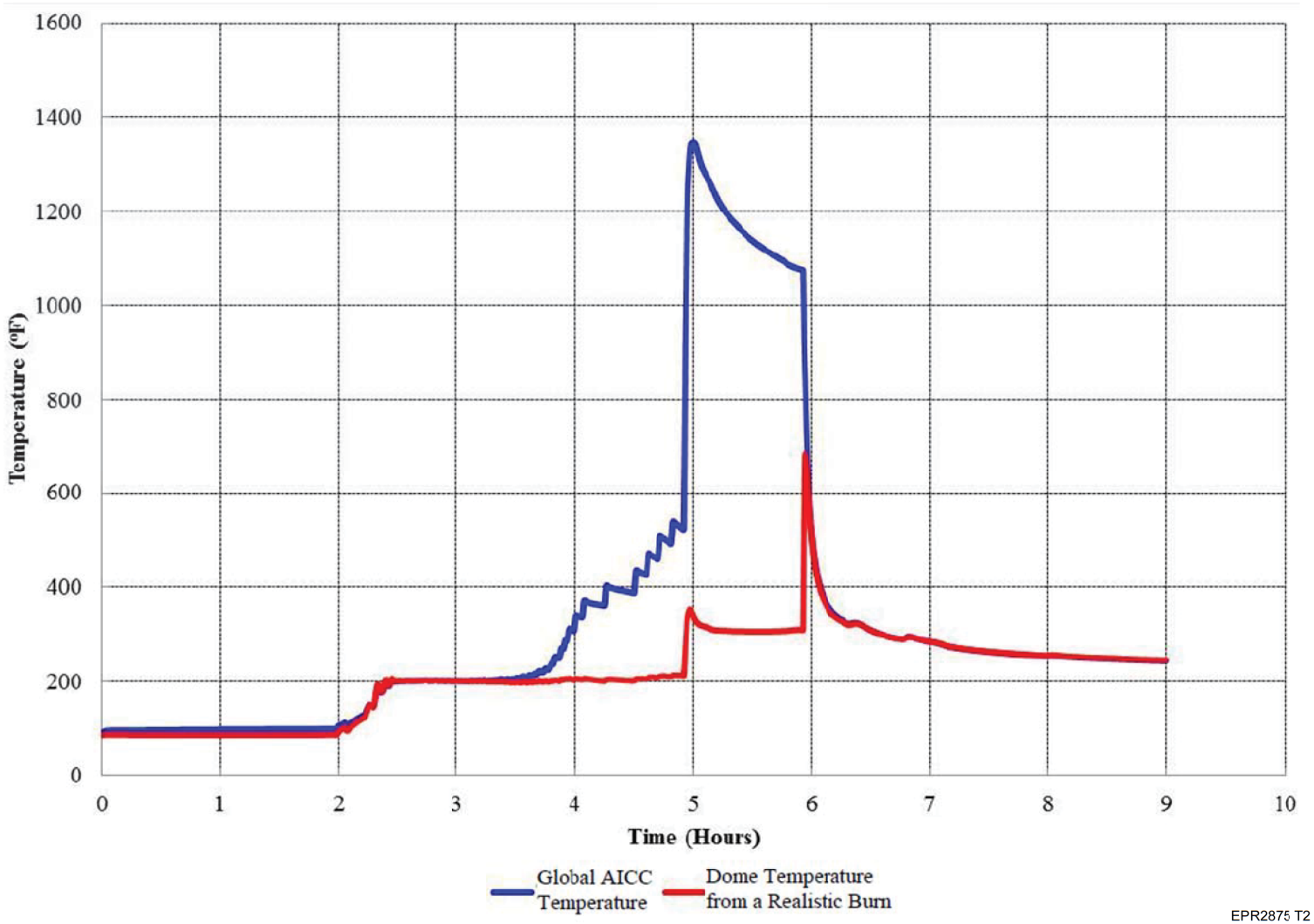
Containment Performance

The results of the analysis for containment response to a global deflagration show that the containment can withstand a global deflagration without a loss of integrity. Figure 6.2.5-14 shows the AICC pressure versus time, which remains below the ultimate capacity pressure for the U.S. EPR containment contained in Table 3.8-6.

Figure 6.2.5-15 shows the containment dome temperature from a realistic hydrogen burn and the global ACC temperature. Note that AICC pressure and temperatures are theoretical values that cannot be reached because actual combustions are not adiabatic, isochoric or complete.

~~Severe accident evaluations are presented in Section 19.2 including a detailed analysis of combustible gas control. For representative and bounding scenarios, those evaluations show that within the containment atmosphere:~~

Figure 6.2.5-15—Global AICC Temperature and Dome Temperature from a Realistic Burn



their safety-related function during design bases events, the equipment necessary for mitigating the severe accident consequences is required to provide a reasonable level of confidence that it will function in a severe accident environment for the necessary time span. This requirement is referred to as "equipment survivability" and is different from "equipment qualification," which is terminology used for the level of assurance provided for equipment necessary for design basis accidents. This implies that the equipment survivability assessment may be performed with a practical engineering approach accompanying best-estimate accident environments.

Different methodologies such as analysis, calculations or data~~Data~~ and test results obtained from type testing, industry experience, or test facilities can justify the operability and survivability of selected equipment and instrumentation. One example of~~The primary source for~~ performance expectations of similar equipment in severe accident environments is EPRI NP-4354 (Reference 21). This information is supplemented by NUREG/CR-5334 (Reference 22). The chamber conditions during these tests envelop those calculated for the U.S. EPR severe accident scenarios. Results of the Industry Degraded Core Rulemaking program (IDCOR) on equipment survivability provide further reassurances that selected equipment has the ability to survive and to perform its function.

Equipment specifications will define the applicable mission time and expected containment conditions during a severe accident for the equipment based on equipment location. Hydrogen burns will be considered in the equipment specifications as appropriate.

The containment integrity is maintained by the containment isolation valves, equipment hatch and airlocks, containment penetrations, and the containment structure itself. A structural analysis of the reactor containment dead-weight loads, prestressing loads, and the internal pressure load due to hydrogen burning was conducted and showed that the liner is within allowable levels of strain. Containment isolation valves are closed early during the accident progression prior to RPV failure when the threat of hydrogen burning is greatest. Their function of closing is unaffected by the conditions created from burning. The performance of leak-tightness by the containment penetrations is not affected by the combustion of hydrogen. Containment isolation valves and penetrations were tested during the EPRI NP-4354 (Reference 21) and NUREG/CR-5334 (Reference 22) tests. Neither test resulted in mechanical degradation that would impact the capability of the components to maintain leak-tightness. Equipment hatch and airlocks are designed to be pressure resistant and airtight (see Section 3.8.2). The seals are embedded in grooves on the flanges and are protected from temperature spikes. The additional pressure load resulting from a spike will compress the seals and enhance contact between mating surfaces. The large metal structure will act as a heat sink over the long run. The components that provide containment isolation are classified as safety grade and are