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Subject: PWR Owners Group
Transmittal of PWROG-15014-NP, Revision 0, "Dry Cask Storage PRA Peer Review Criteria," (PA-RMSC-1027)

References:

1. NRC email from Keven Coyne to Roy Linthicum dated October 28, 2014.

The purpose of this letter is to transmit Pressurized Water Reactor Owners Group (PWROG) Topical Report, PWROG-15014-NP, Revision 0, "Dry Cask Storage PRA Peer Review Criteria," (PA-RMSC-1027) for information only, as requested in the Reference 1 email. The report is not submitted for NRC review and approval pursuant to the provisions of 10 CFR 170.11(a)(1)(iii)(A) and a TAC number should not be opened associated with PWROG-15014-NP, Revision 0.

This report is begin provided for information as requested [Reference 1] to support the NRC in their activities with regard to the development of NRC Research Level 3 PRA Model.

Correspondence related to this transmittal should be addressed to:

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D048
NRR

If you have any questions, please do not hesitate to contact me at (205) 992-7037 or Mr. W. Anthony Nowinowski, Program Manager of the PWR Owners Group, Program Management Office at (412) 374-6855.

Sincerely,

Norman J Stringfellow

Jack Stringfellow
Chairman and Chief Operating Office
PWR Owners Group

NJS:WAN:rfn

Enclosure 1: PWROG-15014-NP, Revision 0 (for information only) (Non-Proprietary)

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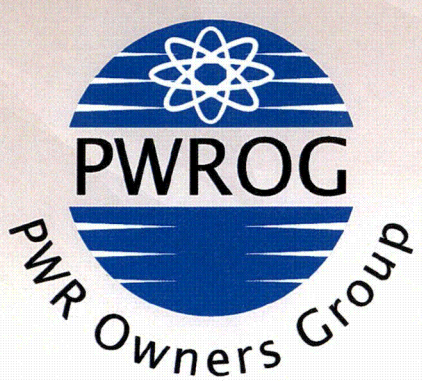


PWROG-15014-NP
Revision 0

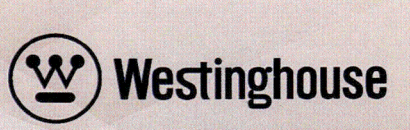
WESTINGHOUSE NON-PROPRIETARY CLASS 3

Dry Cask Storage PRA Peer Review Criteria

Risk Management Committee

PA-RMSC-1027

July 2015



PWROG-15014-NP
Revision 0

Dry Cask Storage PRA Peer Review Criteria

PA-RMSC-1027

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July 2015

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The participants of the Dry Cask Storage PRA Requirements Workshop co-sponsored by the Nuclear Regulatory Commission (NRC) and the PWROG on January 27-29, 2015:

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Utility Member	Plant Site(s)	Participant	
		Yes	No
Ameren Missouri	Callaway (W)	X	
American Electric Power	D.C. Cook 1 & 2 (W)	X	
Arizona Public Service	Palo Verde Unit 1, 2, & 3 (CE)	X	
Dominion Connecticut	Millstone 2 (CE)	X	
	Millstone 3 (W)	X	
Dominion VA	North Anna 1 & 2 (W)	X	
	Surry 1 & 2 (W)	X	
Duke Energy Carolinas	Catawba 1 & 2 (W)	X	
	McGuire 1 & 2 (W)	X	
	Oconee 1, 2, & 3 (B&W)	X	
Duke Energy Progress	Robinson 2 (W)	X	
	Shearon Harris (W)	X	
Entergy Palisades	Palisades (CE)	X	
Entergy Nuclear Northeast	Indian Point 2 & 3 (W)	X	
Entergy Operations South	Arkansas 1 (B&W)	X	
	Arkansas 2 (CE)	X	
	Waterford 3 (CE)	X	
Exelon Generation Co. LLC	Braidwood 1 & 2 (W)	X	
	Byron 1 & 2 (W)	X	
	TMI 1 (B&W)	X	
	Calvert Cliffs 1 & 2 (CE)	X	
	Ginna (W)	X	
FirstEnergy Nuclear Operating Co.	Beaver Valley 1 & 2 (W)	X	
	Davis-Besse (B&W)	X	
Florida Power & Light \ NextEra	St. Lucie 1 & 2 (CE)	X	
	Turkey Point 3 & 4 (W)	X	
	Seabrook (W)	X	
	Pt. Beach 1 & 2 (W)	X	
Luminant Power	Comanche Peak 1 & 2 (W)	X	

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United States Member Participation* for PA-RMSC-1027

Utility Member	Plant Site(s)	Participant	
		Yes	No
Omaha Public Power District	Fort Calhoun (CE)	X	
Pacific Gas & Electric	Diablo Canyon 1 & 2 (W)	X	
PSEG – Nuclear	Salem 1 & 2 (W)	X	
South Carolina Electric & Gas	V.C. Summer (W)	X	
So. Texas Project Nuclear Operating Co.	South Texas Project 1 & 2 (W)	X	
Southern Nuclear Operating Co.	Farley 1 & 2 (W)	X	
	Vogtle 1 & 2 (W)	X	
Tennessee Valley Authority	Sequoyah 1 & 2 (W)	X	
	Watts Bar 1 & 2 (W)	X	
Wolf Creek Nuclear Operating Co.	Wolf Creek (W)	X	
Xcel Energy	Prairie Island 1 & 2 (W)	X	

* **Project participants as of the date the final deliverable was completed. On occasion, additional members will join a project. Please contact the PWR Owners Group Program Management Office to verify participation before sending this document to participants not listed above.**

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Utility Member	Plant Site(s)	Participant	
		Yes	No
Asociación Nuclear Ascó-Vandellòs	Asco 1 & 2 (W)	X	
	Vandellos 2 (W)	X	
Axpo AG	Beznau 1 & 2 (W)	X	
Centrales Nucleares Almaraz-Trillo	Almaraz 1 & 2 (W)	X	
EDF Energy	Sizewell B (W)	X	
Electrabel	Doel 1, 2 & 4 (W)	X	
	Tihange 1 & 3 (W)	X	
Electricite de France	58 Units	X	
Eletronuclear-Eletrobras	Angra 1 (W)	X	
Eskom	Koeberg 1 & 2 (W)	X	
Hokkaido	Tomari 1, 2 & 3 (MHI)	X	
Japan Atomic Power Company	Tsuruga 2 (MHI)	X	
Kansai Electric Co., LTD	Mihama 1, 2 & 3 (W)	X	
	Ohi 1, 2, 3 & 4 (W & MHI)	X	
	Takahama 1, 2, 3 & 4 (W & MHI)	X	
Korea Hydro & Nuclear Power Corp.	Kori 1, 2, 3 & 4 (W)	X	
	Hanbit 1 & 2 (W)	X	
	Hanbit 3, 4, 5 & 6 (CE)	X	
	Hanul 3, 4 , 5 & 6 (CE)	X	
Kyushu	Genkai 1, 2, 3 & 4 (MHI)	X	
	Sendai 1 & 2 (MHI)	X	
Nuklearna Electrarna KRSKO	Krsko (W)	X	
Ringhals AB	Ringhals 2, 3 & 4 (W)	X	
Shikoku	Ikata 1, 2 & 3 (MHI)	X	
Taiwan Power Co.	Maanshan 1 & 2 (W)	X	

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1 INTRODUCTION

In the Nuclear Regulatory Commission's (NRC's) staff Commission paper (SECY-11-0089, July 7, 2011), options were provided for undertaking Level 3 probabilistic risk assessment (PRA) activities. In a staff requirements memorandum (SRM), dated September 21, 2011, the Commission directed the staff to conduct a full-scope, comprehensive site Level 3 PRA.

The scope of the NRC's efforts to develop a Level 3 PRA is quite broad, including the development of a new Level 1 PRA and Level 2 PRA. The scope includes internal fire and internal flood, as well as external hazards, such as seismic and high winds risk, at power and during low power/shutdown operating states. The scope included all sources of radiological release (e.g., spent fuel pool, dry cask storage system), and multi-unit risk.

Recognizing the need for a high level of quality assurance, the NRC decided to perform PRA peer reviews, using a process similar to the industry's practice. To ensure independence and consistency, the NRC requested that the Pressurized Water Reactor Owners Group (PWROG) provide PRA peer review leads. The PWROG agreed, and by the end of 2014, three PRA peer reviews had been completed.

As the NRC continued to work on the dry cask storage PRA, it was recognized that performing a PRA peer review was problematic. There is no existing standard, trial-use standard, or draft standard that would articulate the requirements needed for a dry cask storage PRA. The standards developing organizations (SDOs) working on PRA standards (i.e., American Society of Mechanical Engineers, ASME, and American Nuclear Society, ANS) have not identifed a stakeholder need to produce such a standard. As such, the NRC requested that the PWROG develop a set of requirements that could be used by the NRC for a self-assessment, and could be used by a PRA peer review team.

The PWROG compiled a preliminary, draft document containing requirements, as adapted from some of the current standards. At the NRC's request, a workshop was held January 27-29, 2015 at the NRC's Church Street offices. This workshop was co-sponsored by the PWROG and the NRC, and, as such, was a public meeting. This document provides the results of that workshop and a set of requirements that can be used to conduct a dry cask storage PRA peer review.

Section 1.1 discusses the purpose of this report and the aforementioned workshop. Section 1.2 discusses the process by which this document was generated. Section 1.3 discusses the scope of the dry cask storage PRA, and correspondingly the scope of this document vis-à-vis the existing standards that were used as a basis. Section 2 contains the table with the technical characteristics and attributes of a dry cask storage PRA (to provide a common benchmark), and a series of tables with an assessment of existing supporting requirements as to their applicability to a dry cask storage PRA. The assessment categories are explained in Section 1.2. Definitions of terms related to dry cask storage system process are provided in Appendix A.

1.1 PURPOSE

The purpose of this report is to document the results of the Dry Cask Storage PRA Requirements Workshop. The workshop was held January 27-29, 2015 at the Church Street Offices of the NRC; this workshop was co-sponsored by the PWROG and the NRC, and, as such, was a public meeting. This section will discuss the purpose of the workscope and identify the participants.

The purpose of the workshop was to:

- Support the NRC's dry cast storage PRA development and peer review
- Provide an informal set of requirements that can be used for self-assessment and to conduct a peer review
- Come to a reasonable consensus (PWROG and NRC) on the requirements

It was stressed at the workshop that the objective (and this document) were not to be construed as a standard or substitute standard; the goal was not to develop a rigorous PRA standard. The standard industry has not expressed any interest in developing a dry cask storage PRA standard. Further, it is understood that the "base" standards being modified were developed for power reactor PRAs, and as such (despite revisions and replacements) still retain the "flavor" and structure (wording) of reactor-centric supporting requirements. Dry cask storage PRA developers and peer review teams need to be aware of this constraint as this document is applied. An effort was made in revsing the supporting requirements in the tables in Section 2 to change the reactor-centric language to language appropriate for a dry cask storage system and process PRA; however, it is recognized that some language may have not have been revised. The users of this document are reminded to keep the context in mind as supporting requirements are used and interpreted to bridge the gap where the original language remains. Further, due to the references in the source standards to "internal-events PRA," "internal-events at-power PRA," "Part 2," "Level 2 PRA," etc., the reader is cautioned to understand that such references actually refer to the appropriate analysis to support the dry cask storage system PRA (and the not the original source standard analyses). This caveat is necessary as every reference has not been identified and included in the table in Section 2. This document can be referenced as a PWROG document, but it has no standing in the standards community.

The participants of the workshop were:

<u>NRC</u>

- Mary Drouin
- Michael Call
- Felix Gonzalez (part-time)
- Kevin Coyne (part-time)
- Alan Kuritzky (part-time)
- Brian Wagner (part-time)

Industry
- David E. McCoy, Westinghouse Electric Company
- Stanley H. Levinson, AREVA Inc.
- Melinda J. Higby, Westinghouse Electric Company
- Thomas Zachariah, Nuclear Energy Institute
- Paul Amico, Jensen Hughes
- Barry D. Sloane, ERIN Engineering
- Eileen M. Supko, Energy Resources International, Inc. (ERI)
- Karl N. Fleming, KNF Consulting Services LLC (part-time)
- Roy Linthicum, Exelon (part-time)

1.2 PROCESS

The basic approach to develop requirements for a dry cask storage PRA suitable for a self-assessment and to support a PRA peer review was to identify the portions of current PRA standards that would be applicable to a dry cask storage PRA, and then review each of the supporting requirements and assess the degree of applicability. When not fully applicable, some modification of the supporting requirements would be necessary.

As a precursor to assessing supporting requirements, the technical elements characteristics and attributes for a dry cask storage PRA were developed, based on similar information in Regulatory Guide (RG) 1.200 [1]. These were reviewed during the workshop; the result of that effort is provided in Section 2.1. In the course of this review, the following questions were considered:

- Have the correct technical elements been identified?
- Are there any technical elements missing?
- For each technical element, is there sufficient description (bullets)? Are there any bullets that are missing?

The initial review of supporting requirements include Part 2 (internal events) (see Table 2.2), Part 5 (seismic, deemed the most relevant external hazard for dry cask storage) (see Table 2.4), Part 6 (screening, deemed the most likely mechanism for other external hazards) (see Table 2.3), and Level 2 PRA (see Table 2.5). Some of the groundrules used during the initial assessment process included:

- Supporting requirements were taken from the ASME/ANS PRA Standard (Addendum A) [2] (Part 2, Part 6), ASME/ANS PRA Standard (Addendum B) [3] (Part 5), the trial use Level 2 PRA Standard (ANS/ASME RA-S-1.2-2014) [4], and ASME/ANS Non-LWR PRA Standard [5] (POS supporting requirements in Table 2-6).
- In general, only the supporting requirement under Capability Category II was considered.
- All references to core damage frequency (CDF) and large early release frequency (LERF) were changed to "specified end state metric" (or equivalent)

- The supporting requirements could be assessed as one of the following:
  - Revise – the supporting requirement language is revised to reflect the application of a dry cask storage PRA; in general, this does not change the intent of the supporting requirement.
  - Replace – replace an existing supporting requirement with a new one.
  - Not Applicable – the supporting requirement need not be reviewed as a part of a dry cask storage PRA peer review.
  - Suitable – the supporting requirement is suitable as written to be included in a dry cask storage PRA peer review.
  - New – a new supporting requirement is needed to support a dry cask storage PRA peer review.
- Some high level requirements required revision to reflect the nature of a dry cask storage PRA. These changes are indicated in the tables in Section 2. Where no change is needed, these high level requirements were deemed suitable.

In the course of review supporting requirements and their assessment during the workshop, the following questions were considered:

- Are there supporting requirements assessed as "suitable" that should be otherwise assessed? If so, why?
- Are there supporting requirements assessed as "not applicable" that should be otherwise assessed? If so, why?
- Are the specified modifications to the supporting requirements working appropriate, if not, suggest an alternative.
- Are there any new supporting requirements unique to a dry cask storage PRA that should be added?

1.3 SCOPE

There are different aspects of scope that need to be defined for this document. First is the PRA scope. As noted in Section 1.2, the supporting requirements of Part 2 (internal events), Part 5 (seismic), Part 6 (screening), and Level 2 PRA. During the workshop, the need for a PRA technical element that corresponded to Plant Operating States (POSs) of a low power/shutdown (LP/SD) PRA became evident. The acronym COS – cask operating state – was adopted, and supporting requirements were developed using the non-Advanced Light Water Reactor (LWR) PRA Standard [5] as a basis (see Table 2.6).

The second aspect of scope was the level of technical adequacy for which the "new" supporting requirements should be written. Developing supporting requirements that spanned the "traditional" assessment levels of Capability Category I, II, and III was beyond what the PWROG could reasonably achieve. While there might be some cases where Capability Category I is sufficient, the general consensus was to focus on Capability Category II, if only a single category was to be pursued. A shortcoming that failed to meet the minimum requirements of Capability Category II for a supporting requirement in a PRA peer review could always be addressed by showing that Capability Category I was sufficient. (This would represent a

deviation in the typical process used for a PRA peer review, following NEI 05-04 [6], but could be explained to the PRA peer review team, as part as the training session.)

The third aspect of scope dealt with the boundaries of the dry cask storage PRA itself. Where does the analysis begin? What are the interfaces to a spent fuel pool PRA?

From an operations stand point, the dry cask storage process starts when an empty canister is placed in the cask loading pit and consequently a fuel assembly is lifted from its spent fuel pool rack cell on its way to be loaded into the canister. If during this fuel movement the assembly is dropped, the development of the consequences from the damaged fuel assembly belongs to the dry cask storage PRA. However, the effects of this dropped fuel assembly on the spent fuel pool or other fuel assemblies in the pool racks will be analyzed as part of the spent fuel pool PRA. For example, if a fuel assembly on its way to the canister is dropped and damages other fuel assemblies in the spent fuel pool racks, the source term from assemblies in the racks are not considered in the dry cask storage PRA, but instead the source term from the dropped assembly is considered in the spent fuel pool PRA.

Once the cask is fully loaded with spent fuel, it is lifted out of the cask loading pit. If during this lift, the cask is dropped, the source term from the damaged fuel inside the cask belongs to the dry cask storage PRA. However, the effects of the dropped heavy load (i.e., loaded cask) will be analyzed as part of the spent fuel pool PRA. For example, if the loaded cask is dropped onto the spent fuel pool rack, the source term from damaged fuel in spent fuel pool racks are not considered in the dry cask storage PRA, but if during this drop, the fuel inside the cask is damaged, then the source term (from the fuel in the cask) is considered as part of the dry cask storage PRA.

It was agreed that the consequences to workers (onsite impacts) were not part of the scope of the dry cask storage PRA.

2 DETERMINATION OF DRY CASK STORAGE PRA PEER REVIEW CRITERIA

2.1 TECHNICAL ELEMENT CHARACTERISTICS AND ATTRIBUTES

Table 2-1 below provides the technical element characteristics and attributes of a dry cask storage PRA. The technical element characteristics and attributes are based on a similar table in RG 1.200 [1].

Table 2-1: Dry Cask Storage Technical Elements and Attributes

Element	Technical Characteristics and Attributes	Comments/Notes
Cask Operating State (COS)	• Identification and characterization of distinct operating states during dry cask operations that represent all phases of the process • Each COS should consider the delineation of all possible end state metrics • Characteristics of operating states include dry cask storage system configuration (e.g., location, movement, and closure of canister, etc.) • Perform each technical element in relation to each defined COS	This technical element was identified and defined during the workshop.
Initiating Event Analysis	• Sufficiently detailed identification and characterization of the spectrum of challenges to the intended function of the cask and its contents during onsite loading, transfer, and storage at the independent spent fuel storage installation (ISFSI) • Proper screening of challenges using qualitative or conservative quantitative assessments	

Table 2-1: Dry Cask Storage Technical Elements and Attributes

Element	Technical Characteristics and Attributes	Comments/Notes
Accident Progression Analysis	• Sufficiently describes the chronology (timeline) of postulated accidents involving significant damage to the cask and its contents • Includes hardware, structures, physical barriers, and operator actions reasonably expected to be used to mitigate the postulated accidents • Includes necessary and sufficient equipment (safety and non-safety) reasonably expected to be used in the dry cask storage process. These items include: the crawler, cranes, electric power, air systems, compressed gas (He), cooling, and other ancillary equipment required for the specific cask design. • Characterizes the thermal, chemical, and mechanical challenges to engineered barriers to fission product release • Phenomenology is appropriately characterized and modeled • End states are defined in sufficient detail so that they can be characterized in terms of radionuclide release timing, cask failure mode, radionuclide release distribution and magnitude • The frequency of the accident sequences leading to the defined end states is calculated	
Cask Capacity Analysis	• Defines the cask structural capacity to withstand accident progression challenges • Codes developed in sufficient detail to analyze the phenomena of interest	
Parameter Estimation Analysis	• Estimation of parameters associated with hazards (external), initiating events, basic event probability models, human actions, unavailability events, and phenomenological events using plant-specific, design-specific, and generic data as applicable • Estimation includes a characterization of the uncertainty	

Table 2-1: Dry Cask Storage Technical Elements and Attributes

Element	Technical Characteristics and Attributes	Comments/Notes
Human Reliability Analysis	• Identification and definition of the human failure events related to the loading, onsite transfer, closure, and onsite storage of dry casks as well as any post-accident human failure events that would impact the mitigation of the identified end states • Quantification of the associated human error probabilities taking into account scenario (where applicable), plant-specific and design-specific factors, and including appropriate dependencies (both pre- and post-accident)	
Systems Analysis	Models of the equipment identified in the accident progression analysis are developed in sufficient detail to achieve the following purposes: • Reflect the as-built, as-operated dry cask storage system and process including how it has performed during the plant history • Reflect the success criteria for the systems ~~to~~ identified for each accident sequence • Capture impact of dependencies, including support systems and harsh environmental impacts • Include both active and passive components and failure modes that impact the function of the system • Include common-cause failures, human errors, unavailability resulting from test and maintenance, etc.	
Source Term Analysis	• Supports calculation of a unique source term for each radionuclide release category (RC) • The metrics used to define a source term can vary depending on the objective and intended application of the PRA. For example, if the Level 2 PRA results are to be used in a Level 3 PRA consequence assessment, it may be necessary to provide more detailed source term information than if no Level 3 PRA is to be performed.	

Table 2-1: Dry Cask Storage Technical Elements and Attributes

Element	Technical Characteristics and Attributes	Comments/Notes
Quantification	• Estimation of the end state frequency for modeled sequences that are not screened as a result of truncation, given as a mean value • Estimation of the accident sequence end state frequencies for each initiating event or phenomena group • Truncation values set relative to the total dry cask storage system end state frequency, such that the frequency results are stable with respect to further reduction in the truncation value	

2.2 SUPPORTING REQUIREMENTS

Table 2-2 below provides a disposition of the SRs applicable to a dry cask storage PRA from Part 2 of the ASME/ANS PRA Standard (ASME/ANS RA-Sa-2009).

Table 2-2: Supporting Requirements for Dry Cask Storage PRA

Technical Element	**Initiating Events (IE)**		
High Level Requirement	IE-A		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
IE-A1	Revise	IDENTIFY those initiating events that challenge ~~normal plant operation~~ **the dry cask storage system** and require successful mitigation to prevent/**minimize** ~~core damage~~ **the specified end state/risk metric** using a structured, systematic process for identifying initiating events that account for ~~plant~~**dry cask storage system**-specific features ...	
IE-A2	Not Applicable		The transients listed in IE-A2 are not germane to a dry cask storage PRA.
IE-A3	Suitable		
IE-A4	Revise	...~~plants~~ **dry cask storage systems** to assess ...	Little industry experience is expected to be available for this supporting requirement.
IE-A5	Suitable		Systems to be evaluated would be related to the entire dry cask storage process (e.g., the crawler, cranes, electric power, air systems, compressed gas, cooling, spent fuel pool cooling, welding equipment, etc.) and transport operation.
IE-A6	Suitable		
IE-A7	Replace	**In the identification of the initiating events, INCORPORATE events that have occurred during COSs other than the one being examined, unless it is determined that an event is not applicable to that COS).**	

Table 2-2: Supporting Requirements for Dry Cask Storage PRA			
IE-A8	Suitable		
IE-A9	Revise	REVIEW plant-specific **and dry cask storage system-specific** operating experience … Delete the second sentence, beginning with "For example …"	This example is not applicable to a dry cask storage PRA.
IE-A10	Not Applicable		Dry cask storage PRA is not dependent on single versus multi-unit site.
High Level Requirement	IE-B	… to facilitate an efficient but realistic estimation of ~~CDF~~ **the end state metric**.	
Supporting Requirements	Assessment	Revised/New Supporting Requirement	Additional Discussion/Notes
IE-B1	Suitable		
IE-B2	Suitable		
IE-B3	Revise	*(a)* events can be considered similar in terms of ~~plant~~ **dry cask storage system** response, success criteria …	
IE-B4	Revise	… those categories with different ~~plant~~ **dry cask storage system** response (i.e., those with different success rate criteria) impacts or those that could have more severe radionuclide release potential ~~(e.g., LERF). This includes such initiators as … outside containment.~~	
IE-B5	Not Applicable	Dry cask storage PRA is not dependent on single versus multi-unit site.	
High Level Requirement	IE-C		
Supporting Requirements	Assessment	Revised/New Supporting Requirement	Additional Discussion/Notes
IE-C1	Suitable		
IE-C2	Suitable		
IE-C3	Suitable		
IE-C4	Suitable		
IE-C5	Revise	CALCULATE initiating event frequencies on a ~~reactor~~ **calendar** year basis ~~[Note (1)]. INCLUDE in the initiating event analysis the plant availability, such that the frequencies are weighted by the fraction of time the plant is at power.~~	Time at power is not germane to initiating event affecting the dry cask storage system.

Table 2-2: Supporting Requirements for Dry Cask Storage PRA			
IE-C6	Revise	The only screening criterion should be: the frequency of the event is less than 1E-7 per ~~reactor~~ **calendar** year (/~~r~~**year**) If ~~either~~ **the** criterion ~~(a) or (b)~~ above is used, ...	
IE-C7	Suitable		
IE-C8	Revise	... dependent upon ~~plant~~**dry cask storage system**-specific design features ...	
IE-C9	Suitable		
IE-C10	Suitable		
IE-C11	Suitable		
IE-C12	Revise	COMPARE results and EXPLAIN differences in the initiating event analysis with generic data sources, **if available,** to provide a reasonableness check of the results. **JUSTIFY the use of any generic data.**	
IE-C13	Revise	... USE industry generic data, **if available,** and INCLUDE ~~plant~~**dry cask storage system**-specific features to decide which **(if any)** generic data are most applicable. **JUSTIFY the use of any generic data.** For extremely ...	
IE-C14	Not Applicable		Interfacing systems loss of coolant accident (ISLOCA) is not a factor in dry cask storage PRA.
IE-C15	Suitable		
High Level Requirement	IE-D		
Supporting Requirements	Assessment	Revised/New Supporting Requirement	Additional Discussion/Notes
IE-D1	Suitable		
IE-D2	Suitable		Documentation supporting requirements are suitable, as a typically included list is provided, which can be adapted for a dry cask storage PRA peer review.
IE-D3	Suitable		

Table 2-2: Supporting Requirements for Dry Cask Storage PRA			
Technical Element	**Accident Sequence Analysis (AS)**		
High Level Requirement	AS-A	… the plant-specific scenarios that can lead to ~~core damage~~ **the end state condition** following each …	
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
AS-A1	Suitable		
AS-A2	Revise	… the ~~key~~ safety functions that are necessary to reach a safe, stable ~~state~~ **end state** and ~~prevent core damage~~ **and prevent or mitigate a release of radioactive material.**	
AS-A3	Suitable		
AS-A4	Suitable		
AS-A5	Revise	DEFINE the accident sequence model in a manner that is consistent with the ~~plant-specific: system design, EOPs, abnormal procedures, and plant transient response~~ **dry cask storage system and process (e.g., normal operating procedures, general radiation protection process, ensuring nuclear criticality safety).**	The Cask Certificate will have procedures to follow. It is not expected that there will be emergency or abnormal procedures applicable to dry cask operations.
AS-A6	Suitable		
AS-A7	Suitable		
AS-A8	Replace	**DEFINE the end state of the accident progression.**	
AS-A9	Revise	USE realistic, applicable (i.e., **vendor calculations** from similar ~~plants~~ **dry cask storage designs**) ~~thermal-hydraulic~~ analyses to determine the accident progression parameters (e.g., timing, ~~temperature, pressure, steam~~) that could potentially affect the operability of the ~~mitigating systems~~ **dry cask storage system.**	
AS-A10	Revise	… and required operator interactions ~~(e.g., systems initiations or valve alignment)~~ are captured.	
AS-A11	Suitable		Should transfers not be used in the event trees to support a dry cask storage PRA, this supporting requirement can be assessed as "not applicable" for a PRA peer review.

Table 2-2: Supporting Requirements for Dry Cask Storage PRA			
High Level Requirement	AS-B		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
AS-B1	Suitable		
AS-B2	Revise	~~For example,~~ ~~(a) turbine-driven system dependency on SORV, depressurization, and containment heat removal (suppression pool cooling)~~ ~~(b) low-pressure system injection success dependent on need for RPV depressurization~~	
AS-B3	Revise	For each accident sequence, IDENTIFY the phenomenological conditions, **if any,** created by the accident progression. ~~Phenomenological impacts include generation of harsh environments affecting temperature, pressure, debris, water levels, humidity, etc. that could impact the success of the system or function under consideration [e.g., loss of pump net positive suction head (NPSH), clogging of flow paths].~~ INCLUDE the impact of the accident progression phenomena, either in the accident sequence models or in the system models.	
AS-B4	Suitable		
AS-B5	Suitable		
AS-B6	Not Applicable		For a dry cask storage system/process, there will not be multiple alignments, and therefore no dependencies to model.
AS-B7	Revise	Delete all examples, starting with "Examples are as follows ..."	
High Level Requirement	AS-C		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
AS-C1	Suitable		
AS-C2	Suitable		Documentation supporting requirements are suitable, as a typically included list is provided, which can be adapted for a dry cask storage PRA peer review.
AS-C3	Suitable		

Table 2-2: Supporting Requirements for Dry Cask Storage PRA			
Technical Element	**Success Criteria (SC)**		
High Level Requirement	SC-A		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
SC-A1	Not Applicable		Since the end state for dry cask storage is not core damage, this SR does not apply. May need a new requirement in concert with AS-A8 about to determine the characteristics of a safe, stable end state.
SC-A2	Replace	**SPECIFY the dry cask storage process parameters and associated acceptance criteria to be used to determine dry cask storage system end state (failed state). SELECT these parameters such that achieving a specified end state is as realistic as practical, in a manner consistent with current best practice. DEFINE computer code-predicted acceptance criteria (if any) with sufficient margin on the code-calculated values to allow for limitation of the code, sophistication of the models, and uncertainties in the results, in a manner consistent with the requirements specified under HLR-SC-B.**	
SC-A3	Suitable		
SC-A4	Replace	**IDENTIFY mitigating systems that are shared between units and the manner in which the sharing is performed should two or more elements of the dry cask storage process experience a common initiating event (e.g., loss of off-site power).**	

Table 2-2: Supporting Requirements for Dry Cask Storage PRA			
SC-A5	Revise; the second and third paragraphs are not applicable	**DEFINE and SPECIFY an appropriate mission time for the modeled accident sequences.** Delete the second paragraph (beginning with "For sequences in which ..." Delete the third paragraph (beginning with "For example, if ..." For sequence in which stable ~~plant~~ **dry cask storage system** conditions would not be achieved by ~~24 hr~~ **the specified mission time** using the modeled ... Delete example (a) (in the fourth paragraph)	
SC-A6	Revise	... consistent with the features, procedures, and operating philosophy of the ~~plant~~ **dry cask storage process.**	
High Level Requirement	SC-B	... sufficient for the quantification of ~~CDF and LERF~~ **the end state metric** ...	
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
SC-B1	Revise	Use appropriate realistic generic analysis/ evaluations that are applicable to the ~~plant~~ **dry cask storage system** for thermal/hydraulic, structural, and other supporting engineering bases in support of success criteria requiring detailed computer modeling. (See SC-B4.) Realistic models or analyses may be supplemented with ~~plant-specific/generic FSAR or other~~ conservative **plant-specific and cask-specific analyses** ~~analysis applicable to the plant~~, but ...	
SC-B2	Suitable		
SC-B3	Suitable		
SC-B4	Revise	Replace "for CDF" with "(for characteristics of the specific safe, stable end state)" Replace "similar class of plant" with "similar type of dry cask storage system"	

Table 2-2: Supporting Requirements for Dry Cask Storage PRA			
SC-B5	Suitable		
High Level Requirement	SC-C		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
SC-C1	Suitable		
SC-C2	Suitable		Documentation supporting requirements are suitable, as a typically included list is provided, which can be adapted for a dry cask storage PRA peer review.
SC-C3	Suitable		
Technical Element	**System Analysis (SY)**		
High Level Requirement	SY-A		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
SY-A1	Suitable		
SY-A2	Suitable		
SY-A3	Suitable		
SY-A4	Suitable		
SY-A5	Revise	… to the extent needed for ~~CDF and LERF~~ determination **of specified end state metric.**	
SY-A6	Suitable		
SY-A7	Suitable		
SY-A8	Suitable		
SY-A9	Suitable		
SY-A10	Suitable		
SY-A11	Suitable		
SY-A12	Suitable		
SY-A13	Suitable		
SY-A14	Revise	Delete the second paragraph, beginning with "Examples of degraded …"	These examples are not applicable to a dry cask storage PRA.
SY-A15	Suitable		
SY-A16	Suitable		
SY-A17	Suitable		
SY-A18	Revise	Delete the second paragraph, beginning with "For example, conditions …"	These examples are not applicable to a dry cask storage PRA.
SY-A19	Suitable		
SY-A20	Suitable		
SY-A21	Suitable		

Table 2-2: Supporting Requirements for Dry Cask Storage PRA			
SY-A22	Suitable		
SY-A23	Suitable		
SY-A24	Suitable		
High Level Requirement	SY-B		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
SY-B1	Suitable		
SY-B2	Suitable		
SY-B3	Suitable		
SY-B4	Suitable		
SY-B5	Suitable		
SY-B6	Suitable		
SY-B7	Suitable		
SY-B8	Suitable		
SY-B9	Suitable		
SY-B10	Revise	... automatic actuation ~~(e.g., low vessel water level)~~. INCLUDE permissive ...	This example is not applicable to a dry cask storage PRA.
SY-B11	Suitable		
SY-B12	Suitable		
SY-B13	Suitable		
SY-B14	Revise	Delete the second paragraph, beginning with "Examples of degraded ..."	These examples are not applicable to a dry cask storage PRA.
SY-B15	Suitable		
High Level Requirement	SY-C		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
SY-C1	Suitable		
SY-C2	Suitable		Documentation supporting requirements are suitable, as a typically included list is provided, which can be adapted for a dry cask storage PRA peer review.
SY-C3	Suitable		

Table 2-2: Supporting Requirements for Dry Cask Storage PRA			
Technical Element	**Human Reliability Analysis (HR)**		
High Level Requirement	HR-A		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
HR-A1	Revise	… those test, inspection, and maintenance activities that ~~require realignment of equipment outside its normal operational or standby status~~ **if performed improperly would have a negative impact on the dry cask storage process.**	
HR-A2	Revise	… can have an adverse impact **on the automatic initiation of standby safety equipment on the dry cask storage process.**	
HR-A3	Suitable		
High Level Requirement	HR-B		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
HR-B1	Suitable		
HR-B2	Suitable		
High Level Requirement	HR-C		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
HR-C1	Suitable		
HR-C2	Suitable		
HR-C3	Suitable		
High Level Requirement	HR-D		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
HR-D1	Suitable		
HR-D2	Suitable		
HR-D3	Suitable		
HR-D4	Suitable		
HR-D5	Suitable		
HR-D6	Suitable		
HR-D7	Suitable		

Table 2-2: Supporting Requirements for Dry Cask Storage PRA			
High Level Requirement	HR-E		Post-initiator HLRs (HR-E through HR-H) may be excluded from the peer review scope at the discretion of the host utility. These HLRs were retained in this table for those utilities that might have some written processes in place.
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
HR-E1	Suitable		
HR-E2	Revise	… defined by the success criteria	This example is not applicable to a dry cask storage PRA.
HR-E3	Suitable		
HR-E4	Revise	USE ~~simulator observations~~ **dry cask storage process dry-runs** or talk-throughs …	
High Level Requirement	HR-F		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
HR-F1	Suitable		
HR-F2	Suitable		
HR-F3	New	**Considering the time available to address an initiator without a specific procedure, JUSTIFY the use of a non-proceduralized set of actions to mitigate an end state metric event.**	
High Level Requirement	HR-G		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
HR-G1	Suitable		
HR-G2	Suitable		
HR-G3	Suitable		
HR-G4	Revise	… analyses or ~~simulation~~ **experience/dry runs** from similar ~~plants~~ **dry cask storage systems** (e.g., ~~plant~~ **casks** of similar design and operation).	
HR-G5	Revise	…or talkthroughs of the procedures or **dry cask storage process dry-runs** ~~simulator observations~~.	
HR-G6	Suitable		
HR-G7	Suitable		
HR-G8	Suitable		

Table 2-2: Supporting Requirements for Dry Cask Storage PRA			
High Level Requirement	HR-H		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
HR-H1	Suitable		
HR-H2	Suitable		This supporting requirement is deemed suitable as there is a caveat in item (a) to justify the omission of a procedure and/or operator training – which is expected to be the case for post-initiator actions during a dry cask storage process.
HR-H3	Suitable		
High Level Requirement	HR-I		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
HR-I1	Suitable		
HR-I2	Suitable		Documentation supporting requirements are suitable, as a typically included list is provided, which can be adapted for a dry cask storage PRA peer review.
HR-I3	Suitable		
Technical Element	**Data Analysis (HR)**		
High Level Requirement	DA-A		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
DA-A1	Revise	Add the following to the supporting requirement: **For dry cask storage PRAs, a probability may be assigned directly to an event tree header (rather than a systems analysis basic event); in this case, USE a process consistent with all of the supporting requirements of HLR-DA-A.**	
DA-A2	Suitable		
DA-A3	Suitable		
DA-A4	Suitable		

Table 2-2: Supporting Requirements for Dry Cask Storage PRA			
High Level Requirement	DA-B	.. of the component in the as-build and as-operated ~~plant~~ **dry cask storage process.**	
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
DA-B1	Revise	... according to type ~~(e.g., motor-operated pump, air-operated valve)~~ and according ...	
DA-B2	Suitable		
High Level Requirement	DA-C	... and collection of plant-specific **and cask-specific** data shall be ...	
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
DA-C1	Suitable		
DA-C2	Revise	COLLECT plant-specific **and cask-specific** data for the basic ...	
DA-C3	Revise	COLLECT plant-specific **and cask-specific** data, in a manner ...	
DA-C4	Suitable		
DA-C5	Suitable		
DA-C6	Suitable		
DA-C7	Revise	BASE number of surveillance tests on ~~plant~~ **dry cask storage system** surveillance requirements and actual practice. BASE number of planned maintenance activities on ~~plant~~ **dry cask storage system** maintenance plans and actual practice. BASE number of unplanned maintenance acts on actual ~~plant~~ **dry cask storage system** experience.	
DA-C8	Suitable		
DA-C9	Suitable		
DA-C10	Suitable		
DA-C11	Suitable		
DA-C12	Not Applicable	[These supporting requirements would be applicable for a spent fuel pool PRA.]	There would be no dry cask storage activities if any equipment/systems were in maintenance.
DA-C13	Not Applicable	[These supporting requirements would be applicable for a spent fuel pool PRA.]	There would be no dry cask storage activities if any equipment/systems were in maintenance.
DA-C14	Not Applicable	[These supporting requirements would be applicable for a spent fuel pool PRA.]	There would be no dry cask storage activities if any equipment/systems were in maintenance.

Table 2-2: Supporting Requirements for Dry Cask Storage PRA			
DA-C15	Suitable		
DA-C16	Suitable		
High Level Requirement	DA-D	… generic industry, ~~or~~ plant-specific **or cask-specific** evidence. Where feasible, generic, and plant-specific **and cask-specific evidence** shall be integrated …	
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
DA-D1	Suitable		
DA-D2	Revise	If neither plant-specific/**cask-specific** nor generic parameter …	
DA-D3	Suitable		
DA-D4	Suitable		
DA-D5	Suitable		
DA-D6	Suitable		
DA-D7	Suitable		
DA-D8	Suitable		
High Level Requirement	DA-E		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
DA-E1	Suitable		
DA-E2	Suitable		Documentation supporting requirements are suitable, as a typically included list is provided, which can be adapted for a dry cask storage PRA peer review.
DA-E3	Suitable		
Technical Element	**Quantification (QU)**		
High Level Requirement	QU-A	The ~~level 1~~ quantification shall quantify ~~core damage~~ **end state metric** frequency ~~and shall support the quantification of LERF~~.	
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
QU-A1	Suitable		
QU-A2	Revise	… estimation of the **specified end state metric** ~~total CDF~~ to identify	
QU-A3	Revise	ESTIMATE the mean **specified end state metric** ~~CDF~~ accounting for …	Ultimately, this supporting requirement may be "Not Applicable" for a dry cask storage PRA.
QU-A4	Revise	… the contributors to the **specified end state metric** ~~CDF~~ commensurate with …	

Table 2-2: Supporting Requirements for Dry Cask Storage PRA			
QU-A5	Suitable		
High Level Requirement	QU-B		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
QU-B1	Suitable		
QU-B2	Suitable		
QU-B2a	New	**ENSURE truncation limits are considered on a release category basis in an integrated Level 1/Level 2 model.**	
QU-B3	Revise	... in decreasing changes in **the specified end state metric** ~~**CDF or LERF**~~, and the final ...	
QU-B4	Suitable		
QU-B5	Suitable		
QU-B6	Suitable		
QU-B7	Suitable		
QU-B8	Suitable		
QU-B9	Suitable		
QU-B10	Suitable		
High Level Requirement	QU-C		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
QU-C1	Suitable		
QU-C2	Suitable		
QU-C3	Suitable		If there are no linked event trees used, then it can be listed as N/A in a peer review.

Table 2-2: Supporting Requirements for Dry Cask Storage PRA			
High Level Requirement	QU-D	The quantification results shall be reviewed, and significant contributors to ~~CDF (and LERF)~~ **the end state metric**, such as initiating events …	
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
QU-D1	Revise	Add the following to the supporting requirement: **ENSURE significant cutsets for each release category are included in the review.**	
QU-D2	Revise	Add the following to the supporting requirement: **ENSURE review for modeling and operational consistency includes review across each release category.**	
QU-D3	Suitable		
QU-D4	Revise	COMPARE results, **where available and applicable,** to those from similar ~~plants~~ **dry cask storage systems (using experience or dry runs)** and …	
QU-D5	Suitable		
QU-D6	Revise	IDENTIFY significant contributors to **the specified end state metric** ~~CDF~~, such as	
QU-D7	Suitable		
High Level Requirement	QU-E		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
QU-E1	Suitable		
QU-E2	Suitable		
QU-E3	Revise	ESTIMATE the uncertainty interval of the **specified end state metric** ~~CDF~~ results.	
QU-E4	Suitable		

Table 2-2: Supporting Requirements for Dry Cask Storage PRA			
High Level Requirement	QU-F		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
QU-F1	Suitable		
QU-F2	Revise	(e) the **specified end state metric** ~~total plant CDF~~ and … (i) the uncertainty distribution for the ~~total CDF~~ **specified end state metric**	Documentation supporting requirements are suitable, as a typically included list is provided, which can be adapted for a dry cask storage PRA peer review.
QU-F3	Revise	… to **the specified end state metric** ~~CDF~~ in the PRA results summary.	
QU-F4	Suitable		
QU-F5	Suitable		
QU-F6	Suitable		

Notes to Table 2-2

1. The source PRA Standard is taken to be ASME/ANS RA-Sa-2009, as this was suggested by the NRC. Further, RA-Sa-2009 has been endorsed by the NRC in Regulatory Guide 1.200.

2. As core damage frequency (CDF) is not an appropriate end state for a dry cask storage PRA, neither is large early release frequency (LERF), hence the entire LE technical element is deemed to be not applicable.

Table 2-3: Supporting Requirements for Dry Cask Storage PRA (Part 6 of ASME/ANS RA-Sa-2009)			
Technical Element	**External Hazard Screening Analysis**		
High Level Requirement	EXT-A		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
EXT-A1	Suitable		NUREG-1855 Table 4-1 also provides an acceptable list of external hazards to be considered.
EXT-A2	Suitable		
High Level Requirement	EXT-B		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
EXT-B1	Revise	...Criterion 1: The event is of equal or lesser damage potential than the events for which the plant **and/or the dry cask storage system have**~~has~~ been designed....	Refer to NUREG-1855, Section 5.2 for acceptable quantitative screening criteria.
EXT-B2	Not applicable.		It is noted that not using the 1975 Standard Review Plan aligns with NUREG-1855, Section 5.2 and the latest expected revision of the ASME/ANS PRA Standard which will, for peer review, be adapted to the cask PRA to look at the specified end state metric.
EXT-B3	Suitable		
EXT-B4	Suitable		
High Level Requirement	EXT-C		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
EXT-C1	Replace	**IDENTIFY the criteria used to determine that an external hazard can be screened using the results of bounding analysis or demonstrably conservative analysis.**	Refer to NUREG-1855, Section 5.2 for acceptable quantitative screening criteria.
EXT-C2	Suitable		
EXT-C3	Not Applicable		Since the original criterion B in EXT-C1 (related to CCDP) has been removed, EXT-C3 is no longer applicable.

Table 2-3: Supporting Requirements for Dry Cask Storage PRA (Part 6 of ASME/ANS RA-Sa-2009)			
EXT-C4	Revise	IDENTIFY those SSCs required to maintain the ~~plant in operation~~ **integrity of the dry cask storage system** or that are required to respond to an initiating event to prevent ~~core damage~~ **the specified end state metric condition**, that are vulnerable to the hazard, and determine their failure modes.	
EXT-C5	Not Applicable		Since the original criterion B in EXT-C1 (related to CCDP) has been removed, EXT-C5 is no longer applicable.
EXT-C6	Revise	BASE the estimation of the mean ~~core damage~~ **specified end state metric** frequency developed here ...	
EXT-C7	Suitable		
High Level Requirement	EXT-D		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
EXT-D1	Suitable		
EXT-D2	Revise	If the screening out of any specific hazard depends on the **cask/ISFSI location and**~~specific plant~~ layout, then CONFIRM...	
High Level Requirement	EXT-E		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
EXT-E1	Suitable		
EXT-E2	Suitable		Documentation supporting requirements are suitable, as a typically included list is provided, which can be adapted for a dry cask storage PRA peer review.

Table 2-4: Supporting Requirements for Dry Cask Storage PRA (Part 5 of ASME/ANS RA-Sb-2013)			
Technical Element	**Seismic Hazard Analysis (SHA)**		
High Level Requirement	SHA-A		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
SHA-A1	Suitable		
SHA-A2	Suitable		
SHA-A3	Suitable		
SHA-A4	Revise	… so that the truncation does not produce unstable final numerical results, ~~such as core damage frequency,~~ and the delineation and ranking of seismic-initiated sequences are not affected.	
SHA-A5	Revise	… to cause significant damage to **the cask, its contents, or ancillary equipment during cask loading, transfer, and long-term storage at the ISFSI** ~~engineered structures or equipment~~.	
High Level Requirement	SHA-B		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
SHA-B1	Suitable		
SHA-B2	Suitable		
SHA-B3	Suitable		
High Level Requirement	SHA-C		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
SHA-C1	Suitable		
SHA-C2	Suitable		
SHA-C3	Suitable		
SHA-C4	Suitable		
High Level Requirement	SHA-D		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
SHA-D1	Suitable		
SHA-D2	Suitable		
SHA-D3	Suitable		
SHA-D4	Suitable		
High Level Requirement	SHA-E		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
SHA-E1	Suitable		
SHA-E2	Suitable		

Table 2-4: Supporting Requirements for Dry Cask Storage PRA (Part 5 of ASME/ANS RA-Sb-2013)			
High Level Requirement	SHA-E		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
SHA-F1	Suitable		
SHA-F2	Suitable		
SHA-F3	Suitable		
High Level Requirement	SHA-F		
Supporting Requirement	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
SHA-G1	Suitable		
High Level Requirement	SHA-G		
Supporting Requirement	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
SHA-H1	Suitable		
High Level Requirement	SHA-I		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
SHA-I1	Suitable		
SHA-I2	Suitable		
High Level Requirement	SHA-J		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
SHA-J1	Suitable		
SHA-J2	Suitable		Documentation supporting requirements are suitable, as a typically included list is provided, which can be adapted for a dry cask storage PRA peer review.
SHA-J3	Suitable		
Technical Element	**Seismic-Fragility Analysis (SFR)**		
High Level Requirements	SFR-A	The seismic-fragility evaluation shall be performed to estimate seismic fragilities of SSCs whose failure may contribute to **the specified end state metric** ~~core damage or large early release, or both~~.	
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
SFR-A1	Suitable		
SFR-A2	Revise	CALCULATE the seismic fragilities on plant-specific **and cask-specific** data…	

Table 2-4: Supporting Requirements for Dry Cask Storage PRA (Part 5 of ASME/ANS RA-Sb-2013)			
High Level Requirement	SFR-B		
Supporting Requirement	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
SFR-B1	Revise	...SELECT the screening level high enough that the contribution to ~~core damage frequency and large early release~~ **the specified end state** frequency from the screened-out components is not significant.	
High Level Requirement	SFR-C		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
SFR-C1	Suitable		
SFR-C2	Suitable		
SFR-C3	Suitable		
SFR-C4	Suitable		
SFR-C5	Suitable		
SFR-C6	Suitable		
High Level Requirement	SFR-D	...identified through the review of plant **and cask** design documents, supplemented as needed ...	
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
SFR-D1	Revise	... through a review of the ~~plant design documents~~ **cask safety analysis report (SAR)** and the walkdown.	
SFR-D2	Suitable		
High Level Requirement	SFR-E		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
SFR-E1	Suitable		
SFR-E2	Suitable		
SFR-E3	Suitable		
SFR-E4	Suitable		
SFR-E5	Suitable		

Table 2-4: Supporting Requirements for Dry Cask Storage PRA (Part 5 of ASME/ANS RA-Sb-2013)			
High Level Requirement	SFR-F	The calculation of seismic-fragility parameters such as median capacity and variabilities shall be based on plant-specific **and cask-specific** data ...	
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
SFR-F1	Revise	...based on plant-specific **and cask-specific** data or, if necessary, on earthquake experience data, fragility test data, and generic qualification test data. Exception: JUSTIFY the use of generic fragility for any SSC as being appropriate for the ~~plant~~ **dry cask storage system and processes.**	
SFR-F2	Revise	... ENSURE that they have site-specific fragility parameters that the significant accident are derived based on plant-specific **and cask-specific** information, such as anchoring and installation of the component or structure and plant-specific **and cask-specific** material test data. *Exception:* JUSTIFY the use of generic parameters that are derived for any SSC as being appropriate for the ~~plant~~ **dry cask storage system and processes.**	
SFR-F3	Suitable		It is not 100% certain that there are no relays that could impact the dry cask storage (e.g., relay chatter causing a loss of power to the crane during a lift). If none are identified, this supporting requirement can be assessed as "not applicable" for a PRA peer review.
SFR-F4	Revise	... as playing a role in the ~~large early release~~ **specified end state** frequency part of the seismic PRA.	
High Level Requirement	SFR-G		
Supporting Requirement	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
SFR-G1	Suitable		
SFR-G2	Suitable		Documentation supporting requirements are suitable, as a typically included list is provided, which can be adapted for a dry cask storage PRA peer review.

Table 2-4: Supporting Requirements for Dry Cask Storage PRA (Part 5 of ASME/ANS RA-Sb-2013)			
Technical Element	**Seismic Plant Response Analysis (SPR)**		
High Level Requirement	SPR-A		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
SPR-A1	Suitable		
SPR-A2	Not Applicable		Seismic events that lead to plant shutdowns are not germane to the dry cask storage PRA.
SPR-A3	Revise	USE the accident sequence and system logic models from the ~~internal-event at-power~~ **dry cask storage** PRA model ...	
SPR-A4	Revise	...instead of starting with the ~~internal events~~ **dry cask storage PRA** model and adapting it, as in Requirement SPR-A3. If this approach is used, ENSURE that the resulting model is consistent with the ~~internal events~~ **dry cask storage** systems model regarding plant response and the cause-effect relationships of the failures.	
SPR-A5	Suitable		
High Level Requirement	SPR-B		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
SPR-B1	Revise	... SATISFY the corresponding requirements in Part 2 **adaption relevant to dry cask storage PRAs**, except where ...	
SPR-B2	Suitable		
SPR-B3	Suitable		
SPR-B4	Suitable		It is not 100% certain that there are no relays that could impact the dry cask storage (e.g., relay chatter causing a loss of power to the crane during a lift). If none are identified, this supporting requirement can be assessed as "not applicable" for a PRA peer review.
SPR-B4a	Suitable		
SPR-B4b	Suitable		
SPR-B5	Suitable		
SPR-B6	Suitable		

Table 2-4: Supporting Requirements for Dry Cask Storage PRA (Part 5 of ASME/ANS RA-Sb-2013)			
SPR-B7	Revise	… modeled in the ~~internal events~~ **dry cask storage system** PRA may be …	
SPR-B8	Not Applicable		The occurrence of small break loss of coolant accidents (LOCAs) is not expected to be a factor to maintain the integrity of the dry cask storage system.
SPR-B9	Suitable		
High Level Requirement	SPR-C		
Supporting Requirement	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
SPR-C1	Suitable		
High Level Requirement	SPR-D		
Supporting Requirement	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
SPR-D1	Revise	…. INCLUDE structures and passive components that may not be present in the ~~internal events~~ **dry cask storage PRA** model but that require consideration in the seismic PRA….	
High Level Requirement	SPR-E	The analysis to quantify **the specified end state metric** ~~core damage and large early release~~ frequencies …	
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
SPR-E1	Revise	In the quantification of ~~core damage frequency and large early release~~ **the specified end state metric** frequency, PERFORM …	
SPR-E2	Suitable		
SPR-E3	Suitable		
SPR-E4	Suitable		
SPR-E5	Revise	In the integrations/quantification analysis, INCLUDE in the uncertainties in ~~core damage frequency and large early release~~ **the specified end state metric** frequency results that arise from …	
SPR-E6	Not Applicable		
High Level Requirement	SPR-F		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
SPR-F1	Suitable		
SPR-F2	Suitable		
SPR-F3	Suitable		

Table 2-5: Supporting Requirements for Dry Cask Storage PRA (Level 2 PRA – ASME/ANS RA-S-1.2-2014)			
Technical Element	**Level 1/Level 2 Interface (L1)**		
Supporting Requirement	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
All High Level and Supporting Requirements	Not Applicable		The dry cast storage PRA is not expected to have the sharp demarcations between Level 1 PRA and Level 2 PRA, and accordingly, these supporting requirements are not applicable.
Technical Element	**Containment Capacity Analysis (CP)**		
High Level Requirement	CP-A	The mechanisms of **canister** ~~primary containment~~ failure shall be identified as input to the assessment of **canister** ~~containment~~ capacity.	"Canister" is defined as the containment boundary for dry cask storage.
Supporting Requirements	**Assessment**	**Comment**	**Additional Discussion/Notes**
CP-A1	Revise	PERFORM a ~~plant-specific~~ **dry cask storage system-specific** search to identify plausible failure mechanisms **of the canister**, accounting for unique design features and guided by calculating environmental conditions within ~~containment~~ **the canister**... In developing a list of potential ~~containment~~ **canister** failure mechanisms, INCLUDE relevant failure mechanisms from a standardized list of "typical" failure mechanisms from studies of ~~other plants with~~ similar **canister** design features. ~~For example, include the relevant failure mechanisms from CP-A3 through CP-A8~~ **Include relevant canister failure mechanisms, such as weld failure, corrosion, overheating, overpressure (including explosive overpressure), drop impacts, forces applied during transfer, etc.**	
CP-A2	Suitable		
CP-A3	Not Applicable		

Table 2-5: Supporting Requirements for Dry Cask Storage PRA (Level 2 PRA – ASME/ANS RA-S-1.2-2014)			
CP-A4	Revise	If ~~core damage~~ accident sequences initiated by external hazards are included in the Level 2 PRA, INCLUDE ~~containment~~ **canister** failure mechanisms caused by the evaluated external hazards	
CP-A5	Revise	INCLUDE ~~containment~~ **canister** failure mechanisms caused by ~~severe~~ accident phenomena. Examples of these phenomena include ~~hydrogen combustion (deflagration and detonation), material creep, or seal failure~~ **closure failure** due to sustained exposure to high temperatures, ~~structural consequences of hydrodynamic loads, dynamic interactions between molten core debris and water~~, direct contact between ~~core~~ **fuel** ~~debris~~**assemblies** and ~~containment~~ **canister confinement boundary components (lid, shell, base, etc.), and impacts from cask drops and cask tip-over, and impact from tornado missles**~~structures, concrete cracking, liner tearing, and radiation damage to containment sealant materials~~ [see Notes (6) and (9)].	

Table 2-5: Supporting Requirements for Dry Cask Storage PRA (Level 2 PRA – ASME/ANS RA-S-1.2-2014)			
CP-A6	Revise	INCLUDE indirect mechanisms of ~~containment~~ **canister** failure caused by ~~severe~~ accident phenomena, for example: (a) ~~erosion or displacement of structures internal to the containment causing a loss of containment integrity~~ ~~(b)~~ a seismic event **during cask loading** **(b) failure of connections to auxiliary systems during cask loading** (c) **failure of supplemental cooling systems during cask loading and transfer**~~failure of the reactor vessel lower head at high pressure~~ ~~(d) thermo-chemical erosion of a concrete reactor pedestal that might result in displacement of the reactor pressure vessel~~ ~~(e) movement of appended piping and structural damage to piping penetrations in the containment pressure boundary~~	
CP-A7	Not Applicable		No suppression pool in dry cask design.
CP-A8	Revise	IDENTIFY a generic quantitative estimate of the likelihood of pre-existing failure modes or plant conditions that compromise ~~containment~~ **canister** capability to withstand ~~severe~~ accident challenges. Data can include industry experience regarding results of ~~10CFR50 Appendix J~~ testing on **prototype canister designs** ~~containment and penetrations~~ and ~~operational issues~~ **industry experience** associated with ~~open containment for maintenance/refueling~~, ~~hatches left open, hatches or~~ closures ~~not tensioned to the correct torque~~ **or weld flaws**, ~~incorrect or deficient seal material in place~~, ~~containment~~ **canister** flaws, and ~~containment~~ corrosion leading to loss of capacity capability (refer to CP-B4) [see Note (13)].	Weld flaws applies to both welds applied during manufacturing and field welds completed during cask loading operations. Canister flaws refer to manufacturing flaws.
CP-A9	Not Applicable		The system for the reference plant does not include external structures.

Table 2-5: Supporting Requirements for Dry Cask Storage PRA (Level 2 PRA – ASME/ANS RA-S-1.2-2014)			
CP-A10	Revise	IDENTIFY those failure mechanisms assessed in CP-A1 through CP-A9 that are to be addressed in the assessment of ~~containment~~ **canister** capacity in HLR CP-B.	
High Level Requirement	CP-B		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
CP-B1	Revise	CALCULATE the ultimate strength of the ~~containment pressure boundary~~ **canister** for both rupture and … OR USE the results of applicable experimental measures of ~~containment~~ **canister** performance …	
CP-B2	Revise	DETERMINE capacity limit(s) for structural materials assuming constant temperature material properties as part of the method selected to evaluate the structural capacity of the **canister** ~~containment or other buildings~~. ~~For example, "failure" might be defined as a maximum global membrane strain away from discontinuities of one percent for the assessment of ultimate pressure capacity for cylindrical reinforced concrete containments.~~ Note that multiple capacity limits might be defined depending on the number and type of failure mechanisms considered. ~~For example, cracking of concrete containments versus catastrophic rupture and tearing of a steel liner versus leakage through penetration seals.~~	This SR is interpreted as applying to the determination of the material properties to be used in determining the structural capacity of the canister.
CP-B3	Suitable		
CP-B4	Revise	EVALUATE the impact of material deterioration for **canisters** ~~structures with more than 10 years of service~~ **in service for longer than the term approved in the initial certificate of compliance for storage (e.g., 20 years)**.	

Table 2-5: Supporting Requirements for Dry Cask Storage PRA (Level 2 PRA – ASME/ANS RA-S-1.2-2014)			
CP-B5	Revise	SPECIFY ~~plant-specific~~ **dry cask storage system-specific** realistic quasi-static thermal-mechanical loads or the physical attributes of challenges on the ~~containment structure~~ **canister** used to evaluate ~~containment~~ **canister** capacity for significant accident progression sequences.	
CP-B6	Not Applicable		The system for the reference plant does not include external structures.
CP-B7	Suitable		
High Level Requirement	CP-C	The capacity of the **canister** ~~primary containment~~ pressure boundary to withstand loads generated by external hazards~~, containment challenges evolving prior to core damage (e.g., loss of containment heat removal),~~ and ~~containment~~ challenges generated by ~~core damage~~ **the defined accident sequences** shall be determined.	
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
CP-C1	Suitable		
CP-C2	Revise	For each failure mechanism and operational mode under consideration, SPECIFY the location and a realistic value of the final opening size in the ~~containment pressure boundary~~ **canister** as a function of pressure if its failure criterion is met for significant ~~containment~~ **canister** challenges. If multiple (alternate) failure locations and/or opening sizes are considered, SPECIFY conditional probabilities assigned to each possibility for significant ~~containment~~ **canister** challenges.	
CP-C3	Revise	If external hazards are included in the Level 2 PRA, CALCULATE the response of the ~~containment pressure boundary~~ **canister** to each such hazard ...	

Table 2-5: Supporting Requirements for Dry Cask Storage PRA (Level 2 PRA – ASME/ANS RA-S-1.2-2014)			
High Level Requirement	CP-D	Uncertainties in **canister** ~~primary containment~~ failure analysis shall be identified.	
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
CP-D1	Revise	... used in the deterministic analysis of ~~containment~~ **the canister** failure ...	
CP-D2	Revise	CHARACTERIZE the uncertainty in ~~containment~~ **canister** failure criteria ...	
CP-D3	Revise	CHARACTERIZE the uncertainty range in the final opening size of ~~containment~~ **canister** to permit ...	
CP-D4	Revise	CHARACTERIZE how the ~~containment~~ **canister** strength or resistance to failure is affected ~~[see Note (8) for examples]~~.	
High Level Requirement	CP-E		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
CP-E1	Revise	DOCUMENT the ~~containment~~ **canister** failure capacity analysis in a manner that facilitates PRA applications, upgrades, and peer review.	
CP-E2	Revise	DOCUMENT the mechanisms of ~~containment~~ **canister** failure. This documentation typically ...	
CP-E3	Suitable		
CP-E4	Suitable		
CP-E5	Suitable		
CP-E6	Suitable		

Table 2-5: Supporting Requirements for Dry Cask Storage PRA (Level 2 PRA – ASME/ANS RA-S-1.2-2014)			
Technical Element	**Severe Accident Progression Analysis (SA)** (Applicable requirements need to be considered in parallel with requirements from Part 2 for the SC technical element to ensure that unique Level 2 aspects are considered.)		
High Level Requirement	SA-A		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
SA-A1	Revise	DEFINE the objectives of deterministic analysis performed to support the Level 2 PRA. Examples include but are not limited to: (a) determine order/timing of ~~severe~~ accident events (b) determine order/timing of operator actions (c) determine ~~Level 2 PRA~~ **the** success criteria (d) generate quantitative measures of parameters used to estimate probabilities of uncertain events and phenomena (e) calculate the ~~plant~~ **dry cask storage system** responses that could challenge the ultimate capacity of the ~~containment~~ **canister** or affect equipment survivability or accessibility (f) calculate source terms (e.g., radionuclide release category characteristics)	
SA-A2	Revise	SPECIFY the output parameters to be calculated; examples include: (a) ~~RCS pressure and~~ **(peak) fuel clad** temperature (b) ~~containment~~ **canister internal** pressure and temperature [see Note (3)] (c) criticality ~~(d) water levels (RPV, containment, CST, BWST, RWST)~~	

Table 2-5: Supporting Requirements for Dry Cask Storage PRA (Level 2 PRA – ASME/ANS RA-S-1.2-2014)			
High Level Requirement	SA-B		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
SA-B1	Suitable		
SA-B2	Revise	ESTIMATE realistic values of input parameters for deterministic calculations. Examples of input parameters include: (a) ~~containment~~ **canister** failure pressure and temperature ~~(b) induced RCS failure criteria~~ ~~(c) reactor vessel failure criteria~~ (d) fission product inventories in the ~~core~~ **canister contents** at the time of ~~core~~ **canister** failure	
High Level Requirement	SA-C		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
SA-C1	Revise	USE a realistic modeling tool that reflects ~~plant-specific~~ **dry cask storage system-specific** design features and contemporary knowledge of ~~severe~~ accident behavior …	
SA-C2	Revise	SPECIFY a basis for applying the method selected in SA-C1 for the intended application. The intended application includes but is not limited to the ~~type of reactor and containment~~ **canister** design and the range of ~~POSs~~ **COSs** and accident sequence characteristics for which the method would be applied. A qualitative evaluation of a relevant application of the selected method that has been used for a similar class of ~~plant~~ **dry cask storage systems** (e.g., **manufacturer, industry, or** Owner's Group generic study) may be used.	
SA-C3	Suitable		

Table 2-5: Supporting Requirements for Dry Cask Storage PRA (Level 2 PRA – ASME/ANS RA-S-1.2-2014)			
High Level Requirement	SA-D		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
SA-D1	Suitable		
SA-D2	Revise	DEMONSTRATE reasonableness and acceptability of the calculated results defined in SA-A2. Examples of methods to achieve this include: (a) comparison with results of the same analyses performed for similar ~~plants~~ **dry cask storage systems**, accounting for differences in unique ~~plant~~ **dry cask storage system** features (b) comparison with results of similar analyses performed with other ~~plant-specific~~ codes **used to evaluate dry cask storage systems** (c) check by other means appropriate to the particular analysis	
SA-D3	Revise	SPECIFY and JUSTIFY the end-point or termination time of ~~severe~~ accident calculations. ~~For the purpose of source term evaluation, USE a minimum end-point or termination time of 36 hours after the onset of core damage (and containment has reached a stable configuration) for all severe accident calculations [see Note (4)].~~	Specification of a minimum termination time for the accident calculations is not considered appropriate. The termination time must ensure that a stable state has been reached.
High Level Requirement	SA-E		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
SA-E1	Suitable		
SA-E2	Suitable		
SA-E3	Suitable		
SA-E4	Suitable		
SA-E5	Suitable		
High Level Requirement	SA-F		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
SA-F1	Revise	DOCUMENT deterministic ~~severe~~ accident analysis in a manner that facilitates PRA applications, upgrades, and peer review.	
SA-F2	Suitable		
SA-F3	Suitable		

Table 2-5: Supporting Requirements for Dry Cask Storage PRA (Level 2 PRA – ASME/ANS RA-S-1.2-2014)			
SA-F4	Suitable		
SA-F5	Suitable		
SA-F6	Suitable		

Table 2-5: Supporting Requirements for Dry Cask Storage PRA (Level 2 PRA – ASME/ANS RA-S-1.2-2014)			
Technical Element	**Prob. Treatment of Level 2 PRA Accident Progression (PT)**		
High Level Requirement	PT-A (Applicable requirements need to be considered in parallel with requirements from Part 2 for the AS technical element to ensure that unique Level 2 PRA aspects are considered.)		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
PT-A1	Revise	USE a methodology for representing the ~~severe~~ accident progression ...	
PT-A2	Revise	*(a)* chronological treatment of events that preserves the order and approximate timeline with which ~~severe~~ accident progression results in radiological release to the environment	Consider "CET" to be defined as applying to the canister for a dry cask PRA peer review.
PT-A3	Revise	DEVELOP a logic structure using the method selected in PT-A1 (i.e., CET or equivalent) that incorporates the items identified in PT-A2, PT-A4, PT-A6, and PT-A7 as well as: (a) initial conditions of Level 2 analysis (output from Level 1 PRA/Level 2 PRA interface, Section 4.3.2) (b) discrimination of different radiological release pathways to the environment (c) accident progression phenomena that affect the evaluation of ~~containment~~ **canister** failure or bypass ~~(address at least those phenomena in Table 4.5-8)~~ (d) loss of ~~containment~~ **cansiter** integrity including time of failure and resulting leakage area and location(s) (e) status of ~~containment~~ **release** mitigation systems including **external** sprays, air cleanup, and ventilation systems (f) accident progression phenomena that may be important to specific ~~POSs~~ **COSs**. These include phenomena ~~such as air ingression and its effects on fuel cladding oxidation and fission product release during reactor shutdown~~ **affecting** accident sequences **initiated during cask loading, transfer, or long-term storage in the ISFSI.**	Consider "CET" to be defined as applying to the canister for a dry cask PRA peer review. Consideration should be given to how canister status at the time of fuel failure, use (or not) of supplemental cooling, oxidizing of fuel, rod splitting, etc., affect the accident progression. In the interest of space and clarity, the items (c) and (d) were deleted in its entirety. The remaining items were renumbered.

Table 2-5: Supporting Requirements for Dry Cask Storage PRA (Level 2 PRA – ASME/ANS RA-S-1.2-2014)			
PT-A4	Revise	SPECIFY the characteristics of ~~severe~~ accident progression (phenomenological events) that could generate mechanical loads and/or thermal challenges to the ~~containment~~ **canister** pressure boundary sufficient to cause structural failure or increased leakage or could induce a release pathway ~~that bypasses the containment pressure boundary, including those identified in Table 4.5-8. Additional resources are provided in Note (8)~~.	
PT-A5	Suitable		
PT-A6	Revise	… mitigating actions by plant personnel directed by ~~plant-specific SAMGs or~~ proceduralized actions, **if any,** accounting for …	Consider "CET" to be defined as applying to the canister for a dry cask PRA peer review.
PT-A7	Suitable	INCLUDE events in the CET (or equivalent) that reflect accident behavior within structures outside the ~~containment~~ **canister** pressure boundary and/or the response of mitigating systems outside the ~~containment~~ **canister** pressure boundary and affect source term attenuation for significant accident progression sequences.	Consider "CET" to be defined as applying to the canister for a dry cask PRA peer review. Applicability needs to be considered for each COS defined for the cask loading and transfer process. For example, if the model begins with cask loading inside the spent fuel structure, fission product retention within the structure would need to be addressed for events initiated during cask loading.
PT-A8	Suitable		May only be applicable during COSs covering cask loading and transfer.
PT-A9	Suitable		
PT-A10	Suitable		Consider "CET" to be defined as applying to the canister for a dry cask PRA peer review.
PT-A11	Suitable		

Table 2-5: Supporting Requirements for Dry Cask Storage PRA (Level 2 PRA – ASME/ANS RA-S-1.2-2014)			
PT-A12	Suitable	INCLUDE events in the CET (or equivalent) that represent operator actions required to establish ~~containment~~ **canister** closure during accident sequences with an open ~~containment~~ **canister** pressure boundary (e.g., during ~~shutdown conditions~~ **cask loading operations**), taking into account the time available and time required for closure.	Consider "CET" to be defined as applying to the canister for a dry cask PRA peer review. May only be applicable during COSs covering cask loading and transfer from the spent fuel storage structure.
PT-A13	Suitable		
PT-A14	Suitable		
PT-A15	Suitable		
PT-A16	Not Applicable		Surrogate release metrics are not expected to be used for a dry cask storage PRA.
High Level Requirement	PT-B (Applicable requirements need to be considered in parallel with requirements from Part 2 for the DA technical element to ensure that unique Level 2 PRA aspects are considered.)		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
PT-B1	Suitable		
PT-B2	Suitable		
PT-B3	Suitable		
PT-B4	Revise	ESTIMATE the conditional probability of phenomenologically-induced ~~containment~~ **canister and/or structure** bypass events in a realistic manner.	Bypass events may only be applicable during COSs covering cask loading operations inside the spent fuel structure where there is potential for bypassing the boundary of the structure (e.g., failure of ventilation system closure on high radiation).
PT-B5	Revise	CHARACTERIZE the probability of ~~containment~~ **canister** failure by comparing the magnitude of the ~~containment~~ **canister** challenges analyzed in Section 4.4 to the capacities of the affected components and structures analyzed in Section 4.3.	
PT-B6	Suitable		
PT-B7	Revise	ESTIMATE the probability of ~~containment~~ **canister** failure events using …	

Table 2-5: Supporting Requirements for Dry Cask Storage PRA (Level 2 PRA – ASME/ANS RA-S-1.2-2014)			
PT-B8	Suitable	… characteristics for physical challenges and structure/component properties with those of the actual as-built, as-operated ~~plant~~ **dry cask storage system and process**.	
PT-B9	Suitable		Applicability may be limited to COSs covering cask loading and transfer operations
PT-B10	Suitable		
High Level Requirement	PT-C (Applicable requirements need to be considered in parallel with requirements from Part 2 for the SY technical element to ensure that unique Level 2 PRA aspects are considered.)		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
PT-C1	Not Applicable		Covered by technical elements SY and DA in Table 2-2.
PT-C2	Not Applicable		Covered by technical element SC in Table 2-2.
PT-C3	Not Applicable		Covered by technical element AS in Table 2-2.
PT-C4	Not Applicable		Equipment survivability in adverse environments should not be a factor in a dry cask storage PRA.
PT-C5	Not Applicable		Equipment survivability in adverse environments should not be a factor in a dry cask storage PRA.
PT-C6	Not Applicable		SGTR is not applicable to the dry cask storage PRA.
PT-C7	Not Applicable		Induced SGTR is not applicable to the dry cask storage PRA.
PT-C8	Revise	PERFORM ~~containment~~ **spent fuel ventilation and applicable canister** isolation systems analysis in a realistic manner … CALCULATE both the failure of ~~containment~~ isolation systems to perform properly … … plus pre-existing failures in the ~~containment~~ isolation analyses …	Applicability may be limited to COSs covering cask loading operations inside the spent fuel structure.

Table 2-5: Supporting Requirements for Dry Cask Storage PRA (Level 2 PRA – ASME/ANS RA-S-1.2-2014)			
PT-C9	Not Applicable		ISLOCA is not applicable to the dry cask storage PRA. May be applicable to the spent fuel pool PRA.
PT-C10	Not Applicable		This is primarily applicable to BWR reactor designs.
PT-C11	Not Applicable		Equipment survivability in adverse radiological environments should not be a factor in a dry cask storage PRA.
PT-C12	Suitable		
High Level Requirement	PT-D (Applicable requirements need to be considered in parallel with requirements from Part 2 for the HR technical element to ensure that unique Level 2 PRA aspects are considered.)		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
PT-D1	Not Applicable		Covered by technical element HR in Table 2-2.
PT-D2	Revise	Realistically ESTIMATE the probability of HFE following the onset of ~~core~~ **fuel** damage consistent with …	May only be applicable to COSs covering cask loading operations. Include applicable AOPs for fuel handling accidents or loss of spent fuel cooling.
PT-D3	Not Applicable		Covered by technical elements SY and DA in Table 2-2.
PT-D4	Not Applicable		Covered by technical element AS in Table 2-2.
PT-D5	Suitable		May only be applicable to COSs covering cask loading and transfer operations.
PT-D6	Suitable		May only be applicable to COSs covering cask loading and transfer operations.
PT-D7	Suitable		
High Level Requirement	PT-E (Applicable requirements need to be considered in parallel with requirements from Part 2 for the QU technical element to ensure that unique Level 2 PRA aspects are considered.)		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
PT-E1	Suitable		
PT-E2	Suitable		Consider "CET" to be defined as applying to the canister for a dry cask PRA peer review.

Table 2-5: Supporting Requirements for Dry Cask Storage PRA (Level 2 PRA – ASME/ANS RA-S-1.2-2014)			
PT-E3	Suitable		
PT-E4	Not Applicable		This is expected to be an integrated Level 2 PRA model with no intermediate Level 1 PRA results.
PT-E5	Suitable		
PT-E6	Suitable		
PT-E7	Not Applicable		Covered by SR QU-E2 in Table 2-2.
PT-E8	Not Applicable		Covered by SR QU-E1 in Table 2-2.
PT-E9	Not Applicable		Covered by SR QU-E4 in Table 2-2.
PT-E10	Not Applicable		Covered by SRs QU-B2 and QU-B3 in Table 2-2.
PT-E11	Not Applicable		Covered by SRs QU-B2 and QU-B3 in Table 2-2.
PT-E12	Not Applicable		Covered by SR QU-D1 in Table 2-2.
PT-E13	Not Applicable		Covered by SR QU-D2 in Table 2-2.
PT-E14	Not Applicable		Covered by SR QU-D3 in Table 2-2.
High Level Requirements	PT-F (Applicable requirements need to be considered in parallel with requirements from Part 2 for the AS, SY, HR, DA, and QU technical elements to ensure that unique Level 2 PRA aspects are considered.)		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
PT-F1	Not Applicable		Covered by SR QU-F1 in Table 2-2.
PT-F2	Suitable		
PT-F3	Revise	DOCUMENT the comparison of ~~severe~~ accident challenges and the ~~containment~~ **canister** capacity.	
PT-F4	Revise	DOCUMENT the basis for the quantification of split fractions or event probabilities associated with ~~severe~~ accident phenomena.	
PT-F5	Suitable		
PT-F6	Revise	*(a)* ~~containment~~ **canister** failure modes and phenomena for each significant accident progression sequence	
PT-F7	Suitable		
PT-F8	Suitable		
PT-F9	Not Applicable	.	Covered by SR QU-F4 in Table 2-2
PT-F10	Suitable		
PT-F11	Suitable		
PT-F12	Suitable		

Table 2-5: Supporting Requirements for Dry Cask Storage PRA (Level 2 PRA – ASME/ANS RA-S-1.2-2014)			
Technical Element	**Radiological Source Term Analysis (ST)**		
High Level Requirement	ST-A		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
ST-A1	Revise	SPECIFY attributes of radionuclide RCs (source term bins) in terms of sequence characteristics that can significantly affect the source term (examples include: release path, time and location of ~~containment~~ **canister** failure~~,~~ **and** availability of sprays~~, and occurrence of molten core-concrete interaction~~) [see Note (1)].	
ST-A2	Suitable		
ST-A3	Suitable		
ST-A4	Suitable		
ST-A5	Suitable		
ST-A6	Not Applicable		Surrogate release metrics are not expected to be used for a dry cask storage PRA.
ST-A7	Not Applicable		Surrogate release metrics are not expected to be used for a dry cask storage PRA.
High Level Requirement	ST-B		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
ST-B1	Suitable		
ST-B2	Revise	Delete item (h).	Item (h) would not be applicable to a dry cask storage PRA.
ST-B3	Suitable		
ST-B4	Suitable		
ST-B5	Suitable		
ST-B6	Revise	JUSTIFY any credit taken for fission product scrubbing as a basis for reducing releases through a ~~containment~~ **canister and/or structure** bypass pathway (e.g., cite relevant experimental evidence or results of deterministic calculations for the decontamination factor used).	Bypass events may only be applicable during COSs covering cask loading and transfer operations.

Table 2-5: Supporting Requirements for Dry Cask Storage PRA (Level 2 PRA – ASME/ANS RA-S-1.2-2014)			
High Level Requirement	ST-C		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
ST-C1	Suitable		
ST-C2	Suitable		
ST-C3	Suitable		
High Level Requirement	ST-D		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
ST-D1	Suitable		
ST-D2	Suitable		
ST-D3	Suitable		
ST-D4	Not Applicable		Surrogate release metrics are not expected to be used for a dry cask storage PRA.
ST-D5	Not Applicable		Surrogate release metrics are not expected to be used for a dry cask storage PRA.
Technical Element	**Evaluation and Presentation of Results (ER)** (Applicable requirements need to be considered in parallel with requirements from Part 2 for the QU technical element to ensure that unique Level 2 aspects are considered.)		
High Level Requirement	ER-A		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
ER-A1	Suitable		
ER-A2	Revise	IDENTIFY the relative contribution of contributors (e.g., initiating events… ~~containment~~ **canister** challenges, ~~containment~~ **canister** failure modes, and source term categories) to each significant RC.	
ER-A3	Not Applicable		The NRC Level 3 PRA is being done as a one-time study. Therefore maintenance and update requirements are not applicable.
High Level Requirement	ER-B		
Supporting Requirement	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
ER-B1	Revise	~~CHARACTERIZE~~ **DOCUMENT** the method(s) used to characterize parametric uncertainty …	

Table 2-5: Supporting Requirements for Dry Cask Storage PRA (Level 2 PRA – ASME/ANS RA-S-1.2-2014)			
High Level Requirement	ER-C		This high level requirement is not applicable; this is expected to be an integrated Level 2 PRA model with no intermediate Level 1 PRA results and no follow-on "applications" as envisioned by the standard.
Supporting Requirements	Assessment	Revised/New Supporting Requirement	Additional Discussion/Notes
ER-C1	Not Applicable		This is expected to be an integrated Level 2 model with no intermediate Level 1 results.
ER-C2	Not Applicable		Changed to Not Applicable for dry cask storage PRA since the PRA will not be used to support any applications.
ER-C3	Not Applicable		Changed to Not Applicable for dry cask storage PRA since the PRA will not be used to support any applications.
ER-C4	Not Applicable		Changed to Not Applicable for dry cask storage PRA since the PRA will not be used to support any applications.
Technical Element	**Interface between Level 2 PRA and Level 3 Analyses (L3)**		
High Level Requirement	L3-A		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
L3-A1	Suitable		
L3-A2	Suitable		
L3-A3	Suitable		
L3-A4	Suitable		
L3-A5	Suitable		
L3-A6	Suitable		
L3-A7	Suitable		
L3-A8	Suitable		
L3-A9	Suitable		
High Level Requirement	L3-B		
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
L3-B1	Suitable		
L3-B2	Suitable		
L3-B3	Suitable		

Table 2-6 was created as the need for a POS set of high level requirements (and the associated supporting requirements) was identified during the workshop. The ASME/ANS non-LWR PRA Standard [5] was selected to provide the basis for the POS requirements. Although, Table 2-6 describes the cask operating state (COS) analysis, to keep the connection/reference with the origin source of requirements, the high level requirements and supporting requirements are still prefixed with POS (rather than COS).

Table 2-6: Supporting Requirements for Dry Cask Storage PRA (Cask Operating State Analysis)

Technical Element	**Plant Operating State Analysis**		
High Level Requirement	POS-A	The ~~plant~~ **cask** operating state analysis shall use a structured, systematic process to identify and define ~~POSs~~ **COSs** to be considered in the PRA, consistent with the specific ~~reactor design~~ **dry cask system design** and scope of the PRA.	
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
POS-A1	Revise	IDENTIFY a representative set of ~~plant~~ **dry cask** evolutions ~~[e.g., maintenance configurations, power changes, low power, shutdown, type of refueling outage(s)]~~ **[e.g., cask loading, draining, closure, transfer, and long-term storage in the ISFSI]** to be analyzed ~~including refueling outages ... hot shutdowns)~~..	
POS-A2	Revise	ENSURE the level of detail in the delineation of POSs **COSs** is consistent with the as-built and as-operated ~~plant~~ **dry cask storage system and process.** ~~For PRAs performed during ... and referenced by, thePRA~~	

Table 2-6: Supporting Requirements for Dry Cask Storage PRA (Cask Operating State Analysis)			
POS-A3	Revise	For each identified ~~plant~~ **cask loading, transfer, or storage** evolution, REVIEW available design-specific and/or plant-specific documentation (such as **the amendment to the certificate of compliance** ~~Technical Specifications, and normal shutdown, refueling,~~ and ~~startup~~ procedures) and records (such as recent ~~outage~~ **cask loading program** plans and records; ~~maintenance plans and records; operations data; trip history; control room logbooks;~~ and plant parameters needed to determine success criteria, mechanistic source terms, and consequences) for the following: • ~~operating modes or~~ operational conditions ~~as defined in plant Technical Specifications~~; • ~~RCPB~~ **cask** configurations, such as ~~vented~~ **open** or ~~not vented~~ sealed; ~~whether temporary RCS penetrations~~ **and drainage and drying connections** are installed ~~and their differential pressure capability taken out of service; changes in configuration of vessel internals; and DHR mechanisms;~~ • ~~available~~ parameter instrumentation; • activities that may lead to changes in the above parameters; • ~~reactor building, containment, or confinement status (e.g., deinerted, intact, open)~~ • **cask location (e.g., in spent fuel pool structure, being transferred, or in ISFSI);** • activities changing the capabilities of structures, systems, and components (SSCs) to support each of the ~~reactor-specific~~ **defined** safety functions that must be satisfied during each ~~POS~~ **COS**.	In the interest of space and clarity, the third bullet was deleted in its entirety.

Table 2-6: Supporting Requirements for Dry Cask Storage PRA (Cask Operating State Analysis)			
POS-A4	Revise	For each ~~plant~~ **cask loading, transfer, and storage** evolution, DEFINE the characteristics of a set of exclusive ~~POSs~~ **COSs** that cover the entire evolution in terms of unique combinations of the following: • sources of radioactive material within the scope of the PRA; • ~~operating modes or~~ operational conditions ~~as defined in plant Technical Specifications~~; • ~~RCPB~~ **cask** configurations; • available parameter instrumentation; • activities that may lead to changes in the above parameters used to define the POS; • ~~reactor building, containment, or confinement~~ **cask** status (e.g., ~~deinerted, intact,~~ open, **sealed, being transferred, draining, drying, helium backfill, in storage at the ISFSI**). Alternatively, a more detailed set of ~~plant~~ **cask** conditions may be used. ASSURE the set of ~~POSs~~ **COSs** is sufficient to support the selection of initiating events, the justification of success criteria, ~~POS~~ **COS** frequency and duration parameters, the evaluations of human failure events (HFEs), the accounting for planned equipment outages, the definition of accident sequences, and the quantification of time-averaged ~~core damage~~ **end state** frequency ~~and large early release frequency~~, and to provide a finite number of sets of ~~plant~~ **cask** conditions for peer reviews. The combination of all ~~POSs~~ **COSs** covers all of the modeled ~~LPSD~~ **dry cask** evolutions.	"Evolution" is defined as the transition from one COS to another. In the interest of space and clarity, the fourth bullet was deleted in its entirety.
POS-A5	Not Applicable		Dry cask storage is not a "living PRA" since the process is not expected to change.
POS-A6	Not Applicable		Supporting requirement number not used.

Table 2-6: Supporting Requirements for Dry Cask Storage PRA (Cask Operating State Analysis)			
POS-A7	Revise	~~For PRAs on operating plants,~~ INTERVIEW appropriate plant personnel (e.g., operations, maintenance, engineering, safety analysis, outage planning) to determine if potential ~~POSs~~ **COSs** of past or future ~~evolutions~~ **cask loading programs have been overlooked.** ~~Information from interviews … correctly reflects the as-designed plant.~~	
POS-A8	Revise	ENSURE that the ~~plant~~ **cask** conditions defined for each ~~POS~~ **COS** of the modeled ~~plant~~ **cask** evolutions support the remaining PRA elements for ~~the internal events~~ **all modeled initiating events and** hazard groups, and REVISE the selected parameter conditions, or SUBDIVIDE the ~~POS~~ **COS** interval into different sets of ~~plant~~ **cask** conditions if the current selections cause risk-significant contributors to be evaluated conservatively.	
POS-A9	Not Applicable		Combined into revised POS-A8.
High Level Requirement	POS-B	The ~~plant~~ **cask** operating state analysis shall justify all screening and grouping of ~~POSs~~ **COSs** or ~~plant~~ **dry cask storage system** evolutions to facilitate an efficient estimation of ~~RCFs~~ **the end state metric.**	
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
POS-B1	Replace	**JUSTIFY any grouping of COSs or cask evolutions performed to facilitate an efficient estimation of RCFs.**	

Table 2-6: Supporting Requirements for Dry Cask Storage PRA (Cask Operating State Analysis)			
POS-B2	Revise	~~ENSURE and~~ JUSTIFY that any screening of individual ~~POSs~~ **COSs** does not eliminate any risk-significant accident sequences. ~~The following quantitative criteria and qualitative comparisons may be used to show that risk-significant accident sequences would not be screened:~~ ~~(a) The frequency of accident sequences from the POS to be screened is quantitatively shown to be <1E-8/plant-yr; or~~ ~~(b) The frequency of event sequences from a POS to be screened is qualitatively demonstrated to be lower in frequency than another POS that is quantitatively demonstrated to not be a risk-significant POS; or~~ ~~(c) The frequency of sequences from the POS to be screened is quantitatively shown to contribute <1% of any risk-significant RCF.~~	Refer to NUREG-1855, Section 5.2 for acceptable screening criteria.
POS-B3	Not Applicable		The purpose of this supporting requirement is covered by POS-B6.
POS-B2	Revise	ENSURE that ~~POSs~~ **COSs** with different **dry cask storage system** response impacts (e.g., those with different success criteria or barrier configurations) or those that could have more severe radionuclide release potential remain separated.	The repeated number of POS-B2 is how the supporting requirement is presented in the source standard.
POS-B3			This supporting requirement needs further clarification that was not available at the time of publication. The repeated number of POS-B3 is how the supporting requirement is presented in the source standard.
POS-B5	Revise	If ~~POSs~~ **COSs** are combined into groups, ENSURE that the most severe or constraining characteristics (with respect to the frequency and consequences of each release category, including consideration of the type and frequency of initiating events) of any ~~POS~~ **COS** within the group are chosen for the combined group.	

Table 2-6: Supporting Requirements for Dry Cask Storage PRA (Cask Operating State Analysis)			
POS-B6	Suitable	Consider "POS" to be equivalent to "COS" for a dry cask PRA peer review.	
High Level Requirement	POS-C	The ~~plant~~ **cask** operating state analysis shall determine the ~~POS~~ **COS** frequencies and durations if applicable to the analysis along with the representative decay heat levels and other plant parameters relevant to the frequency or consequences of event sequences and release categories, associated with each ~~POS~~ **COS**.	
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
POS-C1	Revise	~~For operating plants,~~ ESTIMATE the average frequency and average duration of ~~plant~~ **cask loading program** evolutions based on a review of applicable plant-specific records ~~(such as operating profile, trip history) and, as appropriate, the frequency of forced outages assigned to each identified safe, stable state~~. [Supporting Requirement (SR) POS-C1 can be addressed in conjunction with SR POS-A1, SR POS-A2, and SR POS-A3].	In the interest of space and clarity, the second paragraph was deleted in its entirety.
POS-C2	Not Applicable		
POS-C3	Revise	SUM the durations for each group of ~~POSs~~ **COSs** to obtain the durations of the groups. ~~The entry frequencies of the grouped POSs are the same (see SR POS-B1), though the frequencies differ for each type.~~	For example, a COS of "move the fuel assembly to the cask" may have 32 entries, and the total duration would be 32 minutes (assuming it takes one minute per assembly). Similarly, a COS of "move the cask" would have fewer entries since there are fewer frequencies.
POS-C4	Not Applicable		The decay heat level per COS would not change, since a maximum bounding decay heat would be used for the cask process.
POS-C5	Not Applicable		Dry cask storage is not a "living PRA" since the process is not expected to change.

Table 2-6: Supporting Requirements for Dry Cask Storage PRA (Cask Operating State Analysis)			
High Level Requirement	POS-D	The ~~plant~~ **cask** operating state analysis shall be documented consistent with the applicable supporting requirements	
Supporting Requirements	**Assessment**	**Revised/New Supporting Requirement**	**Additional Discussion/Notes**
POS-D1	Revise	DOCUMENT the plant cask operating state analysis in a manner that facilitates PRA applications, upgrades, and peer review.	
POS-D2	Revise	DOCUMENT the processes used to identify, define, group, and characterize the ~~plant~~ **cask** evolutions and ~~POSs~~ **COSs** and to quantify the ~~POS~~ **COS** frequency, durations, and decay heat levels, including the inputs, methods, and results. For example, the documentation typically includes the following: (a) selection and definitions of the ~~plant~~ **cask** evolutions; (b) the process and criteria used to identify ~~POSs~~ **COSs**; (c) the process and criteria used to group ~~POSs~~ **COSs**; (d) the definition of each ~~POS~~ **COS** group; (e) the defining characteristics of each ~~POS~~ **COS**; (f) the evolution types, average durations, and average frequencies; (g) the average durations and average frequencies of ~~POSs~~ **COSs**; ~~(h) the decay heat associated with each POS of each plant evolution;~~ (~~i~~**h**) specific interfaces with other PRA tasks for traceability, and to facilitate configuration control when interfacing tasks are updated.	
POS-D3	Revise	DOCUMENT the sources of model uncertainty and related assumptions associated with the ~~plant~~ **cask** operating state analysis.	
POS-D4	Not Applicable		

3 REFERENCES

[1] "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," Regulatory Guide 1.200, U.S. Nuclear Regulatory Commission, February 2004. Current version is Revision 2, March 2009.

[2] "Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications," ASME Standard RA-S-2002, ASME, April 2002. Version referenced is "Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications," ASME/ANS RA-Sa-2009 (Addenda to ASME/ANS RA-S-2008), ASME, 2009.

[3] "Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications," ASME Standard RA-S-2002, ASME, April 2002. Version referenced is "Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications," ASME/ANS RA-Sb-2013 (Addenda to ASME/ANS RA-S-2008), ASME, 2013.

[4] "Severe Accident Progression and Radiological Release (Level 2) PRA Standard for Nuclear Power Plant Applications for Light Water Reactors (LWRs)," ASME/ANS RA-S-1.2-2014, published as a trial use standard, ASME/ANS, January 2015.

[5] "Probabilistic Risk Assessment Standard for Advanced Non-LWR Nuclear Power Plants," ASME/ANS RA-S-1.4-2013, published as a trial use standard, ASME/ANS, December 2013.

[6] "Process for Performing Internal Events PRA Peer Reviews Using the ASME PRA Standard," NEI 05-04, Rev. 3, Nuclear Energy Institute, November 2009.

4 CONCLUSIONS

Through the process of the joint industry/NRC workshop and subsequent review, the PWROG has developed a set of dry cask storage PRA requirements that are suitable for using in the PRA development (e.g., self-assessment) and PRA peer review. These requirements were not developed via a consensus process, nor with the endorsement of any SDO.

APPENDIX A: DEFINITIONS

independent spent fuel storage installation (ISFSI): a complex designed and constructed for the interim storage of spent nuclear fuel, solid reactor-related greater than class C (GTCC) waste, and other radioactive materials associated with spent fuel and reactor-related GTCC waste storage. An ISFSI which is located on the site of another facility licensed under this part or a facility licensed under 10 CFR part 50 and which shares common utilities and services with that facility or is physically connected with that other facility may still be considered independent. [Source: 10 CFR 72.3]

multi-purpose canister (MPC): the sealed spent nuclear fuel canisters, which consist of a honeycombed fuel basket contained in a cylindrical canister shell, which is welded to a baseplate, lid with welded port cover plates, and closure ring. The MPC provides the confinement boundary for the contained radioactive materials. [Source: Appendix A of HI-STORM 100 Certificate of Compliance (CoC) Amendment 7]

overpack: a cask which receives and contains the sealed MPC for interim storage on the ISFSI. An overpack provides gamma and neutron shielding, and provides for ventilated air flow to promote heat transfer from the MPC to the environment. The term overpack does not include the transfer cask.

spent fuel storage casks (SFSCs): containers approved for the storage of spent fuel assemblies at the ISFSI. The HI-STORM 100 SFSC System consists of the overpack-and its integral MPC. [Source: Appendix A of HI-STORM 100 CoC Amendment 7]

transfer cask: a container designed to contain the MPC during and after loading of spent fuel assemblies and to transfer the MPC to or from the OVERPACK/VVM. The HI-STORM 100 System employs either the 125-Ton or the 100-Ton HI-TRAC transfer cask.

unloading operations: all licensed activities on a SFSC to be unloaded of the contained fuel assemblies. Unloading operations begin when the overpack or transfer cask is no longer suspended from or secured on the transporter and end when the last fuel assembly is removed from the SFSC. Unloading operations does not include MPC transfer.