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DID-01	DID	2.2.1	24	The working group is not clear regarding the NGNP approach to the fourth criterion [require containment structures and safety features to prevent the release of fission products]. NRC's regulations address this criterion in the requirements for evaluation of a hypothetical accident in 10 CFR 50.34 and 10 CFR 52.79, as discussed in the LBE white paper assessment above. This regulatory requirement is predicated on the potential for severe events that could result in release of appreciable quantities of fission products from reactor fuel. The regulatory requirement is imposed to assure that mitigation of consequences, as well as prevention of these very low probability but high consequence events, are appropriately considered as part of the DID	RAI LBE-1 RAI LBE-3 RAI LBE-6 RAI DID-15 RAI DID-19 RAI DID-20 RAI DID-32 RAI DID-36	This issue is predicated on LWR rationale that there can be a large release from the HTGR and does not take into account the description provided in white papers of fuel performance and fission product barriers for HTGR design concept.
DID-02	DID	2.2.1	25	Pending further details of such an approach [LBE selection], it is not possible for the working group to make a preliminary assessment of the adequacy of the DID approach insofar as selection of LBE is concerned with regard to inclusion of "severe accidents," and insofar as a proper assessment of bounding source terms is concerned. The working group believes that a conservative deterministic selection of LBE could ensure adequate DID for the NGNP prototype	RAI LBE-23 RAI LBE-33 RAI DID-14	The LBE selection process includes bounding event sequences as discussed in responses to the following RAIs: LBE-23, LBE-33, and DID-14.
DID-03	DID	2.2.1	26	Demonstrating the adequacy and sufficiency of the proposed DID approach requires a thorough understanding of and proper implementation of event selection (including a stronger deterministic element, as discussed in the assessment of the LBE white paper), safety classification and treatment of SSCs, source term, emergency planning, and scope and applicability of PRA methodologies (including risk metrics). In the absence of detailed design information on these topics at this point in time, it is premature to make more definitive conclusions on the adequacy and sufficiency of the details of the proposed DID approach. Such conclusions would be the result of detailed NRC staff review of a specific detailed NGNP design, perhaps in a topical report which could be reviewed prior to receipt of a license application.	RAI DID-6 RAI DID-23 RAI DID-34 RAI LBE-30	The response to RAI LBE-30 recognizes the lack of detail design at this stage but rather addresses the principles of risk-informing defense-in-depth. The intent of the white paper is to describe the methodology to be applied for application of defense-in-depth. The approach to application of DID is addressed in the response to RAI DID-6. The response to RAI DID-34 provides discussion of the programmatic attributes which contribute to DID. Also, see response to RAI DID-23.
DID-04	DID	2.2.2	27	However, several items of the framework defer more substantial discussion to the license application stage, which limits the working group's ability to assess the proposal. For example, the NGNP safety design claims to include multiple robust barriers to radioactive material release. However, independence of barrier concept and challenges to barrier integrity cannot be addressed until the PRA and other detailed design information are submitted to support the license application. Additional information regarding the approach for each of the plant capability DID principles can be provided during pre-application interactions with a prospective licensee to ensure their proper consideration as the design is developed.	RAI DID-2 RAI DID-7 RAI DID-9 RAI DID-14 RAI DID-15 RAI DID-22 RAI DID-23 RAI DID-32 RAI DID-34 RAI LBE-30	RAI DID-23 appears to encompass this issue directly. Quantitative objective criteria for establishing DID capability is addressed in response to RAI DID-34. The response to RAI DID-2 addresses DID principles. The response to DID-9 addresses the DID approach with respect to addressing uncertainties. The response to RAI DID-32 addresses DID capability with respect to fuel barriers. The response to DID-7 appears to be focused on TLRC, not DID principles.
DID-05	DID	2.2.3	28	The efficacy of the programs is indeterminate at this point in time, given the lack of specific information about those programs. Therefore, no conclusions can be made until specific programs are proposed by a license applicant, and reviewed and approved by the NRC staff. For example, some non¬safety-related SSCs are expected to have special treatment to provide DID. As discussed in the SSC white paper assessment below, it is not clear how the appropriate treatment will be identified and applied for this purpose, and that is difficult to quantify the effects of treatment in a PRA. The working group believes that conservative engineering judgment is needed to ensure the adequacy of treatment of SSCs providing DID.	RAI DID-31 RAI DID-32 RAI DID-34 RAI SSC-10 RAI SSC-12 RAI SSC-20 RAI SSC-24	The response to RAIs DID-31 and 34 address programmatic DID with respect to special treatment of NSR SSCs. The response to RAI DID-32 addresses special treatment requirements for fuel to provide programmatic DID. The response to RAI SSC-10 addresses special treatment as an element of DID. The response to RAI SSC-12 addresses special treatment in the context of DID for DBEs and BDBEs. The response to RAIs SSC-20 and 24 address the PRA approach and its effect on special treatment to support DID.
DID-06	DID	2.2.3	28	It is also the working group's view that the scope of programmatic DID topics does not adequately consider programmatic elements for managing catastrophic events. Especially in view of related recommendations from the NRC's near-term review of insights from the Fukushima Dai-Ichi accident (e.g., Recommendation 8), the working group believes that the Project should give broader consideration to how such programmatic DID measures as emergency operating procedures (EOPs), severe accident management guidelines (SAMGs), and extensive damage mitigation guidelines (EDMGs) are applied to limit the progression and consequences of hypothetical catastrophic events (i.e., severe accident or security events beyond the design basis).	RAI DID-9 RAI DID-12 RAI DID-13	DID-12 (incorporating risk insights into programmatic DID). The response to RAI DID-9 addresses use of programmatic measures with respect to uncertainties. RAI DID-13 and its response appear to directly address this issue.
DID-07	DID	2.2.5	31	The scope of topics covered in DID Outcome Objective 5 appears to the working group to be reasonable. However, in the absence of NGNP design-specific information on these topics at this point in time, it is premature for the working group to make any conclusions on the adequacy and sufficiency of the details intended to be covered in the proposed topics. Such conclusions would be the result of detailed NRC staff review of a specific detailed NGNP design, perhaps in a topical report which could be reviewed prior to receipt of a license application. Such a review would determine whether the proposed approach demonstrates compliance with regulatory requirements	RAI DID-23	The response to RAI DID-23 addresses otcome objectives with respect to adequacy of DID.
LBE-01	LBE	2.1.1	5	New application of using plant-specific PRA for selection of LBEs: It can be expected that requirements and guidance for the technical adequacy of a PRA for this expanded application will need to be established and implemented. Requirements for this application will necessarily be different and likely more demanding than those for a "design PRA" that supports certification in accordance with 10 CFR Part 52.	RAI LBE-4 RAI LBE-7 RAI LBE-11 RAI LBE-14 RAI DID-5 RAI DID-17 RAI SSC-4 RAI SSC-7	
LBE-02	LBE	2.1.1	6	It is not possible to assess the adequacy of implementation of the approach (use of deterministic judgment in selecting LBEs) until considerably more detail is provided regarding the proposed NGNP design, processes used to conduct the deterministic evaluation, and the outcome of the design effort by the reactor vendor		

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LBE-03	LBE	2.1.1	6	The LBE white paper does not clearly describe how engineering judgment will be used to deterministically select LBEs in the event categories that are conservative with respect to the calculated dose consequences relative to the LBEs developed from the NGNP PRA. For example, such LBE sequences would involve conservative assumptions potentially involving a combination of such aspects as conservative initiating events (i.e., initiating event severity) with respect to the resulting mechanistic source term, conservative SSC performance characteristics associated with fission product barriers and accident heat removal and conservative core thermal-fluid characteristics resulting in conservative fission product releases and FP distributions during normal operation (e.g., conservative bypass flow, during normal operation).	RAI LBE-3 RAI LBE-10 RAI LBE-22 RAI LBE-23 RAI LBE-26 RAI LBE-27 RAI DID-2 RAI DID-28	
LBE-04	LBE	2.1.1	8	The staff will need to assess whether emergency planning basis event (EPBEs) identified on the basis of event sequence probability would provide an adequate spectrum of events for emergency response planning for NGNP. In this regard, additional deterministically selected initiating events and sequences in the BDBE region may be required to provide an adequate spectrum of accident dose consequences.	RAI LBE-40	
LBE-05	LBE	2.1.2	10	Principle 5 (Section 4.3 of NUREG-1860) describes the containment system as an essential aspect of the NRC's defense-in-depth philosophy and provides a design basis approach and criteria for the defense-in-depth capability of the containment system. The containment system must be shown to be capable of preventing an unacceptable release of radioactive material to the public for a hypothetical event representing a serious challenge to fission product retention in the fuel and the coolant system.		This related to the Part 100 siting issue.
LBE-06	LBE	2.1.2	10	Neither the NGNP LBE White Paper nor the NGNP MST white paper identified an approach or criteria for demonstrating the defense-in-depth capability of the functional containment system.	RAI DID-15 RAI DID-19 RAI DID-22	This related to the Part 100 siting issue.
LBE-07	LBE	2.1.2	11	The working group believes that whether LBE sequences below the lower frequency cutoff for the DBE region (i.e., 1E-5 per reactor-year) can be excluded from the accidents considered in developing the NGNP siting source term and assuring adequate DID of the NGNP functional containment system presents policy issues that the Commission would have to determine.	RAI LBE-39	
LBE-08	LBE	2.1.2	11	Additionally, design basis events have been identified using deterministic engineering judgment for current reactors; establishment of a frequency cutoff criterion involves interpretation of regulations (e.g., 10 CFR 50.34(a)(1)(ii)(D) or 52.17(a)(1)(ix)) in a new manner, and, as such, presents policy issues that the Commission would have to determine.	RAI LBE-1 RAI LBE-5 RAI LBE-21 RAI LBE-29	
LBE-09	LBE	2.1.3	12	As stated above, the NGNP Project proposes that the frequency of LBEs be expressed on a per plant-year basis where a plant is defined as a collection of reactor modules having selected shared systems and that the guidelines for the upper and lower frequency bounds for categorizing events be on a per plant-year basis. Therefore, for events involving a single reactor module, the frequency ranges per reactor module per year would be the proposed frequency ranges divided by the number of reactor modules that comprise the plant. For example, for such events, as stated above, for an eight reactor module plant design, the proposed lower frequency cutoff of 1E-4 per plant-year for DBEs impacting only one of an eight reactor module plant would result lower frequency cut off guideline of about 1E-5 per reactor-year. Thus, the cut-off frequencies on a reactor-year basis would vary depending	RAI LBE-5 RAI LBE-21 RAI LBE-29	
LBE-10	LBE	2.1.3	13	It is the working group's view that DBEs involve event sequences or initiating events with mean frequencies less than 1E-2 per reactor-year and a mean frequency greater than 1E-5 per reactor-year. Additionally, it is the working group's view that BDBEs should involve event sequences or initiating events with mean frequencies less than 1E-5 per reactor-year and a mean frequency greater than 1E-7 per reactor-year.	RAI LBE-5 RAI LBE-21 RAI LBE-29	
LBE-11	LBE	2.1.3	13	The frequency ranges as well as whether both event sequence frequency and initiating event frequency should be considered in the categorization of LBEs are considered Commission policy issues.	RAI LBE-5 RAI LBE-21 RAI LBE-29	
LBE-12	LBE	2.1.4	16	It is the working group's view that the dose calculation model for AOOs should include all the SSCs that have a role in the deterministic safety analysis of the event sequence, but that a conservative calculation of the mechanistic source term should be used to demonstrate that 10 CFR 20 dose limits are met.		
LBE-13	LBE	2.1.4	17	It is the working group's view that the Project should pursue the development of an appropriate regulatory limit (e.g., a technical specification limit) to ensure the required level of integrity of the fuel barrier during normal operation as well as AOOs. As a minimum, it is the working group's view that the deterministic safety analyses for AOOs should include the demonstration that the fuel design limits (i.e., the maximum design conditions, such as the maximum fuel irradiation temperature, associated with the NGNP fuel qualification test program) are not exceeded during any AOO.		

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LBE-14	LBE	2.1.4	17	Current regulatory practice uses conservative calculations to demonstrate conformance with AOO acceptance criteria. In addition, presently, AOOs are not expected to yield offsite dose consequences. The NGNP Project proposes a best estimate calculation with some level of potential offsite consequences. The working group believes that, while use of 10 CFR 20 to establish AOO acceptance criteria is appropriate, calculations demonstrating compliance with those criteria should be done conservatively for events which, by definition, are considered likely to occur within the lifetime of the facility.	RAI LBE-6 RAI LBE-12 RAI LBE-15 RAI LBE-32	
LBE-15	LBE	2.1.4	17	However, this use of the F-C curve and whether associated calculations should be best estimate or conservative is considered to be a potential Commission policy issue, since it involves a new interpretation of the regulations and associated guidance for demonstrating compliance.	RAI LBE-6 RAI LBE-34 RAI LBE-36	
LBE-16	LBE	2.1.4	18	Bounding events which would otherwise fall within the BDBE region should be evaluated [as design basis events] to ensure adequate defense-in-depth for containment of fission products, in accordance with regulatory requirements.	RAI LBE-28	
LBE-17	LBE	2.1.4	18	Deterministic elements of the proposed approach should be strengthened to ensure conservative selection of bounding events, including events used to justify proposed emergency response measures.	RAI LBE-3 RAI LBE-23 RAI LBE-26 RAI LBE-27	
LBE-18	LBE	2.1.5	19	As previously stated in the working group's assessment of LBE outcome objective 3, it is the working group's view that BDBEs should include event sequences or initiating events with mean frequencies down to 1E-7 per reactor-year. For a multi-modular plant with four reactor modules, this would be equivalent to event sequences or initiating events with mean frequencies greater than 4E-7 per plant-year. It is the working group's view that 1E-7 per reactor-year provides a reasonable cutoff for assessing whether the NGNP meets the NRC safety goals.	RAI LBE-37	Related to LBE-09 and LBE-10.
LBE-19	LBE	2.1.5	19	The PRA event sequence frequency cutoff for establishing emergency planning requirements is considered a Commission policy issue.		
LBE-20	LBE	2.1.6	21	The working group agrees with the proposed scope of events and phenomena to be considered, but notes that additional requirements may arise from NRC's evaluation of lessons learned from Fukushima Dai-ichi.		
LBE-21	LBE	2.1.7	21	Further, the working group agrees that the consequences of DBAs can be based on event-specific mechanistic source terms, and that these source terms should be calculated on conservative basis. However, the details of the conservative mechanistic source term calculation methodology have not yet been provided, so the working group has not been able to evaluate whether the margin associated with such calculations is reasonable. It is expected that any staff determination on this issue would be made during interactions with the NGNP license applicant.	RAI LBE-11 RAI DID-19	
LBE-22	LBE	2.1.8	22	The working group views the frequency ranges for categorizing LBEs as guidelines, and not sharp break points in categorizing events. That is, considering a BDBE which falls near the upper frequency boundary for such events could ensure such an event is addressed in an appropriately conservative manner. Any final staff decisions on the adequacy of LBE categorization would be made during the NGNP licensing review.		
SSC-01	SSC	2.3.1	32	Per footnote 9 on page 32, the white paper should not reference 50.34 for dose limits. The operative reference is 52.70 for COL applications (which is identical to 50.34).	RAI DID-26	
SSC-02	SSC	2.3.1	33	NRC wants all barriers to fission product release to be identified and classified as SR and the definition of SR SSCs should make this clear.	RAI DID-36 RAI SSC-17	RAI DID-36 partially addresses why HPB is not SR for the function of radionuclide retention. RAI SSC-17 at a very high level provides the criteria for SSCs being classified as SR but does not get into the functions and why the HPB and RB are safety related but not for radionuclide retention.
SSC-03	SSC	2.3.1	33	The NGNP criteria for determining SR SSCs should be stated in a fashion similar to 10 CFR 50.2 and should be equivalent, in principle, to this definition. In addition, design basis events in this definition should include AOOs.		
SSC-04	SSC	2.3.1	33	NGNP's specification of treatment for select non-safety related SSCs as a means of incorporating defense-in-depth is incomplete (see sections 2.3.2 and 2.3.4)	RAI SSC-1, 3, 5, 6, 10, 12, 24	
SSC-05	SSC	2.3.1	33	There is not sufficient design detail to support implementation of the approach for the purpose of concluding an acceptable outcome.		
SSC-06	SSC	2.3.1	34	The white paper does not describe how the NRC policy on RTNSS will be implemented for NGNP.	RAI SSC-25	
SSC-07	SSC	2.3.2	36-37	SSCs will need to conform to ASME Code requirements which are not yet developed as well as existing Code requirements which are applicable and adaptable to NGNP.	RAI LBE-17 RAI LBE-38	
SSC-08	SSC	2.3.2	35-45	Although not explicitly stated by NGNP, the NRC believes that SSCs which comprise the helium pressure boundary should be classified as safety-related.	RAI DID-36 RAI SSC-17	RAI DID-36 partially addresses why HPB is not SR for the function of radionuclide retention. RAI SSC-17 at a very high level provides the criteria for SSCs being classified as SR but does not get into the functions and why the HPB and RB are safety related but not for radionuclide retention.
SSC-09	SSC	2.3.2	35-45	SSCs associated with the "reactor building containment" should be classified as "safety-related with special treatment" if the SSCs are relied upon to avoid exceeding TLRC.		Not clear what issue is since we have neither a "reactor building containment" nor a classification of "safety-related with special treatment."
SSC-10	SSC	2.3.2	35-37	Safety-related SSCs that provide principle barriers to the release of fission products should have appropriate special treatment requirements in the form of engineering safety and design limits, and the safety analyses should demonstrate that these limits are not exceeded for any AOO.	RAI DID-19	RAI DID 19 provides a partial response but does not cover the AOO disconnect

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SSC-11	SSC	2.3.2	36-45	SSCs relied upon to perform required safety functions to prevent or mitigate the consequences of BDBEs to comply with Part 100 should be safety-related.	RAI SSC-15, 17, 18, 27	
SSC-12	SSC	2.3.2	36	In accordance with 50.49(b), SSCs involved in the prevention and mitigation of AOOs should be safety-related and not classified as NSRST. Operational SSCs included in this category for mitigation of AOOs are anticipated to include operational core cooling systems and operational waste treatment systems. Such SSCs credited with prevention and mitigation of AOOs are designated (using deterministic judgment) as safety-related to ensure the integrity of the principle fission product barriers rather than to ensure that Part 20 limits are met. The NRC considers AOO dose acceptance criteria to be a potential policy issue.	RAI LBE-12 RAI SSC-8, 11	
SSC-13	SSC	2.3.2	36	SSCs relied upon to prevent the frequency of DBEs with consequences greater than Part 20 offsite dose limits from increasing from a lower event category to a higher event category should be classified as safety-related. If the degree of special treatment for an SSC is to be commensurate with its safety significance, it is inappropriate that a lesser degree of special treatment be assigned to an SSC mitigating such an AOO.	RAI DID-34	
SSC-14	SSC	2.3.3	38	The scope of SSCs classified as safety-related appears to be incomplete because of the lack of design detail does not allow a conclusion of the acceptability of any specific design feature or SSC performance or treatment. This item is open pending provision of necessary design detail.		
SSC-15	SSC	2.3.4	40	A performance monitoring program is not described in the white paper which may contribute to defining special treatment requirements.		
SSC-16	SSC	2.3.4	40	Table 1 of the white paper suggests that special treatment requirements for design reliability to not apply to SSCs categorized as NSRST which the NRC considers to be inconsistent with its defense-in-depth philosophy.		
SSC-17	SSC	2.3.4	40-41	NGNP does not identify a special treatment program for maintaining availability of NSRST SSCs during plant operation. The NRC suggests something equivalent to an Administrative Controls Manual be considered for non-safety related SSCs.	RAI SSC-9 RAI SSC-19	
SSC-18	SSC	2.3.4	43-44	The definition of NSRST SSCs addresses only providing defense-in-depth in terms of controlling the frequency of an accident but does not address any role in mitigation of accident consequences. An NSRST function to mitigate accidents should be explicitly included in the definition of SSCs required to prevent DBEs from increasing in frequency into the AOO region.	RAI LBE-10 RAI SSC-16	
SSC-19	SSC	2.3.4	41-44	The special treatment attributes presented in Table 1 of the white paper creates a considerable configuration control challenge. The level of tracking of special treatment attributes is unclear.		
SSC-20	SSC	2.3.4	43-44	The NRC believes the use of the NSRST classification introduces additional complexity in the licensing process which appears to the NRC to potentially give rise to exemptions being requested by the applicant. However, the NRC does not have sufficient information about the design or possible exemption application to make a preliminary assessment as to whether the approach is reasonable or would be acceptable.	RAI SSC-8	
SSC-21	SSC	2.3.4	43-44	The proposed use of the NSRST classification increases the scope of review for a prospective license application and introduces additional regulatory uncertainty.		
SSC-22	SSC	2.3.4	43-44	The white paper does not address whether NSRST SSCs will be considered basic components within the context of reportability requirements under 10 CFR 21.		