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Mr. James E. Lyons
Director, New Reactor Licensing Project Office
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: Resolution of Generic Topic ESP-7 (Meeting Section 10 CFR 52.17(a)(1))

PROJECT 689

Dear Mr. Lyons:

On February 5, the NRC staff responded to our December 20, 2002, resolution letter on ESP-7 by stating that, based on its interpretation of NRC regulations, ESP applications must contain complete radiological dose consequence information to demonstrate compliance with Part 100 radiological consequence criteria set forth in 10 CFR 50.34(a)(1). In a public meeting on March 5, we indicated that we disagree with the staff's interpretation and believe it to be unnecessary, problematic and inconsistent with the objective to determine site suitability. We consider this to be an unresolved generic issue and intend to pursue it through comments on the ESP Review Standard, the forthcoming Notice of Proposed Rulemaking on Part 52 and other means.

This notwithstanding, to allow the pilot ESP applications to proceed as scheduled, we discussed use of a bounding approach to provide design basis accident (DBA) radiological consequence analyses and demonstrate compliance with Part 100, consistent with the staff's view. Such an approach, while not preferred by the industry, is considered workable by the pilot ESP applicants and would be generally consistent with the approach described by the staff in the final bullet of its February 5 letter.

As we discussed on March 5, bounding DBA radiological consequence analyses provided by pilot ESP applicants would focus on releases to the environment and not on the nature and behaviors of the source term inside containment. Providing such analyses would satisfy pertinent NRC regulations, including:

- Section 52.17(a)(1), which states in part:

  "...The application must also contain a description and safety assessment of the site on which the facility is to be located. The assessment must contain an analysis and evaluation of the major structures, systems, and components of the facility that bear significantly on the acceptability of the site under the radiological consequence evaluation factors identified in Section 50.34(a)(1) of this chapter. Site characteristics must comply with Part 100 of this chapter."

- 10 CFR 100.21(c)(2), which states that "site atmospheric dispersion characteristics must be evaluated and dispersion parameters established such that:

  "Radiological dose consequences of postulated accidents shall meet the criteria set forth in Section 50.34(a)(1) of this chapter for the type of facility proposed to be located at the site."

- The radiological consequence criteria (i.e., evaluation factors) identified in Section 50.34(a)(1) are as follows:

  "(ii)(D)(1) An individual located at any point on the boundary of the exclusion area for any 2 hour period following the onset of the postulated fission product release, would not receive a radiation dose in excess of 25 rem total effective dose equivalent (TEDE) (footnote omitted).

  (2) An individual located at any point on the outer boundary of the low population zone, who is exposed to the radioactive cloud resulting from the postulated fission product release (during the entire period of its passage) would not receive a radiation dose in excess of 25 rem total effective dose equivalent (TEDE)"

Under this approach, as also discussed on March 5, we do not agree with the staff's view that bounding DBA radiological consequence analyses provided by pilot ESP applicants must describe either (1) times and rates of fission product appearance into containment, or (2) the chemical forms of fission products released to the environment. This information is not germane to the demonstration that the criteria of 10 CFR 50.34(a)(1) are met, or otherwise necessary to support required NRC staff reviews and findings for ESP. Rather, this information is design-related and site-independent by nature and thus appropriately subject to NRC safety review in a design certification or combined license proceeding. We understand that

the staff is revising Chapter 15 of the ESP Review Standard (RS-002) based on the March 5 discussions prior to its forthcoming release for public comment.
In accordance with the protocol established for documenting resolution of generic ESP issues, we request that, by reply to this letter, the NRC confirm the understandings and expectations that resulted from our discussions of this issue as identified below. To provide for timely resolution of generic issues and continued progress toward submittal of ESP applications in mid-2003, we request that NRC respond within 30 days.

Understandings/Expectations

1. ESP-7 pertains only to the required ESP safety assessment of radiological dose consequences of postulated design basis accidents. As discussed during our December 5, 2002, public meeting, other radiological-related ESP reviews, including safety and environmental reviews of radiological releases during normal operation and environmental review of design basis accident consequences, will be addressed separately by other means in accordance with applicable requirements and guidance.

2. As part of ESP applications, the NRC staff will review and approve the site's short term atmospheric dispersion factors (χ/Qs) to be used in future CP or COL applications.

3. As described in Enclosure 1, ESP applications will provide bounding DBA dose consequence analyses to demonstrate that the site is acceptable based on the radiological consequence criteria of 10 CFR 50.34(a)(1). Because of the different source terms and release mechanisms, the ESP accident assessment will identify the bounding radioactivity releases for the various reactor technologies and the spectrum of design basis accidents considered.

4. Bounding DBA radiological consequence analyses provided by pilot ESP applicants will focus on releases to the environment and not on the nature and behaviors of the source term inside containment. In general, accident analyses for ESP will not describe either (1) times and rates of fission product appearance into containment, or (2) the chemical forms of fission products released to the environment. Such detailed information is not germane to the demonstration that the criteria of 10 CFR 50.34(a)(1) are met and is not otherwise necessary to support required NRC staff reviews and findings for ESP. Releases provided in vendor safety analysis reports or otherwise specified by reactor suppliers are indicative of the performance of major structures, systems and components intended to mitigate accident consequences. However, in recognition of the view expressed by the NRC staff in its February 5 letter, the pilot applicants' site safety analysis reports will include information on release

paths, credited mitigation features, etc., to the extent practical and appropriate for the accident being analyzed.

5. NRC review and approval of accident source term information is not necessary for ESP. The NRC staff will review bounding release history information and analyses similar to other PPE values, i.e., the staff will not perform a detailed technical review of bounding accident analyses provided in ESP applications.

6. If a COL application references an ESP and a certified design, the COL applicant must provide information sufficient to demonstrate, and the NRC shall confirm, that the surrogate χ/Q used for design certification falls within (i.e., is greater than or equal to) the site characteristic χ/Q specified in the ESP.

7. If a COL application does not reference a certified design, the COL applicant must demonstrate that the criteria of 10 CFR 50.34(a)(1) are met by providing complete DBA radiological consequence analyses using the site characteristic χ/Q.

An updated status listing of generic ESP topics is provided as Enclosure 2 for information.

We look forward to your confirmation of the understandings and expectations described above related to ESP-7. If you have any questions concerning this request, please contact me (rls@nei.org, 202-739-8128) or Russ Bell (rjb@nei.org, 202-739-8087).

Sincerely,

Ron Simard

Enclosures

c: Ronaldo V. Jenkins, NRC/NRR
NRC Document Control Desk

Enclosure 1 – ESP-7 Approach to Performing Radiological Consequence Assessment of Design Basis Accidents For Preparation of an Early Site Permit Site Safety Assessment

Pursuant to the NRC's February 5, 2003, response to the industry's proposed resolution to Early Site Permit Topic No. 7 (ESP-7), "Guidance for Satisfying 10 CFR 52.17 (a) (1) Requirements," this paper describes how the pilot ESP applicants plan to demonstrate conformance with the criteria of 10 CFR 50.34 (a)(1). This approach uses bounding reactor accident radiological releases and post-accident site dispersion factors (χ/Q) to evaluate the acceptability of an ESP Applicant's site. The proposed approach is similar to that outlined and discussed with the Nuclear Regulatory Commission (NRC) staff in a December 5, 2002, public meeting for addressing design basis accidents for an ESP applicant's Environmental Report.

10 CFR 52.17 requires that the ESP application include a safety assessment of the site that includes an analysis and evaluation of the major structures, systems, and components of the facility that bear significantly on the acceptability of the site under the radiological consequence evaluation factors identified in 10 CFR 50.34(a)(1). 10 CFR 50.34(a)(1) provides general criteria (i.e., evaluation factors) for demonstrating this objective. 10 CFR 52.17 requires that the site characteristics comply with 10 CFR Part 100. Part 100 identifies requirements for the site (atmospheric dispersion) characteristic in 100.21(c) related to radiological dose consequences of postulated accidents. The approach described in this paper is suitable for use in ESP applications based on the Plant Parameters Envelope approach, i.e., when specific design information is not available or when several candidate reactor plants are being considered for the ESP site. The approach to be used for site safety assessments follows.

1. **Introduction:** Applicants for Early Site Permits will evaluate a spectrum of representative design basis accidents in order to assess the radiological consequences associated with the alternative advanced reactor technologies being considered for future deployment. The selection of accidents will be based upon current NRC regulatory guidance to the extent practical. Short term accident (RG 1.145) site dispersion factors at the exclusion and low population zone boundaries that are based on onsite data will be used to perform the assessments. The design basis accident(s) radioactivity released to the environs will be as provided in the reactor vendor's standard safety analysis reports or as specified to be bounding by the reactor supplier. These released activities are indicative of the performance of major structures, systems, and components intended to mitigate the consequences of accidents.

2. **Selection of Accidents:** Accidents will be selected to cover a spectrum of events and reactor types. Consistent with regulatory objectives for determining site suitability, the selection will include low probability accidents postulated to

result in significant releases of radioactivity to the environs. As such, it is expected that the evaluations will include light water reactor (LWR) Loss of Coolant Accidents (LOCA) that presume substantial fuel damage in the core followed by the release of significant amounts of fission products into a containment building. In addition, accidents of higher frequency but with lower potential for significant releases will be considered as part of the site evaluation to permit qualitative assessment of potential risks at the site. Selected accidents identified in Regulatory Guide 1.183, vendor design certification packages, vendor technical summary documents, and USNRC standard review plans for safety analyses will be reviewed to establish the spectrum of accidents to be evaluated for LWRs.

It is not considered necessary to analyze all possible accidents for the alternative reactor types that may be deployed. The set of accidents to be reviewed is expected to focus more on the light water reactor (LWR) designs because they have pre-approved, certified standard designs and have recognized postulated accident bases. Accidents of lesser severity for some of the newer reactor types being considered are not as well defined and application of the accepted analytical conservatisms applied to LWRs through regulatory guides and standard review plans may be inappropriate based on their design characteristics. In addition, the newer reactor designs are being developed because of their potential for inherent safety and reduced radiological consequences relative to current LWR technology (for example, multi-module station installations for the GT-MHR and PBMR, and elimination of the LOCA in the IRIS by eliminating all large loop piping). Thus, it is not necessary to consider all accidents but only a sufficiently robust and conservative set in order to demonstrate site suitability.

3. **Source Terms:** Time-dependent activities released to the environs are used in the dose evaluations. The released activities account for the reactor core source term and accident mitigation features in the reactor vendor's certified designs. For reactor designs not currently certified, releases specified by the vendor will be used in the evaluations.

   The different reactor technologies have used or planned to use different source terms and approaches in defining the accident spectrum and the associated activity releases. For example, the ABWR certified design source term is based on the use of TID-14844 methodology whereas the AP1000 makes use of the alternate source term guidance and NUREG 1465 methodology (as discussed in Regulatory Guide 1.183). The ACR-700 uses attributes of both methods in assessing their limiting design basis scenarios. The AP600 and or AP1000 source terms and releases are expected to bound the limiting accident release for the IRIS advanced reactor. The GT-MHR and PBMR use mechanistic accident source terms considered representative of gas-cooled reactors and are bounded by the LWR technology. Because of the different source terms and release mechanisms, the ESP accident assessment will identify the bounding

radioactivity releases for the various reactor technologies and spectrum of design basis accidents considered.

4. **Evaluation of Radiological Consequences:** Accident doses will be evaluated at the site's proposed exclusion area boundary and low population zone. The evaluations will use short-term accident dispersion characteristics based on Regulatory Guide 1.145 methods and on-site meteorology data. Accident doses will be expressed as total effective dose equivalents (TEDEs) consistent with the requirements of 10 CFR 50.34.[1] The doses will be determined using accepted dose conversion factors, breathing rates, and time intervals such as those incorporated into regulatory guides and the Standard Review Plans.

   The site safety analysis will identify to the extent practical the activity release paths, credited mitigation features, significant analysis parameters and assumptions, and the time-dependent activities released to the environment. Where dose consequences have been determined for certified designs using approved methods and representative site meteorology, the consequences will be scaled to the proposed site using the site-specific χ/Q dispersion characteristics.

   The doses will be compared to the acceptance criteria in 10 CFR 50.34 and 10 CFR Part 100 to demonstrate that these criteria have been satisfied. In this context, the offsite radiological consequences would be considered acceptable if the doses are below the 10 CFR 50.34 criteria as defined in Regulatory Guide 1.183 and the NUREG-0800 Standard Review Plans.[2] In the absence of specific dose limits for non-LWR accidents, the LWR dose criteria would be applied based on consideration of frequency of occurrence and the consequences of the non-LWR accident.

   The ability to meet the radiological consequence criteria of 10 CFR 50.34(a)(1) with margin provides assurance that an acceptably low risk of public exposure exists at the ESP site. The integration of surrogate design information via the PPE concept and site characteristics in the assessment of accident radiological consequences in this approach is considered sufficient to demonstrate compliance with the 10 CFR 52.17(a)(1) requirements to evaluate the major structures, systems and components of candidate reactors that bear significantly on the acceptability of the site.

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[1] For technologies evaluated using the criteria of 10 CFR 100, Subpart A (i.e., not using the alternative source term methodology), accident doses not be expressed in terms of TEDE should be compared with appropriate dose limits specified in 10 CFR 100.

[2] Specific guidance for ESP is to be provided in the forthcoming ESP Review Standard (RS-002), Chapter 15, "Radiological Consequences of DBAs," currently under development by the NRC staff.

Status of Generic ESP Interactions/Topics – April 2003

ESP Topic	NEI Resolution Letter	NRC Response	Status/Remarks (Concerns highlighted)
1. ESP application form & content and ESP review guidance	*Later		• Industry comments on ESP Review Standard (RS-002) provided 3/31 • More time to be provided for late sections on QA, Security, and Dose Consequence Analyses (available in April) • ESP-1 resolution letter to follow RS-002 review/comment/revision process *
2. ESP inspection guidance	Post-IMC-2501		• IMC-2501 to be conformed to resolution of ESP-3 (QA) • IMC-2501 and ESP inspection procedures to be completed to support June submittals
2a. Pre-application interactions (voluntary nature, plans for local public mtgs & review fee structure)	11/26	1/10	Resolved
3. QA requirements for ESP information	12/20	2/3	• Follow-up questions discussed on Mar. 5 • Continuing concern about NRC expectations for Appendix B-equivalent controls
4. Nominal NRC review timeline	Target April		• NRC discussed ESP review timeline on 1/29 • Industry may propose ways to reduce overall time to ESP
5. Mechanism for documenting resolution of ESP issues	9/10	11/5	Resolved
6. Use of plant parameters envelope (PPE) approach	12/20	2/5	Resolved
7. Guidance for satisfying §52.17(a)(1) requirements	a. 12/20	2/5	• Supplemental resolution letter addresses continuing concern about nature of dose analyses to be provided by pilot applicants • NRC revising RS-002 based on March 5 discussions • NEI to continue to pursue more optimal resolution (i.e., sole focus for ESP on Chi/Q) via RS-002 and other means
	b. 4/10		
8. Fuel cycle and transportation impacts (Tables S-3 & S-4)	Target April		• Industry preparing resolution letter based on March 26 discussion w/NRC
9. Criteria for assuring control of the site by the ESP holder	Target April		Resolution Pending
10. Use of License Renewal GEIS for ESP	2/6	4/1	Evaluating NRC response
11. Criteria for determining ESP duration (10-20 years)	12/20	2/5	Resolved
12. NEPA consideration of severe accident issues (SAMAs and impacts)	a. 12/20	2/12	• Second resolution letter planned based on March 26 discussion w/NRC to clarify treatment in ESPAs of severe accident impacts
	b.Target April		
13. Guidance for ESP seismic evaluations	Target April		Resolution pending

ESP Topic	NEI Resolution Letter	NRC Response	Status/Remarks (Concerns highlighted)
14. Applicability of Federal requirements concerning environmental justice	*None		• Commission action pending in response to Dec. 20 NEI letter • No ESP-specific discussion of EJ or ESP-14 resolution letter necessary*
15. Appropriate level of detail for site redress plans	11/26	1/16	Resolved
16. Guidance for ESP approval of emergency plans	4/7		Resolution pending
17. Petition to eliminate duplicative NRC review of valid existing site/facility information	*None		• Commission action pending on petition PRM-52-1 • No ESP-specific discussion or ESP-17 resolution letter necessary*
18. Petition to eliminate reviews for alternate sites, sources and need for power	*None		• Supplemental industry comments on PRM-52-2 provided on Dec. 18 • Staff recommendation and Commission action pending • No ESP-specific discussion or ESP-18 resolution letter necessary*
18a Alternative site reviews	12/20	3/7	• Evaluating NRC response • Further input to be provided via comments on RS-002
18x Need for alternative energy source evaluation and review	*None		• * NEI to comment via RS-002 that that ESPAs need not address alt. sources
19. Addressing effects of potential new units at an existing site	Target April		Resolution pending
20. Practical use of existing site/facility information	11/26	12/18	Resolved
21. Understanding the interface of ESP with the COL process.	COLTF Item*		• Purpose is clarity of expectations regarding reference to an ESP by a COL applicant • Analogous to "COL Items" identified as part of the design certifications • Issue to be transferred to COLTF *
22. Form and content of an ESP	Target April		• NEI draft included as enclosure with 12/20 ESP-6 letter • Updated version to be provided via ESP-22 letter; NRC response to provide comments