Department of Energy
Germantown, MD 20874-1290

August 31, 1995

The Honorable John T. Conway
Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue, N.W.
Suite 700
Washington, D.C. 20004

Dear Mr. Chairman:

This is in response to your letter, dated June 13, 1995, which provided comments on DOE-STD-1023-94 from the Defense Nuclear Facilities Safety Board's staff and outside experts. This standard has been under development for a considerable period of time and included reviews by your staff. Enclosure 1 provides responses to the comments, which have resulted in additional revisions to the standard, now scheduled to be issued in September 1995. A copy of the revised standard that responds to your recent comments is included as Enclosure 2. We will monitor the evolving NRC activities in the same area and will consider future refinements that may come out of the commercial nuclear industry.

We appreciate the work that the staff and their outside experts have done in reviewing this standard. Their comments have contributed to improving the final document. Please contact Richard Stark (301) 903-4407 with questions or comments.

Sincerely,

Orin F. Pearson /RLS

Orin F. Pearson
Deputy Assistant Secretary
Nuclear and Facility Safety

2 Enclosures

cc:
Dr. G. Cunningham, DNFSB

DOE-STD-1023-95 NATURAL PHENOMENA HAZARDS ASSESSMENT CRITERIA
Defense Nuclear Facilities Safety Board
Consolidated Review Comments by Staff and Outside Experts

SUGGESTED COMMENTS

COMMENT	RESPONSE
(DOE-STD-1023-92)	
General	
1. The intent of the Standard would be better served if the primary focus of the document shifts to defining *acceptance criteria* for the methodologies that are being used to estimate NPH load levels throughout the DOE complex. As it is presently structured, the Standard attempts to cover several fronts simultaneously: The contents are a mixture of performance specifications (minimal), prescriptive step-by-step procedures (for major deliverables), and commentary (sprinkled throughout the document). These are at odds with both the title and the forward of the Standard. Once the acceptance criteria are segregated from the rest of the document, separate step-by-step recommended procedures/methods for producing the end products and an appropriate commentary could be prepared and included as Appendices if deemed necessary or even desirable.	1. Document has been reformatted to move guidance and commentary to Appendix A.
2. Conflicts and overlaps with 1020, which could contribute to difficulties during applications of both standards, should be carefully edited. For example, Section 5.2.1.3 of 1023 specifies that "a probabilistic wind hazard shall be conducted at a level appropriate for the performance categories of the SSCs at a site". This appears to be in conflict with Section D.1 of 1020, which does not require the use of a probabilistic wind hazard assessment, but relies on the methodology presented in ASCE 7. A clearer focus for this Standard would minimize the level of conflicts and overlaps with 1020 requirements.	2. Agree, conflicts and overlaps in DOE-STD-1020 will be edited in its next version. Re: Section D.1, First, this is an Appendix and is, thus, not formally a requirement. Second, ASCE 7, as referenced, is used to define a uniform approach to designs, i.e., given a prescribed wind speed, it shows how to determine wind pressures, net forces, etc. Selection of the wind loads for PC-3 & 4 is done as described in 1023 as they require lower probabilities. The wind load selection methodology in ASCE 7 is applicable to PC-1 & PC-2 and is based on a probabilistic hazard assessment evaluated at 10% probability in 50 years, roughly once every 500 years.

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3. Obviously 1020 and 1023 are companion documents and a better delineation of contents is necessary. Two alternatives are suggested: 1. All material on load levels may be edited out from 1020 and incorporated into this Standard as appropriate and 1020 dedicated to only response analysis methodologies for NPH loads. Decoupling of load specification and response analysis is desirable during times of evolutionary developments in both. The temptation for easy compensatory requirements might thus be eliminated. 2. The load level acceptance criteria in this Standard could be subsumed into 1020 and the present document modified to become a stand-alone Commentary on 1020 and a Tutorial on recommended procedures.	3. It is true that there is some overlap between 1020 and 1023. However, it is undersireable to delay publication of 1023 in order to make the proposed editorial changes to the already issued 1020. The proposed changes will be considered during the next revision of 1020 which will be more directly impacted by the proposed changes than 1023.
4. Although several paragraphs are devoted to the independent review of the specification and assessment of NPH loads, prescriptive requirements are made relative to what is acceptable and what is not acceptable (section 5.1.5). By definition, independent reviewers should be left alone to determine if a given result is acceptable or not. The requirements for an independent review would be limited only to the composition of the review panel, the required credentials of the panelists and a general scope or level of the review.	4. This section was not meant to be prescriptive to independent reviewers but a "sanity check" by the analyst conducting the PSHA. To clarify, the title of Section 5.1.5 (now 3.1.5) has been changed to "Historical Earthquake Ground Motion Check". The independent peer review process applicable to the PSHA is discussed in Sections 3.1.2.3a as well as elsewhere in the document.
Technical	
5. Seismic: This Section reiterates, in general terms, the steps of how to generate	5.
a) Probabilistic hazard curves for both ZPA and spectral amplification, for two rather arbitrarily selected frequency bands (which, incidentally, miss the very important frequency band of 2.5-5 Hz for reinforced concrete shear wall structures); and	(a) The shapes of the spectra are the important quantities, they can be scaled at any frequency. As in DG 1032, it is more appropriate to scale at a frequency range of interest than the ZPA. All of the methods identified produce broad bed sectra

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b) How to deaggregate the results of the probabilistic seismic hazard assessment (PSHA) to obtain controlling magnitude and distance sets for the preselected frequency bands. This deaggregation is erroneously characterized as the deterministic approach (section 5.1.3.1).	that do not (ny) frequency. (b) The calculation of a site-specific spectral shape using a specified, controlling magnitude and distance is a deterministic process, but not "the deterministic approach". The title has been changed and the deaggregation guidance moved to Appendix A.
6. Any deterministic (SIC probabilisitic) approach should employ an independent methodology, as for example described in the Draft Regulatory Guide DG-1015. Moreover, the use and mixing of median, mean 84th percentile ZPAs, analytic and empirical spectral shapes, needs to be clarified and a rational basis for the use of one or the other provided. The selection of means, medians and other fractiles should be based on sound technical arguments. Having a rational basis becomes particularly important when the concept of a unified approach is being promoted for seismic, wind and flood. Obviously, the selection of any exceedance fractile cannot be made without considering the inherent safety factors employed in the design process and the ultimate target reliability of a given SSC.	6. New Draft Regulatory Guide DG-1032 (formerly DG-1015) does not contain a deterministic approach as an independent methodology. Standard 1023 has been edited to help avoid mixing of mean and median. Mean hazard determination is used throughout. Spectral shape is specified as median. A median shape scaled to a mean anchor point results in approximately mean values throughout the frequency range. The shapes are compared to a mean UHS. The use of 84th percentile in the historical check is based on judgment - to be consistent with NPP reactors.
7. It is expected that significant differences would exist between probabilistically and deterministically generated ground motions, particularly, when close-in faults or seismogenic regions are known to generate characteristic earthquakes. These differences should be explainable, since both the deterministic and probabilistic ground motions stem from the same basic site geology and seismology. Having explained and reconciled the different results, the design basis ground motion could then be specified based on the specific geologic and geotechnical facts at each site. Ground motions based on the so-called controlling magnitude and distance sets may not even be compatible with local site characteristics, except maybe in an average sense.	7. It is DOE's position that the proposed criteria in STD-1023 are comprehensive and that deterministic estimates of ground motion following the procedures of 10CFR100, Appendix A and Standard Review Plan 2.5.2 are not necessary. Ground motions are based on Uniform Hazard Spectra then checked with spectral shapes from deaggregated controlling earthquakes and, as a "sanity check", compared with historical earthquakes. The shape from the controlling earthquake is based on site-specific conditions based on data obtained as specified in STD-1022. Any difference from deterministically generated ground motions result from ignoring return periods

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	and uncertainty in the deterministic method.
8. Except for fault offset estimation (as a possible design basis), earthquake induced ground failure modes, such as liquefaction, slope stability, lateral spreading and subsidence, are related to the response of soils subjected to ground shaking and thus must be covered outside of this Standard, in a manner similar to for example, the treatment of structures in 1020. However, the characterization of ground motion with adequate energy in the frequency range of engineering interest and/or duration of strong shaking is an important issue that needs to be directly addressed in the acceptance criteria. For example, liquefaction, slope stability and tank hydrodynamic analyses require that long period and long duration effects be adequately modeled into the design ground motions. Similarly, high frequency large impulses (that are thought to have caused the many cracks in the welded beam-column connections of steel high-rise buildings during the Northridge earthquake) should also be adequately considered in the specifications of the design ground motions.	8. Agreed, the ground failure modes check should be in 1020. They have been removed from 1023. Specific reference to long period motions is made in 1023. Duration is generally associated with magnitude and guidance is being published. The purpose of 1023 is to define the DBE which is defined as a response spectrum. Generation of time histories with adequate power, etc., is covered in ASCE 4 which is referenced in 1020.
9. A choice, from among three methods, is provided to generate site specific spectra without any requirements as to how to select the one that is most appropriate. Differences in these spectra would suggest that some sensitivity checks be made during the selection process.	9. Guidance for accounting for uncertainty in ground motion characterization is given in the SSHAC report.
10. A similar concern as above relates to the choice of control points where design ground motions are specified	10. Control points are given in 1023.
11. Criteria to decide when a site is near a tectonic boundary is missing. And the basis for the different multipliers (1.5 and 1.25) requires justification.	11. Information has been added in Appendix A.
12. The level of simplification of the PSHA that would be acceptable for PC-3 is not provided.	12. Reference is made to the SSHAC report.

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13. The use of existing hazard curves simply because they exist is questionable. Some evaluation as to the adequacy of the existing curves needs to be established.	13. The "new" LLNL curves have been determined to be adequate by NRC in D. G. 1032.
14. The use of the deterministic site spectra cannot be a choice by the user. Deterministic spectra should always be considered as a sanity check on the final ground motion selected.	14. See comment 7.
15. Wind: It is not clear why industry standards (i.e. ASCE 7-93 and ANS 2.3) are not used to define *minimum* wind hazards, as the data base of extreme wind, particularly tornadoes, is not robust enough to apply on a site specific basis. Additionally, for PC-4 and PC-3 facilities a minimum tornado assessment should be considered (e.g. Fujita 2-157 mph and Fujita 1-112 mph, respectively). It would also be prudent to require the exploration of other types of wind (e.g. "microbursts") that could be characteristic of certain sites.	15. ASCE 7-93 is referenced. Appendix D of 1020 explains the use of ANS 2.3. A minimum tornado was considered previously during development of 1020 and was determined to be not necessary. As it is, the tornado probabilities being considered are lower than necessary to meet the performance goals. The Standard is based on well-established methodologies. Methodology for design against microbursts is not well established.
Flooding: No significant concerns.	