



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555

ACTION - Beckjord, RES

Cys: Taylor  
Sniezek  
Thompson  
Blaha  
LSoffer, RES  
Murley, NRR

August 18, 1992

AD93-1  
PDR

MEMORANDUM FOR: James M. Taylor  
Executive Director for Operations

FROM: Samuel J. Chilk, Secretary

SUBJECT: QUESTIONS ON SECY-92-215

Commissioner de Planque requested staff response to the following questions when the final rule package is forwarded for Commission approval:

1. With respect to the five year update on manmade hazards, what has been the experience from cases such as San Onofre where such updates were required, or from any other instances? Discuss the number and significance of concerns and the implementation with respect to the value of a five year (or some other frequency) update.
2. Further detail is needed on how staff would propose to consider both the deterministic and probabilistic seismic hazards with "comparable weight", particularly if the controlling earthquakes from the two approaches are dissimilar.
3. Staff should provide a more detailed discussion of the relationship of the early site renewal process and the proposed changes to Part 100. For instance, what is the purpose of the proposed change to Appendix Q to Part 52? If possible, provide a "timeline" example of how the 40 year projection of population distribution would apply for a case of an early site permit review under Subpart A of Part 52, a renewal of such a permit, a review under Appendix Q or a COL review under Part 52 where no early site review was done.
4. Based on the sample comparison of present population density with the projections that were made at the time of licensing, give an estimate of the error of those projections and the implications for the proposed population density criteria.

5. What has been done with respect to population distribution in environmental reviews associated with "CP/OL" recapture? What does staff intend to do for license renewal?

{EDG} (RES)

(SECY Suspense:

6/1/93)

9000200

cc: The Chairman  
Commissioner Rogers  
Commissioner Curtiss  
Commissioner Remick  
Commissioner de Planque  
OGC  
OCAA  
OIG



OFFICE OF THE  
SECRETARY

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August 18, 1992

AD93-1  
PDR  
ACTION - Beckjord, RES

Cys: Taylor  
Sniezek  
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MEMORANDUM FOR: James M. Taylor  
Executive Director for Operations

FROM: Samuel J. Chilk, Secretary

SUBJECT: SECY-92-215 - REVISION OF 10 CFR PART 100,  
REVISIONS TO 10 CFR PART 50, NEW APPENDIX B  
TO 10 CFR PART 100 AND NEW APPENDIX S TO 10  
CFR PART 50

The Commission (with all Commissioners agreeing) has approved the issuance of the proposed documents with the changes discussed below and in the attached pages for a 120-day public comment period. Additionally, the Commission certifies that this rule will not have a significant economic effect on a substantial number of small entities pursuant to the Regulatory Flexibility Act of 1980 (5 U.S.C. 605 (b)). The Commission also notes the items contained in paragraph 3. of the staff's recommendations.

The Federal Register notice should solicit comments on the pros and cons of grandfathering existing sites with an exclusion area less than 0.4 mile for the possible placement of additional units, if found suitable from safety considerations.

-(EDO)- (RES) (SECY Suspense: 9/20/92) 9000200

The Federal Register notice should be modified such that the intent of proposed revisions that impose new requirements are clearly stated in the rule and the associated regulatory guide contains surrogates for their implementation.

-(EDO)- (RES) (SECY Suspense: 9/20/92) 9000200

The proposed regulatory guides and SRP should be modified to ensure that figures and tables in the regulatory guides clearly define the units used (e.g., annual probabilities) and that a list of references be included, where appropriate.

-(EDO)- (RES) (SECY Suspense: 9/20/92) 9000200

SECY NOTE: THIS SRM, SECY-92-215, AND THE VOTE SHEETS OF ALL COMMISSIONERS WILL BE MADE PUBLICLY AVAILABLE 10 WORKING DAYS FROM THE DATE OF THIS SRM

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Staff should also seek international comments on the 0.4 mile exclusion area and population densities in order to obtain a broader range of insights on this matter.

~~(EDC)~~ (RES) (SECY Suspense: 6/1/93) 9000200

The upcoming advanced notice of rulemaking on 10 CFR Part 50 which deals with decoupling the site from the source term should include a request for public comment on reconsideration of current requirements on Emergency Planning Zones.

~~(EDC)~~ (RES) (SECY Suspense: 9/20/92) 9000201

Attachments:  
As stated

cc: The Chairman  
Commissioner Rogers  
Commissioner Curtiss  
Commissioner Remick  
Commissioner de Planque  
OGC  
OCAA  
OIG

Since this seems to be a denial of PRM-50-20 from Free Environment, the Heading and ACTION parts of the FRN should be revised to reflect this fact.

be used for judging the acceptability of future nuclear power plant sites. Similarly, in keeping with Regulatory Guide 4.7, the projected population density 40 years after initial site approval should not exceed 1000 people per square mile.

With regard to the petition by Free Environment, Inc. (PRM-50-20), the Commission concludes that the criteria in Regulatory Guide 4.7 provide a reasonable degree of separation for a range of population centers, including "major" population centers, depending upon their size. Further, codifying the population density criteria of this guide is expected to ensure a low level of risk, including the risk of latent cancer fatality as well as long-term land contamination. Finally, the Commission concludes that granting of the petitioner's request to specify population criteria out to 40 miles rather than 30 miles would not substantially reduce the risks to the public, but could significantly increase the difficulty of obtaining suitable reactor sites in some regions of the nation. For these reasons, the Commission has decided not to adopt the proposal by Free Environment, Incorporated.

An important point regarding population projections and their application should be made. Because the validity and reliability of population projections, particularly for relatively small regions, decreases markedly as the projection time period increases, population projections for the purpose of assessing site suitability are to be limited to 40 years. Population projections beyond this time period become unreliable and speculative. The 40 year period for population projections is to be distinguished from the 60 year or more plant lifetime.

Because analyses have shown that current plant designs can meet the Commission's Safety Goals and that other risks can be kept at a very low level at sites that have significantly higher population densities than those being proposed, the Commission wishes to emphasize that these population density levels do not indicate the upper limits of acceptability. These levels represent preferred values, that, if exceeded, require that an applicant provide justification for not locating a reactor at an alternative site having a lower population density. Therefore, the population density limits proposed in the regulation are to be used only in the siting decision process to be applied at the time of initial site approval or early site permit renewal to determine whether alternative sites that have lower population densities should be considered. The Commission does not intend to consider license conditions or operating restrictions upon an operating reactor solely upon the basis that the population density around it may reach or exceed the proposed siting decision values given above during the plant lifetime. Because of the possibility for confusion resulting from numerical values being cited in the regulation, the Commission is also requesting comments on whether numerical population density values should be cited in the regulation or whether these should be stated in a regulatory guide only. The Commission is also requesting comments on whether the values of 500 and 1000 persons per square mile are appropriate, and whether population density criteria need be specified out to 30 miles, or whether another distance is more appropriate.

**D. Meteorological Factors.** Radiological doses that incorporate site meteorological data need no longer be calculated for the purpose of determining site suitability. Meteorological data will still be needed for safety analysis and for assessing the adequacy of certain plant features, as well as to determine plant adequacy in regard to meteorological extremes, such as tornados and maximum probable precipitation. Therefore, the proposed regulation maintains the requirement to collect and characterize meteorological data representative of the site.

The Commission has examined the variations in site meteorology that have



100 has adopted an approach using both probabilistic and deterministic evaluations. The staff proposes to use both the deterministic (currently being used) and the probabilistic evaluations together and compare the results of each to provide insights unavailable if either method were used alone. The principal limitations of the deterministic evaluation --- its ability to incorporate only one model and one data set at a time and its inability to allow weighted incorporation of numerous models --- can be assessed by comparing its results with the results of a probabilistic evaluation accomplished in parallel. Similarly, the principal limitation of the probabilistic evaluation --- its tendency to allow its results to be dominated by the tails rather than the central tendency of distributions of uncertain knowledge or expert opinion --- can be assessed by comparing its results with the results of one or more deterministic evaluations.

The NRC believes that taken together, this approach can allow more informed judgments as to what the appropriate Safe Shutdown Earthquake Ground Motion should be for a given site. Both the applicant's judgments and those of the NRC will be improved. Therefore, the NRC believes that this approach is the best way to accomplish the objective of this aspect of the revised regulation and arrive, through analysis, at a site-specific ground motion that appropriately captures what is known about the seismic regime. Using both probabilistic and deterministic evaluations ~~will~~ lead to a more stable and predictable licensing process than in the past. *to complement each other should*

In order to implement this approach, the NRC has proposed a requirement that the probability of exceeding the Safe Shutdown Earthquake Ground Motion at a site be lower than the median probability of exceedance computed for the current population of the operating plants. This requirement assures that the design levels at new sites will be comparable to those at many existing sites, particularly more recently licensed sites. This criterion is also used to identify significant seismic sources, in terms of magnitude and distance, affecting the estimates of ground motions at a site.

4. Safe Shutdown Earthquake. The existing regulation (10 CFR Part 100, Appendix A, Section V(a)(1)(v)) states that when the maximum vibratory accelerations of the Safe Shutdown Earthquake at the foundations of the nuclear power plant structures are determined to be less than one tenth the acceleration of gravity (0.1 g) ..... it shall be assumed that the maximum vibratory accelerations of the Safe Shutdown Earthquake at these foundations are at least 0.1 g (Also, Section V(a)(1)(iv) contains the phrase "at each of the various foundation locations") The location of the seismic input motion control point as stated in the existing regulation has led to confrontations with many applicants that believe this stipulation is inconsistent with good engineering fundamentals.

The proposed regulation would move the location of the seismic input motion control point from the foundation-level to free-field, at the free ground surface or hypothetical rock outcrop, as appropriate. The 1975 version of the Standard Review Plan placed the control motion in the free-field. The proposed regulation is also consistent with the resolution of Unresolved Safety Issue (USI) A-40, "Seismic Design Criteria" (August 1989), that resulted in the revision of Standard Review Plan Sections 2.5.2, 3.7.1, 3.7.2, and 3.7.3. *the different purposes of the "free ground surface" and the "foundation level" should be clarified, as referenced in sections V.(b) and V.(c) of appendix B to the proposed Part 100.*

5. Value of the Operating Basis Earthquake Ground Motion (OBE) and Required OBE Analyses. The existing regulation (10 CFR, Appendix A, Section V(a)(2)) states that the maximum vibratory ground motion of the OBE is one-

2. In making use of the probabilistic and deterministic evaluations as proposed in Draft Regulatory Guide DG-1015, is the proposed procedure in Appendix C to DG-1015 adequate to determine controlling earthquakes from the probabilistic analysis?

3. In determining the controlling earthquakes, should the median values of the seismic hazard analysis, as described in Appendix C to Draft Regulatory Guide DG-1015, be used to the exclusion of other statistical measures, such as, mean or 85th percentile? (The staff has selected probability of exceedance levels associated with the median hazard analysis estimates as they provide more stable estimates of controlling earthquakes.)

4. Should the median target level of  $1E-4$  for LLNL or  $3E-5$  for EPRI be raised or lowered, that is, should the next generation of nuclear power plants have design levels for seismic events approximately equal to, greater than, or less than the current nuclear power plants?

5. The proposed Appendix B has included a criterion that states: "the probability of exceeding the Safe Shutdown Earthquake Ground Motion is considered acceptably low if it is less than the median probability computed from the current [EFFECTIVE DATE OF THE REGULATION] population of nuclear power plants". This is a relative criterion without any specific numerical value of the probability of exceedance. Because of the current status of the probabilistic seismic hazard analysis, method dependent probabilities or target levels are identified in the proposed regulatory guide. Comments are solicited as to whether the above criterion, as stated, needs to be included in the regulation and, if not, should it be included in the regulation in a different form (e.g., a specific numerical value).

6. For the probabilistic analysis, how many controlling earthquakes should be generated to cover the frequency band of concern for nuclear power plants? (For the four trial plants used to develop the criteria presented in Draft Regulatory Guide DG-1015, the average of results for the 5 Hz and 10 Hz spectral velocities was used to establish the probability of exceedance level. Controlling earthquakes were evaluated for this frequency band, for the average of 1 and 2.5 Hz spectral responses, and for peak ground acceleration.)

## XII. Finding of No Significant Environmental Impact: Availability

The Commission has determined under the National Environmental Policy Act of 1969, as amended, and the Commission's regulations in Subpart A of 10 CFR Part 51, that this proposed regulation, if adopted, would not be a major Federal action significantly affecting the quality of the human environment and therefore an environmental impact statement is not required.

The revisions associated with the reactor siting criteria in 10 CFR Part 100 and the relocation of the plant design requirements from 10 CFR Part 100 to 10 CFR Part 50 have been evaluated against the current requirements. The Commission ~~NRC~~ has concluded that relocating the requirement for a dose calculation to Part 50 and adding more specific site criteria to Part 100 does not decrease the protection of the public health and safety over the current regulations. The proposed amendments do not affect nonradiological plant effluents and have no other environmental impact.

The addition of Appendix B to 10 CFR Part 100, and the addition of Appendix S to 10 CFR Part 50, will not change the radiological environmental impact offsite. Onsite occupational radiation exposure associated with

The location of this boundary should be clarified to be measured either from the reactor center point or the outer edge of the new 0.4 mile exclusion area, whichever is correct.

the thyroid from iodine exposure.

(ii) An individual located at any point on the outer radius of a 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 total radiation dose to the whole body in excess of 25 rem or a total radiation dose in excess of 300 rem to the thyroid from iodine exposure. For purposes of this evaluation, a low population zone boundary of 3.7 miles is assumed.

(iii) With respect to operation at the projected initial power level, the applicant is required to submit information prescribed in paragraphs (a)(2) through (a)(8) of this section, as well as the information required by this paragraph, in support of the application for a construction permit.

A NOTE: Reference is made to Technical Information Document (TID) 14844, dated March 23, 1962, which contains a fission product release into containment which has been used in past evaluations. The fission product release given in TID-14844 may be used as a point of departure upon consideration of severe accident research insights available since its issuance, upon consideration of plant design features intended to mitigate the consequences of accidents, or upon characteristics of a particular reactor. Copies of Technical Information Document 14844 may be obtained from the Commission's Public Document Room, 2120 L Street, NW. (Lower Level), Washington, DC., or by writing the Director of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, Washington, DC. 20555.

\* \* \* \* \*

(12) On or after [EFFECTIVE DATE OF THE REGULATION], applicants who apply for a construction permit pursuant to this part, or a design certification or combined license pursuant to Part 52 of this chapter, as partial conformance to General Design Criterion 2 of Appendix A to this part, shall comply with the earthquake engineering criteria in Appendix S of this part.

(b) \* \* \* \* \*

(10) On or after [EFFECTIVE DATE OF THE REGULATION], applicants who apply for an operating license pursuant to this part, or a design certification or combined license pursuant to Part 52 of this chapter, as partial conformance to General Design Criterion 2 of Appendix A to this part, shall comply with the earthquake engineering criteria of Appendix S to this part. However, if the construction permit was issued prior to [EFFECTIVE DATE OF THE REGULATION], the applicant shall comply with the earthquake engineering criteria in Section VI of Appendix A to Part 100 of this chapter.

\* \* \* \* \*

5. In §50.54, paragraph (ee) is added to read as follows:  
§50.54 Conditions of licenses.

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features with respect to postulated reactor accidents, in order to assure that such designs provide assurance of low risk of public exposure to radiation, in the event of such accidents.



PART 100 — REACTOR SITE CRITERIA

10. The authority citation for Part 100 continues to read as follows:

AUTHORITY: Secs. 103, 104, 161, 182, 68 Stat. 936, 937, 948, 953, as amended (42 U.S.C. 2133, 2134, 2201, 2232); sec. 201, as amended, 202, 88 Stat. 1242, as amended, 1244 (42 U.S.C. 5841, 5842).

11. The table of contents for Part 100 is revised to read as follows:

PART 100 - REACTOR SITE CRITERIA

- Sec.  
100.1 Purpose.  
100.2 Scope.  
100.3 Definitions.  
100.8 Information collection requirements: OMB approval.

Subpart A — Evaluation Factors for Stationary Power Reactor Site Applications before [EFFECTIVE DATE OF THIS REGULATION] and for Test Reactors.

- 100.10 Factors to be considered when evaluating sites.  
100.11 Determination of exclusion area, low population zone, and population center distance.

Subpart B — Evaluation Factors for Stationary Power Reactor Site Applications on or after [EFFECTIVE DATE OF THIS REGULATION].

- 100.20 Factors to be considered when evaluating sites.  
100.21 Determination of exclusion area and population distribution.  
100.22 Evaluation of potential man—related hazards.

APPENDIX A — Seismic and Geologic Siting Criteria for Nuclear Power Plants.  
APPENDIX B — Criteria for the Seismic and Geologic Siting of Nuclear Power Plants on or after [EFFECTIVE DATE OF THIS REGULATION].

12. Section 100.2 is revised to read as follows:

§100.1 Purpose.

(a) This part sets forth standards for evaluation of the suitability of proposed sites for stationary power and testing reactors subject to Part 50 or Part 52 of this chapter.

(b) This part identifies the factors considered by the Commission in the evaluation of reactor sites and the standards used in approving or disapproving proposed sites.

13. Section 100.2 is revised to read as follows:

§100.2 Scope.

(a) This part applies to applications filed under Part 50 or Part 52 of this chapter for early site permit, construction permit, operating license, or

upon consideration of population distribution. Political boundaries are not controlling in the application of this guide. Where very large cities are involved, a greater distance may be necessary because of total integrated population dose consideration.

(b) For sites for multiple reactor facilities consideration should be given to the following:

(1) If the reactors are independent to the extent that an accident in one reactor would not initiate an accident in another, the size of the exclusion area, low population zone and population center distance shall be fulfilled with respect to each reactor individually. The calculated envelopes of each of the plants areas shall be overlayed of the areas such that the outermost composite boundary shall then be taken as the plant boundary.

(2) If the reactors are interconnected to the extent that an accident in one reactor could affect the safety of operation of any other, the size of the exclusion area, low population zone and population center distance shall be based upon the assumption that all interconnected reactors emit their postulated fission product releases simultaneously. This requirement may be reduced in relation to the degree of coupling between reactors, the probability of concomitant accidents and the probability that an individual would not be exposed to the radiation effects from simultaneous releases. The applicant would be expected to justify to the satisfaction of the Commission the basis for such a reduction in the source term.

(3) The applicant is expected to show that the simultaneous operation of multiple reactors at a site will not result in total radioactive effluent releases beyond the allowable limits of applicable regulations.

NOTE: For further guidance in developing the exclusion area, the low population zone, and the population center distance, reference is made to Technical Information Document 14844, dated March 23, 1962, which contains a procedural method and a sample calculation that result in distances roughly reflecting current siting practices of the Commission. The calculations described in Technical Information Document 14844 may be used as a point of departure for consideration of particular site requirements which may result from evaluation of the characteristics of a particular reactor, its purpose and method of operation. Copies of Technical Information Document 14844 may be obtained from the Commission's Public Document Room, 2120 L Street, NW. (Lower Level), Washington, DC, or by writing the Director of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, Washington, DC. 20555.

[rewrite to make identical to current Part 100.]

19. Subpart B (§§100.20 - 100.22) is added to read as follows:

Subpart B — Evaluation Factors for Stationary Power Reactor Site Applications on or after [EFFECTIVE DATE OF ~~THE FINAL~~ REGULATION].

§100.20 Factors to be considered when evaluating sites.

The Commission will take the following factors into consideration in determining the acceptability of a site for a stationary power reactor:

(a) Population density and use characteristics of the site environs, including the exclusion area, the population distribution, and the compatibility of the site with the development of an emergency plan.

(b) The nature and proximity of man-related hazards (e.g. airports, dams, transportation routes, military and chemical facilities).

(c) Physical characteristics of the site, including seismology, meteorology, geology, and hydrology.

(1) Appendix B, "Criteria for the Seismic and Geologic Siting of Nuclear Power Plants After [Effective Date]," describes the criteria and nature of investigations required to obtain the geologic and seismic data necessary to determine site suitability. <sup>must</sup>

(2) Meteorological characteristics of the site that are necessary for safety analysis or that may have an impact upon plant design (such as maximum probable wind speed and precipitation) <sup>must</sup> ~~should~~ be identified and characterized.

(3) Factors important to hydrological radionuclide transport (such as soil, sediment, and rock characteristics, adsorption and retention coefficients, ground water velocity, and distances to the nearest surface body of water) should be obtained from on-site measurements. The maximum probable flood along with the potential for seismic induced floods discussed in Appendix B <sup>must</sup> ~~should~~ be estimated using historical data.

§100.21 Determination of exclusion area and population distribution.

(a) Each reactor facility <sup>must</sup> ~~shall~~ have an exclusion area, as defined in §100.3(a) of this part.

(1) For sites with a <sup>must</sup> ~~single~~ reactor facility, the distance to the exclusion area boundary at any point (as measured from the reactor center point) shall be at least 0.4 miles (640 meters). <sup>must</sup>

(2) For sites with multiple reactor facilities, consideration <sup>must</sup> ~~should~~ be given to the following: If the reactors are independent to the extent that an accident in one reactor would not initiate an accident in another, the size of each exclusion area <sup>must</sup> ~~shall~~ be determined with respect to each reactor individually. The exclusion area for the site <sup>must</sup> ~~shall~~ then be taken as the plan overlay of the sum of the exclusion areas for each reactor. If the reactors are interconnected to the extent that an accident in one reactor would initiate an accident in another, the size of the exclusion area for each reactor <sup>must</sup> ~~shall~~ be determined on a case by case basis.

(b)(1) If the offsite population density at the proposed site exceeds the values given in paragraph (b)(2) of this section, the site <sup>must</sup> ~~may~~ not be approved by the Commission unless the applicant demonstrates either: <sup>will</sup>

(i) That there are no reasonably available alternative sites with significantly lower population densities, or

(ii) That the proposed site is preferred over an alternative site with significantly lower population density on the basis of other considerations.

(2) The population density, including weighted transient population, projected at the time of initial site approval or early site permit renewal should not exceed 500 people per square mile averaged over any radial distance out to 30 miles (cumulative population at a distance divided by the total circular area at that distance). The projected population density, including weighted transient population, 40 years after the time of initial site approval or early site permit renewal should not exceed 1000 people per square mile averaged over any radial distance out to 30 miles.

(3) Transient population must be included for those sites where a significant number of people (other than those just passing through the area) work, reside part-time, or engage in recreational activities and are not permanent residents of the area. The transient population should be considered for siting purposes by weighting the transient population according to the fraction of the time the transients are in the area.

(c) Physical characteristics of the proposed site, such as egress limitations from the area surrounding the site, that could pose a significant impediment to the development of emergency plans, ~~shall~~ <sup>must</sup> be identified.

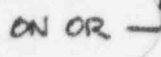
#### §100.22 Evaluation of Man-related Hazards.

(a) Potential hazards to the plant from man-related activities associated with nearby transportation routes, military, and industrial facilities ~~shall~~ <sup>must</sup> be identified and their potential effects evaluated. Potential hazards to the plant include such effects as explosions, fires, toxic and/or flammable chemical releases, dams (both upstream and downstream), pipeline accidents, and aircraft crashes and impacts.

(b) The effects of offsite hazards ~~shall~~ <sup>must</sup> have a very low probability of affecting the safety of the plant. The likelihood and consequences of offsite hazards ~~shall~~ <sup>must</sup> be estimated using data and assumptions that are as realistic and representative of the site as is practical. The design bases for which the plant is ~~shall be~~ <sup>must</sup> designed ~~shall~~ <sup>must</sup> be specified.

20. Appendix B to Part 100 is added to read as follows:

#### APPENDIX B TO PART 100 -- CRITERIA FOR THE SEISMIC AND GEOLOGIC SITING OF NUCLEAR POWER PLANTS AFTER [EFFECTIVE DATE]

ON OR  OF THIS REGULATION

##### General Information

This appendix applies to applicants who apply for an early site permit or combined license pursuant to Part 52 of this chapter, or a construction permit or operating license pursuant to Part 50 of this chapter on or after [EFFECTIVE DATE OF THIS REGULATION]. However, if the construction permit was issued prior to [EFFECTIVE DATE OF THIS REGULATION], the operating license applicant shall comply with the seismic and geologic siting criteria in Appendix A to Part 100 of this chapter.

#### I. Purpose

General Design Criterion 2 of Appendix A to Part 50 of this chapter requires that nuclear power plant structures, systems, and components important to safety be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches without loss of

Major Change - to get all conforming documents



#### 4.2 Cumulative Absolute Velocity (CAV) Limit

The CAV should be calculated as follows: For each component of the free-field ground motion, (1) the absolute acceleration (g units) time-history is segmented into 1-second intervals, (2) each 1-second interval that has at least 1 exceedance of 0.025g is integrated over time, (3) all the integrated values are summed together to arrive at the CAV. Additional guidance on how to determine the CAV is provided in EPRI TR-100082.

The CAV Limit is exceeded if any CAV calculation is greater than 0.16 g-second.

#### 4.3 Instrument Operability Check

After an earthquake at the plant site, the response spectrum and CAV should be obtained using the calibration standard (see Regulatory Position 1.1(4)) to demonstrate that the system was functioning properly.

### 5. Criteria for Plant Shutdown

If the OBE vibratory ground motion is exceeded or significant plant damage occurs, the plant must be shut down.

5.1 OBE Exceedance. If the response spectrum check and the CAV limit, performed in accordance with Regulatory Position 4.1 and 4.2, were exceeded, the OBE was exceeded and plant shutdown is required. If either limit does not exceed the criterion, the earthquake motion did not exceed the OBE. The determination of whether or not the OBE has been exceeded should be performed even if the plant automatically trips off-line as a result of the earthquake, or

5.2 Damage. The plant should shutdown if the walkdown inspections, performed in accordance with Regulatory Position 2 (Section 4.3.2 of EPRI NP-6695), discover damage.

Verify that the EPRI guidance covers the essential details needed  
DG-1017 - 7 to ensure that plant equipment  
will function in a seismic environment (similar to USI A-46, "Seismic  
Qualification of Equipment," where detailed review procedures have been

in different frequency bands, these earthquakes should be specified. The description of the potential earthquake(s) is to include the maximum intensity or magnitude and the distance from the assumed location of the potential earthquake(s) to the site. For the seismotectonic province surrounding the site, the DSE is assumed to occur within 25 km of the site. The staff independently evaluates the site ground motion produced by the largest earthquake DSE associated with each ~~geologic structure or tectonic province~~ seismic source. Controlling earthquakes (CE) are those earthquakes that have the greatest effect on the ground motion at the nuclear power plant site. Acceptance of the description of the potential controlling earthquake(s) that would produce the largest ground motion at the site is based on the staff's independent analysis.

#### 2.5.2.5 Seismic Wave Transmission Characteristics of the Site.

In meeting the requirements of Reference 1, this subsection is accepted when the seismic wave transmission characteristics (amplification or deamplification) of the materials overlying bedrock at the site are described as a function of the significant frequencies. The following material properties should be determined for each stratum under the site: seismic compressional and shear wave velocities, bulk densities, soil index properties and classification, shear modulus and damping variations with strain level, and water table elevation and its variation. In each case, methods used to determine the properties should be described in Subsection 2.5.4 of the SAR and cross-referenced in this subsection. For the ~~maximum earthquake~~ controlling earthquake, determined in Subsection 2.5.2.4, the free-field ground motion (including significant frequencies) must be determined, and an analysis should be performed to determine the site effects on different seismic wave types in the significant frequency bands. If appropriate, the analysis should consider the effects of site conditions and material property variations upon wave propagation and frequency content.

The free-field ground motion (also referred to as control motion) should be defined to be on a ground surface and should be based on data obtained in the free field. Two cases are identified depending on the soil characteristics at the site and subject to availability of appropriate recorded ground-motion data. When data are available, for example, for relatively uniform sites of soil or rock with smooth variation of properties with depth, the control point (location at which the control motion is applied) should be specified on the soil surface at the top of the finished grade. The free-field ground motion or control motion should be consistent with the properties of the soil profile. For sites composed of one or more thin soil layers overlying a competent material, or in case of insufficient recorded ground-motion data, the control point is specified on an outcrop or a hypothetical outcrop at a location on the top of the competent material. The control motion specified should be consistent with the properties of the competent material.

February 10, 1992 Finished grade elevations at NPPs are not unique. The

2.5.2-7

finish grade is often different depending on which plant building is referred to. A definition of "finished grade" should be appropriately added to the SRP.