AGENDA
JUNE 13, 2002, MEETING
WITH NUCLEAR ENERGY INSTITUTE (NEI)
T10A1 9:00 -11:30 AM

9:00 a.m.	Introductory Comments	NRC / NEI
9:10 a.m.	Follow-up Items from May 28 Meeting	
	. ESP Applicant Fee Waiver Process	NRC
	. ESP-2: NRC Pre-Application Activities	NRC
	. ESP-3: Availability of Applicant QA Plans	NEI/Applicants
	. ESP-5: Proposal for Issue Tracking System	NRC
9:20 a.m.	Topics for Next Meeting	NRC/NEI/Applicants
	. ESP-7: 10CFR 52.17 Requirements	
	. ESP-12: Severe Accident Mitigation Alternatives	
	. Feedback on ESP Pre-Application Activities	
	. Prioritization of Generic ESP Issues	
9:40 a.m.	Discussion of ESP seismic evaluation guidance	NEI/Applicants
	. Regulatory Framework	
	. Industry Methodology / Approach	
	. NRC Review Process	
	. Specific Issues	
11:10 a.m.	Public Comment	
11:20 a.m.	Summary	NRC/NEI/Applicants
11:30 a.m.	Adjourn	

Early Site Permit Meeting with Nuclear Energy Institute

June 13, 2002
NRC Handouts

Early Site Permit Meeting

- Follow-up Items from May 28 Meeting
  - Response to Fee Waiver Query
  - ESP-2: NRC Pre-Application Activities
  - ESP-5: Proposal for Issue Tracking System
- Topics for Next Meeting
  - ESP-7: 10CFR 52.17 Requirements
  - ESP-12: Severe Accident Mitigation Alternatives
  - Prioritization of Generic ESP Issues

Response to Fee Waiver Query

- Waivers can be sought in accordance with Part 170.21, Footnote 4, either
  - In response to an NRC request (at the Associate Office Director Level) to resolve an identified safety, safeguards, or environmental issue, or to assist NRC in developing a rule, regulatory guide, policy statement, generic letter, or bulletin; or
  - As a means of exchanging information between industry organizations and the NRC for the purpose of supporting generic regulatory improvements or efforts.

- Applicants seeking a fee waiver may use license renewal fee waiver precedence as applicable to seek an exemption to Part 170 fees.

NRC Pre-Application Activities

- All pre-application activities except for the Local Public Meeting are voluntary and depend on the availability of staff resources and the consent of the applicant.

- Staff has identified areas as Potential Scheduling Impediments (PSIs) which could benefit from pre-application work.

- Preliminary pre-application activities to address PSIs
  - Quality Assurance => 5/28 Meeting (ESP-3)
  - Site Safety => Site Visit/ Meetings
  - Environmental Review => Site Visit

Proposal for Issue Tracking System

- The resolution of those ESP issues that will materially impact future ESP applications should be documented via letters to and from the Director of New Reactor Licensing Project Office, NRR. The purpose of the subject system is to document the resolution process, to track interim commitments and to identify any lessons learned associated with generic and applicant specific issues.

- Attachment 1 contains a sample Issue Tracking Summary for ESP-6 (Use of bounding plant parameter envelope) as of 5/28/02.

Topics for Next Meeting

ESP-7: 10 CFR 52.17 Requirements

- Part 52.17 requires that the early site permit application must contain, among other things, "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 in Part 50.34(a)(1)." How do the Applicants plan to satisfy these requirements in your forthcoming early site permit applications for other than the light-water reactor designs? How do the Applicants plan to establish/characterize radiological release categories and their respective frequencies for use in the environmental assessment of Class 1 through 9 accidents?

Topics for Next Meeting

ESP-12: Severe Accident Mitigation Alternatives

- NEPA and the US Court of Appeals decision in Limerick requires the NRC to include consideration of severe accident mitigation design alternatives (SAMDAs) in the environmental review. SAMDA reviews are based on a specific plant design, site (or site characteristics), and risk profile. SAMDA reviews have been performed for each of the certified ALWR designs (based on reference site parameters), and could be applied to an ESP if the site parameters are bounded by the reference site parameters. For other reactor designs, a design- and site-specific SAMDA analysis would be needed. How do the Applicants plan to address SAMDA requirements if the ESP application does not include a commitment to use one of the certified designs?

Topics for Next Meeting

Priorization of Generic ESP Issues

- Focus on issues which might be a Potential Scheduling Impediment (PSI). Examples: ESP-2 and ESP-3
- Summer 2002
  - ESP 13: Guidance for seismic evalautions required by 10 CFR 50, Appendix S
  - ESP-6: Use of bounding plant parameter envelope approach
  - ESP-7: Guidance for satisfying 10 CFR 52.17(a)(1) requirment for description and safety assessment of the facility
  - ESP-12: Guidance for satisfying NEPA requirement to evaluate severe accident mitigation alternatives
  - ESP-1: ESP application template

Topics for Next Meeting

Priorization of Generic ESP Issues (Cont'd)

- Fall 2002
  - ESP-8 : Use of a bounding approach for providing fuel cycle and transportation info required by NEPA
  - ESP-10: Use of ESP of relevant findings from 10 CFR 51, Subpart B, Appendix B (License Renewal GEIS)
  - ESP 17: Use of existing site/facility information (PRM-52-1)
  - ESP 18: NEPA- required review of alternatives (PRM- 52-2)

Topics for Next Meeting

Priorization of Generic ESP Issues (Cont'd)

- Winter 2003
  - ESP-9: Criteria for assuring control of the site by the ESP holder
  - ESP-11: Criteria for determining the initial duriation of an ESP (10-20 years)
  -
- Spring 2003
  - ESP 14: Applicability of Federal requirements concerning environmental justice
  - ESP 15: Appropriate level of detail for site redress plans
  - ESP 16: Guidance for ESP approval of "complete" emergency plans

DRAFT Rev. C 06/10/2002 10:00 AM
TOPIC# ESP - 13

TOPIC: Guidance for seismic evaluations required by 10 CFR 50, Appendix S

DESCRIPTION:

Prior to January 10, 1997, the regulation governing seismic siting issues and the determination of the design basis ground motions for nuclear power facilities was Appendix A to 10 CFR Part 100, "Seismic and Geologic Siting Criteria for Nuclear Power Plants." The approach in Appendix A is a deterministic methodology. Past licensing experience in applying Appendix A and the lessons associated with addressing the Charleston earthquake issue in the 1980's, demonstrated the need to adopt methodologies and procedures that quantitatively identify and incorporate uncertainties associated with geologic and seismologic data, the range of credible scientific interpretations based on these data and their role in the evaluation of seismic hazards (See Regulatory Guide 1.165). For applications on or after January 10, 1997, 10 CFR 100.23 and Appendix S of 10 CFR 50 were added to adopt new methods and procedures.

With the publication of Regulatory Guide 1.165 in March 1997, the NRC has provided specific guidance with respect to the regional and site geological, seismologic and geophysical investigations and probabilistic evaluations that should be conducted to address the uncertainties associated with geologic and seismic siting and in determining the seismic design ground motion for a plant. However, the guidance has not yet been applied in an actual ESP or other licensing action.

For sites currently occupied by a licensed nuclear power plant, it is reasonable to expect there are geologic and seismic information economies that may support an effort to site a new plant on an existing site. The safety analysis report (SAR) for an existing nuclear power plant will be a good starting point to plan data collection activities and focus geological, geophysical and geotechnical investigations that are required by current regulations. However, since current geologic and seismic siting regulations require the uncertainties associated with data and their interpretations be evaluated as part of the siting process, the scope of regional site investigation requirements could be more focused and the breadth of the evaluations that are conducted, more extensive than required by past regulations (before January 10, 1997).

Given that the seismic and geotechnical activities associated with the ESP application can have a significant impact on schedule, personnel resources and cost, and since the industry would be applying regulations with which it and the NRC has little applied experience, the industry believes it is essential to an efficient ESP application and review process that certain details concerning a generic seismic and geotechnical implementation plan be discussed and resolved prior to implementing the seismic and geotechnical investigations.

QUESTIONS / ITEMS FOR DISCUSSION:

Questions:

(1) What are the NRC's expectations for interactions with a potential applicant relating to seismic and geotechnical work in the period prior to ESP application submittal?

(2) What are the NRC's expectations regarding the use of previously accepted site information in an ESP application pertaining to an existing site?

(3) Does the NRC intend to observe a potential applicant's fieldwork relating to seismic and geotechnical?

(4) If yes to (3) above, what work elements will be observed and what standard or objectives will be used to assess this work?

DISCUSSION ITEMS:

Focus of Seismic Hazards Study -
Update of "site database" is focused only on those areas important to assessing the probabilistic ground motion level for the site and the dynamic stability of the subsurface materials. The industry approach includes the following elements:

- Starting point for defining the seismic source interpretations from the EPRI / SOG (~1985) (industry preferred source).
- Recent (published and gray literature) interpretations of seismic sources in the region and ground motion attenuation would be compiled and evaluated to determine if they are significantly different from EPRI. Sensitivity analyses, if needed, may be performed using acceptable third-party PSHA software or the EPRI code. If a complete recalculation of the EPRI results with some specified changes (e.g., new attenuation models, new rates, and Mmax for seismic region), the EPRI code would be used.
- Controlling earthquakes may be defined on the basis of sensitivity calculations performed using acceptable third-party software if not available from EPRI results. Appropriate rock spectral shapes defined using NUREG/CR-6728.
- Starting point for defining the soil amplification effects would be the data gathered for the UFSAR.
- Limited site data together with published information would be used to assess appropriate site amplification models. Procedures in NUREG/CR-6728 would be used to develop free-field SSE.
- Starting point for assessing the potential for surface rupture/nearby faulting would be the existing facility UFSAR. Readily available data would be searched for indications of new features that should be evaluated. If such features are identified,

they may be the target for new data gathering efforts, depending on their potential significance.

Focus of Geotechnical Study -
The geotechnical study would be focused on confirming if necessary, or as appropriate updating, existing geotechnical information for the plant site. Detailed geotechnical investigation consistent with RG-1.132 and DG-1101 would be deferred to design. If confirmatory study is necessary, it would likely be similar or consistent with the following:

- Geotechnical studies would be limited mostly to a confirmatory field exploration program. An exploration program, for example, could be comprised of:
  - ⇒ 3 borings (2 to ~100 feet and 1 to ~250 feet) and 4 cone penetrometer test (CPT) soundings (depth of ~80 feet). Seismic CPTs would be conducted in 1 or 2 soundings to obtain Vs values. Downhole Vs measurements would be made in the deep borehole. Piezometers would be installed in all boreholes. Soil samples would be collected by SPT and Dennison-type sampling methods.
  - ⇒ Samples of soil recovered from borings would be tested in a laboratory to confirm classifications and engineering properties. Several resonant column/cyclic torsional tests might be conducted to confirm modulus-damping behavior at higher shearing strains.
  - ⇒ Liquefaction assessment would be made for saturated cohesionless soil layers using empirical methods (SPT, CPT, and Vs). Guidelines given in DG-1105 would be followed as appropriate.
- Information in the UFSAR for foundations design would be reviewed relative to new geotechnical information. The purpose of the review would be to determine if any significant changes are needed for the foundation design criteria.

INDUSTRY APPROACH:

The studies and investigations conducted in this area are intended to be consistent with the general guidance provided in Regulatory Guide 1.165. The approach to these studies and investigations would be determined in part by the extent and quality of the existing database for the site. The approach to these studies and investigations also would depend to some extent on the licensing strategy adopted, as one can make a trade off between conservatively enveloping uncertainties versus expending resources to reduce those uncertainties. Because of these issues, a phased program of work activities would likely be developed. The phases in the work primarily pertain to the data gathering activities.

The generic approach involves completing the initial data gathering and evaluation tasks and then preparing an assessment of the options for performing or not performing more extensive studies, such as new geophysical surveys, trenching, detailed mapping, down-hole velocity measurements, and dynamic testing of soil samples. Results of the data

gathering and evaluation tasks would be used in seismic hazards, ground motion, and geotechnical hazards evaluations and reporting.

The initial phase of the seismic work would involve an assessment to determine whether or not the EPRI hazard assessment needs to be updated. The EPRI hazards assessment dates from the late 1980s and doesn't necessarily reflect the current understanding of seismic hazards in the Central and Eastern United States (CEUS). The approach to be used for this assessment is given in the three-step process outlined in Appendix E, Section E.3 of Regulatory Guide 1.165

Step 1: Evaluate if recent information would suggest that there are significant differences from the previous seismic hazard characterization.

Step 2: If potentially significant differences are identified, then sensitivity analyses are performed to assess whether or not these differences have a significant impact on the site hazard.

Step 3: If Step 2 indicates that there are significant differences in the hazard, then the probabilistic seismic hazards assessment (PSHA) for the site is revised by either updating the previous calculations or, if necessary, performing a new PSHA analysis.

The result of this three-step process is either an assessment that the existing EPRI hazard results are applicable for the site or that a new hazard analysis is required.

Concurrent with this seismic hazards assessment existing geotechnical information would be collected and reviewed to identify existing site conditions and to serve as a basis for site-specific ground motions and geotechnical hazards evaluations. Depending on the existing data for the subject site, this site characterization work may include a limited drilling and sampling program and a limited cone penetrometer testing program. If necessary, these programs would be to confirm conditions that have been determined in previous explorations at the site and to collect information that can be used for local site-effect studies, should they be needed.

The strategy taken with this limited exploration work is to obtain sufficient information to carry out an early assessment of conditions. This information would serve as a basis for determining the need for additional site characterization information required either for the ESP or for a future facility design.

Information from the available documentation and the above mentioned tasks would be used to conduct geotechnical engineering evaluations relevant to the ESP and to a report summarizing the results of the work. The contents of this report would likely provide information need for the Site Safety Analysis Report (SSAR) and the Environmental Report (ER) being prepared as part of the ESP. The geotechnical engineering evaluations would consider the potential for liquefaction, seismic-induced settlement, and seismic-related instability of the earth structure forming any cooling-water reservoirs downstream of the existing facility. The potential for instability of dams upstream of the facility, if any, would also be identified. The intent of the geotechnical engineering studies would

be to confirm that existing conditions don't present an unusual hazard to the proposed facility during a design seismic event.

NRC STAFF POSITION: *(Pending outcome of discussions on June 13, 2002).*

Issue No. Heading	Stated Concern(s) Background	Industry and NRC Views (1/10/02)	Next Action
ESP-6 Bounding Plant Parameter Envelope (PPE) vs. optional configurations	Part 51, Subpart A delineates the information that must be included in a early site permit application. In some instances, this information is a value. For example, §52.17(a)(1)(iv) states that the application must contain the maximum level of radiological and thermal effluents each facility will produce and §52.17(a)(1)(v) requires a description of the type of cooling systems, intakes, and outflows that may be associated with each facility. For certified designs, the associated PPE may have values that could be used to satisfy the two examples cited above. However, if the reactor type has not been selected, it is not clear how the rule provisions, noted in the examples, would be satisfied. This approach raises several questions: 1) what is NRC's expectation; can more than one value be provided in an ESP application, 2) if a value is provided for a new technology and no bounding PPE exists, what kind of NRC review is conducted?	These issues (formerly ESP-1 and 2) concern how to develop an ESP application if the reactor type had not yet been selected. The staff stated that ESPs were expected to be used by a company who did not know what plant design was going to be built. However, the staff expects that certain features of the plant will be known, such as whether it will be a BWR, PWR, or gas-cooled reactor of a certain power level. This would allow the applicant to estimate the footprint of the plant, the power level, and cooling needs. The staff is looking for more than a general description, and the applicant is going to have to make some type of projections. NEI indicated that they wanted to use their plant parameter envelope (PPE) approach for a gas-cooled reactor, using bounding values where appropriate. The staff indicated that this approach may be acceptable for the safety portion of the review, but not necessarily for the environmental review. Concerns regarding adequate protection may be addressed, but compliance with the National Environmental Policy Act 0f 1969 (NEPA) may not be met. Where parameters are of a finite value (such as the number of units), the applicant should use a bounding value. NEI further asked how the staff would address a request for an exemption to an ESP. The staff responded that if there is an exceedance in one area, the issue would be reopened and would have to be addressed. The whole ESP would still have finality, except in that one area, which would have to be reviewed and would be subject to litigation.	Further Discussions (NEI)

ATTACHMENT 1 - SAMPLE TRACKING SYSTEM ITEM

Issue No.	Stated Concern(s)	Industry / NRC Views (4/24/02)	Next Action (Responsible Org.)
Heading	Background		
ESP-6 Bounding Plant Parameter Envelope (PPE) vs. optional configurations	DESCRIPTION: Part 51, Subpart A delineates the information that must be included in a early site permit application. In some instances, this information is a value. For example, §52.17(a)(1)(iv) states that the application must contain the maximum level of radiological and thermal effluents each facility will produce and §52.17(a)(1)(v) requires a description of the type of cooling systems, intakes, and outflows that may be associated with each facility. For certified designs, the associated PPE may have values that could be used to satisfy the two examples cited above. However, if the reactor type has not been selected, it is not clear how the rule provisions, noted in the examples, are satisfied. <u>QUESTION(S) FOR DISCUSSION</u>: For non-certified designs, applicants will utilize best-available information from vendors. Is the use of non-certified design information acceptable for establishing PPEs and what is the regulatory risk?	Applicants may submit bounding plant parameters. The applicants determine those bounding values. Additional reasonable conservations may be included in the proposed bounding values. The applicant need not justify or submit the basis for each bounding value and accepts the risk that a specific technology parameter later addressed as part of a COL application may exceed the bounding value accepted at the ESP stage. Any such variances would be addressed at the COL stage on a case basis. In certain instances, a bounding parameter approach appears impracticable. For example, some icing effects can only be considered in the context of specific designs. In such instances, applicants are expected to provide sufficient detailed design information for specific reactor types that could reasonably be expected to be built on the proposed site.	Further Discussions (NEI)

ATTACHMENT 1 - SAMPLE TRACKING SYSTEM ITEM

NEI

Seismic-Related Work for an ESP Project

Nuclear Energy Institute
Early Site Permit Task Force

Presentation to the

U. S. Nuclear Regulatory Commission

June 13, 2002

NEI

Agenda

- ❑ Introduction
- ❑ Meeting Objectives
- ❑ Regulatory Requirements
- ❑ General Example
- ❑ Discussions

NEI

Meeting Objectives

- ❑ Discuss industry approach to applying existing regulatory guidance to ESP applications
- ❑ Convey to NRC the following industry positions
  - ➢ High level of reliance on existing data
  - ➢ Limited geotechnical investigations to support ESP
  - ➢ Use of EPRI methodology, data and results is acceptable
- ❑ Request feedback from NRC Staff:
  - ➢ Approach outlined in today's discussion
  - ➢ Identification of any unpublished regulatory material
  - ➢ Ongoing NRC activities regarding seismic hazards

NEI

Overview of Regulatory Requirements

- Applicable Regulations
- Implementation Guidelines
- Integrated Decision Process

NEI

Applicable Regulations

- 10 CFR 100.23 - *Geologic and Seismic Siting Criteria* - applies for ESP applications
  - PSHA is an acceptable basis for determining the design basis ground motion for a site
- 10 CFR Part 50, Appendix S – *Earthquake Engineering Criteria for Nuclear Power Plants* - applies for ESP applications
  - Design basis ground motion is for free-field conditions at the ground surface
  - Applicant may determine the appropriate OBE level

NEI

Implementation Guidance

- Principal guidance for implementation of Part 100.23 requirements for determining design basis ground motions for a site is contained in RG 1.165
- Principal guidance for acceptable geotechnical characterization of a site is contained in RG 1.132
- Additional guidance on acceptable approaches for assessing hazard consistent ground motions at a site is contained in NUREG/CR-6728 and NUREG/CR-6769

NEI

Integrated Decision Process

- Basic Understandings:
  - Median hazard is accepted for determining design basis ground motion at a site
  - Existing EPRI/SOG seismic sources and source parameters are accepted as starting basis for assessing design basis ground motion for site in Central and Eastern United States (CEUS)
    - (per RG 1.165 and NRC's approval letter for EPRI methodology, data, and results)
  - An up-to-date site-specific geological, seismological, and geophysical investigation must be performed

NEI

Integrated Decision Process (Cont'd)

- Basic Understandings - continued:
  - The acceptability of existing EPRI/SOG probabilistic seismic hazard (PSHA) results by implementing the evaluations described in RG 1.165 (C.3), considering current relevant data
- Objectives of Geology, Seismic and Earthquake Engineering:
  - Demonstrate that site seismic characteristics conform to the seismic design requirements of a bounding plant design for which ESP is planned
  - Provide sufficient information necessary to define the seismic characteristics in an ESP

NEI

Specific Guidance for ESP

- Regulatory Guide (RG) 1.165:
  - Published in March 1997
  - Addresses uncertainties in determining seismic design ground motion for a plant
    - Geological, seismologic, geophysical, and geotechnical investigations
  - Probabilistic approach

NEI

Seismic Process for Site with Existing Facility

- Utilize as much existing data as possible
  - Use the existing facility Updated Final Safety Analysis Report (UFSAR) as the starting point:
    - Bring the geologic and seismic information in UFSAR up to date
    - Update information in conformance with new regulations (e.g., 10 CFR 100.23) and ensure consistency with new guidance (e.g., RGs 1.165 & 1.132; DG-1101)
- Seismic source interpretations from LLNL or EPRI/SOG are acceptable inputs for site-specific analysis
  - Near term (i.e., the lead applicants), industry will use EPRI/SOG methodology, data and results

NEI

Ground Motion Characteristics

- Median reference probability (10^{-5} per year)
- Motions computed for rock
- Site-specific soil effects used to determine SSE

NEI

General Approach for ESP

- Focus of study:
  - Seismic hazard studies
    - Assess appropriate SSE ground motions and potential for surface rupture
  - Geotechnical investigations
    - Assess appropriate site amplification models and site dynamic stability

NEI

Seismic Hazard Evaluation

- Starting Point - Use EPRI/SOG PSHA Database
  - Accepted by US NRC as an appropriate seismic hazard methodology and database
  - Provides well documented set of seismic hazard input interpretations

NEI

Update Seismic Hazard Database

(Regulatory Position 1 of RG-1.165)

- Follow guidance in RG-1.165 Appendix D for types of data needed
- Focus on data and interpretations post-EPRI/SOG
- Primary data sources will be published literature, available PSHA studies for important facilities, and discussions with active researchers in the region
- Newly identified features may require more detailed investigations

NEI

Perform PSHA

(Follow Regulatory Position 3 of RG-1.165)

- Assess applicability of EPRI/SOG PSHA results to site using 3-step procedure outlined in Appendix E of RG-1.165
- Obtain median 10^{-5} annual exceedance probability ground motions from either existing EPRI/SOG PSHA results or updated PSHA results
- Identify controlling earthquakes using procedure given in Appendix C of RG-1.165

NEI

Assess Applicability of EPRI/SOG PSHA Results *(Appendix E of RG-1.165)*

- STEP 1: Assess impact of post-EPRI/SOG data on characterization of seismic sources and ground motion attenuation
- STEP 2: If step 1 identifies potential significant differences from EPRI/SOG database, perform PSHA sensitivity analyses to assess impact. If not, use existing EPRI/SOG results for rock ground motion
- STEP 3: If significant differences in hazards exist, perform updated PSHA. If not, use existing EPRI/SOG results for rock ground motion

NEI

Determine SSE Spectra

(Follow Procedures Identified in Reg. Pos. 4 of RG-1.165)

- Define appropriate rock spectrum using spectral shapes for CEUS (e.g., NUREG/CR-6728)
- Assess site amplification characteristics using results of geotechnical investigations
- Perform site response analyses using procedures to develop free-field surface motions (e.g., NUREG/CR-6728)
- Develop appropriate smooth SSE free-field spectra

NEI

Assess Potential for Surface Faulting at Site

- Starting point will be the detailed site investigations already performed.
- Data gathered as part of update of earth sciences database will be used to identify new features that should be evaluated.
- If such features are identified, they may reach the threshold for new data gathering efforts, depending on their potential significance.

NEI

Geotechnical Program

- Objective:
  - Confirm or update existing geotechnical information for plant site
  - Consider RG-1.132, DG-1101, and DG-1105
- Scope of Work:
  - Extent of explorations and evaluations sufficient for an Early Site Permit
  - Additional exploration and evaluations will likely be needed in the future for COL

NEI

Field Explorations

- Existing Information:
  - Existing explorations circa 1977
  - Involved 20+ borings with extensive soil sampling
- Planned Program:
  - Confirmatory drilling and sampling*
    - 2 holes to till (~100 ft)
    - 1 hole to rock (~250 ft)
  - Cone penetrometer testing (CPT)*
    - 4 to ~80 feet

*Exact number of tests are applicant specific

NEI

Geophysical Program

- Existing Information:
  - S- & P- wave velocities
  - Down-hole, up-hole, and surface wave methods
- Planned Program:
  - Confirmatory testing*
    - seismic CPTs at 2 locations for spatial variability
    - downhole velocity measurements in deep borehole
  - Empirical correlations

*Exact number of tests are applicant specific

NEI

Laboratory Testing

- Existing Information:
  - Full set of classification and strength properties
  - Cyclic liquefaction and modulus tests
- Planned Program:
  - Limited amount of classification testing
  - Limited number of modulus/damping tests
  - No cyclic liquefaction tests - - plan to use SPT and CPT empirical correlations

NEI

Liquefaction Assessment

- Existing Information:
  - Liquefaction study completed and confirmed in USAR
  - Cyclic liquefaction testing was conducted
- Planned Program:
  - Confirmatory analyses using updated SPT/CPT method per DG-1105
  - Incorporate any revisions to peak ground acceleration and applicable magnitude

NEI

Future Discussion Items

- Industry will provide positions on the following:
  - Definition of "significant increase" in hazard estimate
  - Treatment of high amplitude high frequency motions

DRAFT
TOPIC# ESP - 13

TOPIC: Guidance for seismic evaluations required by 10 CFR 50, Appendix S

DESCRIPTION:

Prior to January 10, 1997, the regulation governing seismic siting issues and the determination of the design basis ground motions for nuclear power facilities was Appendix A to 10 CFR Part 100, "Seismic and Geologic Siting Criteria for Nuclear Power Plants." The approach in Appendix A is a deterministic methodology. Past licensing experience in applying Appendix A and the lessons associated with addressing the Charleston earthquake issue in the 1980's, demonstrated the need to adopt methodologies and procedures that quantitatively identify and incorporate uncertainties associated with geologic and seismologic data, the range of credible scientific interpretations based on these data and their role in the evaluation of seismic hazards (See Regulatory Guide 1.165). For applications on or after January 10, 1997, 10 CFR 100.23 and Appendix S of 10 CFR 50 were added to adopt new methods and procedures.

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- Recent (published and gray literature) interpretations of seismic sources in the region and ground motion attenuation would be compiled and evaluated to determine if they are significantly different from EPRI/SOC Sensitivity analyses, if needed, may be performed using acceptable third-party PSHA software or the EPRI code. If the seismic source characterization and/or ground motion models must be updated, site specific hazards results will be calculated.
- Controlling earthquakes may be defined on the basis of sensitivity calculations performed using acceptable third-party software if not available from EPRI results. Appropriate rock spectral shapes will be used (e.g. NUREG/CR-6728).
- Starting point for defining the soil amplification effects would be the data gathered for the UFSAR.
- Limited site data together with published information would be used to assess appropriate site amplification models. Procedures in NUREG/CR-6728 would be used to develop free-field SSE.
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indications of new features that should be evaluated. If such features are identified, they may be the target for new data gathering efforts, depending on their potential significance.

Focus of Geotechnical Study -

- The geotechnical study would be focused on confirming if necessary, or as appropriate updating, existing geotechnical information for the plant site. Detailed geotechnical investigation consistent with RG-1.132 and DG-1101 would be deferred to COL. If confirmatory study is necessary, it would likely limited to a confirmatory field exploration program.

INDUSTRY APPROACH:

The studies and investigations conducted in this area are intended to be consistent with the general guidance provided in Regulatory Guide 1.165. The approach to these studies and investigations would be determined in part by the extent and quality of the existing database for the site. The approach to these studies and investigations also would depend to some extent on the licensing strategy adopted, as one can make a trade off between conservatively enveloping uncertainties versus expending resources to reduce those uncertainties. Because of these issues, a phased program of work activities would likely be developed. The phases in the work primarily pertain to the data gathering activities.

The generic approach involves completing the initial data gathering and evaluation tasks and then preparing an assessment of the options for performing or not performing more extensive studies, such as new geophysical surveys, trenching, detailed mapping, down-hole velocity measurements, and dynamic testing of soil samples. Results of the data gathering and evaluation tasks would be used in seismic hazards, ground motion, and geotechnical hazards evaluations and reporting.

The initial phase of the seismic work would involve an assessment to determine whether or not the EPRI/SOC hazard assessment needs to be updated. The EPRI/SOC hazards assessment dates from the late 1980s and doesn't necessarily reflect the current understanding of seismic hazards in the Central and Eastern United States (CEUS). The approach to be used for this assessment is given in the three-step process outlined in Appendix E, Section E.3 of Regulatory Guide 1.165

Step 1: Evaluate if recent information would suggest that there are significant differences from the previous seismic hazard characterization.

Step 2: If potentially significant differences are identified, then sensitivity analyses are performed to assess whether or not these differences have a significant impact on the site hazard. If not, use existing EPRI/SOG results for rock ground motion

Step 3: If Step 2 indicates that there are significant differences in the hazard, then the probabilistic seismic hazards assessment (PSHA) for the site is revised by either updating the previous calculations or, if necessary, performing a new PSHA analysis. If not, use existing

EPRI/SOG results for rock ground motion

The result of this three-step process is either an assessment that the existing EPRI/SOC hazard results are applicable for the site or that a new hazard analysis is required.

Concurrent with this seismic hazards assessment existing geotechnical information would be collected and reviewed to identify existing site conditions and to serve as a basis for site-specific ground motions and geotechnical hazards evaluations. Depending on the existing data for the subject site, this site characterization work may include a limited drilling and sampling program and a limited cone penetrometer testing program. If necessary, these programs would be to confirm conditions that have been determined in previous explorations at the site and to collect information that can be used for local site-effect studies, should they be needed.

The strategy taken with this limited exploration work is to obtain sufficient information to carry out an early assessment of conditions. This information would serve as a basis for determining the need for additional site characterization information required either for the ESP or for a future facility design.

NRC STAFF POSITION: *(Pending outcome of discussions on June 13, 2002).*