EDO Principal Correspondence Control

FROM: DUE: 10/24/05 EDO CONTROL: G20050660
DOC DT: 09/22/05
FINAL REPLY:

Graham B. Wallis, ACRS

TO:

Reyes, EDO

FOR SIGNATURE OF : ** GRN ** CRC NO:

Reyes, EDO

DESC:

Interim Letter: Exelon Generation Company, LLC, Application for Early Site Permit and the Associated NRC Staff's Draft Safety Evaluation Report

DATE: 09/23/05

ASSIGNED TO: CONTACT:

NRR Dyer

ROUTING:

Reyes
Virgilio
Kane
Silbe
Dean
Cyr/Burns
Paperiello, RES
Caldwell, RIII
Dixon-Herrity, OEDO
ACRS File

SPECIAL INSTRUCTIONS OR REMARKS:

Prepare response to ACRS for EDO signature. Add Commissioners and SECY as cc's.

USE SUBJECT LINE IN RESPONSE.

Template: EDO-001 E-RIDS: EDO-01

UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, D. C. 20555

September 22, 2005

Mr. Luis A. Reyes
Executive Director for Operations
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

SUBJECT: INTERIM LETTER: EXELON GENERATION COMPANY, LLC, APPLICATION FOR EARLY SITE PERMIT AND THE ASSOCIATED NRC STAFF'S DRAFT SAFETY EVALUATION REPORT

Dear Mr. Reyes:

During the 525th meeting of the Advisory Committee on Reactor Safeguards, September 8-10, 2005, we met with representatives of the NRC staff and Exelon Generation Company, LLC (the applicant) to discuss the application for an early site permit for the Clinton site, and the associated NRC staff's draft Safety Evaluation Report. We reviewed the application and the draft Safety Evaluation Report to fulfill the requirement of 10 CFR 52.23 that the ACRS report on those portions of an early site permit application that concern safety. Our Subcommittee on Early Site Permits also discussed this matter during a meeting on September 7, 2005. We also had the benefit of the documents referenced.

RECOMMENDATION

A thorough, expeditious review of the applicant's performance-based seismic hazard analysis methodology should be conducted, recognizing that this methodology may be used by applicants for purposes other than early site permits.

DISCUSSION

Exelon Generation Company, LLC (Exelon) has applied for an early site permit for locating nuclear power plants or modules having a total power generation rate of 2400 to 6800 MW_{th} on the site where the Clinton plant, a BWR6 within a Mark III containment, is currently operating. The early site permit application is based on the now familiar "plant parameter envelope" approach since the applicant has not identified the particular reactor technology that will be adopted. The plant parameter envelope is based on the characteristics of designs such as the AP1000 and Advanced Boiling Water Reactor (ABWR) as well as other designs such as International Reactor Innovative and Secure (IRIS), Economic and Simplified Boiling Water Reactor (ESBWR), Gas-Turbine Modular Helium Reactor (GT-MHR), and Pebble Bed Modular Reactor (PBMR). The staff has prepared a draft Safety Evaluation Report of this application.

This is an interim review of the application and the draft Safety Evaluation Report. This is the third early site permit application we have reviewed this year.

Nature of the Site

The proposed site is located in a rural setting in central Illinois. The terrain is essentially flat with some rolling hills. Nearby population centers with populations in excess of 25,000 include Springfield (74 km away), Peoria (75 km), Champaign (49 km), Urbana (65.5 km), Decatur (36 km), and Bloomington (36 km). Nearer the site (< 16 km away) are the small towns Clinton (population 7000), as well as DeWitt, Weldon, and Wapella each with a population of less than 1000.

Population trends in the larger cities near the site have been estimated based on census data. Modest growth in population over the next 60 years is anticipated in these population centers. Interestingly, data obtained from other sources led the applicant to anticipate that populations in the rural regions around the site will decline modestly over the next 60 years.

Three highways and a railroad run near and through the site. Threats to the plant safety posed by accidents involving hazardous materials on these transportation routes or accidents at agriculture supply facilities in the area have been characterized well by the applicant and do not pose significant safety issues.

Weather

Weather at the proposed site is well characterized in recent years as would be expected for a site with an operating nuclear power plant. The weather is marked by rather warm summer periods and harsh winters. Weather extreme characteristics of the site have been based on historical data. Neither the applicant nor the staff have taken account of literature suggesting that there are cycles in weather that may complicate the prediction of future weather extremes based on historical records.

Seismicity

The essential issue of the proposed site is associated with seismic hazards and related risks. The site can be affected by the New Madrid seismic source (320 km), the Wabash Valley seismic source (209 km) and the central Illinois source zone associated with historic as well as prehistoric earthquakes. The first of these seismic sources has received much study. The U.S. Geological Survey has found that major earthquakes similar to those of the New Madrid seismic source in 1811-1812 recur at intervals of 200 to 800 years. Also evidence indicates that the maximum magnitude of earthquakes at the Wabash Valley source could be larger than had been anticipated at the time the plant now operating at the Clinton site was approved.

The central Illinois seismic source zone is poorly defined. It is thought to be responsible for a large magnitude earthquake in the area of the nearby population center at Springfield about 6700 years ago and perhaps a more recent prehistoric earthquake. There is no particular geologic structure associated with these earthquakes. The Springfield earthquake is known through examinations of prehistoric soil liquefaction evidence. Consequently, the seismic epicenter cannot be as precisely localized as the better known seismic events that are used to characterize the seismic risk at the Clinton site.

The applicant has chosen to characterize the seismic hazard using a methodology that differs from that utilized in previous early site permits and recommended in the agency's Regulatory Guide 1.165. The alternative, American Standards for Civil Engineers (ASCE) Standard 43-05, "Seismic Design Criteria for Systems, Structures and Components in Nuclear Facilities", is an industry standard with a quality pedigree. It may well be used by other applicants in the future for early site permits and other purposes. The alternative has many features in common with the more familiar method recommended by the NRC staff. These features include requirements for surveying literature data and conducting a probabilistic seismic hazard assessment. The methods differ in the target acceptance criterion. The alternative method seeks to find the ground motion spectrum that will result in a 10^{-5} yr^{-1} probability for the onset of inelastic deformation of safety significant systems, structures, and components. The mean ground motion spectrum (plot of peak ground acceleration against vibrational frequency) for the proposed Clinton site calculated using this alternative methodology is quite similar to that derived by the NRC-endorsed methodology for a recurrence frequency of 10^{-4} yr^{-1}. On the other hand, the applicant claims that its results are bounded by results using the NRC-approved methodology for frequencies less than 16 Hz and exceed the results of the approved methodology only modestly at the higher, less important, frequencies. The applicant asserts that the result yields a core damage frequency (CDF) of 1-4 $x10^{-6}$ yr^{-1}. Documentation to substantiate this assertion is not available now for review. The applicant further asserts that the alternative will promote greater regulatory stability in the face of continuing improvements in our understanding of the seismicity of the site though it is not immediately apparent why this is so.

The performance-based treatment of the seismic hazard of the Clinton site proposed by the applicant is an industry standard and merits consideration as an alternative to the methods currently found acceptable by the staff. Thorough review of the proposed methodology is complicated by some discrepancy between inputs to the methodology cited by the applicant and the references from which the inputs were derived. These inputs are, of course, issues in staff requests for additional information that are being considered by the applicant now.

Acceptance of this methodology by the staff for use in connection with the early site permits may have implications for other regulatory activities involving seismic hazard analyses. A thorough, prompt review of the proposed methodology recognizing the breadth of possible applications is needed.

Most open items in the staff review of the non-seismic portion of the Clinton early site permit application have been satisfactorily resolved. The staff is now re-examining the list of 15 permit conditions in light of criteria the staff established during the review of the North Anna early site permit application. It is anticipated that some of the permit conditions will evolve into action items for the combined license stage. The applicant is preparing responses to seven open items identified in connection with the seismic aspects of the application. It is anticipated that a more nearly finalized safety evaluation report will be available for review in early 2006.

Sincerely,

Graham B. Wallis

Graham B. Wallis
Chairman

References:

1. U.S. Nuclear Regulatory Commission, Draft Safety Evaluation Report, "Safety Evaluation of Early Site Permit Application in the Matter of Exelon Generation Company, LLC, for the EGC Early Permit Site," February 2005.
2. U.S. Nuclear Regulatory Commission, Supplemental Draft Safety Evaluation Report, "Safety Evaluation of Early Site Permit Application in the Matter of Exelon Generation Company, LLC, for the EGC Early Permit Site," August 2005.
3. Exelon Generation Company, LLC, Early Site Permit Application, September 23, 2003.
4. U.S. Nuclear Regulatory Commission, Review Standard, RS-002, "Processing Applications for Early Site Permit Applications," May 3, 2004.
5. U.S. Nuclear Regulatory Commission, Regulatory Guide 1.165, "Identification and Characterization of Seismic Sources and Determination of Safe Shutdown Earthquake Ground Motion," March 1997.