



UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, DC 20555 - 0001

May 29, 2009

MEMORANDUM TO: ACRS Members

FROM: Derek A. Widmayer, Senior Staff Scientist **/RA/**
Reactor Safety Branch B, ACRS

SUBJECT: CERTIFICATION OF THE MINUTES FOR THE MEETING OF
THE EARLY SITE PERMITS SUBCOMMITTEE, December 3,
2008 – ROCKVILLE, MARYLAND

The minutes of the subject meeting have been certified on May 7, 2009 as the official record of the proceedings for that meeting. A copy of the certified minutes is attached.

Attachment: Certified Minutes

cc: ACRS Staff Engineers
S. Duraiswamy
J. Flack
H. Nourbakhsh



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May 7, 2009

MEMORANDUM TO: Derek A. Widmayer, Senior Staff Scientist
Reactor Safety Branch B, ACRS

FROM: Dr. Dana A. Powers, Chairman
Early Site Permits Subcommittee

SUBJECT: CERTIFICATION OF THE MINUTES FOR THE MEETING OF
THE EARLY SITE PERMITS SUBCOMMITTEE, December 3,
2008 – ROCKVILLE, MARYLAND

I hereby certify, to the best of my knowledge and belief, that the minutes of the subject meeting on December 3, 2008, are an accurate record of the proceedings of that meeting.

/RA/

5/7/2009

Dana A. Powers, Chairman
Early Site Permits Subcommittee

Date

**ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
EARLY SITE PERMITS SUBCOMMITTEE MEETING MINUTES
December 3, 2008
Rockville, MD**

INTRODUCTION

The Advisory Committee on Reactor Safeguards (ACRS) Subcommittee on Early Site Permits met on December 3, 2008, at 11545 Rockville Pike, Rockville, MD, in Room T-2B3. The purpose of the meeting was to review and discuss the application for an early site permit (ESP) submitted by the Southern Nuclear Operating Company (SNC or the applicant) for the Vogtle site, the SNC request for a limited work authorization (LWA) to perform limited construction work at the Vogtle site, and the associated NRC staff Safety Evaluation Report (SER). The Subcommittee planned to gather information, analyze relevant information and facts to formulate proposed positions, as appropriate, for deliberation by the full ACRS. The entire meeting was open to the public. Mr. Derek A. Widmayer was the cognizant ACRS staff scientist and the Designated Federal Official for this meeting. The Subcommittee received no written comments or requests for time to make oral statements from any members of the public regarding this meeting. The meeting was convened at 8:30 am and adjourned at 4:41 pm.

ATTENDEES

ACRS

D. Powers, Chairman
M. Bonaca, Member
W. Shack, Member
J. Sieber, Member
S. Armijo, Member

O. Maynard, Member
H. Ray, Member
G. Apostolakis, Member
W. Hinze, Consultant
D. Widmayer, ACRS Staff

NRC Staff

C. Araguas, NRO/DNRL
B. Thomas, NRO/DE
L. Bauer, NRO/DSER
B. Musico, NSIR/DPR
J. Ma, NRO/DE
C. Munson, NRO/DSER
G. Stirewalt, NRO/DSER
W. Wang, NRO/DSER
H. Ahn, NRO/DSER

N. Chokshi, NRO/DSER
S. Gonzalez, NRO/DSER
J. George, NRO/DSER
B. Tegeler, NRO/DE
A. Shropshire, NSIR/RSRLB
B. Harvey, NRO/DSER
S. Coffin, NRO/DNRL
R. Karas, NRO/DSER

Others

C. Constantino, BNL
D. Moore, SNC

J. Davis, SNC
C. Pierce, SNC

A. Findikakis, Bechtel
J. Prebula, Bechtel
C. Kincaid, PNNL

T. Admundson, EP Consulting
B. LaPay, Westinghouse

OPENING REMARKS BY THE SUBCOMMITTEE CHAIRMAN

Dr. Dana Powers, Chairman of the Early Site Permits Subcommittee, stated that the purpose of this meeting was to conclude the review of the application for an ESP from SNC for the Vogtle site, including the staff's final SER, in fulfillment of the ACRS requirement in 10 CFR Part 52.23 to report on those portions of an ESP that concern safety. He stated also that the Subcommittee would review and comment on SNC's request for a LWA. He stated that the subcommittee would treat the LWA like any other NRC staff request and make recommendations to the Full Committee as appropriate.

SOUTHERN NUCLEAR OPERATING COMPANY PRESENTATION

(SNC Slides 1 – 48)

Mr. Chuck Pierce, Licensing Manager for the Southern Nuclear Vogtle Units 3 and 4 Program, introduced the SNC presentation for the meeting. He started by noting the timeline for the project would start with excavation in the May or June 2009 timeframe with the engineered backfill work authorized under the LWA beginning around the Sept or Oct 2009 timeframe. It will take about 12 months to complete the backfill construction. Then there would be about 48 months of construction, then 6 months of startup activity. This puts the startup of Vogtle Unit 3 at about April 2016 (SNC Slides 1 – 4).

Mr. Jim Davis, the Vogtle ESP Application Project Engineer, continued the applicant's presentation. He explained that the ESP permit application consisted of five parts, with Part 2, the Safety Analysis Report and Part 5, the Emergency Plan, covering most of the information analyzed in the NRC staff's SER. He introduced the Vogtle site as a 3100 acre site about 26 miles southeast of Augusta, Georgia, on the coastal plain across the Savannah River from the Department of Energy's Savannah River Site in Barnwell, South Carolina. (SNC Slides 5 – 10). In response to a question from ACRS Member Ray, Mr Davis explained that the new switchyard will serve the two new units, but there will be a connection between the old and new switchyards.

Mr. Davis explained that the next discussion would be about 40 Open Items (SNC Slide 11) that SNC had to respond to since the presentation to the ACRS Early Site Permit Subcommittee in October 2007. The first of these was in Meteorology. NRC asked for SNC to include a 100-year return period for meteorological data, which SNC did, closing the Open Item (SNC Slide 12). A short discussion ensued, during which Chairman Powers mentioned the issue of whether you can adequately predict future weather using 100-years of past data.

Mr. Angelos Findikakis from Bechtel (consultant to SNC) provided a discussion of the 4 Open Items related to hydrology from the Draft SER (SNC Slides 13 & 14). SNC demonstrated the adequacy of available water resources for safety-related purposes in answering the first hydrology Open Item.

The remaining 3 hydrology-related Open Items dealt with site groundwater issues, and SNC's use of the MODFLOW model for predictive groundwater modeling (SNC Slides 15 – 19). SNC used one year of data to calibrate the model and the members had some questions about whether this was adequate, especially whether one-year of data adequately calibrates the model considering the likelihood of the recurrence of a 100-year flood during the lifetime of the new reactor units. Consultant Hinze explored

whether the modeling took into account the variable thickness of the Utley limestone. The licensee responded that variable hydraulic conductivities were used to model the Utley limestone to account for variations in thickness. In response to another question, the applicant stated that all parametric values used by the model during the calibration computer runs were within the bounds of measured values.

SNC then discussed the alternative predictive modeling that was conducted. First, they modeled the future conditions considering the new structures and other changes to the site produced if Units 3 and 4 were built. The NRC open item concerned whether SNC had considered all the potential pathways in their predictive modeling, so next they provided the results of several models where they forced the groundwater to go in different directions from the base-line prediction. The open item was closed because the parameters used to force the model in separate directions were way outside the possible boundary of reasonable values for it to actually occur. The members asked how the applicant adequately modeled the backfill and changed conditions at the site if the new Units were built and were satisfied with the details given by SNC to clarify these items. This included forcing the groundwater divide to move underneath the new units and seeing that the necessary parameter changes to get this to occur were impossible for the site conditions.

Mr Don Moore from SNC began the discussion of the 22 open items in the Draft SER on Geology, Seismology, and Geotechnical Engineering (SNC Slides 20 – 30). As background, Mr. Moore explained that the upper 90 feet of sand is not suitable to support the new units, and will be removed. Below this is 70 feet of hard clay known as the Blue Marl. In response to a question, he explained that the backfill being emplaced after removal of the upper sand is a silty sand with a maximum fine content of 25% and typically near 15%, and it will be compacted to 95 percent modified proctor. Mr. Moore stated that the total amount of material being excavated is 3.6 million cubic yards. He explained that the nuclear island will be embedded about 40 feet into the backfill. Consultant Hinze asked about the removal of high-permeability incompetent Utley limestone, and SNC showed a slide demonstrating how far away from the nuclear island the excavation will take place, including removal of incompetent Utley limestone.

In response to a question, SNC explained that the backfill would be placed with specifications that will be determined later with an Inspection, Test, Analyses, and Acceptance Criteria (ITAAC) that will be discussed later in the meeting. SNC explained that the removal of this amount of material and placement of backfill was done for the operating units at the Vogtle site, and so they have experience doing this. Chairman Powers pointed out that operating Vogtle Units 1 and 2 do not have a large tank of water sitting on top of the reactors which makes the situation different for the two new units.

SNC explained that a site-specific seismic analysis was performed to arrive at a ground motion response spectra as well as a foundation input response spectra at the foundation depth. In response to an inquiry from Member Shack, SNC explained that a site-specific seismic analysis was required for two reasons: (1) because the ground motion response spectra and foundation input response spectra both exceeded the certified design motion response spectra (CSDRS) presented in the Design Certification Document (DCD) for the AP1000 reactor design, and (2) because the site soil profiles were significantly different than the generic soil profiles evaluated in the DCD.

Five Open Items dealt with vibratory ground motion aspects (SNC Slide 24). The Charleston seismic source needed to be updated. SNC used the EPRI-SOG PSHA developed in 1989 and the NRC had some concerns about the Dames and Moore seismic characterization that is part of the EPRI SOG. Discussion ensued about further studies that have been done since then to characterize earthquakes in the Charleston seismic zone. The TIP study was done in the late 1990s, and NRC wanted that to be considered. New paleoliquefaction studies have been done recently and these needed to be included in the seismic information.

The update to the Charleston Seismic Source Zone was conducted using a SSHAC Level 2 process by William Lettis and Associates. Consultant Hinze mentioned he was surprised that recent data collected by Pradeep Talwani of the University of South Carolina was not included in the William Lettis and Associates study. SNC did not have a specific answer as to why this data was not included in the Lettis study.

Additional Open Items on Seismic information concerned the methodologies used by SNC to calculate the soil uniform hazard response spectra (SNC Slide 25). SNC provided additional data to the NRC so staff could perform an independent calculation. NRC asked for additional information on how SNC calculated the vertical ground motion response spectra. Member Apostolakis asked several questions about the fragility curves that were used in the calculation. Both Mr Moore of SNC and Mr Munson of the NRC staff provided explanations of the use of fragility curves in the calculation. It was mentioned that the approach was discussed in great detail during the Committee's review of the Clinton Site ESP, and also that the new Regulatory Guide 1.208 included this methodology.

Member Ray asked about the relationship of the information being presented on the ground motion response spectra and how it related to the performance of the structures that were presented and evaluated in the DCD. It was explained that the Limited Work Authorization that would be presented later in the Subcommittee meeting requested authorization to begin only foundation preparation work, and the issues about structural response to seismic events would be considered in the COLA review. The Subcommittee members discussed briefly that the authorization granted for foundation preparation work somehow had to be coordinated with any future authorization for construction of structures on the prepared foundation. The Members agreed to discuss later whether a generic issue existed concerning the use of fragility curves and the methodology in Regulatory Guide 1.208.

SNC discussed the Open Item concerning surface faulting (SNC Slide 26). The NRC staff wanted additional descriptions of these features and more data demonstrating these were injected sand dikes and not formed tectonically. For several geotechnical engineering Open Items, the NRC staff wanted additional soil property data. SNC provided data that was collected for the COLA and the LWA which was collected since the ESP application was submitted, especially on liquefaction potential of the Blue Bluff Marl and the backfill. Several calculations in the SER were updated and clarified based on the additional data and supplied to the NRC.

Mr Ted Amundson from EP Consulting, (consultant to SNC) discussed the 13 Open Items in the Draft SER on emergency planning at the Vogtle site (SNC Slides 31 – 33). A couple of Open Items were closed by providing additional information to conform better to NRC regulatory guidance. An open item was closed on ITAACs by providing a

separate ITAAC for Unit 4 to go along with ITAAC on Unit 3. SNC also responded to one item by saying that separate emergency exercises would be conducted for each of the Units once they were operating. SNC also provided additional information on a new school that will be constructed in the emergency zone of the new Units and on the staffing plan on Table B-1. In response to a question from Member Maynard, SNC responded that they have committed to a 60-minute staff response time in their emergency plan. In response to an inquiry from Member Ray, SNC responded that the staffing plan was built with resources to respond to an emergency at Units 1 and 2 at the same time as Units 3 and 4, but that the details of exactly who would staff each position will not be worked out until much closer to actual operation of the new units.

Mr. Admundson discussed the conditions proposed for emergency planning for the Early Site Permit. There are six proposed conditions, three for each of the new units, all related to emergency action limits (EALs), which still need to be figured out after details of the as-built plant and site-specific data have been resolved. He explained that these conditions will be carried over as COL conditions when that review is completed. One condition pertains to the Technical Support Center and its centralized location to serve all four Units when they are operating. SNC believes the reasons for this condition will be resolved during the COLA review and it will not be carried over as a condition of that license.

Mr. Davis then began the discussion of the LWA (SNC Slides 34 – 48). He explained that once the new LWA rule was promulgated, that SNC submitted a revision to their existing LWA request to meet the new rule. He explained that some pre-construction activities (e.g., demolition, removal of old slabs, storm water management) were already ongoing, and that the activities requested in the LWA are scheduled to begin in mid-2009. Before they receive the LWA, they will begin excavation, which is allowed by the new rule. He stated that a footprint of the hole would extend to a total of a nine-acre area. Some discussion took place about the use of a ramp for vehicle traffic into the excavated pit and its location away from any sensitive areas where backfill will need to meet precise specifications. Mr. Davis discussed the use of a mechanically stabilized earth (MSE) (retaining) wall to create a boundary between the backfill and foundation mudmat that is requested in the LWA to stabilize the site prior to approval to construct foundation and subsequent structures. Mr. Davis provided some details of the MSE wall construction and anchoring and the fact that they constructed a test pit and put in a small section of wall and successfully tested that they could compact backfill close to it, as planned for the actual construction.

Mr. Davis then explained the placement of the waterproof membrane that is requested in the LWA. Mr. Davis stated in response to a question from member Armijo that the membrane is not a safety-related item, because the water table will be about 15 feet below the bottom of the slab and the design is qualified for a water table up to two feet from the slab. Mr. Davis explained the placement of the waterproof membrane on the surface of the MSE wall, forming a barrier between it and construction of foundation structures when it begins.

Mr. Davis explained the two backfill ITAACs included in the SER for the LWA activities. The first ITAAC is to assure that 95 percent compaction is achieved and the second ITAAC is for a shear wave velocity at the foundation level of 1000 foot per second to be achieved. Mr. Davis stated that they achieved the 1000 foot per second value in the test pit at a depth of 40 feet, so they will attempt to acquire the requirement at the 40 foot

depth once placement of the backfill is completed. Mr. Davis further explained that since the waterproof membrane was going to create a shear plane between the mudmat and the foundation following construction, the staff required an ITAAC of SNC to achieve a coefficient of friction of 0.7 between the nuclear island and the base slab.

Member Ray requested whether the applicant had evaluated the addition of the two new units into the grid as part of the LWA, and SNC explained that such an evaluation is included in the COLA. Member Ray commented that the integration of the units into the grid is related to the site and might make more sense if it was considered as part of the ESP, but he was satisfied that it would be reviewed as part of the COL review by the staff. The meeting adjourned for a 15 minute break at the conclusion of this discussion.

At the resumption of the meeting, Chairman Powers, after consultation with the ACRS Chairman, outlined the responsibilities of the subcommittee for its review of the LWA. The subcommittee is to ensure that sufficient ITAACs have been identified and the acceptance criteria defined sufficiently to fulfill its obligations to the full committee.

NRC STAFF PRESENTATION

(NRC Slides 1 – 96)

Christian Arugas, the NRC Project Manager for the Vogtle ESP application review, introduced the NRC staff portion of the subcommittee meeting. He explained that first the staff would present its findings for the open items on the ESP application and then for the open items on the LWA request.

He reminded the subcommittee that the staff's presentation at the October 2007 meeting described the staff's findings and conclusions on subjects for which there were no open items, and also that no presentation had been made on the LWA request yet. Therefore, the staff planned to make the presentations on the LWA more detailed since it was the initial presentation to the subcommittee. He pointed out that the staff decided that rather than issuing a separate safety evaluation report on the LWA, to combine the findings for the ESP and the LWA into the one SER that was provided to the subcommittee for review. He went over a few of the past schedule milestones and then summarized the remaining schedule, which ends with an ASLB finding after mandatory hearings at the end of the summer 2009 (NRC Slides 4 & 5).

Mr. Arugas presented some background slides (NRC Slides 6 & 7) that reiterated information already presented by SNC, such as the location of the two new plants, the open items and what subjects they dealt with, and the permit conditions that were specified following the staff review.

Mr. Arugas handled the meteorology open item (NRC Slide 10), which asked SNC to base its design temperature on a 100-year return rather than the 30-years presented in the application. Chairman Powers asked whether the staff considered global warming a phenomena that should be taken into account on this data point. Mr. Brad Harvey of NRC staff answered that the AP1000 design document has a margin built in to account for extreme temperatures and that the staff considers this margin to cover for any temperature extreme that might arise from global warming. In response to a question from member Sieber, Mr. Harvey said that the margin was on average about two or three degrees Fahrenheit. In response to a question from member Armijo, Mr. Harvey

explained that the 30-year return and temperature was 107 (or 109) degrees F and the 100-year return temperature was 115 degrees F.

Mr. Charles Kincaid from the Pacific Northwest National Laboratory discussed the NRC staff positions on hydrology open items from the draft SER (NRC Slides 11 – 19). The first item was the need for SNC to supply additional information on how the 780,000 gallon water tanks would be supplied with makeup water. The staff determined that the groundwater supply was sufficient to supply the initial filling of the tanks and subsequent makeup water when needed. The second item concerned the alteration of the groundwater profile due to construction. SNC supplied the NRC staff with its groundwater model and the staff performed additional modeling beyond that completed by SNC and concluded that the predictive modeling by SNC was adequate.

In response to a question from Dr. Hinze, Mr. Kincaid explained what data and information was used from the original characterization of the site before units 1 and 2 were constructed. In response to a question from member Armijo, Mr. Kincaid explained that the site topography dominated the groundwater responses and neither a very conservative high or low value of infiltration caused the predominant groundwater pathway to change. The highest water table value the staff was able to coax from the model was 176 feet, and the base of the structures is at 180, so the worst case scenario still did not reach the level of the structures in the backfill. In response to inquiries from Dr. Hinze, Mr. Kincaid stated that the Utley limestone was not influencing the topography of the water table shown on one of the slides.

Addressing an open item concerning whether SNC had looked at sufficient groundwater pathways, the staff has confirmed the Mallard Pond drainage pathway as the most likely pathway and that a Daniels Branch pathway, although possible, is unlikely. Mr. Kincaid said that with lots of additional data that is not available and with the highly conservative infiltration rate of 50% of precipitation, the Daniels Branch pathway could be seen, but with uncertainty was still unlikely to occur. The next open item addressed was for the applicant to provide the nearest point along each pathway that may be accessible to the public. With the information from SNC, NRC staff looked at the pathways and modeled them differently than SNC. Using the data provided by SNC with different modeling parameters, the staff was satisfied with the results as long no chelating agents were available to speed the transport of radionuclides along the preferred pathways. Therefore, a COL action item was identified that the COL or CP applicant confirm that no chelating agents be commingled with radioactive waste liquids and no agents are used for cleaning up an accidental release.

Dr. Hinze suggested that the SER be looked at in several places to ensure that the use of the term “generally” when modifying “acceptable,” was what was intended by the staff.

Next, Ms. Sarah Gonzalez presented the NRC staff discussion of the significant geology, seismology, and geotechnical engineering open items in the Draft SER (NRC Slides 20 – 41). First, she discussed the open items dealing with vibratory ground motion, the first of which was the Dames and Moore seismic source zone Mmax and probability of activity. The Dames and Moore EPRI –SOG team determined there was only a 26 percent probability that an earthquake above a magnitude of 5 could occur in the region, which was significantly inconsistent with (lower than) the other EPRI-SOG teams. The applicant determined that the hazard curve only changed by 5 percent if the Dames and Moore contribution to the curve were removed, indicating it had limited significance to

the hazard curve. Based on this, the NRC staff was convinced that the seismic hazard at the site was being adequately characterized even with the significant difference in Dames and Moore's analysis.

Dr. Hinze explained that the radius of the Charleston and East Tennessee seismic zones reaches out to the edge of the continental shelf where there is the continental margin. He discussed studies conducted by Basham and Adams that concluded the continental margin should be considered a seismic zone with a possibility of an earthquake of order of magnitude of 7. Because of low detectability of an earthquake in the continental shelf, Dr. Hinze speculated whether the shelf should be considered another seismic zone that would influence the Vogtle site. The staff indicated that they had started with the EPRI-SOG study and did not add any seismic source zones to those evaluated in that original study.

The next open item dealt with the applicant's position that no new information has been developed since 1986 that would require any revision to the original EPRI model of the East Tennessee seismic source zone. The staff's position is that recent studies (e.g., the TIP Study) suggest that significant revisions to the EPRI model are warranted. The NRC staff closed this item by performing an analysis showing that the Charleston zone dominates the hazard and that any significant increase in the hazard posed by the East Tennessee source zone does not influence the total hazard at the Vogtle site significantly. The NRC staff's analysis showed that at magnitude 6.5 (representative magnitude based on latest studies) the hazard at .1g only contributed 0.21%, which is less than the 1.0 % EPRI criteria for including a source zone in the seismic analysis.

The next open item dealt with updates to the Charlestown source zone. Ms. Laurel Bauer provided the NRC staff discussion on this subject. The staff had concerns about the adequacy of the Charleston source zone because of recent paleoliquefaction features discovered around the Vogtle site, approximately 45 to 65 miles from the Charleston epicentral area, centered around the Edisto River. She stated that based on expert opinion of the paleoliquefaction features, that a different source zone model was unwarranted. She also stated the staff asked the applicant to go back and look at areas studied recently where no paleoliquefaction features were recorded to ensure that data had not been missed that would change the staff opinion

Dr. Hinze asked the staff if they had considered the work of Jeff Munsey who has identified new historical seismic events in South Carolina. The staff explained that they assumed the historical catalog was up-to-date, and did not consider any additional past events from recent work. The source term update looked at newer events.

The staff addressed the open item where field work by the applicant observed injected sand dikes in a trench near the site and the staff asked for more information that allowed them to conclude that the dikes were dissolution features and not seismic in origin. Additional information also showed they were pre-Quaternary in age. In addressing a question from Dr. Hinze, Gary Stirewalt of the NRC staff said the features were from dissolution of the Utley limestone and were confined stratigraphically.

The staff then addressed the geotechnical open items which dealt with insufficient field and laboratory testing of the subsurface materials. The staff was concerned because the applicant relied a lot on data from construction of Units 1 and 2 in the 1970s. SNC supplied additional field and lab test data with the LWA request, more than was required

for the ESP, and the staff was satisfied that complete subsurface material characterization using modern test methods was supplied.

The next open item is related to the shear wave velocity profile of the site. The applicant relied on shear wave velocity measurements collected for Units 1 and 2, and did not supply enough measurements for the Blue Bluff marl and the lower sand units. In response, the applicant supplied lower sand and Blue Bluff marl shear wave velocity measurements. Dr. Hinze asked several questions concerning the methodologies used to take the measurements and the discrepancies between these measurements and those taken in the 1970s for the older units, and between the deeper and shallow measurements. Mr. Constantino from BNL in support of SNC explained the use of SASW for surface and down-hole measurement techniques and why they might provide slightly differing results. Dr. Hinze pointed out that only SASW was going to be used (see ITAACs) to measure the shear wave velocity of the backfill when it is emplaced, and he asked if SNC was satisfied that SASW alone was going to provide satisfactory measurements. Mr. Constantino stated that he believed that, after the experience gained using the test pit on the backfill, and with the knowledge of the shear wave velocity profiles that will contribute to the GMRS, they were capable of placing the backfill appropriately and achieving the necessary shear wave velocity profiles in the backfill.

In response to the remaining open items, the applicant provided additional details from rhythmic column and torsional shear tests and developed its own site-specific shear modulus reduction and damping curves. Using these curves, they performed a sensitivity study, and the results show that EPRI and Savannah River Site curves are adequate, which the applicant had used in its seismic analysis. The sensitivity analysis showed that an update was not required. The site response analysis and liquefaction analysis assumed that the 88 feet of incompetent material on top of the Blue Bluff marl was removed, so the removal of this material is mandated to ensure the safety analysis remains valid, and this is identified as condition 1 of the ESP.

Dr. Hinze explored with the NRC staff the theory that current seismic activity evidence in the Charleston source zone could be explained by aftershocks from New Madrid. The NRC staff stated that such a theory was highly debated. Ms Bauer of the NRC staff said that there was a lot better data explaining the New Madrid sequences than there is for the Charleston source zone. The meeting adjourned for a 60 minute lunch break at the conclusion of this discussion.

Mr. Bruce Musico of the Office of Nuclear Security and Incident Response (NSIR) presented the NRC staff review of the Emergency Planning (EP) information in the ESP (NRC Slides 42 – 47). He explained that this was the first application the staff had seen which provided a complete and integrated EP for the proposed early site permit location. The previous three ESP applications had all submitted major features of the EP and put off the integrated plan for the COLA stage. The initial review identified 13 open items and 3 COL items. Once the staff completed its review, there are no longer any open items, and there are 6 ESP conditions, and no COL items. Mr. Musico explained the complicated licensing situation that existed as this EP review was going on. The NRC staff is currently reviewing NEI 07-01 as well as the Westinghouse DCD Revision 17. Because both of these were moving targets, the criteria for the ESP EP section was not final as the review was ongoing.

In response to a question from Member Bonaco, Mr. Musico explained that the EP was a site plan integrated for all 4 units at the site and would be implemented through changes to the Units 1 and 2 EP to add Unit 3 and then Unit 4 as they came on line, through the process of approval in 10 CFR 50.54(q).

Mr. Musico then explained the permit conditions that are proposed for the ESP in lieu of the COLA action items. Permit Conditions 2 and 3 deal with including NEI 07-01 for Units 3 and 4, respectively, when the endorsement of that is completed. Permit Conditions 4 and 5 deal with including the rulemaking for DCD Rev, 17 when that is complete for the two new Units, and Conditions 6 and 7 are for the final sets of emergency action levels when they are finalized.

Permit Condition 1 deals with the final location of the Technical Support Center (TSC). It was explained that the AP1000 DCD locates the TSC in the Annex Building close to the control room. Westinghouse is proposing a change to the TSC from a Tier 1 to a Tier 2* item and consolidating the TSC for all four Units at the Vogtle Site in a centrally located building. Member Ray questioned the staff on the ESP Permit Condition and the centrally located TSC, as well as the ITAAC that is described to call for successful testing of the centrally located TSC. Member Ray was concerned about the NRC staff's partial acceptance of the TSC when it deviates significantly from the guidance in NUREG-0696, where the TSC should be about a two minute walk to a reactor's control room. Mr. Musico explained that the guidance in NUREG-0696 was developed following TMI over 25 years ago, and that the staff considers improvements in communication technology to allow for the flexibility for the additional time it may take to travel from a centrally located TSC to any of the Vogtle unit's control rooms.

Member Ray expressed his concern about the precedent setting nature of such a licensing action when there is an expectation in guidance and developed by previous experience. Mr. Musico explained that a centrally located TSC had already been approved, and that one of the driving forces for the NRC change to allow flexibility is Post- 9/11 security considerations (which cannot be discussed).

Member Ray also expressed his concern that improved communications may be generally recognized, but he did not understand what specific communication improvements would be implemented at the Vogtle TSC. Mr. Musico explained that cellphones, radios, and other means of communication described in the SER's previous section were relied upon as the improved items. Mr. Musico discussed the changes that have come about in technology since TMI, and that the most complicated communication device then was a fax machine. Chairman Powers asked about the reliability of cellphones, especially when there is a surge in usage during an emergency and the possibility of saturation. Mr. Musico answered that the cellphone is not the primary communication device relied upon, and that it is only considered a backup.

A discussion ensued about the use of a dedicated line of communication being more appropriate, and Mr. Musico explained that there would be a dedicated communication network, and only brought up cellphones as one example of improved technologies that would be a backup.

In response to a question from Member Maynard, Mr. Musico explained that the DCD locates the TCS in between the Units 2 and 3 power blocks, and that a COL applicant

would have to request departure from the DCD for a different location if they did not want to locate the TSC as proposed in the DCD.

Mr. Musico further explained the nature of the ITAAC for the EALs. He explained that RG 1.101 is the guidance that the applicant refers to and that NEI 07-01 is likely to be endorsed by a revision to the RG. He explained that the applicant is required to use the version of the guidance that is in effect six months prior, and that when RG 1.101 is revised, it will be the basis for the ITAAC results, for example, to bring the information up to the latest RG criteria.

Member Ray verified that there was no disagreement with the applicant on the development of EAL levels as an ITAAC, and that the staff had fully examined the emergency plans to accommodate an accident at more than one of the Vogtle units. Stephanie Coffin of NRO staff discussed the additional advantages of having a common TSC for all four units to offset the original time constraint. Member Ray noted that his comments are based on his experiences over the years and the original reasons for the time constraint in the guidance. Member Sieber noted that the protection of the individuals in the TSC is also of paramount importance as far as where it is located.

Mr. Araguas brought the ESP discussion to a close by reading the conclusions of the staff for recommending issuance of the ESP with the conditions discussed (NRC Slide 48). Mr. Araguas introduced the LWA portion of the presentation by reviewing the recent rulemakings and the changes they resulted in for LWA requests and reviews by the staff, including the new definition of "construction" (NRC Slides 49 – 55). SNC submitted a revised LWA request on November 30, 2007, to conform to the new rules. Mr. Araguas explained that the areas the staff would be concentrating on for the LWA presentations were geotechnical engineering properties, including the backfill, foundation preparations, and quality assurance.

Mr. Weijan Wang of the NRO staff discussed the geotechnical engineering technical area of the LWA request review (NRC Slides 56 – 71). He stated that the staff sent 26 RAIs to SNC in three technical areas to obtain more information on the site properties. The first technical area needing more information was the adequacy of the site investigations. The second technical area was the adequacy of the engineering properties of the subsurface materials. The third technical area was the adequacy of the backfill specifications.

The site investigations for the ESP included only 14 borings and these did not even cover the footprint of one AP1000 design. Of these only 3 penetrated the load-bearing Blue Bluff Marl. The material properties were based on limited field measurements and lab testing and relied a lot on investigations conducted for Units 1 and 2. For the LWA, in response to site concerns, SNC obtained an additional 174 borings, 42 of which penetrated the Blue Bluff Marl. In response to a question from Dr. Hinze, Mr. Wang said that the spatial variability in the Blue Bluff Marl they are seeing across the 42 borings is not remarkable. Mr. George of the NRO staff stated that the Blue Bluff Marl is over-consolidated silts and clays and is very hard and dense. It is cemented by carbonaceous material and is a fairly homogenous material, especially in terms of its engineering properties. In response to a question from Chairman Powers about the locations of the borings on a slide, Mr. Wang stated that many of them are at the center of the major Category 1 and 2 structures.

As for the technical area of engineering properties, SNC conducted another 742 penetration test measurements, and did laboratory analysis on 94 samples of the Blue Bluff Marl. They performed 111 penetration tests on the lower sand layer and 29 lab samples were analyzed. They also conducted soil velocity measurements on 6 boreholes. Mr. Wang reiterated the ITAAC that has been developed to ensure the backfill properties meet the criteria required by the analysis for approval of the LWA that was discussed previously.

Chairman Powers asked what it meant that the backfill will meet the AP1000 DCD. Mr. Constantino from BNL answered that there are about 16 criteria in the DCD that need to be met, and the shear wave velocity is just one. He explained that the 1000 foot per second measurement must be met at the bottom of the basemat. He also explained that the in situ velocity profiles for the layers must be developed for the depth all the way down to the hard rock in order to conduct the earthquake analysis required. Chairman Powers inquired as to why there were only 2 measurements being taken in the ITAAC when 16 criteria or so must be met. Mr. George of the staff explained that many of the criteria will be met by SNC in determining their soil mix and establishing their soil properties (such as density, gradation, etc.) when mixing and placing, etc. and that the relationship of all of them together allows the staff to ask for the two ITAAC measurements to verify the entire soil property specifications and engineering has been conducted properly. Ms. Becky Karas of NRO staff explained that the two properties being addressed in the ITAAC are the most critical in terms of assuring that all of the soil properties will meet all the criteria in the AP1000 DCD.

Member Armijo asked why all or most of the parameters from the AP1000 DCD are not also delineated in an ITAAC? Mr. Constantino explained that as the backfill is placed and it is compacted to meet 95% proctor, that all of the gradation parameters, density, etc. are all part and parcel of achieving 95% proctor, so you meet all of them while obtaining that compaction measurement. Then shear wave velocity is measured after all of that process is completed to guarantee the expected performance.

Mr. Bret Tegeler of the NRO staff provided the results of the staff's review for the foundation preparation work described in the LWA request (NRC Slides 72 – 88), including placement of the concrete mudmat, waterproof membrane, the mechanically stabilized MSE retaining wall, and a temporary drain. He explained that in addition to external flooding protection, the membrane also transfers lateral seismic loads from the nuclear island to the supporting soil, therefore the review of the LWA must ensure that the mudmat and membrane can support the site-specific ground motion induced by a seismic event at the site. In response to a question from Member Sieber about the possibility of a grounding wire penetrating the membrane, SNC responded that they were not aware of any penetrations through the mudmat. SNC and NRO staff both replied that they would look into this further.

Mr. Tegeler explained that the intention for the LWA review sections is for them to remain final through the review of the COLA for the new Vogtle units. Since Westinghouse has submitted Rev. 17 of the DCD and the current approved design comes from Rev. 15, the staff will ensure that no changes in the critical design areas have changed in Rev. 17 for the conclusions to remain final, which is the expected path at this time.

Member Armijo asked about the coefficient of friction of the membrane, which the DCD identifies has to be 0.7. Mr. Ma of the NRO staff explained that the soil coefficient is 0.45, so that number governs in the analysis. There will be an ITAAC to ensure that the membrane/mudmat unit achieves the desired coefficient of friction following installation in order that it does not contribute to any sliding. .

Mr. Tegeler explained that the ground motion response spectra is developed under SRP Section 2.5, and it is compared to the certified design. In this case, at Vogtle, the certified ground motion response spectra exceeds the AP1000 certified design at two frequency ranges, a low range below 1 Hertz and at a higher range at about 12 Hertz. Mr. Tegeler described the site-specific seismic analysis that was done since the certified ground motion spectra is exceeded. In response to a question from Member Ray, Mr. Tegeler explained that the modeling at this point is 2-dimensional and is adequate for determining the response of the foundation. For in-structure response issues, he stated that the staff will probably ask for a higher fidelity model, perhaps a 3-dimensional model. He said that the SASSI models were being used for the analysis.

Dr. Hinze asked how much uncertainty there was with the 2-dimensional modeling, and Mr. Tegeler explained that most of the uncertainty would be on the in-structure response. He said the 2-dimensional model was probably sufficient for looking at the rigid body motion of the nuclear island, but that for local vibration modes, the 3-dimensional model is more appropriate. Mr. Tegeler described some calculations the staff performed as a check on the applicant's analysis to further ensure that sliding and overturning were not a concern for the foundation for the new plants at Vogtle. Mr. Ma described more of the site-specific foundation seismic analysis that shows there is a margin of safety of 2.34 in the bearing capacity of the foundation compared to the soil to respond to a seismic event without sliding or overturning.

Chairman Powers described his frustration. He summarized that the staff determined that the site's peak ground motion spectra is not bounded by the approved design, so the staff has done site-specific analysis to approve the foundation work proposed so far. Mr. Tegeler stated that the staff will be looking further at in-structure response as part of the SCOL review. He stated that preliminary analysis shows that the exceedance in the high frequency area will probably go away as a concern, but the staff will need to focus on the lower frequency exceedance. Member Ray stated that he thought the staff was premature making these partial conclusions at this time. Mr. Tegeler stated he partially agreed because the applicant has done only 2-dimensional analysis so far. Mr. Tegeler stated that the conclusions being discussed are not in the SER, that he was only discussing these in terms of the presentation to the ACRS. As far as the analysis has been done so far, there are no indications that the seismicity is a concern.

Members Ray and Armijo both expressed a concern that the approval of the LWA essentially pre-judges the approval of the full reactor without full seismic analysis having been completed, as they understand the situation. Member Ray asked why there isn't a permit condition that requires a demonstration that the in-structure responses are consistent with the certified design. Further discussion pointed out that the ESP approves the site for construction, and the COL review will be where the exceedances are addressed. Between the ESP stage and COL stage, the applicant can do further analysis of the site that will result in the exceedances going away, and/or propose changes to the standard design to address the exceedances. At this point with the added LWA, the staff is concluding that the pad won't slide or overturn, but that the in-

structure conclusions are not being reached yet. Mr. Araguas pointed out that the applicant is at risk in accepting this gap and deciding to go ahead with the approved LWA construction. There is a chance that the COL will not be issued if the in-structure response analysis does not come out satisfactorily. Member Ray stated that he thought a permit condition was warranted, especially in comparison with the staff's need for a permit condition for the TSC location.

Chairman Powers stated that it appeared that the Subcommittee would be able to state that the Vogtle site has been thoroughly evaluated and the activities proposed for the LWA look okay as far as the basemat and mudmat are concerned, but that the approved AP1000 design as documented in the DCD and associated NRC rule could not be constructed on the basemat as analysis stands at this time. Mr. Araguas stated that this conclusion would be consistent with what is being proposed in the ESP and LWA.

Ms. Coffin of NRO staff stated that it was difficult to determine where the ESP review ended and the LWA review began, and continuing, where the LWA review ended and the COL review started. With that background, she said that NRC engineers would not recommend approval of the LWA if there was not a path to success evident. Mr. Araguas added to this point by pointing out that the applicant had originally asked for rebar placement, but that staff said no to this, as there were design changes in the latest Revision of the DCD that would not allow the staff to allow these construction activities. Mr. Thomas of the NRO staff stated that the basic engineering analysis at this point just requires the design load from the unit sitting on top of the basemat, and there is sufficient information at this point and the staff does not believe there are any major changes that will cause a change to the weight of the reactor unit (nuclear island).

Mr. LaPay of Westinghouse said that the only area in the preliminary detailed in-structure response that was a concern is sloshing of the in-containment water storage tank. He said they expect this problem to be resolved within the 3-dimensional analysis when it is completed. Mr. Tegeler stated again that there are no concerns with the proposed activities so far, and that further review of the COLA, including more sophisticated modeling (including 3-dimensional) will address whether sloshing is a concern. Further discussion took place that design changes may be needed to address the problem of sloshing of the water in the tank at Vogtle. At this point, Chairman Powers asked for a 15 minute break.

When the meeting resumed, Mr. Shropshire of NSIR staff discussed the staff's review of the SNC's fitness for duty program (NRC Slides 89 – 95). After determining that the applicant needed to put a program in place for the activities to be conducted under the LWA, the staff evaluated the information in accordance with the recently revised Part 16. He stated that the applicant included all of the necessary information under Subpart K of the new rules, and accepted the program. The key factors for the acceptance including that they would be randomly testing 50 percent of the construction staff, and that there was already a program in place at the operating Vogtle units to conduct the program. He stated that NSIR staff was developing an inspection procedure to check on applicant's implementation of the program. In answer to a question from Chairman Powers, Mr. Shropshire said the only significant question about the program now is what sanctions the applicant would place on a construction worker who violates the requirements of the program.

Mr. Araguas presented a last slide (NRC Slide 96) showing that the applicant revised their quality assurance manual consistent with industry template NEI-06-14A and it is acceptable to the staff. This concluded the staff's presentation on the LWA.

COMMITTEE DISCUSSION AND CONCLUSIONS

Chairman Powers asked the members if they had comments. Member Sieber said he agreed with Member Maynard's earlier observation that as far as the information presented, the requirements for an ESP and LWA seem to have been satisfied. Member Bonaca also agreed and said the staff did a good thing in looking beyond the information necessary to approve the ESP and LWA and seeing if there was a success path forward for eventual approval for the whole plant. Member Maynard said he also agreed with the conclusion, but that it would be appropriate to identify a couple of outstanding items in the letter. Member Ray said that the information for the Emergency Plan was fine given the conditions that are included. Member Ray also said that he agreed with Chairman Power's characterization of the seismic issue, but voiced his concern that if the NRC staff approves the ESP and the LWA, that there is a natural bias towards approval of the entire plant at the COLA review stage.

Dr. Hinze stated that the staff had done an excellent and comprehensive job of review, but that he would like to make a few points about some of his concerns just so there are no holes in the review. He said he would prepare a status of the 22 open items for seismic and geotechnical engineering, and a summary of seismic zone information for the Vogtle site.

Chairman Powers concluded the meeting by saying the Subcommittee would prepare a letter complementary to the staff on their work improving the characterization of the site. He stated that the letter would make it clear that the Subcommittee could not attest to the site characteristics being bounded by and certified reactor design that had been reviewed by the ACRS. He said the LWA work could be supported based on the information provided and discussed.

The meeting finished with a discussion of the length and breadth of information that should be presented to the Full Committee at the following day's meeting. The meeting adjourned at 4:41 pm.