

## Hosung Ahn

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**From:** Hosung Ahn  
**Sent:** Friday, April 04, 2008 2:47 PM  
**To:** 'Eric L. Geist'  
**Subject:** RE: Item #91  
**Attachments:** ABWR COL SER Chapter 2\_template\_Tsunami\_Clean.doc

Dear Eric,

Thank you for sending me the papers.

I mean you can forward the report to your collaborators with a caution note but not any citations other than SER nor to the public.

Attached is the PSER tsunami template. Please fill in subsection 1,2, and 6.  
For subsection 4, there is not much you can do right now, but briefly describe the summary of FSAR content of each heading (this is a leading paragraph for upcoming review descriptions) and description of the issuance of three RAIs (discussion items 88, 89, 90) into the appropriate heading. That's the end of Phase I. Please contact me if you have questions on it.

Have a good weekend!

Hosung

-----Original Message-----

**From:** Eric L. Geist [mailto:egeist@usgs.gov]  
**Sent:** Thursday, April 03, 2008 5:25 PM  
**To:** Hosung Ahn  
**Subject:** RE: Item #91

Dear Hosung,

Thanks for this information--I will not distribute it. Dave Twichell sent me electronic copies of most of the papers referenced during the site audit for section 2.4.6. They are attached--please let me know if you cannot read the files. The only one that is missing is Coleman et al. (1983).

>Dear Eric,

>

>Attached file is an extracted file for STP Units  
>1&2 FSAR tsunami part, which said there is no tsunami record or  
>potential. Please note that this is "NOT FOR PUBLIC DISCLOSURE"  
>information.

>

>Attached email is for trip report format.

>

>

>Hosung

>

>

>-----Original Message-----

>From: Eric L. Geist [mailto:egeist@usgs.gov]

BH

>Sent: Thursday, April 03, 2008 1:48 PM

>To: Hosung Ahn

>Subject: RE: Item #91

>

>Dear Hosung,

> OK, that makes sense. During the discussion for item #91, there  
>was mention of obtaining excavation photos for Units 1 & 2. Is there  
>anything we need to do to follow up on this? Also, did I recall  
>correctly during our training at the USGS Golden office that it may be  
>possible to examine the excavation for Units 3 & 4, along with the  
>geologists reviewing sections 2.5.1-3? Perhaps we would need to  
>coordinate with the USGS Project Manager for 2.5 (Buddy Schweig) for  
>such an examination in the future? I'm not sure what the rules are for  
>this. I'll pass on any information to our tsunami deposit  
>expert...Eric

>

>>Dear Eric,

>>

>>I understand that you need the criteria, but on our log sheet, we  
>>already said to the applicant that #91 was resolved. Could you add  
>>this question as a second item on either #90 or #89, as what I did on  
>>#117? You may feel awkward, but our managements concern the number of  
>>RAIs. Thanks.

>>

>>

>>Hosung

>>

>>-----Original Message-----

>>From: Eric L. Geist [mailto:egeist@usgs.gov]

>>Sent: Wednesday, April 02, 2008 8:10 PM

>>To: Hosung Ahn

>>Subject: Item #91

>>

>>Dear Hosung,

>> I talked to our tsunami deposit expert (Bruce Jaffe) regarding  
>>item #91. He was wondering if we can ask the applicant what specific  
>>geologic criteria they used to determine whether or not a tsunami  
>>deposit is present at the site. This would help our review process.  
>>Unfortunately, he was in the field before the site audit and I  
>>couldn't bring this up last week.

>> Thanks...Eric

>>

>>>Eric,

>>>

>>>That's certainly a good news and I hope the subcontract issue be  
>>>resolved soon so that the project will be speed up.

>>>

>>>Last week's site audit gone well but ended up with many RAIs  
>>>especially on the hydrogeology area as attached. Regarding the  
>>>tsunami section, we decided that two items were resolved (#91, #92),  
>>>one item will be RAI (#90), and two items (#88, #89) will be  
>>>responded by the applicant soon or they will be RAIs if they are not  
>>>response in time. In a week or so, I will send you the outline of the  
>>>draft PSER for tsunami section.

>>>

>>>In all, I'd like thanks to you, Dave and Pat in providing invaluable

>>>expert assistance during the site audit. In specific, Pat's  
>>>presentation and follow-up discussion on the tsunami modeling was  
>>>very useful to us to convenience the integrity and technicality of  
>>>his modeling.

>>>  
>>>Keep in touch in cases

>>>  
>>>Hosung

>>>  
>>>

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>(04320327)  
>From: Hosung Ahn <Hosung.Ahn@nrc.gov>  
>To: "charley.kincaid@pnl.gov" <charley.kincaid@pnl.gov>  
>CC: Raj Anand <Raj.Anand@nrc.gov>  
>Date: Mon, 31 Mar 2008 10:50:23 -0400  
>Subject: Sample Trip Report  
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>Charley,  
>

>Attached is the Vogtle ESP trip report as an example, where the front  
>part (page 1) is all you need to prepare (suggest that two tables there  
>be the text format instead of the table format so that PM could easily  
>add the other sections), then attach the discussion table as you  
>prepared.

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>  
>  
>Hosung Ahn  
>Hydrologist  
>NRC/NRO/DSER/RHEB  
>301-415-1398  
>Hosung.Ahn@nrc.gov  
>

>  
>  
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>(04320328)

<STP COLA PSER>

## 2.4S.6 PROBABLE MAXIMUM TSUNAMI

### 2.4S.6.1 Introduction/Overview/General

*(Guidance: This sub-section should provide a brief overview of the contents of the FSAR Section 2.4S.1 based on the RG 1.206 Section C.I.2.4.1 Hydrology Description as well as the applicant's major investigations, activities, assumptions, and conclusions as following. It should be one or two paragraphs in total as the following statement.)*

Section 2.4S.6, "Probable Maximum Tsunami," of the FSAR addresses the geohydrological design basis developed to ensure that any potential tsunami hazards to the SSCs important to safety are considered in the plant design. This section include the description of probable maximum tsunami, historical tsunami record, source generator characteristics, tsunami analysis, tsunami water levels, hydrography and harbor or breakwater influences on tsunami, and effects on safety-related facilities.

### 2.4S.6.2 Summary of Application

*(Guidance: This sub-section should provide the major summarized description of the COL application Section 2.4S.1. This subsection should include the following headings in accordance with RG 1.206 and the corresponding COL application:)*

#### 2.4S.6.2.1 Probable Maximum Tsunami

....

#### 2.4S.6.2.2 Historical Tsunami Record

....

#### 2.4S.6.2.3 Source Generator Characteristics

....

#### 2.4S.6.2.4 Tsunami Analysis

....

#### 2.4S.6.2.5 Tsunami water levels

....

#### 2.4S.6.2.6 Hydrography and Harbor or Breakwater Influences on Tsunami

....

#### 2.4S.6.2.7 Effects on Safety-related Facilities

....

*(Each numbered heading within this section should include a brief opening paragraph that describes what the applicant did, what assumptions the applicant made, and what the applicant concluded. The conclusion of each heading should include the following statement as an example.)*

### 2.4S.6.3 Regulatory Basis

*(Guidance: This section describes the regulation rules, regulatory guides, etc., used by the applicant in writing the COL application and by the staff for its review as the following example. This sub-section should include regulatory requirement and acceptance criteria.)*

The regulatory requirements for identifying potential tsunami hazards in the site vicinity are based on the 10 CFR 52.17 and 10 CFR Part 100. The NRC staff considered the following regulatory requirements in reviewing the identification of potential hazards in site vicinity:

- 10 CFR 52.17(a), with respect to the requirement that the application contain information regarding the physical characteristics of a site (including seismology, meteorology, geology, and hydrology) to determine its acceptability to host a nuclear unit(s).
- 10 CFR 100.20(c), also requires that the review take into account the physical characteristics of a site (including seismology, meteorology, geology, and hydrology) to determine its acceptability to host a nuclear unit(s).
- 10 CFR 100.23, as it relates to investigating the tsunami potential at the site

To evaluate the information provided in FSAR 2.4.6, applicant applied the NRC-endorsed analytical methodologies found in the following:

- RG 1.70, Revision 3, issued November 1978
- RG 1.29
- RG 1.59, Revision 2, issued August 1977
- RG 1.102, Revision 1, issued September 1976
- RG 1.125, Revision 1, issued October 1978

Section 2.4.6 of RS-002 provides the following review guidance used by the NRC staff to evaluate this FSAR section. The regulatory requirements to establish the acceptance criteria for reviewing this section are as following:

- The regulations at 10 CFR 52.17(a) and 10 CFR 100.20(c) require that the NRC take into account the site's physical characteristics (including seismology, meteorology, geology, and hydrology) when determining its acceptability to host a nuclear unit(s). The regulations at 10 CFR Part 52 and 10 CFR Part 100 apply to RS-002, Section 2.4.6, because they address the physical characteristics, including hydrology, considered by the Commission when determining the acceptability of the proposed site. To satisfy the hydrologic requirements of 10 CFR Part 52 and 10 CFR Part 100, the SSAR should contain a description of the hydrologic characteristics of the coastal region in which the proposed site is located and an analysis of severe seismically induced waves. The applicant's

description should be sufficient to assess the site's acceptability and the potential for a tsunami to influence the design of SSCs important to safety for a nuclear unit(s) of specified type that might be constructed on the proposed site. Meeting this requirement provides reasonable assurance that the most severe flooding likely to occur as a result of a tsunami will pose no undue risk to the type of facility proposed for the site.

- The regulation at 10 CFR 100.23(c) requires that the NRC consider the geologic and seismic factors when determining suitability of the site. Pursuant to 10 CFR 100.23(c), an investigation must be completed to obtain geologic and seismic data necessary for evaluating seismically induced floods and water waves. This regulation also applies to RS-002, Section 2.4.6, because it requires the investigation of distantly and locally generated waves or tsunamis that have affected or could affect a proposed site, including available evidence regarding the runup or drawdown associated with an historic tsunami in the same coastal region and local features of coastal topography that might modify runup or drawdown. RG 1.70 provides more detailed guidance on the investigation of seismically induced flooding.
- Though not required at the ESP stage, the applicant for a COL must demonstrate compliance with GDC 2 as it relates to designing SSCs important to safety to withstand the effects of a tsunami.

To judge whether the applicant has met the requirements of 10 CFR Part 52, 10 CFR Part 100, and 10 CFR 100.23 with respect to tsunamis and the analysis thereof, the NRC uses the following acceptance criteria which are described in Section 2.4.6 of RS-002:

- If it has been determined that tsunami estimates are necessary to identify flood or low-water design bases, the NRC will consider the applicant's analysis to be complete if it addresses the following areas and if the NRC staff can independently and comparably evaluate them based on the applicant's submission:
  - ✓ All potential distant and local tsunami generators, including earthquakes, volcanoes and landslides, are investigated, and the most critical ones are selected.
  - ✓ Conservative values of tsunamigenic parameters for the selected sources are used in the analysis.
  - ✓ Tsunami waves are estimated using well calibrated and verified tsunami propagation models. Physical models can be used to analyze tsunami wave dynamics and to design the hydraulic structures of the plant as well as wave protection structures. RG 1.125 provides guidance in the use of physical models of wave protection structures.

- ✓ Bathymetry and topography data used in modeling are provided (or are readily obtainable).
  - ✓ Detailed descriptions of shoreline protection and safety-related facilities are provided for wave runup and drawdown estimates. RG 1.102 provides guidance on flood protection for nuclear power plants.
  - ✓ Ambient water levels, including tides, sea level anomalies, and wind waves, are estimated using NOAA and USACE publications as described in RG 1.59.
  - ✓ If the applicant adopts RG 1.59, Position 2, the design basis for tsunami protection of all safety-related facilities identified in RG 1.29 should be shown at the COL stage to prepare any emergency operating procedures.
- The applicant's estimates of tsunami runup and drawdown levels are acceptable if the estimates are no more than 5 percent less conservative than the NRC staff's estimates. If the applicant's estimates are more than 5 percent less conservative (based on the difference between normal water levels and the maximum runup or drawdown levels) than the NRC staff's, the applicant should fully document and justify its estimates or accept the NRC staff's estimates.
  - This section of the FSAR will also be acceptable if it states that the criteria used to determine that tsunami flooding estimates are not necessary to identify the flood design basis (e.g., the site is not near a large body of water).

#### 2.4S.6.4 Technical Evaluation

*(Guidance: This is the most important section of the SER! In accordance with RG 1.206, this subsection includes the following headings:)*

##### 2.4S.6.4.1 Probable Maximum Tsunami

....

##### 2.4S.6.4.2 Historical Tsunami Record

....

##### 2.4S.6.4.3 Source Generator Characteristics

....

##### 2.4S.6.4.4 Tsunami Analysis

....

##### 2.4S.6.4.5 Tsunami water levels

....

##### 2.4S.6.4.6 Hydrography and Harbor or Breakwater Influences on Tsunami

....  
2.4S.6.4.7 Effects on Safety-related Facilities

*(For each heading, provide a brief (1-2 sentences) description of contents and then start into the RAIs. Each RAI should provide a brief description of what the staff asked followed by a brief description of the applicant's response. Include the major issues of the RAI's and the conclusion reached by the applicant for each RAI response. This will be followed by the staff evaluation of the RAI responses which must show what the staff did to reach its conclusion. Following the RAI descriptions will be an overall conclusion for the subsection.*

*If the staff performed confirmatory analyses and made site visits and audits to verify its conclusions, then these should be included into this subsection. Figures and tables should be incorporated frequently to describe the staff's confirmatory analyses. The staff can include the figures that were provided by the applicant if needed. In summary, each of the following should include in each heading of this section:*

- *Summary of FSAR contents*
- *Brief description of staff's review*
- *Insurance and resolution of RAIs and Open Items*
- *Confirmatory analysis and major findings*
- *Conclusion.)*

2.4S.6.5 Post Combined License Activities

TBD - NRC staff to provide further guidance

2.4S.6.6 Conclusions

*(Guidance: Provide a brief overall conclusion, resulting bases, and the regulations met or fulfilled by the COL applicant, and end with the conclusion statement in SRP Section 2.4.6 or in the form of the following statement.)*

The staff finds that this area is addressed within the generic DCD and the related NRC FSER provided in NUREG-1503. The applicant has provided sufficient information to support issuance of a COL license.