

August 20, 2012

Via e-mail

Lawrence A. Salomone  
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3420 Hillview Avenue  
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Dear Mr. Salomone:

Reference: *EPRI (2004, 2006) Ground Motion Model Review Project*, Decision Point 2—  
PPRP Agreement with TI Team Recommendation to Update Ground Motion  
Model

This letter provides in writing the views of the Participatory Peer Review Panel (PPRP)<sup>1</sup> regarding Decision Point 2 in the Project Plan that was addressed at Working Meeting #5 at EPRI headquarters in Palo Alto, California, on August 14, 2012. All four members of the PPRP (Walter J. Arabasz, Brian Chiou, Richard Quittmeyer, and Robert B. Whorton) attended the working meeting.

### **General Statement of the PPRP's Position**

The PPRP believes that the paramount question at Decision Point 2 is this: Can the EPRI (2004, 2006) Ground Motion Model (GMM) be used with credibility and confidence for the specific purpose of computing ground motion response spectra (GMRS) at existing nuclear power plant sites in response to the NRC RFI 50.54 (f) letter dated March 12, 2012?

Based on our own collective expertise and after carefully monitoring the process by which the TI Team and the Project Manager (PM) have addressed this question, the PPRP fully supports their recommendation<sup>2</sup> that the EPRI (2004, 2006) GMM be updated for the defined task.

### **Guidance from NUREG-2117**

Four points of guidance from Chapter 6 of NUREG-2117, Rev. 1<sup>3</sup> are germane:

#### *1. Overriding Reason for Considering an Update*

In section 6.2 on page 115, NUREG-2117 states: “It is important to remember that the overriding reason for considering the update of an existing hazard study is the same as the fundamental reason for employing the SSHAC process in the first place—the need to attain high levels of assurance that the larger technical community’s data, models, and methods have

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<sup>1</sup> All acronyms used in this report are defined in the Appendix.

<sup>2</sup> As presented at Working Meeting #5, the recommendation of the TI Team and the PM states: “It is appropriate to update the existing EPRI (2004, 2006) GMM to incorporate current data, models and methods before it is used to calculate GMRS at existing nuclear power plant sites. The updated EPRI (2004, 2006) GMM should be the ‘appropriate’ EPRI (2004, 2006) GMM referred to in the NRC RFI 50.54 (f) letter dated March 12, 2012.”

<sup>3</sup> NRC, 2012. Practical Implementation Guidelines for SSHAC Level 3 and 4 Hazard Studies, NUREG-2117, Rev. 1, NRC Office of Nuclear Regulatory Research.

been considered and the CBR of TDI have been represented.” In the case of the EPRI (2004, 2006) GMM, does that assurance continue to exist and does the GMM still have viable technical bases? We believe the answers must be no in light of the assessment by the TI Team, together with the PM, that: (1) seven of the thirteen original ground motion prediction equations (GMPEs) used in the EPRI (2004, 2006) GMM, based on feedback from the original developers, are either no longer supportable or should be updated with newer models based on more recent data; (2) three new GMPEs more recently developed by ground motion experts should be evaluated and possibly integrated into an updated GMM; (3) eighty percent of the 28,000 earthquake records in a new ground motion database for Central and Eastern North America postdate the development of the EPRI (2004, 2006) GMM; and (4) preliminary comparison of the new ground motion data to predictions by the EPRI (2004, 2006) GMM indicate that updating of the GMM would likely improve its predictive reliability.

## *2. Criteria for What Entails a “Significant” Change*

In section 6.2 on page 116, NUREG-2117 provides key guidance for assessing whether an update to an existing hazard study is needed and, in particular, what may constitute a sufficient basis for deciding to update:

“For a reasoned decision to be made, criteria need to be established for what entails a ‘significant’ change to the hazard analysis. For this assessment, it is recommended that two criteria be used: (1) an assessment should be made of whether or not the new information would lead to a change in the estimates of the CBR of the TDI in the major components of the model (e.g., SSC or GMC) and (2) an analysis should evaluate the magnitude of the change in the calculated hazard results and the significance to the subsequent use of the results. Either of these alone may indicate that an update is required [underlining added for emphasis]. Clearly, changes in the calculated hazard results are the most diagnostic criteria that inform a decision on whether or not to update a study. However, much of the credibility and confidence in a hazard study comes from the conclusion that it has appropriately captured the CBR of the TDI.”

## *3. Availability of Diagnostic Hazard Results*

Regarding the availability of diagnostic hazard results at Decision Point 2—considering, for example, that hazard calculations remain to be made as part of Task 7 during Phase 2 of the current project—section 6.3 of NUREG-2117 on page 120 offers relevant guidance:

“Clearly, the exploratory studies carried out to evaluate whether or not a hazard study needs to be replaced must be done in an expedited manner and are not the same as carrying out a complete study. Therefore, the assessment of whether the existing study is viable (as well as the potential changes in the calculated hazard results) must be based on limited evaluations and expert judgment.”

In other words, one can make an appropriate decision to update even if the potential changes in the calculated hazard results are not exactly known at the time.

#### 4. *Involvement of the PPRP, the Sponsor, and the Regulator*

In section 6.2 on page 115, NUREG-2117 states: “Because both the sponsor and regulator need confidence and assurance, the decision whether or not to replace or refine a hazard study should be made in light of communication between the sponsor and regulator.” Clearly, the PPRP is not the decision-maker on whether or not to update. Under SSHAC guidelines, the PPRP in effect is a referee on technical content and process in this Review Project. The TI Team, together with the PM, has had the responsibility to assess whether the technical bases of the EPRI (2004, 2006) GMM remain viable, and they have put forward their recommendation that an update of the GMM is appropriate. The quotation at the beginning of this paragraph intimates the necessary involvement of the regulator, namely the NRC, at least in concurrence with the sponsor on any decision to update. For reasons we go on to explain, we believe that active NRC concurrence is important for Phase 2.

#### **Perspectives Relating to NRC Concurrence and External Observers**

We feel compelled to add a few comments relating to the *framework* for deciding whether or not—and how—to update the EPRI (2004, 2006) GMM. We do so for two reasons. First, to help avoid stumbling blocks in interactions with the NRC and, second, to give interested parties outside this project a better understanding of some of the particular circumstances of the EPRI (2004, 2006) GMM Review Project vis-à-vis NUREG-2117.

During Working Meeting #5, in open discussion with attending NRC staff, there was general recognition of shortcomings in language in Chapter 6 of NUREG-2117 as relating to guidance on updating existing hazard studies. In particular, it became apparent that some of the guidance in Chapter 6 was framed with intended application more to updates of seismic source characterizations than to ground motion modeling. Circumstances particular to the current EPRI (2004, 2006) GMM Review Project were not anticipated—such as the potential need to update a GMM for use prior to completion of the ongoing, SSHAC-Level-3 NGA-East Project.

We are encouraged to believe that the guidance in Chapter 6 of NUREG-2117 can be used to inform, but not unduly constrain, the decision-making “between the sponsor and the regulator” about whether or not and how to update the EPRI (2004, 2006) GMM. In its current form, the language in Chapter 6 makes it an imperfect frame of reference for the decision-making. We say this because of changes in language in the final version of the NUREG which eliminated “revise” as one of three possible end actions of updating—leaving only “replace” and “refine.” A strict reader of the current revised version of NUREG-2117 may find problematic wording relating to the concepts of *viable* versus *non-viable*, *replace* versus *refine*, and *site-specific* versus *regional* as they apply to ground motion modeling—including the current proposed revision of the EPRI (2004, 2006) GMM, which is a SSHAC Level 3 product.

We point out, as we did in our review of the Project Plan, that this review project is being carried out as a quasi-Level 3 SSHAC assessment. Comparison with the eleven required elements for a SSHAC Level 3 assessment that are outlined in Chapter 4 (Table 4-1) of NUREG-2117 shows that the only missing element in this project is the minimum of three formal workshops. A feedback workshop is planned in this project for October 17, 2012. However, in place of formal workshops for the identification and evaluation of (a) hazard-significant issues and available data and (b) alternative interpretations, the TI Team followed

less formal but still structured processes. To be clear, we do not wish to overstate the SSHAC rigor of the current project, but it certainly is more than a Level 2 assessment.

The following comment is for any readers who may revisit the June 2012 Project Plan for this EPRI (2004, 2006) Ground-Motion Model Review Project. When the PPRP reviewed the Project Plan, we urged the TI Team to explicitly define the criteria they would use for Decision Point 2—that is, whether or not to update the EPRI (2004, 2006) GMM. They did so, but not with full clarity in terms of the guidance of NUREG-2117 that we outlined earlier. We believe that the latter should provide the appropriate terms of reference for the decision-making, not the imperfect statements in the Project Plan, which includes different wording in the Executive Summary (p. viii–ix), the body of the text (p. 7), and in the flowchart of Figure 4-1 (p. 15).

### **Conclusions and Recommendation**

The PPRP is favorably impressed with the execution of this project in terms of adherence to schedule and the timely completion of tasks that have led to the key project milestones of reaching Decision Point 2 and concluding Phase 1, as scheduled, by the end of August 2012.

Restating our consensus position, the PPRP fully supports the TI Team's recommendation that the EPRI (2004, 2006) GMM be updated before it is used to calculate ground motion response spectra at existing nuclear power plant sites in response to the NRC RFI 50.54 (f) letter dated March 12, 2012. Regardless of its impacts on hazard calculation, we expect that this update will result in an improved GMM that better reflects the CBR of current technical interpretations relating to earthquake processes and ground motion attenuation in Central and Eastern North America and better represents the available observations.

Finally, in order to ensure timely NRC concurrence with *how* the TI Team updates the GMM in Task 5—that is, to ensure that the methodology used for updating be acceptable to the NRC in terms of NUREG-2117 guidance, we recommend that the TI Team outline the methodology it now proposes to use and provide it in written form at an early date to the PPRP and the NRC for review.

Please contact us if you wish to discuss any of our observations, comments, or recommendations.

For the PPRP,



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**APPENDIX****ACRONYMS**

CBR	Center, Body, and Range
EPRI	Electric Power Research Institute
GMC	Ground Motion Characterization
GMM	Ground Motion Model
GMPE	Ground Motion Prediction Equation
GMRS	Ground Motion Response Spectrum (or Spectra)
NGA-East	Research project to develop a new ground motion characterization (Next-Generation Attenuation) model for Central and Eastern North America
NRC	U.S. Nuclear Regulatory Commission
NUREG	NRC Nuclear Regulation Report
PM	Project Manager
PPRP	Participatory Peer Review Panel
SSC	Seismic Source Characterization
SSHAC	Senior Seismic Hazard Analysis Committee
TDI	Technically Defensible Interpretations
TI	Technical Integrator