

## INFORMAL COMMUNICATION

**To:** Larry Salomone  
**From:** PPRP  
**Date:** October 13, 2010  
**Subject:** Key Issues for TI Team to be Attentive to as They Revisit the CEUS SSC Model and Revise the Project Report

This informal note is to highlight key issues raised in our review comments on the Draft Report—to help guide the TI Team as it revisits the CEUS SSC model and revises its report during the next few months. Because we apparently won't be interacting with the TI Team as it carries out this work, we want to communicate as clearly as possible to preclude, or at least minimize, any need for later corrective actions.

**Short List of PPRP's Major Concerns**

The endgame is a CEUS SSC model and report that the PPRP can endorse. Based on e-mail interactions and a teleconference, the following is a short list of the PPRP's major concerns (numbered for convenient reference, not for priority), embedded in our review comments<sup>1</sup>:

1. Approach to declustering and the impact on the catalog of earthquakes used to perform smoothing. Only one approach is used and it is not clear what impact this would or would not have on the catalog, and ultimately the seismicity parameters. [S 3-5; see also Attachment 1 here, *PPRP Commentary on New Methods (or Other Methods) with a Weight of 1.0 and SSHAC Guidance*]
  2. The weights on the split between Mmax zones and Seismotectonic zones. [S 4-9]
- Note:** To be clear, the PPRP recognizes that ownership of the CEUS SSC model (and hence the weights on the master logic tree) belongs to the TI Team. The PPRP has the responsibility to ensure that the distribution of the technical community's views and corresponding uncertainties have been appropriately considered and reasonably represented in the model—and that thorough justification is provided for all weights in the model.
3. Statistical analysis of the SCR data base and how it is used to establish the weights on Mmax between the prior distributions. [S 5-9, S 5-10]

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<sup>1</sup> We assume that the TI Team will do a responsible job of responding to our concerns regarding clarity, consistency, and the need for thorough technical editing.

4. The approaches used, and weights, for assignment of  $M_{max}$  to seismic source zones. Specifically, the TI Team considers the Kijko approach in addition to the Bayesian approach, and has assigned relative weights to the two approaches. [S 5-6, S 5-7, S 5-8]

**Note:** Regarding Item 4, and some other important SSC model issues that did not have the benefit of being explicitly discussed in a workshop setting, the PPRP must judge whether the TI Team sufficiently understands and treats the proponent views (including the range of views and uncertainties).

5. The statistical analysis and approach to smoothing. Only one approach is used. The results from the statistical analysis directly impact the rates of seismicity considered and the proportion of larger to smaller events for each of the sources. [S 5-11, S 5-12, S5-13, S 5-14, S 5-16; see also Attachment 1 here, *PPRP Commentary on New Methods (or Other Methods) with a Weight of 1.0 and SSHAC Guidance*]
6. The criteria and basis for defining seismotectonic zones, and the application of these criteria so that a clear definition of each seismotectonic zone is supported. [S 4-2, G 7-2, G 7-4]
7. A full explanation of the causes, and implications for hazard calculations, of (a) the generally poor fit of the realizations of the modeled recurrence rate obtained from the earthquake catalog and (b) differences between the CEUS SSC model results and USGS and EPRI-SOG (COLA) findings. [G 8-2, S 8-2]

**Note:** The PPRP feels a responsibility to ensure that the characterization of earthquake sources is consistent with historical seismicity data, as well as with any other pertinent datasets, and that the final model spans the center, body, and range accepted by the technical community. The “best” model must not only be pleasing to the TI Team but must fit available data. Further, it is incumbent on the TI Team to fully understand the assumptions in the CEUS SSC model and to provide high confidence that the model truly represents the community distribution.

8. Explicit recognition of the issue raised by Lombardi (2003) regarding the incorrect use of the maximum likelihood method in estimating the  $b$ -value for mainshocks. The methodologies used by the TI Team for recurrence calculations should be carefully reviewed to ensure that there is no systematic bias in the maximum-likelihood estimates of  $b$ -values, such as criticized in the Lombardi paper. [S 5-11]

We understand your desire to let the TI Team do its work before having to respond to any of our PPRP review comments. If you or the TI Team have questions or would like clarification of any of our review comments or points in this communication, please contact us.

For the PPRP,

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## ATTACHMENT 1

### **PPRP Commentary on New Methods (or Other Methods) with a Weight of 1.0 and SSHAC Guidance**

A principal focus of the SSHAC guidelines is the appropriate assessment of epistemic uncertainty in the current state of knowledge of technical issues of interest. The SSHAC guidelines, therefore, describe a process that is focused on accurately representing the “community distribution” through assessment and evaluation activities that include (1) a critical review of all scientifically viable alternative viewpoints and theories and (2) a series of structured interactive workshops, including a proponent workshop focused on assessing alternate methods, theories and approaches. These activities are included because it is an explicit goal (indeed requirement) of the SSHAC guidelines that the final model represents the community distribution (i.e. the center, body, and range of the viable alternatives). Typically, the representation of the community distribution is achieved through a logic-tree approach which weights the viable existing alternatives in a transparent and justifiable way.

The SSHAC guidelines do not preclude the use of new or different approaches beyond those already found in the technical community. Indeed, the guidelines specifically state that the guidelines themselves should not be a barrier to progress and development. The guidelines also allow for weighting of approaches that are not simply a representation of the current view of the technical community; the SSHAC approach allows for evolution of thinking and is not simply expert elicitation. Therefore, when new approaches are introduced, the questions should focus on how the alternative approach is implemented in the model, consistent with goals and requirements of the SSHAC guidelines, and how that consistency is demonstrated.

There are two ways in which new approaches can be incorporated into a SSHAC-based project. The first way is to introduce a new approach as a “proponent” approach and to add it to the logic tree and assign a weight based on its relative merit among the alternatives. In theory, this is relatively straightforward.

A second way, as chosen by the TI team in this project, is to adopt a new method and assign it a weight of 1.0, thereby replacing the range of alternative approaches used in the community with a single approach. Theoretically, this is allowable under the SSHAC guidelines as long as the requirement that the community distribution is effectively represented continues to be met. The use of a single approach must not artificially reduce the assessed epistemic uncertainty. In this case, the method used should not simply be another proponent model, because it is being treated as a “replacement” or “proxy” model that can represent the community distribution in a more elegant or computationally efficient way. The use of a “replacement” model comes with a high bar to reach in terms of showing that the SSHAC guidelines are being met. As a minimum, it should be demonstrated that the new approach is consistent with both the range of

outcomes of traditionally accepted approaches (i.e., the community distribution), and also with the appropriate data that are available.

If the new method cannot be demonstrated to appropriately represent the community distribution, it is difficult to judge how it is not just another proponent model that should be incorporated with (and not replace) other proponent methods. To simply choose a proponent model approach and say that is the “best” one and give it a weight of 1.0 is inconsistent with the SSHAC guidelines. It is acceptable for any development team to develop a model (or approach) that they think is the “best”— but that is different than saying that a model (or approach) is consistent with the SSHAC process, and it must meet a high standard.