Seismic Reevaluation of Nuclear Facilities in Taiwan

Development of the Hazard Input Document for Taiwan Using SSHAC Level 3 Methodology

WORKSHOP #3 PROCEEDINGS

June 2017

National Center for Research on Earthquake Engineering
National Applied Research Laboratories

LIST OF ABBREVIATIONS and COMMON ACRONYMS

AEC	Atomic Energy Council
AFE	Annual Frequency of Exceedance
ANS	American Nuclear Society
ANSI	American National Standards Institute
BBP	Broadband Platform (SCEC)
CA/Mex	California/Mexico
CBR	Center, Body and Range
CEUS	Central and Eastern United States
CFR	Code of Federal Regulations
CGS	Central Geological Survey
CWB	Central Weather Bureau
DBE	Design Basis Earthquake
DCPP	Diablo Canyon Power Plant
DCR	Design Change Request
DSHA	Deterministic Seismic Hazard Analysis
EE	Evaluator Expert
EPRI	Electric Power Research Institute
ESEL	Expedited Seismic Equipment List
ESEP	Expedited Seismic Evaluation Process
FCR	Field Change Request
FLEX	The Diverse and FLEXible Coping Capability
FSAR	Final Safety Analysis Report
GEM	Global Earthquake Model
GIS	Geographic Information Systems
GMC	Ground Motion Characterization
GMM	Ground Motion Models
GMPE	Ground Motion Prediction Equation
GMRS	Ground Motion Response Spectrum
GPS	Global Positioning System
GS	Geometric Spreading
HCLPF	High Confidence of Low Probability of Failure
HID	Hazard Input Document
IES	Institute of Earth Sciences (Academia Sinica)

JGR	Journal of Geophysical Research
MTN(IES)	Seismic Array in the Taiwan Mountain Area
Moho	Mohorovicic
NCREE	National Center for Research on Earthquake Engineering
NCU	National Central University
NGA	Next Generation Attenuation
NML	Normal Fault Mechanisms
NPP	Nuclear Power Plant
NRC	Nuclear Regulatory Commission
NTTF	Near Term Task Force
NTU	National Taiwan University
NUREG	Nuclear Regulation
OBS	Ocean Bottom Seismometer
ODB	Ocean Data Bank
PEER	Pacific Earthquake Engineering Research Center
PFDHA	Probability Fault Displacement Hazard Analysis
PGA	Peak Ground Acceleration
PM	Project Manager
PPRP	Participatory Peer Review Panel
PSHA	Probabilistic Seismic Hazard Analysis
PTI	Project Technical Integrator
PVNGS	Palo Verde Nuclear Generating Station
QA	Quality Assurance
RB	Reactor Building
RE	Resource Expert
REV	Reverse Fault Mechanisms
RG	Regulatory Guide
RLGM	Review Level Ground Motion
SCEC	Southern California Earthquake Center
SFP	Spent Fuel Pool
SMA	Seismic Margin Assessment
SMA	Strong Motion Accelerographs Network (IES)
SMART1	Strong Motion Accelerograph Array in Taiwan, Phase1 (IES)
SMART2	Strong Motion Accelerograph Array in Taiwan, Phase2 (IES)
SONGS	San Onofre Nuclear Generating Station

SPID	Screening, Prioritization and Implementation Details
SPRA/SPSA	Seismic Probability Risk (Safety) Assessment
SS	Strike-Slip Fault Mechanisms
SSC	Seismic Source Characterization
SSCs	Structures, Systems and Components
SSE	Safe Shutdown Earthquake
SSHAC	Senior Seismic Hazard Analysis Committee
SSI	Soil-Structure Interaction
SWUS	Southwestern United States
TAO	Terrestrial, Atmospheric and Oceanic Sciences
TDI	Technical Defensible Interpretation
TEC	Taiwan Earthquake Research Center
TI	Technical Integrator
TNGA	Taiwan Next Generation of Attenuation Relations
TPC	Taiwan Power Company
TSMIP	Taiwan Strong Motion Instrumentation Project
UHRS	Uniform Hazard Response Spectrum

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Workshop #3 Introduction

In response to the 50.54(f) letter issued in March 2012, an updated probabilistic seismic hazard analysis (PSHA) based on a Senior Seismic Hazard Analysis Committee (SSHAC) Level 3 process (Budnitz et al., 1997; NRC 2012, NUREG 2117) is required to be conducted for all operating nuclear power plants in the United States. In Taiwan, the Atomic Energy Council (AEC) requested Taiwan Power Company (TPC) to reevaluate seismic hazard and review the seismic design basis of nuclear facilities in Taiwan based on the suggestions in NTTF 2.1: Seismic. As the result, TPC launched the "Seismic Reevaluation of Nuclear Facilities" Project executed by the National Center for Research on Earthquake Engineering (NCREE). A seismic hazard analysis will be performed for four nuclear power plants assigned by the Taiwan Power Company (TPC) by developing the Seismic Source Characterization (SSC) model and the Ground Motion Characterization (GMC) model as basic inputs to a site-specific probabilistic seismic hazard analysis (PSHA). SSC describes the future earthquake potential (e.g., magnitudes, locations and rates), and GMC describes the distribution of the ground motion as a function of magnitude, style of faulting, source-to-site geometry and site condition. For the seismic hazard analysis, both of these models will be developed following the guidelines of the Senior Seismic Hazard Analysis Committee (SSHAC) Level 3 process (Budnitz et al., 1997; NRC, 2012). The SSC model developed in this study is majorly specific to the region of the study sites with a 320-kilometer radius. The GMC model for the rock ground motions applicable to the study sites will be developed in this study in parallel. The GMC logic tree model will incorporate relevant empirical ground motion models as well as results from numerical simulations. The PSHA calculations and the development of surface response spectra considering site-specific site amplification are not part of this project and will be performed subsequent to the SSC and GMC SSHAC Level 3 studies by another project. The hazard results of four study sites evaluated by using the SSC and GMC models developed in this study will meet the requirements of SSHAC Level 3 methodology.

The objective of this study is to develop SSC and GMC models that capture the center, body and range (CBR) of the technically defensible interpretations (TDI) with SSHAC Level 3 methodology as described in NUREG 2117 (NRC, 2012) for use in PSHA for the study sites. TDI are defined as the development, assessment, and weighting of the scientifically justifiable and defensible interpretations of earth science and geotechnical data by appropriate experts in these fields using a structured process of evaluation and integration with full access to all available data. The purpose of this Project Plan is to describe how the SSHAC Level 3 process will be applied to develop the SSC and GMC models for the study sites

This is the third out of three Workshops that will be conducted in accordance with the applicable SSHAC Level 3 guidelines.

Objective

The primary goal of Workshop 3 will be for the TI Teams to integrate information into models that represent the CBR of TDI.

Preparation

Following Workshop 2, a series of meetings and internal work will be performed to evaluate the available data and range of alternative proponent models. The SSC and GMC TI Teams will evaluate the data presented at Workshop 2 and integrate the information into logic trees that constitute the SSC and GMC

model V2. Formal RE and PE presentations based on newly available data will be provided at working meetings, where possible. These presentations at working meetings will be provided as part of the final documentation of the Taiwan SSHAC Level 3 project. The basis for the SSC and GMC model V2 characterizations will be documented and provided to PPRP prior to Workshop 3 so that PPRP will be able to fully evaluate the SSC and GMC model V2 before the workshop.

Process

Workshop 3 will last five days and be attended by PTI, the TI Teams and staff, PPRP, the Hazard Analysts, and the selected REs and PEs that are identified by the TI Teams, as needed. The first part of Workshop 3 will be allocated to select PE presentations based on data or analyses performed following Workshop 2. Following the selection of the PE presentations, the main activities of Workshop 3 will begin. In contrast to Workshops 1 and 2, PPRP will be the active participants in Workshop 3 to fully query the model parameters, level of documentation, uncertainty, and rationale in developing the model.

During Workshop 3, the SSC and GMC model V2 logic trees will be presented to PPRP and the selected REs and PEs, as needed. The workshop provides an opportunity for the REs, PEs, and PPRP to review and challenge the TI teams' evaluations and the technical justifications used to develop the structure of the SSC and GMC logic trees and weights on branches of the logic trees (e.g., whether any significant interpretations are missing, how the TI Teams have integrated the alternative models and data uncertainties, etc.). The TI Teams will use this feedback in developing the final version of the SSC and GMC logic trees.

At Workshop 3, the Hazard Analysts will present the results of hazard sensitivity analyses to the TI Teams and PPRP to provide the TI Teams with feedback about the implications of the SSC and GMC logic trees on hazard. REs, PEs, and PPRP will also use the hazard sensitivity results to focus the discussion on the technical issues and parameters that have the greatest effect on the hazard at the study sites.

The proceedings of Workshop 3 will be documented in a brief workshop summary report for distribution to the Project Sponsor and members of PPRP, and PPRP will submit a letter to the Project Sponsor, PTI, and TI Team Leads documenting their observations of the workshop. PTI and the TI Team Leads will provide written responses to the PPRP comments. The workshop summary and PPRP letter will be made publicly available and become part of the final documentation of the Taiwan SSHAC Level 3 project.

Topics and Issues

- SSC and GMC model V2 logic tree.
- Preliminary hazard calculations of study sites and sensitivity analysis of SSC and GMC model V2 logic tree to identify hazard-significant issues and parameters.
- Review and challenge of the TI Team logic tree.
- Identification of shortcomings of the logic tree.
- Identification of key models and parameters requiring further evaluation.
- Identification of additional analyses to better constrain logic trees.

Workshop #3 Agenda with RE&PE

Taiwan SSHAC Level 3 Project
Workshop #3 Agenda – Day 1 Morning

June 19, 2017 (Monday), Morning
Tsai Lecture Hall of National Taiwan University, Taipei, Taiwan

Session	Time	Topic	Dur. (min.)	Speaker	RE&PE
09:00 ~ 10:40 Chaired by C.L. Wu					
Project Introduction	09:00 ~ 09:10	Opening, Project Introduction and Workshop Ground Rules	10	S.J. Hwang (黃世建) C.L. Wu (吳俊霖)	Jean-Claude Sibuet Wen-Nan Wu (吳文男) Ya-Ju Hsu (許雅儒) Jing-Yi Lin (林靜怡) J.Bruce H. Shyu (徐澔德) Song-Chuen Chen (陳松春) Char-Shine Liu (劉家瑄) Kuo-En Ching (景國恩) Ruey-Juin Rau (饒瑞鈞) Yin-Tung Yen (顏銀桐)
	09:10 ~ 09:30	SSHAC Training	20	N. Abrahamson	
SSC Tasks and Issues	09:30 ~ 10:00	SSC Tasks and Issues	30	B.S. Huang (黃柏壽)	
	10:00 ~ 10:30	Sensitivity Analysis	30	C.H. Loh (羅俊雄)	
	10:30 ~ 10:40	*PPRP Reviews, Comments and Question* *REs and PEs Comments and Questions*			
10:40 ~ 11:00		*Break*			
11:00 ~ 12:30 Chaired by B.S. Huang					
Logic Tree	11:00 ~ 12:30	Current Logic Tree Principle of Weighting, Scaling Law	90	K. Clahan	Jean-Claude Sibuet Wen-Nan Wu (吳文男) J.Bruce H. Shyu (徐澔德) Yin-Tung Yen (顏銀桐)
		PPRP Reviews, Comments and Questions *REs and PEs Comments and Questions*			
12:30 ~ 13:30		*Lunch*			

Taiwan SSHAC Level 3 Project
Workshop #3 Agenda – Day 1 Afternoon

June 19, 2017 (Monday), Afternoon
Tsai Lecture Hall of National Taiwan University, Taipei, Taiwan

Session	Time	Topic	Dur. (min.)	Speaker	RE&PE
13:30 ~ 15:00 Chaired by Kevin					
Areal Source- I	13:30 ~ 15:00	Areal Source Shallow, Deep zone and Zoneless 1.Geological Scheme Zoning 2.Seismic Source Type *PPRP Reviews, Comments and Questions* *REs and PEs Comments and Questions*	90	C.T. Cheng (鄭錦桐)	Kuo-En Ching (景國恩) Ruey-Juin Rau (饒瑞鈞)
15:00 ~ 15:20		*Break*			
15:20 ~ 16:50 Chaired by Kevin					
Areal Source -II	15:20 ~ 16:50	Areal source modeling: 1.B value Processing 2.Three Region Boundary 3.Max. Magnitude Setting 4.Volcanic Source 5.Earthquake Catalog Application *PPRP Reviews, Comments and Questions* *REs and PEs Comments and Questions*	90	C.H. Yeh (葉錦勳)	Wen-Nan Wu (吳文男) Kuo-En Ching (景國恩) Ruey-Juin Rau (饒瑞鈞)
16:50 ~ 17:00		*Break*			
17:00 ~ 17:40		Summary of Day 1 (N. Abrahamson)			
17:40 ~ 18:00		Comments and Questions from Observers			
18:00		*Adjourn*			
18:00 ~ 19:00		*Closed Meeting: PPRP, Sponsor, PM, PTI and TI Lead*			

Taiwan SSHAC Level 3 Project
Workshop #3 Agenda – Day 2 Morning

June 20, 2017 (Tuesday), Morning
Tsai Lecture Hall of National Taiwan University, Taipei, Taiwan

Session	Time	Topic	Dur. (min.)	Speaker	RE&PE
09:00 ~ 10:40 Chaired by C.T. Cheng					
Fault Source-I	09:00 ~ 10:30	Introduction of Fault Source Modeling *PPRP Reviews, Comments and Questions* *REs and PEs Comments and Questions*	90	C.H. Yeh (葉錦勳)	Jean-Claude Sibuet Wen-Nan Wu (吳文男) J.Bruce H. Shyu (徐澔德) Kuo-En Ching (景國恩) Ruey-Juin Rau (饒瑞鈞)
10:30 ~ 11:00		*Break*			
11:00 ~ 12:30 Chaired by C.T. Cheng					
Fault Source - II	11:00 ~ 12:30	North Primary Fault - Shanchiao, ST-II,Aodi, North Ilan and S Fault *PPRP Reviews, Comments and Questions* *REs and PEs Comments and Questions*	90	B.S. Huang (黃柏壽)	Jean-Claude Sibuet J.Bruce H. Shyu (徐澔德) Kuo-En Ching (景國恩) Ruey-Juin Rau (饒瑞鈞)
12:30 ~ 13:30		*Lunch*			

Taiwan SSHAC Level 3 Project
Workshop #3 Agenda – Day 2 Afternoon

June 20, 2017 (Tuesday), Afternoon
Tsai Lecture Hall of National Taiwan University, Taipei, Taiwan

Session	Time	Topic	Dur. (min.)	Speaker	RE&PE
13:30 ~ 15:00 Chaired by Kevin					
Fault Source -III	13:30 ~ 15:00	South Primary Fault-Hengchun Fault and West Hengchun Offshore Structure (Geometry of Manila Subduction Zone) *PPRP Reviews, Comments and Questions* *REs and PEs Comments and Questions*	90	A.T. Lin (林殿順)	Jean-Claude Sibuet Ya-Ju Hsu (許雅儒) Jing-Yi Lin (林靜怡) Song-Chuen Chen (陳松春) J.Bruce H. Shyu (徐澔德) Char-Shine Liu (劉家瑄) Kuo-En Ching (景國恩) Ruey-Juin Rau (饒瑞鈞)
15:00 ~ 15:20		*Break*			
15:20 ~ 16:50 Chaired by C.H. Yeh					
Fault Source-IV	15:20 ~ 16:50	Other Faults Onshore and Offshore Faults *PPRP Reviews, Comments and Questions* *REs and PEs Comments and Questions*	90	C.T. Cheng (鄭錦桐)	Jean-Claude Sibuet Jing-Yi Lin (林靜怡) J.Bruce H. Shyu (徐澔德) Char-Shine Liu (劉家瑄) Kuo-En Ching (景國恩) Ruey-Juin Rau (饒瑞鈞)
16:50 ~ 17:00		*Break*			
17:00 ~ 17:40		Summary of Day 2 (N. Abrahamson)			
17:40 ~ 18:00		Comments and Questions from Observers			
18:00		*Adjourn*			
18:00 ~ 19:00		*Closed Meeting: PPRP, Sponsor, PM, PTI and TI Lead*			

Taiwan SSHAC Level 3 Project
Workshop #3 Agenda – Day 3 Morning

June 21, 2017 (Wednesday), Morning

Tsai Lecture Hall of National Taiwan University, Taipei, Taiwan

Session	Time	Topic	Dur. (min.)	Speaker	RE&PE
09:00 ~ 10:40 Chaired by A.T. Lin					
Subduction Zone Source Model - I	09:00 ~ 10:20	Ryukyu Subduction Zone *PPRP Reviews, Comments and Questions* *REs and PEs Comments and Questions*	80	C.T. Cheng (鄭錦桐)	Jean-Claude Sibuet Ya-Ju Hsu (許雅儒) Jing-Yi Lin (林靜怡) Char-Shine Liu (劉家瑄) Kuo-En Ching (景國恩) Ruey-Juin Rau (饒瑞鈞)
10:20 ~ 10:40		*Break*			
10:40 ~ 12:00 Chaired by C.T. Cheng					
Subduction Zone Source Model - II	10:40 ~ 12:00	Manila Subduction Zone *PPRP Reviews, Comments and Questions* *REs and PEs Comments and Questions*	80	A.T. Lin (林殿順)	Jean-Claude Sibuet Ya-Ju Hsu (許雅儒) Jing-Yi Lin (林靜怡) Char-Shine Liu (劉家瑄) Kuo-En Ching (景國恩) Ruey-Juin Rau (饒瑞鈞)
12:00 ~ 12:30		Summary of Day 3 morning (N. Abrahamson)			
12:30 ~ 13:30		*Lunch*			

Taiwan SSHAC Level 3 Project
Workshop #3 Agenda – Day 3 Afternoon

June 21, 2017 (Wednesday), Afternoon
Tsai Lecture Hall of National Taiwan University, Taipei, Taiwan

Session	Time	Topic	Dur. (min.)	Speaker	RE&PE
13:30 ~ 15:00 Chaired by K.L. Wen					
Introduction and GMC Roadmap	13:30 ~ 13:40	Opening and Introduction of Workshop Ground Rules	10	S.J. Hwang (黃世建) C.L. Wu (吳俊霖)	Adrian Rodriguez-Marek Nicolas Kuehn Ralph Archuleta Hungjun Si (司宏俊) Yi-Hau Chen (程毅豪) Kun-Sung Liu (劉坤松) Ming-Che Hsieh (謝銘哲) Yin-Tung Yen (顏銀桐)
	13:40 ~ 14:40	GMC Roadmap and Current GMC Logic Tree	60	K.L. Wen (溫國樑)	
	14:40 ~ 15:00	*PPRP Reviews, Comments and Questions* *REs and PEs Comments and Questions*			
15:00 ~ 15:20		*Break*			
15:20 ~ 16:50 Chaired by K.L. Wen					
Hazard Sensitivity Analysis	15:20 ~ 16:20	Hazard Feedback and Sensitivity of Current Logic Tree	60	N. Abrahamson	Adrian Rodriguez-Marek Nicolas Kuehn Ralph Archuleta Hungjun Si (司宏俊) Yi-Hau Chen (程毅豪) Kun-Sung Liu (劉坤松) Ming-Che Hsieh (謝銘哲) Yin-Tung Yen (顏銀桐)
	16:20 ~ 16:50	*PPRP Reviews, Comments and Questions* *REs and PEs Comments and Questions*			
16:50 ~ 17:00		*Break*			
17:00 ~ 17:40		Summary of Day 3 (N. Abrahamson)			
17:40 ~ 18:00		Comments and Questions from Observers			
18:00		*Adjourn*			
18:30 ~ 19:30		*Closed Meeting: PPRP, Sponsor, PM, PTI and TI Lead*			

Taiwan SSHAC Level 3 Project
Workshop #3 Agenda – Day 4 Morning

June 22, 2017 (Thursday), Morning
Tsai Lecture Hall of National Taiwan University, Taipei, Taiwan

Session	Time	Topic	Dur. (min.)	Speaker	RE&PE
09:00 ~ 10:40 Chaired by B. Chiou					
GMMs with TDIs for Crustal Source - I	09:00 ~ 09:10	Opening	10	C.L. Wu (吳俊霖)	Adrian Rodriguez-Marek Nicolas Kuehn Ralph Archuleta Hungjun Si (司宏俊) Yi-Hau Chen (程毅豪) Kun-Sung Liu (劉坤松) Ming-Che Hsieh (謝銘哲) Yin-Tung Yen (顏銀桐)
	09:10 ~ 09:50	Adjusted Foreign Model for Crustal Source in Taiwan	40	P.S. Lin (林柏伸) B. Chiou (丘士正)	
	09:50 ~ 10:10	Development of Taiwan Model for Crustal Source - I	20	S.H. Chao (趙書賢) C.C. Hsu (許喬筑)	
	10:10 ~ 10:40	*PPRP Reviews, Comments and Questions* *REs and PEs Comments and Questions*			
10:40 ~ 11:00		*Break*			
11:00 ~ 12:30 Chaired by B. Chiou					
GMMs with TDIs for Crustal Source - II	11:00 ~ 11:20	Development of Taiwan Model for Crustal Source - II	20	V.B. Phung C.H. Loh (羅俊雄)	Adrian Rodriguez-Marek Nicolas Kuehn Ralph Archuleta Hungjun Si (司宏俊) Yi-Hau Chen (程毅豪) Kun-Sung Liu (劉坤松) Ming-Che Hsieh (謝銘哲) Yin-Tung Yen (顏銀桐)
	11:20 ~ 11:40	Comparison of Median Models with TDIs for Crustal Source	20	P.S Lin (林柏伸)	
	11:40 ~ 12:00	Statistical Uncertainty of Median Models for Crustal Source	20	S.H. Chao (趙書賢) C.C. Hsu (許喬筑)	
	12:00 ~ 12:30	*PPRP Reviews, Comments and Questions* *REs and PEs Comments and Questions*			
12:30 ~ 13:30		*Lunch*			

Taiwan SSHAC Level 3 Project
Workshop #3 Agenda – Day 4 Afternoon

June 22, 2017 (Thursday), Afternoon
Tsai Lecture Hall of National Taiwan University, Taipei, Taiwan

Session	Time	Topic	Dur. (min.)	Speaker	RE&PE
13:30 ~ 15:00 Chaired by P.S. Lin					
Logic Tree of Median for Crustal Source	13:30 ~ 13:50	SOF Factor Nodes for Crustal Source	20	H.C. Chiu (邱宏智)	Adrian Rodriguez-Marek Nicolas Kuehn Ralph Archuleta Hungjun Si (司宏俊) Yi-Hau Chen (程毅豪) Kun-Sung Liu (劉坤松) Ming-Che Hsieh (謝銘哲) Yin-Tung Yen (顏銀桐)
	13:50 ~ 14:30	Visualization Technique and Weights of Median Models for Crustal Source	40	C.H. Loh (羅俊雄) V.B. Phung	
	14:30 ~ 15:00	*PPRP Reviews, Comments and Questions* *REs and PEs Comments and Questions*			
15:00 ~ 15:20		*Break*			
15:20 ~ 16:50 Chaired by P.S. Lin					
Logic Tree of Sigma for Crustal Source	15:20 ~ 15:50	Logic Tree and Weights of Tau Model for Crustal Source	30	Y.N. Huang (黃尹男)	Adrian Rodriguez-Marek Nicolas Kuehn Ralph Archuleta Hungjun Si (司宏俊) Yi-Hau Chen (程毅豪) Kun-Sung Liu (劉坤松) Ming-Che Hsieh (謝銘哲) Yin-Tung Yen (顏銀桐)
	15:50 ~ 16:20	Logic Tree and Weights of PhiSS Model for Crustal Source	30	Y.N. Huang (黃尹男)	
	16:20 ~ 16:50	*PPRP Reviews, Comments and Questions* *REs and PEs Comments and Questions*			
16:50 ~ 17:00		*Break*			
17:00 ~ 17:40		Summary of Day 4 (N. Abrahamson)			
17:40 ~ 18:00		Comments and Questions from Observers			
18:00		*Adjourn*			
18:00 ~ 19:00		*Closed Meeting: PPRP, Sponsor, PM, PTI and TI Lead*			

Taiwan SSHAC Level 3 Project
Workshop #3 Agenda – Day 5 Morning

June 23, 2017 (Friday), Morning
Tsai Lecture Hall of National Taiwan University, Taipei, Taiwan

Session	Time	Topic	Dur. (min.)	Speaker	RE&PE
09:00 ~ 10:40 Chaired by Y.N. Huang					
GMMs with TDIs for Subduction Source - I	09:00 ~ 09:10	Opening	10	C.L. Wu (吳俊霖)	Adrian Rodriguez-Marek Nicolas Kuehn Ralph Archuleta Hungjun Si (司宏俊) Yi-Hau Chen (程毅豪) Kun-Sung Liu (劉坤松) Ming-Che Hsieh (謝銘哲) Yin-Tung Yen (顏銀桐)
	09:10 ~ 09:50	Adjusted Foreign Model for Subduction Source in Taiwan	40	B. Chiou (丘士正) P.S. Lin (林柏伸)	
	09:50 ~ 10:10	Development of Taiwan Model for Subduction Source - I	20	S.H. Chao (趙書賢) C.C. Hsu (許喬筑)	
	10:10 ~ 10:40	*PPRP Reviews, Comments and Questions* *REs and PEs Comments and Questions*			
10:40 ~ 11:00		*Break*			
11:00 ~ 12:30 Chaired by Y.N. Huang					
GMMs with TDIs for Subduction Source - II	11:00 ~ 11:20	Development of Taiwan Model for Subduction Source - II	20	V.B. Phung C.H. Loh (羅俊雄)	Adrian Rodriguez-Marek Nicolas Kuehn Ralph Archuleta Hungjun Si (司宏俊) Yi-Hau Chen (程毅豪) Kun-Sung Liu (劉坤松) Ming-Che Hsieh (謝銘哲) Yin-Tung Yen (顏銀桐)
	11:20 ~ 11:40	Comparison of Median Models with TDIs for Subduction Source	20	P.S Lin (林柏伸)	
	11:40 ~ 12:00	Statistical Uncertainty of Median Models for Subduction Source	20	S.H. Chao (趙書賢) C.C. Hsu (許喬筑)	
	12:00 ~ 12:30	*PPRP Reviews, Comments and Questions* *REs and PEs Comments and Questions*			
12:30 ~ 13:30		*Lunch*			

Taiwan SSHAC Level 3 Project
Workshop #3 Agenda – Day 5 Afternoon

June 23, 2017 (Friday), Afternoon
Tsai Lecture Hall of National Taiwan University, Taipei, Taiwan

Session	Time	Topic	Dur. (min.)	Speaker	RE&PE
13:30 ~ 15:00 Chaired by H.C. Chiu					
Logic Tree of Median for Subduction Source	13:30 ~ 14:10	Visualization Technique and Weights of Median Models for Subduction Source	40	C.H. Loh (羅俊雄) V.B. Phung	Adrian Rodriguez-Marek Nicolas Kuehn Ralph Archuleta Hungjun Si (司宏俊) Yi-Hau Chen (程毅豪) Kun-Sung Liu (劉坤松) Ming-Che Hsieh (謝銘哲) Yin-Tung Yen (顏銀桐)
	14:10 ~ 15:00	*PPRP Reviews, Comments and Questions* *REs and PEs Comments and Questions*			
15:00 ~ 15:20		*Break*			
15:20 ~ 16:50 Chaired by H.C. Chiu					
Logic Tree of Sigma for Subduction Source	15:20 ~ 15:50	Logic Tree and Weights of Tau Model for Subduction Source	30	Y.N. Huang (黃尹男)	Adrian Rodriguez-Marek Nicolas Kuehn Ralph Archuleta Hungjun Si (司宏俊) Yi-Hau Chen (程毅豪) Kun-Sung Liu (劉坤松) Ming-Che Hsieh (謝銘哲) Yin-Tung Yen (顏銀桐)
	15:50 ~ 16:20	Logic Tree and Weights of PhiSS Models for Subduction Source	30	Y.N. Huang (黃尹男)	
	16:20 ~ 16:50	*PPRP Reviews, Comments and Questions* *REs and PEs Comments and Questions*			
16:50 ~ 17:00		*Break*			
17:00 ~ 17:40		Summary of Day 5 (N. Abrahamson)			
17:40 ~ 18:00		Comments and Questions from Observers			
18:00		*Adjourn*			
18:00 ~ 19:00		*Closed Meeting: PPRP, Sponsor, PM, PTI and TI Lead*			

Workshop #3 Participants

Group	Individual	Affiliation
Participatory Peer Review Panel	William Lettis	Lettis Consultants International, Inc., USA
	Yousef Bozorgnia	University of California, Berkeley, USA
	茅聲燾 Sheng-Taur Mau	California State University, Northridge, USA
	馬國鳳 Kuo-Fong Ma	National Central University, Taiwan
Project Management Office	黃世建 Shyh-Jiann Hwang	NCREE, Taiwan
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