Appendix A

Biographies of Project Participants

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A.1 Technical Integrator Leads

Kevin J Coppersmith, PhD, of Coppersmith Consulting, Inc., is the Project Technical Integrator and the Technical Integration (TI) Lead of the Seismic Source Characterization (SSC) Team for the Hanford Probabilistic Seismic Hazard Analysis (PSHA) Project. He has 33 years of consulting experience, with primary emphasis in probabilistic hazard analyses (seismic, volcanic, and related geohazards) for design and review of critical facilities within regulated environments. He has pioneered approaches to characterizing earth sciences data and their associated uncertainties for PSHAs for a range of critical facility sites, including nuclear power plant sites, high-level waste repositories, dams, offshore platforms, pipelines, and bridges. Dr. Coppersmith was a member of the Senior Seismic Hazard Analysis Committee (SSHAC), which provided PSHA methodology guidance to the U.S. Nuclear Regulatory Commission (NRC), U.S. Department of Energy (DOE), and Electric Power Research Institute (EPRI). As a co-principal investigator, he recently completed a study for the NRC on reviewing lessons learned from the application of SSHAC Study Level 3 and 4 methodologies over the past 10 years. In light of that study, he worked with NRC research staff to develop NUREG-2117, which provides detailed implementation guidance for SSHAC Level 3 and 4 studies.

Dr. Coppersmith has extensive experience in leading SSHAC Level 3 and 4 studies for nuclear facilities. He served as the SSC Technical Facilitator/Integrator (TFI) for SSHAC Level 4 seismic hazard studies at the Yucca Mountain, Nevada, high-level waste repository, and he was the SSC TFI for the PEGASOS (Pan-European Gas-AeroSOls Climate Interaction Study) SSHAC Level 4 study for four nuclear power plants in Switzerland. He was also the TFI for the probabilistic volcanic hazard analysis conducted in 1996 for Yucca Mountain, as well as for the update to that study completed in 2008. He was the TI lead for the Central and Eastern United States Seismic Source Characterization for Nuclear Facilities project, which was a SSHAC Level 3 project conducted under the joint sponsorship of the NRC, DOE, and several nuclear utilities. Dr. Coppersmith served on the Participatory Peer Review Panel (PPRP) for BC Hydro's SSHAC Level 3 seismic hazard analysis for 41 sites in the service area in British Columbia, Canada. He also served as SSC TI Lead for the SSHAC Level 3 PSHA conducted for the Thyspunt nuclear power plant in South Africa. He also chairs the PPRP for the SSHAC Level 3 PSHA being conducted for the Diablo Canyon nuclear power plant in central California.

In addition to conducting more than 100 major projects worldwide as part of his consulting career, Dr. Coppersmith has served on numerous advisory panels for both the public and private sectors, providing advice regarding probabilistic hazard and risk decisions for natural phenomena. He has been an invited speaker and lecturer regarding the practical implementation of earth science knowledge at academic forums and professional conferences on several continents. He has published more than 60 papers in peer-reviewed journals, served as a member of the Board of Directors of the Seismological Society of America, and has been a member of the editorial boards of the journal *Earthquake Spectra* and the *Journal of Geophysical Research, Solid Earth*. In addition, he has served on multiple panels and committees of the U.S. National Research Council, which is the operating arm of the U.S. National Academy of Sciences. Dr. Coppersmith received his BS in geology from Washington & Lee University

in 1974 and his PhD from the University of California, Santa Cruz, in 1979. His dissertation research included the development of paleoseismic data for a major branch of the San Andreas Fault in central California.

Julian J Bommer, PhD (Ground Motion Characterization [GMC] TI Lead), is a consultant in the fields of seismic hazard and risk assessment. He is engaged in this role for several major engineering projects around the world, including serving as a member of Seismic Advisory Board for the Panama Canal during the design of the canal expansion. He has worked on many other seismic hazard and risk-related studies for dams, bridges, and large buildings around the world. After the 2001 destructive earthquake in southern Peru, he was engaged as an expert witness with regard to the ground motion levels and damage at the Ilo-2 power plant. His work has also covered several projects related to the hazard and risk from induced seismicity, including enhanced geothermal projects in Berlín (El Salvador), Basel (Switzerland), and the United Kingdom, reservoir-induced seismicity in Spain, and earthquake activity associated with natural gas extraction in The Netherlands.

Dr. Bommer has extensive experience in nuclear projects, including serving on the Seismic Advisory Board for the Diablo Canyon power plant in coastal California, and serving as a member of review panels for the assessment of seismic hazard for nuclear plants in Romania and Abu Dhabi. He is currently advising Eletronuclear on the re-assessment of seismic hazard at the Angra dos Reis power plant in Brazil, and he served as the Project TI and GMC TI Lead on the SSHAC Level 3 PSHA for the Thyspunt nuclear power plant in South Africa. Dr. Bommer chaired the PPRP for the first 2 years of the SSHAC Level Next-Generation Attenuation (NGA)-East project in the United Kingdom and he holds the same position for the SSHAC Level 3 Blue Castle Holdings site-specific PSHA for a new-build nuclear site in Utah, USA. In the United Kingdom, Dr. Bommer is a member of the Expert Panel on Seismic Hazard and Climate Change of the Office for Nuclear Regulation. Dr. Bommer is a registered expert in seismic hazard assessment with the International Atomic Energy Agency (IAEA). He was also part of the team engaged by the NRC to develop the implementation guidelines for SSHAC Level 3 and 4 hazard studies in NUREG-2117.

Dr. Bommer is a Civil Engineer with a Master's degree in geotechnical engineering and a PhD in engineering seismology. He is currently a Senior Research Investigator in the Department of Civil & Environmental Engineering of Imperial College London, where he was Professor of Earthquake Risk Assessment until 2011. Prior to joining the faculty at Imperial College, Dr. Bommer worked at the Jesuit-run Universidad Centroamericana in El Salvador, developing modules in engineering seismology and initiating research in seismic hazard and risk assessment, including the installation of a network of digital strong-motion accelerographs. He has published extensively on topics related to the characterization and prediction of earthquake ground motion, seismic hazard assessment, and earthquake loss estimation, as well as several field studies of damaging earthquakes (he has conducted post-earthquake field studies in Algeria, Armenia, California, Colombia, El Salvador, Greece, Italy, Japan, Mozambique, Peru and Turkey). His publications have been widely cited in the technical literature: at the date of publication of this report, he has a total of 109 publications listed in the Thomas Reuters *Web of Science*, with an average of 31 citations per paper and an *h*-index of 34. He has served as an Associate Editor for the *Bulletin of the Seismological Society of America* and as a member of the Editorial Boards of *Bulletin of Earthquake Engineering*, *Engineering Geology* and *Soil Dynamics & Earthquake Engineering*. From 2000 to 2002 Dr. Bommer was chairman of the Society for Earthquake and Civil Engineering Dynamics, the United Kingdom chapter of the European and International Associations for Earthquake Engineering.

A.2 SSC TI Team

Ryan T Coppersmith is a Senior Project Geologist with Coppersmith Consulting, Inc., in Walnut Creek, California. His experience is in structural geology specializing in bedrock mapping, seismic hazard analysis, and SSC. He has worked on several nuclear siting projects and PSHA projects in the United States and internationally. He participated in the SSHAC Level 3 PSHA study for the Thyspunt nuclear power plant in South Africa as a member of the SSC TI Team.

Mr. Coppersmith's consulting experience includes several PSHA studies and participation as an SSC TI Team member in two SSHAC Level 3 studies for nuclear facilities. He has been involved in the completion of responses to Requests for Additional Information from the NRC for the Harris, Levy, and DTE Fermi nuclear power plants' combined operating license (COL) applications. He has also been involved in several field-mapping efforts for nuclear sites to characterize both regional and site-specific structures. He has experience in mapping geomorphic surfaces, paleoseismic trenches, and bedrock structures to characterize faults as well as in mapping fluvial and marine terraces to assess regional uplift rates. Mr. Coppersmith has expertise in the use of the geologic data in building SSC models and quantifying the associated uncertainties. Other major geologic studies carried out in support of PSHAs for nuclear facilities include reviewing and documenting geologic literature, compiling project and geographic information system (GIS) databases, interpreting site geological data, and characterizing seismic sources. As part of a probabilistic fault displacement hazard analysis for oil-production facilities within the Caspian Sea, Mr. Coppersmith characterized submarine faults using seismic reflection data. As part of detailed site-specific studies, he has experience in collecting and interpreting ground-based light detection and ranging (LiDAR) data to interpret geologic structures and to map fault zone exposures. He is proficient in computer software such as ArcGIS, Canvas, Adobe, Matlab, GoCad, and Cyclone (3D software). His academic research focused on the structural analysis of outcrop-scale faulting along sea-cliff exposure near the San Simeon fault zone in California. This study resulted in a revised understanding of the history of the fault zone and of the way strike-slip systems evolve over time. Mr. Coppersmith received his BS in geology from Washington & Lee University in 2006 and his MS from the University of Texas at Austin in 2008.

Kathryn L Hanson is a Principal Geologist with AMEC Environment & Infrastructure, Inc., in Oakland, California. She has more than 35 years of applied research and consulting experience, conducting and directing investigations to quantitatively assess geologic hazards to critical facilities in the United States and abroad. Her work has involved the integration of earth science data and treatment of the uncertainty in these data to assess seismic, volcanic, and related geohazards in a variety of tectonic environments, both onshore and offshore. She has conducted both probabilistic and deterministic geohazard assessments to support successful siting, engineering, and design of nuclear facilities, dams, pipelines, and other critical facilities.

Ms. Hanson's consulting experience has emphasized regional and site-specific geologic, seismologic, and geophysical studies to identify and evaluate geohazards such as potential earthquake ground motions, surface faulting and related secondary deformation, landslides, and tsunamis. Her work incorporates state-of-the-art methods in the use of geologic data to understand fault behavior and characterize seismic sources. She was the technical lead for SSC and surface faulting investigations in support of Early Site Permits (ESPs) and COL applications for several potential nuclear power plant sites and existing nuclear plants in the Central and Eastern United States, and she participated as a reviewer for similar studies for new-build nuclear plants in the United Kingdom. She has extensive SSHAC 3 experience, having been a

key participant in the EPRI/DOE/NRC Central and Eastern United States Seismic Source Characterization (CEUS SSC) Project, the BC Hydro PSHA, the Thyspunt nuclear power plant in South Africa, and ongoing Pacific Gas and Electric Diablo Canyon PSHA SSHAC 3 projects.

Ms. Hanson chaired an American Nuclear Society working group that developed national guidelines and criteria for performing investigations of nuclear facilities sites for seismic hazard assessments (ANSI/ANS 2.27). She was the senior author of the NRC's NUREG/CR 5503. In addition, she has written numerous major consulting reports and abstracts summarizing technical studies, and she has written or co-written more than 20 papers published in peer-reviewed journals and proceedings volumes. She earned a BS in geology from Iowa State University (1974) and an MS from the University of Oregon (1977).

Dr. Jeffrey Unruh is a Senior Principal Geologist and President of Lettis Consultants International, Inc., in Walnut Creek, California. He is a registered Professional Geologist with more than 22 years of research and consulting experience in neotectonics, structural geology, and seismic hazard evaluation.

Dr. Unruh has conducted comprehensive multidisciplinary studies of seismic hazards for large engineered structures such as nuclear power plants, dams, water transportation systems, and liquid natural gas facilities. Most of these studies have been performed for state and federal agencies and large utilities, and many were conducted under regulatory review. Dr. Unruh performed and managed SSCs in support of COL applications for new nuclear power plants in Virginia and Texas. These studies were conducted as SSHAC Level II investigations. Dr. Unruh served as part of the TI staff for the BC Hydro SSHAC Level III seismic hazard investigation, and has conducted analyses of stress, strain, and structural geology for PG&E in support of the ongoing SSHAC Level III update of the seismic hazard model for the Diablo Canyon nuclear power plant in California.

Dr. Unruh is an expert in the neotectonics of the Coast Ranges, Sierra Nevada, Walker Lane belt, and Central Valley of California. He recently participated in a study funded by the U.S. Army Corps of Engineers and the National Science Foundation to investigate the seismotectonics of the southern Sierra Nevada and San Joaquin Valley. Dr. Unruh has also performed numerous seismotectonic and neotectonic investigations in support of geothermal exploration and development. Representative projects include studies at the Coso, Steamboat, Salton Sea, and Dixie Valley geothermal fields, as well as evaluations of geothermal prospects in the Imperial Valley (California), Klamath Valley (Oregon), and Guam. Dr. Unruh has published more than 30 research papers in peer-reviewed journals, and he currently holds an appointment as a Research Geologist in the Department of Earth and Planetary Sciences at the University of California, Davis.

Lorraine Wolf, PhD, is a Professor of Geophysics in the Department of Geology and Geography and the Director of Undergraduate Research in the Office of the Provost at Auburn University in Auburn, Alabama. Dr. Wolf has more than 22 years of experience in conducting investigations in the field of applied geophysics, with expertise in seismology and potential fields. Her work has involved the application of these methods to earthquake hazards, including site response and fault characterization, and environmental contamination. Dr. Wolf has participated in PSHAs for Makushin Volcano and southern Alaska. She has been an active researcher for more than 15 years in the New Madrid Seismic Zone of the Central United States, where she has been involved in paleoseismic investigations and site characterization. She has participated in studies of recent earthquakes and induced seismicity, archaeological sites, and sites with ground failure due to carbonate dissolution (sink-holes). More

recently, she has been involved in collecting and modeling gravity and magnetic data for fault characterization in Washington and Alabama.

Dr. Wolf has expertise in electrical resistance tomography, magnetic and gravity modeling, self-potential and seismic surveying, and microtremor analyses. She has developed geophysical survey methodologies for locating and mapping buried earthquake-induced soil liquefaction features, such as sand dikes and sand blows, and is currently co-authoring a training manual for NRC personnel on the use of paleoliquefaction features for seismic hazard analyses. As part of her research, Dr. Wolf has been involved in developing coupled deformation and fluid pressure modeling algorithms for use in studying the hydrological response to coseismic strain resulting from large earthquakes. Her work has been funded by the U.S. Geological Survey (USGS) National Earthquake Hazards Program, the NRC (subcontract from Tuttle and Associates), the USGS Water Resources Division, the National Science Foundation, and the Petroleum Research Fund of the American Chemical Society.

Dr. Wolf earned a BA (1974) and MA (1976) in English literature from Binghamton University (formerly SUNY-Binghamton) and a PhD (1989) in geophysics from the University of Alaska Fairbanks. She was a Post-doctoral Scholar for 2 years at the Air Force Geophysics Laboratory (Phillips Lab) in Boston before joining the staff at the National Research Council in Washington, D.C., as a Program Officer on the Board of Earth Sciences and Resources and the Director of World Data Center A. Later, Dr. Wolf served as the Assistant Executive Director for the Commission on Geosciences, Environment and Resources before coming to Auburn University in 1993. Dr. Wolf served for 9 years as Associate Editor for the *Bulletin of the Seismological Society of America*. She has written numerous consulting reports and abstracts summarizing technical results, has served in an editorial role for 13 NRC reports, and has authored or co-authored more than 35 papers in peer-reviewed journals and proceedings volumes.

A.3 GMC TI Team

Linda Al Atik, PhD, is an independent consultant in earthquake engineering in San Francisco, California. She is an established expert in the ground motion characterization in geotechnical earthquake engineering. In addition to her role on the GMC TI Team for the Hanford PSHA, Dr. Al Atik leads working groups on the characterization of ground motion variability for the Next-Generation Attenuation Relationships for Central and Eastern North America (NGA-East) and for the Next-Generation Attenuation Relationships for active tectonic regions (NGA-West 2) projects. She also serves as member of the TI Team for the ground motion characterization of the SSHAC Level 3 NGA-East Project and serves as a member of a support team to the GMC TI Team of the SSHAC Level 3 Southwestern U.S. Ground Motion Characterization (SWUS GMC) project.

Dr. Al Atik has been called on by other SSHAC projects to provide technical expertise in ground motion modeling. She developed a new method for the adjustment of empirical ground motion prediction equations to different reference bedrock conditions for the SSHAC Level 4 PEGASOS Refinement Project. She also participated as a GMC Proponent Expert on Vs-Kappa scaling issues at Workshop 2 of the SSHAC Level 3 Thyspunt Nuclear Siting Project. She participated as a resource expert on the characterization of the variability of ground motion and the development of hybrid empirical models for the PEGASOS Refinement Project. Linda has worked on numerous other PSHA and GMC projects in North America.

Prior to working as an independent consultant in earthquake engineering, Dr. Al Atik served as a Post-doctoral Scholar in the Dept. of Civil and Environmental Engineering, University of California, Berkeley. In this position she studied effects of soil nonlinear response on the variability of ground motion models and provided a modified method for the application of the random effects approach for the development of ground motion models. She also evaluated single-station standard deviation of ground motion models. While in this role she developed an improved approach for spectral matching and worked on developing a spectral matching approach to the Newmark displacement target response spectrum. Dr. Al Atik developed an NGA Excel tool that allows the computation of weighted spectral values from all the NGA models and updated the random effects, the probabilistic seismic hazard, and the spectral matching codes.

Dr. Al Atik has a PhD in geotechnical engineering from the University of California, Berkeley; a MS in Geotechnical Engineering from the University of California, Berkeley and a BE in Civil and Environmental Engineering from American University of Beirut, Lebanon.

Adrian Rodriguez-Marek, PhD, is an Associate Professor of Civil Engineering at Virginia Polytechnic Institute and State University (Virginia Tech) in the United States. He is an established expert in the field of ground motion prediction, seismic site response, and earthquake geotechnical engineering. He participated in the SSHAC Level 3 PSHA study for the Thyspunt nuclear power plant in South Africa as a member of the GMC TI Team. Prof. Rodriguez-Marek has also led work on the development of single-station models for the SSHAC Level 4 PEGASOS Refinement Project in Switzerland, and is a key member of the Sigma Working Group for the NGA-East project, where he is participating in the development of single-station models for the Central and Eastern United States. He has also been invited to contribute to the SSHAC Level 3 PSHA studies currently under way for the Diablo Canyon nuclear power plant, the Blue Castle nuclear site ESP application in Utah, and the SWUS seismic hazard study for nuclear power plants in the Southwestern United States. Outside of seismic hazard studies, Prof. Rodriguez-Marek has also provided geotechnical consulting services in a variety of projects involving, among others, the peer review of the seismic response of a bridge over the Orinoco River in Venezuela, and dynamic analysis for the design of launch platforms for NASA space shuttles.

Prof. Rodriguez-Marek obtained his PhD in civil engineering from the University of California at Berkeley in 2000. Prior to his appointment at Virginia Tech, he held an Assistant (and later Associate) professor post at Washington State University. He has also held visiting professor positions at the University of Concepción, Chile, at the Laboratoire de Géophysique Interne et Technophysique, in Grenoble, France, and the École Nationale des Ponts et Chaussées (Paris Tech), in France. His research and his teaching are focused on geotechnical earthquake engineering. Past research projects include research on site amplification of earthquake ground motions, characterization of near-fault ground motions, soil-structure interaction, performance-based design of structures subject to near-fault ground motions, paleoliquefaction analysis, geotechnical stability of coal combustion residual products, and site-specific site-response analysis using single-station standard deviations. He is currently directing a five-university research study on the characterization of topographic amplification for earthquake ground motions. Prof. Rodriguez-Marek has also led post-earthquake investigations of various events, including the 2001 Southern Peru Earthquake and the 2003 Colima Earthquake in Mexico. He has 24 articles in peer-reviewed publications and more than 40 technical reports and conference publications. In addition to his publications, he has been invited to give numerous technical presentations, and served as a reviewer

for more than 15 journals. Dr. Rodriguez-Marek is the incoming chair of the Earthquake Engineering and Soil Dynamics committee of the Geo-Institute of the American Society of Civil Engineering in the United States.

Gabriel R Toro, PhD, is a Senior Principal Engineer at Lettis Consultants International. He has more than 30 years of experience in PSHA, development of ground motion prediction equations, probabilistic modeling of soils and their effects on earthquake ground motion, and probabilistic modeling of other natural hazards and their effects on special structures and on the built environment. He has been an active participant in nearly all large-scale PSHA projects and methodology-development efforts since the 1980s, including the first Diablo Canyon PSHA, the EPRI-SOG (Seismicity Owners Group) study, the SSHAC study, the Yucca Mountain PSHA (SSHAC Level 4), the PEGASOS study (SSHAC Level 4), the recently completed CEUS SSC (SSHAC Level 3), and numerous seismic hazard studies for recent ESP and COL applications to the NRC. In addition, he has conducted numerous seismic hazard studies for bridges, nuclear-fuel facilities, industrial facilities, and USGS-sponsored regional studies in the central United States. Dr. Toro has developed ground motion prediction equations for intraplate regions, where strong-motion data are limited and simplified physical models must be used. His ground motion prediction equations for the CEUS have been widely used. He was a member of the expert panel in the EPRI (2004) ground motion study (SSHAC Level 3), was the TI Lead for the recently completed EPRI (2013) ground motion study (SSHAC Level 2), and is the PPRP Chair for the ongoing NGA-East ground motion study (SSHAC Level 3). Dr. Toro is a member of the SSC TI Team for the PSHA for the Palo Verde Nuclear Generating Station in Arizona (SSHAC Level 3), and is a Resource Expert in the ongoing SWUS ground motion study (SSHAC Level 3). Dr. Toro also developed a widely used probabilistic model for the variation of shear-wave velocity as a function of depth, for the purpose of calculating the effect of uncertainty in site effects on earthquake ground motions. He and others have applied this model in most recent ESP and COL applications, and he has performed the subsequent site-response analysis for a number of them. He has served as peer reviewer for seismic hazard and loss studies in the United States, Malaysia, Bolivia, Guatemala, Jamaica, and Perú.

Dr. Toro has a civil engineering degree (with Honors) from the National University of Colombia, and Master's and PhD degrees in civil engineering from the Massachusetts Institute of Technology. He has published more than 40 papers in peer-reviewed journals and conference proceedings, and numerous technical reports to clients and funding agencies. His research and publications have earned him a Thesis of Merit recognition from the National University of Colombia in 1979, the OMAE Award from ASME in 1994, and the EERI Outstanding Paper Award in 2001.

Robert R. Youngs, PhD, a Principal Engineer at AMEC Environment & Infrastructure, Inc. Oakland California, has more than 35 years of consulting experience, with primary emphasis in hazard and decision analysis. He has pioneered approaches for incorporating earth sciences data and their associated uncertainties into probabilistic hazard analyses. The focus of this work has been on developing quantitative evaluations of hazard by combining statistical data and expert judgment. Dr. Youngs has considerable experience in assessing earthquake hazards in central and eastern North America and implementing SSHAC processes. He was a member of the research teams that developed EPRI's seismic hazard assessment for nuclear power plants in the CEUS, as well as EPRI-sponsored research projects to assess ground motions (1993) and maximum magnitudes (1994) for the CEUS. He was also a member of the project team for the NRC project to develop response spectral shapes for analysis of nuclear facilities (NUREG/CR-6728) in 2001, and for the EPRI project to characterize ground motions in the CEUS for analysis of nuclear facilities in 2004. Dr. Youngs has completed seismic hazard analyses of existing and

proposed nuclear power plants throughout the United States (including in Alabama, Florida, Louisiana, Michigan, and North Carolina) and internationally, including in Ontario, Canada, and Switzerland (PEGASOS project). He earned his BS in civil engineering at California State Polytechnical University, Pomona (1969), and his MS and PhD in geotechnical engineering at the University of California, Berkeley (1982).

A.4 Hazard Calculation Team

Valentina Montaldo Falero, PhD, a Seismologist with AMEC Environment & Infrastructure, Inc., is the Seismic Hazard Analyst for the Hanford PSHA project. She has 14 years of research and consulting experience in PSHA, earthquake catalog development and analysis, and ground motion simulation.

Dr. Montaldo Falero's experience in SSHAC Level 3 projects includes the Central and Eastern United States Seismic Source Characterization for Nuclear Facilities project, for which she contributed to the preparation and analysis of the earthquake catalog, and the BC Hydro SSHAC Level 3 study, for which she prepared and analyzed the uniform earthquake catalog and performed seismic hazard calculations at 42 dam sites. She also contributed to the PEGASOS Refinement Project by testing alternative ways to compute maximum magnitude distributions (bootstrap technique and generalized extreme value approach), by calculating probability distributions of earthquake inter-arrival times and verifying earthquake recurrence calculations.

Dr. Montaldo Falero has participated in a number of probabilistic seismic hazard studies for nuclear power plants and nuclear repositories in the United States, Canada, and the UK, including five COL application studies for proposed nuclear sites in the United States (DTE Fermi, River Bend, Turkey Point, Levy, and Harris nuclear power plants). Her responsibilities included preparing or verifying calculation packages on earthquake catalog and earthquake recurrence analysis, PSHA, site-response analysis, and preparing sections of the Final Safety Analysis Report. As part of these studies, Dr. Montaldo Falero has tested and documented the use of AMEC in-house probabilistic seismic hazard software, for which she obtained commercial grade dedication under NQA-1 requirements. In addition, she performed PSHAs and sensitivity studies for two facilities within the Idaho National Laboratory, and various dams in Oregon, Washington, and Kentucky.

Prior to joining AMEC, Dr. Montaldo Falero was a researcher at the Italian Institute for Geophysics and Volcanology (INGV) in Milan, Italy. Her research focused on ground motion simulation and seismic hazard analysis. Dr. Montaldo Falero collaborated in developing the Italian national seismic hazard map currently in use and participated in projects funded by the Italian Civil Defense Agency. She has co-authored several papers about aspects of PSHA, ground motion simulation, and the compilation of earthquake catalogs. Dr. Montaldo Falero received her MS (Laurea) in geology from Universita' degli Studi di Milano (Italy) in 2000, and her PhD from Universita' degli Studi di Milano-Bicocca (Italy) in 2006.

Robert Youngs (see GMC Team)

A.5 Participatory Peer Review Panel

Ken Campbell, PhD, (PPRP Chairperson) is Vice President of CoreLogic EQECAT Inc. and Sole Proprietor of Kenneth W Campbell Consulting providing consulting services in the fields of ground motion and seismic hazard assessment. He received a MS in engineering from the University of Los Angeles (UCLA) in 1972 with a thesis that applied linear system theory to the estimation of seismic site response and a PhD in geotechnical engineering from UCLA in 1977 with a dissertation that applied Bayesian probability techniques to the estimation of earthquake recurrence frequency in terms of fault slip rate and characteristic magnitude. Dr. Campbell has more than 40 years of professional experience in technical management, engineering, consulting, and research in the areas of engineering seismology, strong ground motion, seismic hazard evaluation, and geotechnical earthquake engineering. Seven of these years were spent as a Project Engineer with the U.S. Geological Survey National Hazards Mapping Program. Dr. Campbell is responsible for directing the development of seismic hazard models and seismic input for EQECAT's global risk-assessment software, portfolio loss studies, and securitization risk analyses for the insurance and financial industries. As a leading expert in strong ground motion estimation and seismic hazard assessment, he also provides consulting expertise for seismic hazard studies of critical facilities worldwide. His consulting and research have led to the authorship of more than 135 publications, many of which have been published in international books and peer-reviewed journals.

Dr. Campbell's experience in earthquake ground motion characterization and seismic hazard analysis related to nuclear facilities includes being a member of the PPRPs for the SSHAC Level 3 BC Hydro PSHA Project (43 dams in British Columbia) and the SSHAC Level 3 Southwest United States Ground Motion Project (ground motion characterization for the Diablo Canyon and Palo Verde nuclear power plants), and an Expert Evaluator on Ground Motion for the SSHAC Level 4 PEGASOS Refinement Project (five nuclear power plants in Switzerland). He participated as a Ground Motion Expert on the Yucca Mountain PSHA Project (high-level nuclear waste repository in Nevada), which many consider to be equivalent to a SSHAC Level 4 project, and on the SSHAC Level 3 CEUS Ground Motion Project (sponsored by EPRI). He also participated as a Ground Motion Expert on the original SSHAC study in 1997 and the Trial Implementation Project (southeastern United States), which was meant to serve as the first implementation of the 1997 SSHAC Level 4 recommended guidelines. He has also participated as an Expert Proponent of the Hybrid Empirical Method of ground motion simulation for the SSHAC Level 3 Thyspunt PSHA Project (nuclear power plant in South Africa), the SSHAC Level 3 Blue Castle PSHA Project (nuclear power plant in Utah), and the SSHAC Level 3 Next-Generation Attenuation (NGA-East) Project (CEUS). He also serves as a member of the Coordination Committee and as a Ground Motion Prediction Equation Developer on the NGA-West and NGA-East Projects. He has served on the DOE Savannah River Advisory Board and as a seismic hazard expert on nuclear facility review missions of the IAEA.

Brian S.-J. Chiou, PhD, is Senior Seismologist at the California Department of Transportation where he has worked since 2000. From 1992 to 2000, he was an engineering seismologist at Geomatrix Consultants, Inc. He has more than 20 years of professional experience in applied research and consulting in strong-motion seismology and earthquake hazard assessment. He is also a member of the PPRP for the Southwest United States Ground Motion Characterization Project and the Hanford Probabilistic Seismic Hazard Analysis Project, both of which are SSHAC Level 3 studies.

Between 2002 and 2007, Dr. Chiou participated in the planning, management, and execution of the NGA Model program, a major collaborative research initiative between the Pacific Earthquake Engineering Research Center, USGS, and Southern California Earthquake Center. He was a developer of the NGA model and is currently working on an update of his model in the Phase 2 of the NGA program. In addition, during the last 10 years, Dr. Chiou has participated in several other research projects, including the development of single-station/single-path standard deviation of ground motions, development of predictive models of directivity and polarization effects, fault rupture hazard methodology, and a design ground motion library. Dr. Chiou earned a BS in geology from National Taiwan University (1981), an MS in geophysics from Saint Louis University (1986), and a PhD in geophysics from the University of California, Berkeley (1991).

William R. Lettis, PhD, is Senior Principal Geologist of Lettis Consultants International, Inc. He has more than 30 years of experience performing regional and site investigations to assess geologic and seismic hazards for large engineered facilities, including bridges, dams, nuclear and fossil fuel plants, pipelines, and liquid natural gas terminals. With more than 100 publications, he is a recognized authority on the assessment of seismic hazards, both in the United States and throughout the world. Dr. Lettis has served as a TI Lead or TI Team member on five SSHAC Level 3 studies (CEUS SSC, BC Hydro, Blue Castle, Diablo Canyon, and Palo Verde) and 18 SSHAC Level 2 studies for new nuclear COL applications. He has worked extensively on geologic and seismic hazard assessments for nuclear facilities both domestically and abroad, including the United Arab Emirates, Israel, Switzerland, Korea, Taiwan, Australia (HIFAR), Turkey, and the United Kingdom. He is the author or co-author of several NRC NUREG volumes, American Nuclear Society Standard NS 2.27 on "Criteria for investigations of nuclear facility sites for Seismic hazard assessment," and the IAEA training manual on "Seismology and Seismic Ground Motion." Dr. Lettis earned his BS in geology from Humboldt State University (1977) and his MS (1979) and PhD (1982) in geology from the University of California, Berkeley.

William Underwood Savage, PhD, is an independent consultant in seismology and seismotectonic interpretation living in Las Vegas, Nevada. During his professional career Dr. Savage has applied his research training and professional experience to seismic safety analyses, focusing on assessing earthquake hazards for the design of critical facilities such as nuclear power plants and major dams and developing and implementing strategies for reducing earthquake vulnerabilities of natural gas and electric power facilities and systems. He has held senior positions with the USGS in Menlo Park, California, and Las Vegas, Nevada, as well as senior positions with Pacific Gas and Electric Company and Woodward-Clyde Consultants. He is an Emeritus Geophysicist at the USGS Earthquake Science Center, Menlo Park, California, and an Adjunct Professor in the Departments of Geoscience and Civil Engineering at the University of Nevada, Las Vegas.

In recent years, Dr. Savage served as the USGS seismologist for the Yucca Mountain Project, where he addressed technical issues associated with the license submittal as well as issues related to nuclear quality assurance. He also recently served as a reviewer of information about the Shoreline fault and related features just offshore of the Diablo Canyon nuclear power plant that was developed for submittal to the NRC as part of an assessment related to future operation of the plant. Dr. Savage was a consultant to Southern California Edison in support of the earthquake safety evaluation of the San Onofre Nuclear Generating Station.

He holds a BS degree in physics from the University of Oregon Honors College, and MS and PhD degrees in seismology from the University of Nevada in Reno. He was a post-doctoral researcher at the USGS in Menlo Park.

J. Carl Stepp, PhD, is currently Sole Proprietor of J. Carl Stepp Consulting providing consulting services in the fields of seismic hazard and risk assessment. His distinguished contributions to nuclear facility regulation focusing on development and worldwide application of seismic hazard and seismic design bases ground motion assessment technologies span more than 40 years. He spent more than 20 years in nuclear plant regulation first with the NRC as chief of the Geosciences Branch, then with EPRI, as director of the Seismic Center. At the NRC he managed the reviews of seismic and geotechnical engineering aspects of safety applications for nuclear plant licenses. With experience gained from these reviews he led the development of the Chapter 2.5 of NRC's Standard Review Plan, NUREG 0800, which established technical and procedural guidance for satisfying the requirements of geologic and seismic safety regulation 10 CFR 100, Appendix A. This experience led him to develop recommendations for revision of the geologic and seismic regulation to provide greater clarity, to reflect evolved seismic hazard assessment technologies, and to permit periodic future updating of guidance as warranted by evolving seismic hazard assessment technologies.

As director of the Seismic Center at EPRI, Dr. Stepp planned and managed a broad seismic and seismic engineering research and technology development program. A key element of the program focused on development of probabilistic seismic hazard assessment methodology to incorporate methodological, data, modeling, and scientific uncertainties. The product of this effort was a regional SSC model for the Central and Eastern United States (the EPRI-SOG CEUS SSC model), which developed and implemented a structured evaluation and assessment of uncertainty in existing geological, geophysical, and seismological data, methods and models. The EPRI-SOG CEUS SSC model provided the primary technical basis for NRC's Regulatory Guide 1.165, which in turn provided procedures accepted by NRC for satisfying the requirements of the newly revised seismic and geologic regulation 10 CFR 100.23. The later formalization of the procedural process implemented for development of the EPRI-SOG model evolved into the now well-established SSHAC Methodology, which is the currently accepted procedure for development of SSC as well as GMC models. As an independent consultant, Dr. Stepp has continued to support the development of seismic hazard technologies and implementation guidance. He is a co-author of the IAEA seismic hazard evaluation guideline and has participated in updating the guideline to keep pace with evolving seismic hazard assessment technologies. He has conducted training courses on the implementation of the IAEA seismic guideline in a number of regions of the world and has provided expert assistance to the IAEA in applying the guideline to evaluate the seismic safety of approximately 15 nuclear plant sites located throughout the world. He chaired the task group that developed the Seismic Topical Report II, Preclosure Seismic Design Methodology for a Geologic Repository at Yucca Mountain, and directed the probabilistic seismic hazard evaluation for the facility site. He subsequently served as Chairman of the Yucca Mountain Project Seismic Advisory Panel. He has continued to support the nuclear utility industry as a member of the Nuclear Energy Institute's New Plant Seismic Issues Resolution Program, which developed technologies for updating the NRC's seismic regulatory guidance: Regulatory Guide 1.208 and the Standard Review Plan, NUREG-0800. He more recently has served as chairman of PPRPs for more than 20 SSHAC studies.