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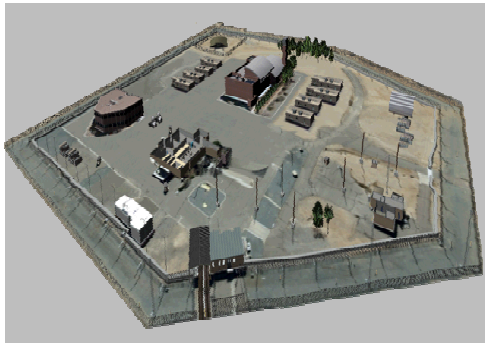

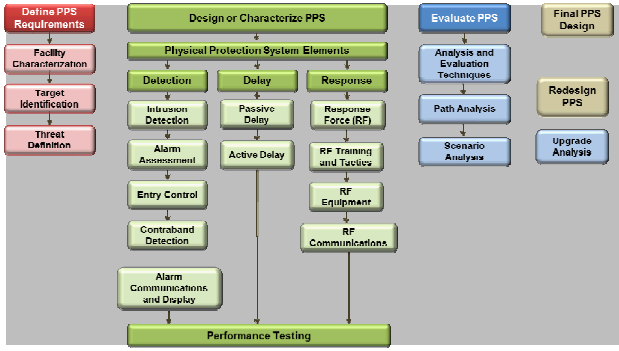

Integrated Security and Consequence Analysis Planning and Design Project– Project Status

Felicia A. Durán, Ph.D.
Security Systems Analysis

KHNP-CRI/SNL Project Meeting, November 18-22, 2013

U.S. DEPARTMENT OF ENERGY | NNSA National Nuclear Security Administration

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Presentation Outline

- Introduction of SNL Team
- Project Scope
- Status of Project Tasks
- Proposed Options for PPS Conceptual Design

SNL Team

Felicia A. Durán

PMTS, Security Systems Analysis Department
Energy, Nonproliferation, and High-Consequence Security Division

Felicia A. Durán is a Principal Member of Technical Staff in the Security Systems Analysis Department at Sandia National Laboratories. She has over 20 years of professional experience supporting technical research programs for the U.S. Department of Energy and the U.S. Nuclear Regulatory Commission in the areas of physical security; systems reliability and risk analysis, including Level II probabilistic risk assessment for commercial reactors.

She is a member of the Institute of Nuclear Materials Management (INMM), serves as Associated Editor for Physical Protection of the *Journal of Nuclear Materials Management,* and is on the Executive Committee of the Southwest Chapter of INMM.

She has a Bachelors degree in Materials Science and Engineering from the Massachusetts Institute of Technology, a Masters degree in Nuclear Engineering from the University of New Mexico, and a PhD in Nuclear and Radiation Engineering, from the University of Texas as Austin.

SNL Team

Moo Lee

Manager, Geomechanics Department
Energy, Nonproliferation, and High-Consequence Security Division

Dr. Moo Y. Lee is the manager of the Geomechanics Department, Sandia National Laboratories. He has over 30 years of experience in hydraulic fracturing in situ stress measurements and complex laboratory / numerical simulations of borehole conditions under poly-axial stress conditions.

Before joining the Geomechanics Department, he was the manager of the Performance Assessment (PA) Department of Sandia National Laboratories, Carlsbad Defense Waste Management Programs Group. Prior to joining the Carlsbad Program Group as a manager, he worked for the Yucca Mountain Project Las Vegas, Nevada and the Geomechanics Department in Albuquerque as a technical staff.

He received his B.S. degree in Mineral and Petroleum Engineering from the Seoul National University, Korea in 1980. After graduation, he came to the U.S. to begin his graduate studies at the University of Wisconsin-Madison, where he received his M.S. and Ph.D degrees in Mining Engineering specialized in Rock Mechanics.

SNL Team

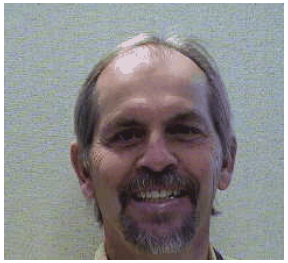
Shawn Taylor

Manager, Security Systems Analysis Department
Energy, Nonproliferation, and High-Consequence Security Division

Dr. Shawn Taylor is the manager of the Security Systems Analysis Department, Sandia National Laboratories. Dr. Taylor has over 10 years' experience in cyber-systems and security including embedded systems, machine learning, enterprise risk management, and cyber-physical security. The Security Systems Analysis Department has expertise that include cyber-physical security, physical security sensors, vulnerability analysis, and enterprise risk analysis.

Dr. Taylor received his Bachelors of Science from the New Mexico Institute of Mining and Technology, and his Masters of Science and PhD from the University of New Mexico.

SNL Team



Jeffrey L. LaChance

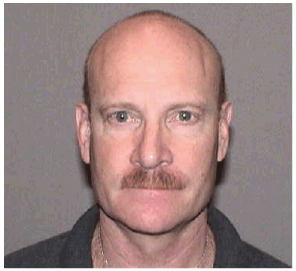
DMTS, Risk & Reliability Analysis Department
Energy, Nonproliferation, and High-Consequence Security Division

Jeffrey L. LaChance is a Distinguished Member of the Technical Staff in the Risk & Reliability Department of Sandia National Laboratories. He has 35 years of experience in nuclear safety and safeguards. Mr. LaChance has focused his work in the area of nuclear safety including probabilistic risk assessment (PRA); safeguards and security; and regulatory, codes and standards development.

Based on his knowledge and experience, Mr. LaChance was asked by the U.S. Department of Energy to go to Japan following the Fukushima Daiichi accident to assess what happened, provide support to the U.S. Embassy and Department of defense, integrate knowledge obtained with U.S. NRC personnel in the embassy, and support the Japanese government in their modeling of the accident behavior.

He has a Bachelors degree in General Engineering (Nuclear Option) from Idaho State University. He is a member of the American Society of Mechanical Engineers/ American Nuclear Society Joint Committee on Nuclear Risk Management, the International Energy Agency Task 31 on Hydrogen Safety, and the National Fire Protection Association and International Organization for Standardization working groups on separation distances for hydrogen facilities.

SNL Team



Timothy A. Wheeler

PMTS, Risk & Reliability Analysis Department
Energy, Nonproliferation, and High-Consequence Security Division

Timothy A. Wheeler is a Principal Member of the Technical Staff in the Risk & Reliability Department at Sandia National Laboratories. Since coming to Sandia in 1980, he has worked in a several areas involving safety and risk assessment of nuclear power plants and transportation of radioactive materials. He was the Sandia project manager for the U.S. NRC Aircraft Threat Assessment program, on which he was also the lead BWR systems analyst. He has also support both U.S. NRC and U.S. DOE risk analysis for the transportation of radioactive wastes, and environmental impact statements for NEPA compliance.

Mr. Wheeler has worked extensively on several programs in support of DOE, NRC, and USCG safety analyses, including system analysis support for U.S. NRC Triennial Fire Safety inspections, low power shutdown safety analysis, plant safety systems analysis for U.S. NRC PRA projects. Mr. Wheeler currently sits on the Subcommittee for Standards Development of the ASME/ANS Joint Committee on Nuclear Risk Management.

He holds a B.S. in Mechanical Engineering from the University of New Hampshire and a M.S. in Systems Engineering from the University of Virginia.

SNL Team

Samuel Durbin II

PMTS, Advanced Nuclear Fuel Cycle Technologies Department
Energy, Nonproliferation, and High-Consequence Security Division

Samuel Durbin II is a Principal Member of the Technical Staff in the Advanced Nuclear Fuel Cycle Technologies Department of Sandia National Laboratories. Since becoming a researcher at SNL in 2005, Dr. Durbin has participated in several multi-disciplinary research efforts including offsite mitigation strategies of radioactive releases, analysis of aerosol dispersal from spent fuel sabotage events, and zirconium fires in spent fuel assemblies. His extensive experimental and analytical background in fluid dynamics and thermal sciences are well suited for the design, analysis, and understanding of complex systems.

Dr. Durbin has a Ph.D. in Mechanical Engineering from the Georgia Institute of Technology.

SNL Team

Janis Trone

PMTS, Performance Assessment Department
Energy, Nonproliferation, and High-Consequence Security Division

Janis Trone is a Principal Member of Technical Staff in the Performance Assessment and Decision Analysis Department of Sandia National Laboratories Carlsbad Program Group.

Ms. Trone has over 25 years experience working on issues related to nuclear waste disposal. She began working on the Waste Isolation Pilot Plant (WIPP) project in 1988 and has worked in many areas including: simulation modeling for the National TRU Program, performance assessment software regression testing and waste inventory to support the recertification of the WIPP, WIPP Quality Assurance team lead, NQA-1 Lead Auditor, and project manager for the KRMC LILW/HLW training programs administered by Sandia National Laboratories.

She is currently working as a technical advisor to the Department of Energy Carlsbad Area Office's National TRU program. Ms. Trone received her BBA in Computer Information Systems from Eastern New Mexico University.

Project Scope

- Statement of Work (SOW) describes activities to address physical security planning and physical protection system (PPS) design, consequence analysis and guidance for computer security, for an advanced nuclear power plant for the Korea Hydro and Nuclear Power Central Research Institute.

Project Scope

- Major Tasks
  - Task 1: Development of a Preliminary Security Plan for an Advanced NPP Design
  - Task 2: Guidance for Computer Security
  - Task 3: Vital Area Identification Analysis
  - Task 4: Loss of Large Area Analysis
  - Task 5: Development of Preliminary Conceptual Design for an Advanced NPP Design
  - Task 6: Consequence Monitoring, Analysis and Impact Studies

Task 1: Development of a Preliminary Security Plan for an Advanced NPP Design

- The Preliminary Security Plan will be based on the most recent template for U.S. commercial nuclear power plants.
- The final deliverable will include the results of other security tasks.
  - Status: Initial Sandia draft outline has been completed. Initial draft incorporating Vital Area Identification information will be completed early 2014. Final version for March 2015 will incorporate information from physical protection system design and evaluation activities.
  - Expected Completion Date: March 2015
  - SNL Staff: F. Durán

Task 2: Guidance for Computer Security

- Provide a collection of IAEA, U.S. NRC, NEI related to the protection of NPP computer security.
  - Status: Completed. A CD with the final report, "Computer Security for Commercial Nuclear Power Plants – Literature Review for Korea Hydro Nuclear Power Central Research Institute" [SAND2013-9156] and files for 32 reports from the literature review have been submitted.
  - Completion Date: October 25, 2013
  - SNL Staff: F. Durán, R. Waymire

Task 3: Vital Area Identification Analysis

- The Vital Area Identification (VAI) analysis methodology and analysis results will be summarized in a report.
  - Status: Preliminary results for the VAI analysis is based on old PRA model but latest location mapping input. Received revised PRA model too late to use for generating results for discussion at meeting. Analysis will need to rerun with revised PRA model for final results. Insights, remaining issues, path forward will be discussed in this meeting.
  - Expected Completion Date: January 2014 (revised to rerun analysis for revised PRA)
  - SNL Staff: J. LaChance, T. Wheeler, F. Durán

Task 4: Loss of Large Area Analysis

- The Loss of Large Area (LOLA) analysis methodology and results for an example LOLA analysis will be summarized in a report.
- Extent of analysis will depend on the PRA and design details available.
  - Status: Approach and analysis plan have been developed. Awaiting final results for VAI analysis.
  - Expected Completion Date: March 30, 2014
  - SNL Staff: J. LaChance, T. Wheeler, F. Durán

Task 5: Development of Preliminary Conceptual Design for an Advanced NPP Design

- The Preliminary Conceptual Design will utilize results from the VAI/LOLA analysis, and will consider requirements for alarms, sensors, and controls.
- Final report will summarize the conceptual design and evaluation.
  - Status: Initial efforts for to define preliminary threat have been completed. Facility characterization is in process. Demonstration design has been developed. Options and schedule for Conceptual PPS Design and Evaluation have been prepared for discussion.
  - Expected Completion Date: December 2014
  - SNL Staff: F.A. Durán, M.J. Parks, G.A. Baum

Task 6: Consequence Monitoring, Analysis and Impact Studies

- Develop storage facility system models to quantify the dose consequence from the specific scenarios analyzed.
- Final report will summarize the results of the consequence assessments.
  - Status: Generic consequence analysis methodology has been documented for presentation at KHNP. These presentation materials will be adapted into report format for the June 2014 deliverable. An FEA deck is in the process of being modified for use in LS-DYNA. This deck will be transferred to KHNP to demonstrate the response of a transport cask to a severe transportation accident. More detailed modeling of the fuel response may need to be reconsidered in order to reduce scope and keep LS-DYNA analysis on schedule.
  - Tentative Completion Date: June 2014
  - SNL Staff: S. Durbin

Task 6: Consequence Monitoring, Analysis and Impact Studies

- Public Acceptance studies will focus on the public perception of risk related to facility design and physical security.
  - Status: Analysis of public perception trends about nuclear safety, security and confidence in nuclear safety have been conducted.
  - Expected Completion Date: March 1, 2015
  - Contract Staff: Prof. Cho, Myongji University
- Consequence monitoring studies will focus on monitoring the dispersion of radioactive materials as a result of a physical security system breach.
  - Status: Collecting data related to fixed dispersion and environmental monitoring systems of the APR1400. Prototype of an aerial platform for laboratory testing has been developed.
  - Expected Completion Date: February 26, 2014
  - Contract Staff: Prof. Yim, University of Las Vegas Nevada

Options for PPS Preconceptual Design and Evaluation

Sandia National Laboratories

KHNP Central Research Institute

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Option 1 - SNL PPS Design & Evaluation												
Develop PreCon Design 1												
Evaluate PreCon Design 1												
Modify PreCon Design 1												
Option 2 - SNL Evaluate/Modify KHNP/CRI PPS Design												
Evaluate KHNP/CRI PPS Design												
Modify KHNP/CRI PPS Design												
Evaluate Modified KHNP/CRI PPS Design												
Option 3 - SNL-KHNP/CRI Collaborate on PPS PreCon Design												
Workshops Using APR1400 Design												
Collaborate on Design												
Collaborate on Evaluation												