

Sandia Engagement with Taiwan Programs in Spent Nuclear Fuel and Radioactive Waste Management

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and

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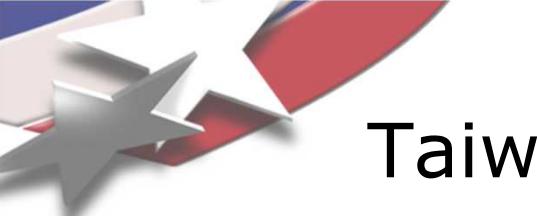
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Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company,
for the United States Department of Energy's National Nuclear Security Administration
under contract DE-AC04-94AL85000.



Sandia Expertise in Radioactive Waste Management

- Long History and Experience in Waste Disposal
 - Scientific Advisor to WIPP
 - Lead Laboratory for YMP
 - Risk and Performance Assessment Technology
 - Site Characterization and Geo-science Technologies
 - Other nuclear waste remediation and disposal projects
- Wide range of related programs
 - Nuclear power plant safety
 - Transportation risk and packaging analyses



Taiwan Industrial Cooperation Program (ICP) Program Phases

LLW Program

- Phase I – [3/05- 7/06]

HLW Program

- Phase I – [6/03 - 8/04]
- Phase II – [10/06 – 3/08] In Progress



LLW Program Phases

- **LLW Phase I [3/05 - 7/06]**
 - Evaluate preliminary site data and conceptual design
 - Develop Performance Assessment (PA) framework
 - Regulatory analysis
 - PA code training
 - Perform and review preliminary PA results

- **Additional phases discussed but on hold pending Taiwan program decisions**



LLW Phase I Technology Transfer

- **Code Training Workshops**

- FRAMES/MEPAS, DUST, BLT-MS, FEHM

- **Regulatory Analysis**

- Presentations on quantitative performance objectives, identifying and screening of features, events, and processes (FEPs) and specification of modeling scenarios

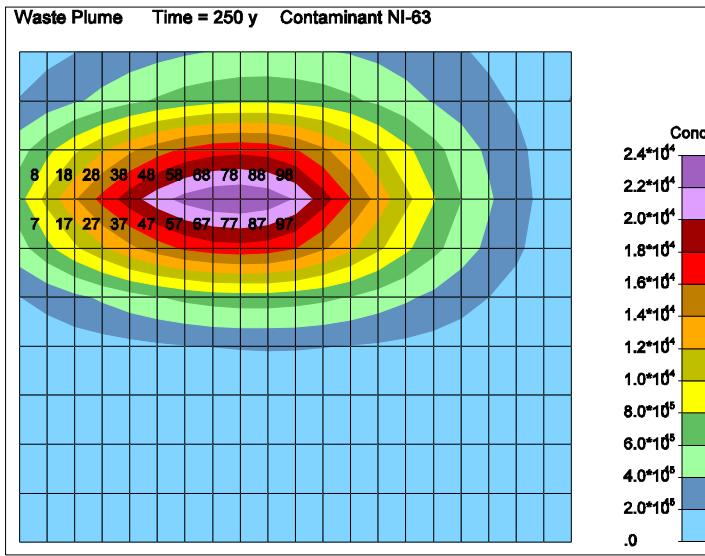
- **Performance Assessment Framework**

- HELP code, GoldSim-BLT integration, FEHM flow models

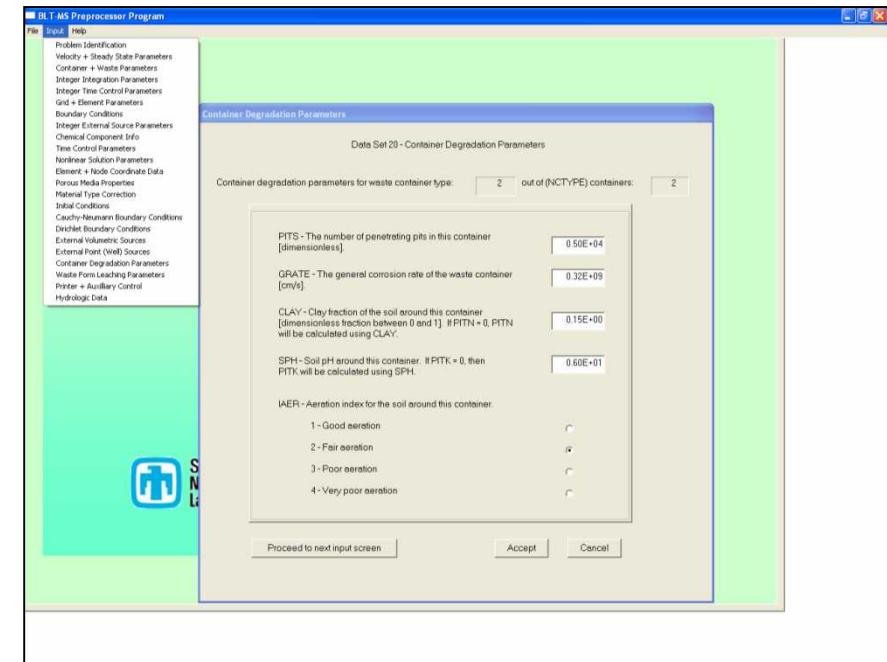
- **Technical Support**

- Evaluated available data and provided comments on data and information needs for performance assessment
 - Obtained approval for and provided several codes to INER
 - Provided INER copies of a number of NRC NUREG, IAEA, and other documents on request
 - Reviewed conference abstracts

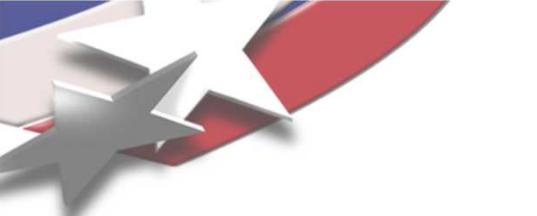
LLW Phase I Technology Transfer



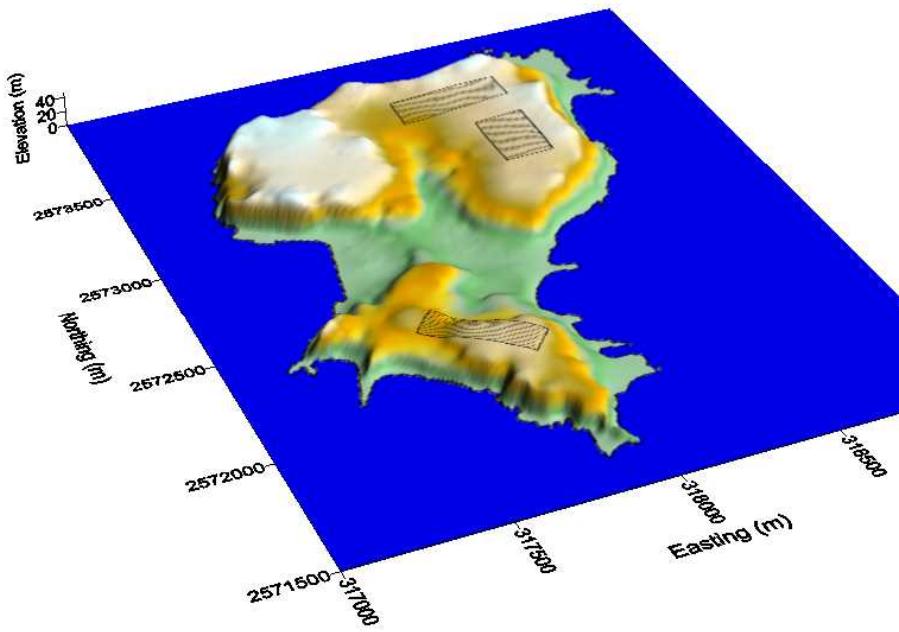
BLTPLOT: Concentration profile for cavern concept from August BLT-MS Workshop



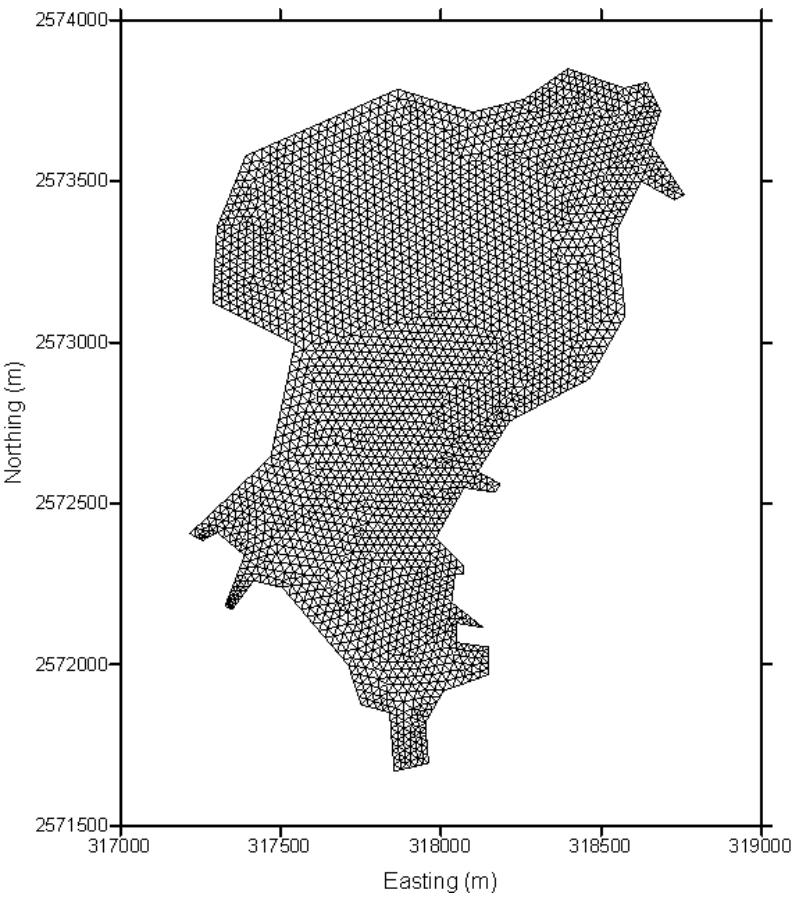
Development of GUI-based BLT-MS pre-processor



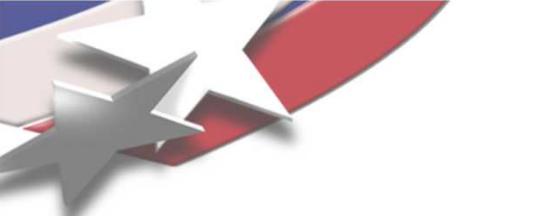
LLW Phase I Technology Transfer



Perspective view of topography and LLW cells for island concept



Groundwater flow model finite element grid for island design concept



Taiwan ICP HLW Program Phases

HLW Phase I – [6/03 - 8/04]

- Established technical contacts between staff at Sandia and INER and ERL
- Gained familiarity with Taiwan's HLW program and technical baseline
- Initiated development and testing of PA code suite
- Conducted Software and QA Workshops
- Performed technical comment and report reviews
- Recommended future technology transfer

HLW Phase I Technology Transfer Workshops

PROBABILISTIC CALCULATION WITH INPAG USING GOLDSIM

INPUTS DIRECTORY

All the values are grouped in an **array data**, whose size is automatically set to the number of species.
The links must be updated if the number of RN is changed

FEHM Workshop

Simulation Results

Simulated Solute Concentrations in the Middle of the Model Domain

Probabilistic Calculation with INPAG using GoldSim

All the values are grouped in an **array data**, whose size is automatically set to the number of species.
The links must be updated if the number of RN is changed

FEHM Workshop

Simulation Results

Simulated Solute Concentrations in the Middle of the Model Domain

Y (m)

X (m)

0 50 100 150 200 250 300 350 400 450 500

0 50 100 150 200

0.05 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1

Slide 8

Key Concepts of QA

Adequate Planning

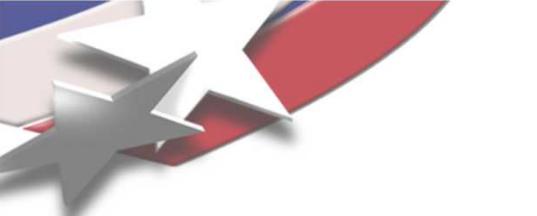
Controlled Execution

Complete Documentation

Thorough Review

Independent Oversight

Sandia National Laboratories



Taiwan ICP HLW Program Phases

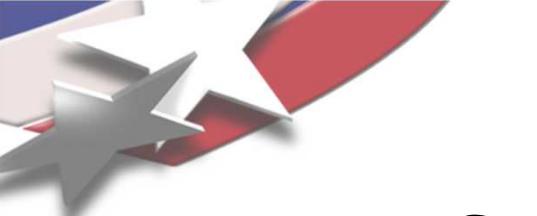
HLW Phase II – [10/06 – 3/08]

– Spent Fuel Interim Dry Storage

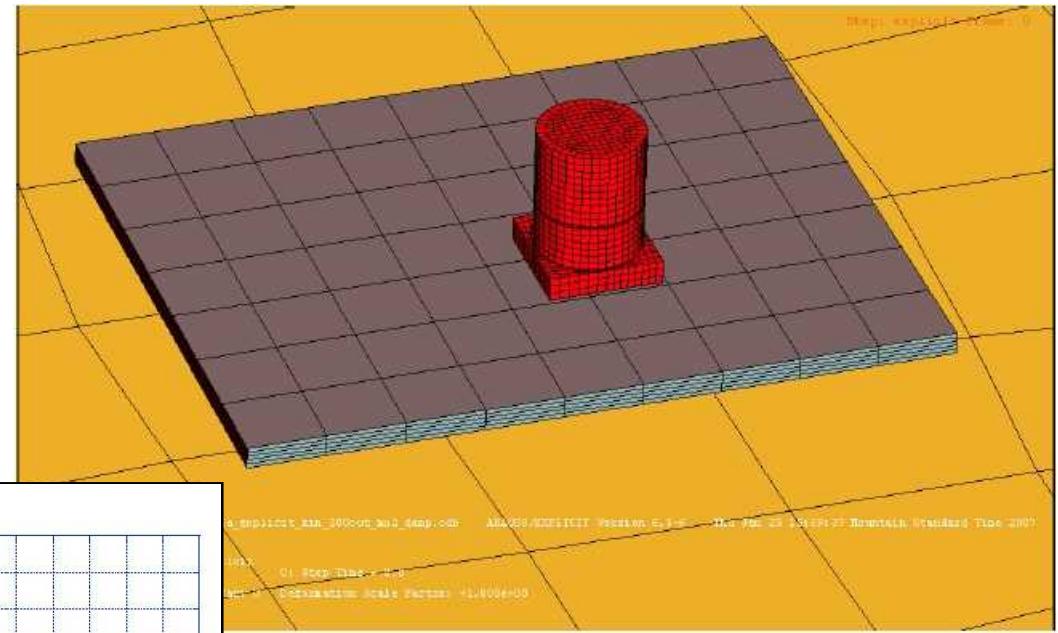
- Review of SAR Thermal and Seismic Analysis
- Development of Sample Thermal and Seismic Models

– Repository Technologies

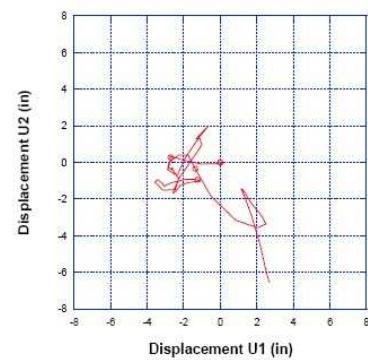
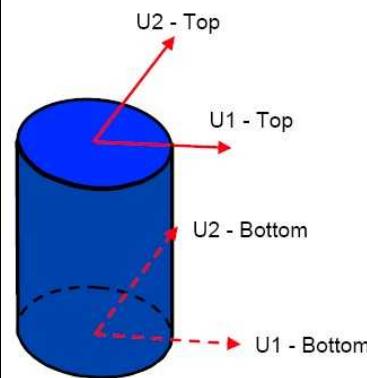
- Site Characterization
 - Workshops with INER and ERL on field, laboratory, and modeling activities related to site characterization, field test planning, data interpretation and model development
- Conceptual model development
- Flow and transport modeling
 - Advanced code applications, biosphere modeling
- Review of INER technical reports



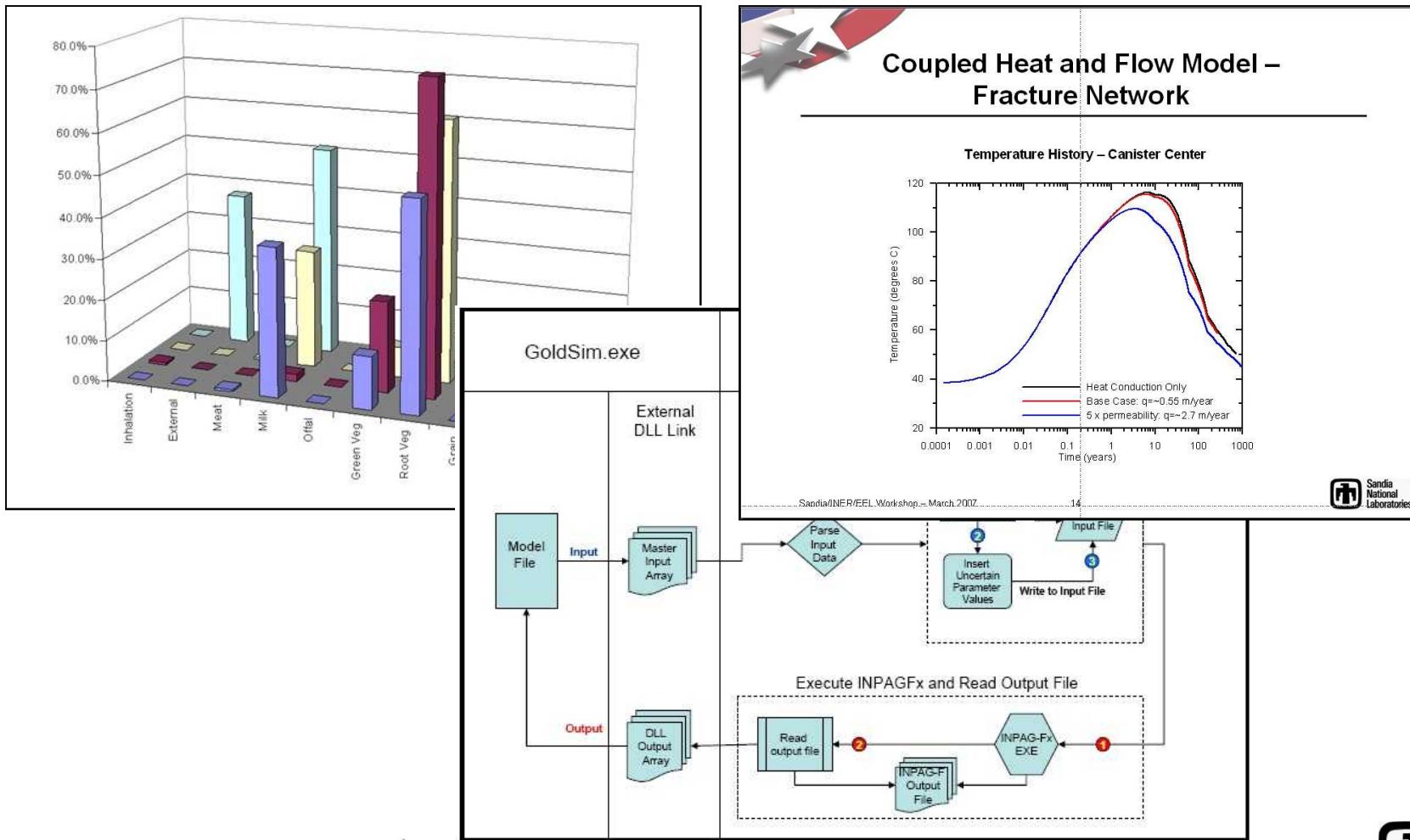
Spent Fuel Interim Storage



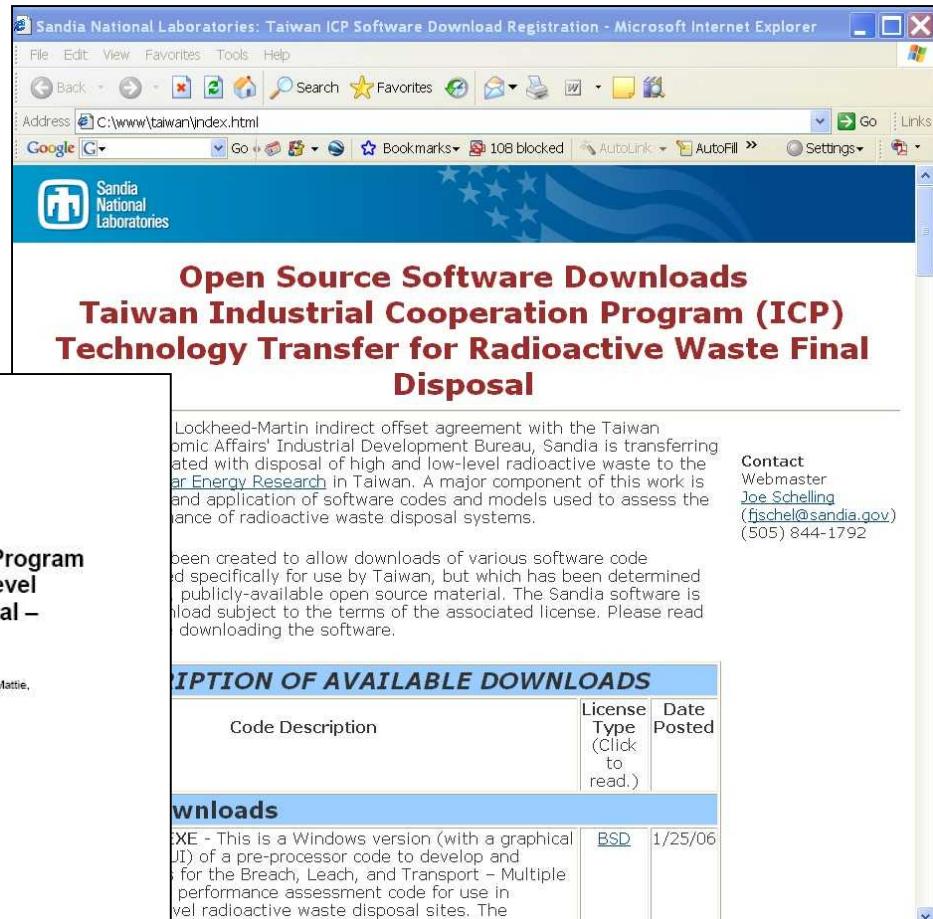
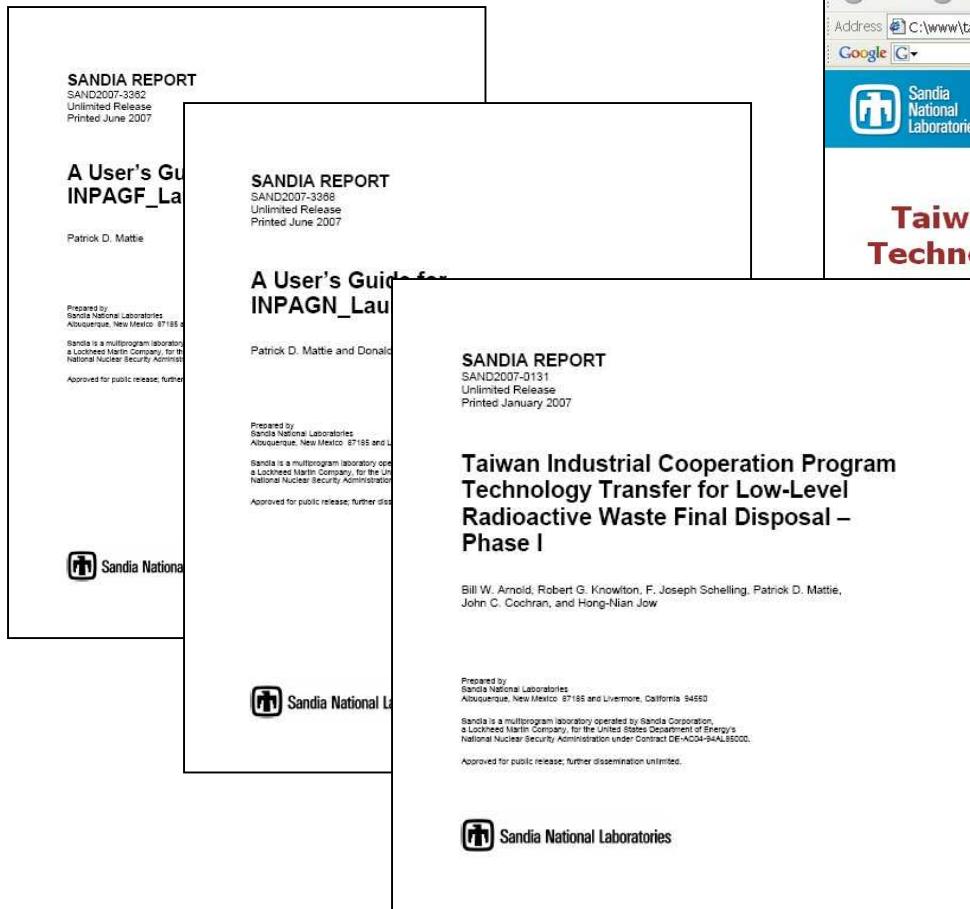
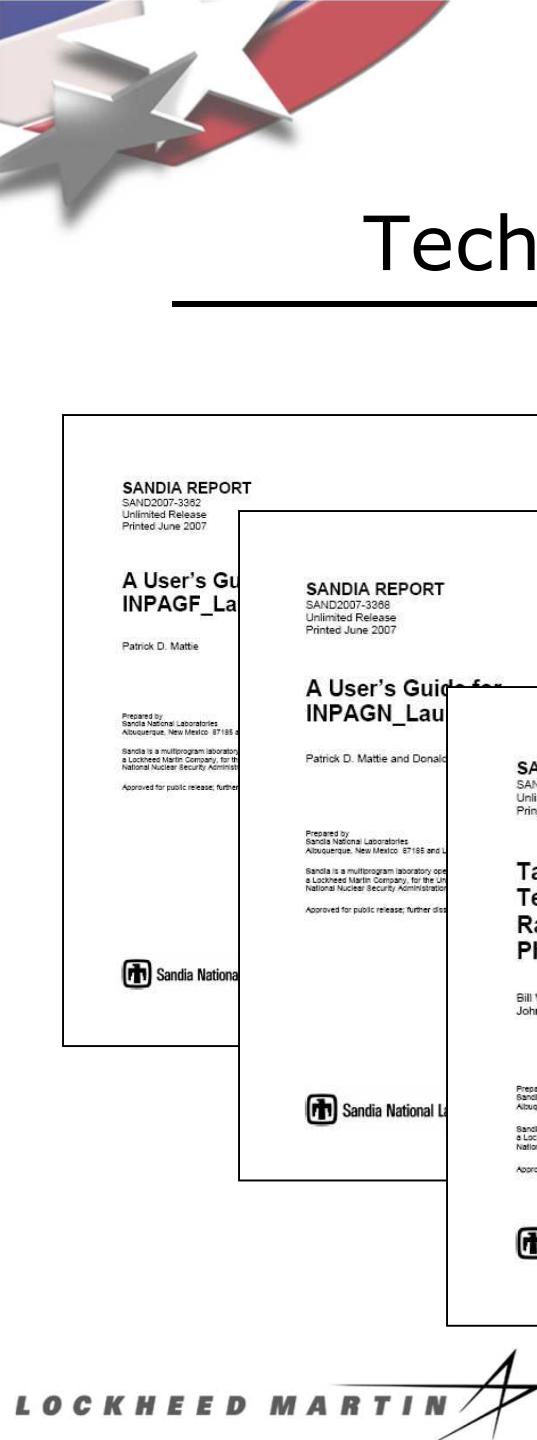
• Cask Displacement

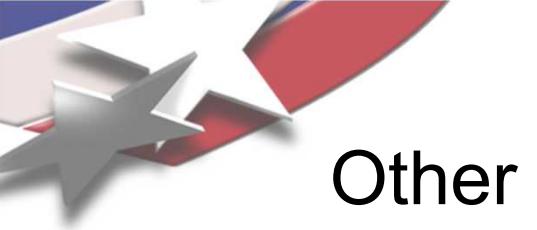


Repository Technologies



Technical Information Transfers





Other Sandia Interactions with Taiwan

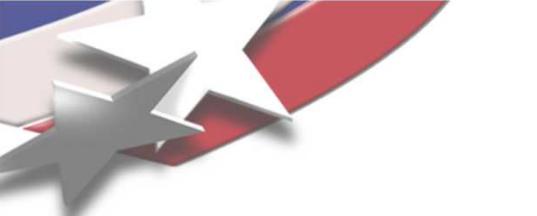
- **AIT/TECRO JSCNEC (Joint Standing Committee on Civil Nuclear Energy Cooperation) meeting:**
 - Sandia has been participating in the AIT/TECRO annual meeting since 1999.
 - In addition to the Physical Protection Topic Area, Sandia also supports DOE/RW in Working Group 2 (Waste Management) discussions and develops new working items jointly with Taiwan organizations.
 - Sandia hosted the AIT/TECRO JSCNEC meeting in 2000 in Albuquerque, New Mexico.



Other Sandia Interactions with Taiwan

(continued)

- Sandia has hosted more than 40 visitors from Taiwan since 1998, including visitors from Taiwan Power, INER, AEC, and Energy and Environment Lab of Industrial Technology Research Institute.
- Sandia organized a Radioactive Waste Management Workshop for US DOE/Carlsbad Office, held in March 1999, at INER.
- Sandia has been a strong supporter of the newly-formed East Asia Forum on Radioactive Waste Management (EAFORM)



Summary

- Sandia has a long history of substantive, productive interactions in radioactive waste management with research organizations in Taiwan.
- Sandia looks forward to future relationships and participation in radioactive waste management activities both in Taiwan and other Asian countries.