

INTERNATIONAL ENGAGEMENT STRATEGIES WORKSHOP REPORT

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CONTENTS

Section	Page
TABLE.....	iii
ACKNOWLEDGMENTS	iv
1 INTERNATIONAL ENGAGEMENT STRATEGIES SUMMARY	1
2 INVENTORY OF REGULATORY AND TECHNICAL ISSUES (D. PICKETT).....	2
3 EXTENDED STORAGE AND TRANSPORTATION/WASTE CONFIDENCE ENVIRONMENTAL IMPACT STATEMENT INFORMATION NEEDS (T. MCCARTIN).....	2
4 REPROCESSING (Y. FARAZ)	3
5 INTERNATIONAL KNOWLEDGE BASES (P. DUBREUILH)	3
6 INTERNATIONAL ENGAGEMENT STRATEGIES (J. GWO).....	3
7 DECOVALEX (R. FEDORS).....	4
8 WASTE PACKAGE AND WASTE FORM (T. AHN).....	4
9 PERFORMANCE ASSESSMENT AND THE SAFETY CASE (O. PENSADO).....	4
10 OVERVIEW OF THE STRATEGY DISCUSSION.....	5
11 CLOSING SUMMARY	5
APPENDIX—International Engagement Strategy Workshop	

TABLE

Table	Page
1 Potential Future Activities With an International Component	5

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QUALITY OF DATA, ANALYSES, AND CODE DEVELOPMENT

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1 INTERNATIONAL ENGAGEMENT STRATEGIES SUMMARY

The International Engagement Strategies Workshop between the U.S. Nuclear Regulatory Commission (NRC) and the Center for Nuclear Waste Regulatory Analyses (CNWRA[®]) was held on August 18, 2011, at NRC in Rockville, Maryland, and by video connection with the CNWRA in San Antonio, Texas. The workshop started at 9:00 a.m. with an introduction by J. Davis and ended at approximately 4:30 p.m. The main purpose of the workshop was to identify potential disposal-related Integrated Spent Nuclear Fuel Regulatory Activities (ISFR) program efforts that would benefit from an international engagement component and to discuss how to develop such activities within the context of the international engagement strategy plan. Approved activities will become part of a broader plan that will eventually include international engagement activities associated with other aspects of the back end of the nuclear fuel cycle, such as reprocessing and storage.

The workshop had two parts, roughly divided between morning and afternoon. Presentations during the first part included summaries of international engagement activities from the past year and examples of potential future activities that illustrated the guidelines for proposing technical work with an international engagement component. Several presentations provided information about how international activities also support data needs in the extended storage, waste confidence, and reprocessing ISFR areas. A concluding set of presentations gave an overview of the high-level priorities, objectives, and goals of the NRC Office of Nuclear Material Safety and Safeguards (NMSS) International Program Plan and provided guidance and examples about how workshop participants are to propose and develop future international engagement activities. The guidelines focused on providing the rationale for a specific international activity and the level of support needed for it; explaining how the international engagement strategies were used to help plan the activity and allocate the resources; stating how the information gained from the international activity would help reduce the cost of developing expertise in this area; and bolstering existing NRC programs by providing a wider knowledge base and describing how to measure the success of the activity. To illustrate this approach, examples were presented (for coupled modeling approaches, waste form and waste package performance, and development of safety cases and performance assessment modeling) of how potential technical activities in these categories could benefit from an international component.

The second part of the workshop was a brainstorming session to identify how international engagement strategies could be aligned with future work on certain key ISFR regulatory and technical issues. Participants worked from a table of items compiled from previously developed lists of potential international connections to specific topics. Participants then applied the guidelines for international engagement strategies (the subject of a presentation earlier in the day) to provide a justification for international engagement for some of the items in the table. As a follow-on activity, participants subsequently prepared and submitted a more detailed set of short descriptions of these and other proposed international engagement activities for technical work, to be considered in the development of a plan for ISFR-related work in the upcoming fiscal year and beyond.

Attendees

NRC: J. Davis, A. Mohseni, J. Rubenstone, K. Stablein, T. McCartin, B. Hill, T. Ahn, R. Fedors, J. Bradbury, Y. Kim, J. Gwo, C. Markley, Y. Faraz, A. Gray, S. Self, and T. Cao

CNWRA: D. Pickett, P. Dubreuilh, J. McMurry, C. Manepally, K. Chiang, R. Pabalan, O. Pensado, and (by video) B. Sagar, X. He, S. Hsiung, R. Janetzke, A. Jung, and M. Juckett

The agenda for this workshop is included as an appendix.

2 INVENTORY OF REGULATORY AND TECHNICAL ISSUES (D. PICKETT)

The presenter reviewed how the disposal-related work activities in ISFR developed from workshops in fiscal year 2010 that identified a set of regulatory and technical issues or “gaps” in the context of anticipated changes to the U.S. high-level nuclear waste management program. Staff described these issues further in short briefing papers. Regulatory issues included topics about updating NRC’s regulations for geologic disposal, improving the efficiency and effectiveness of the repository licensing process, and achieving consistency with other NRC regulations and with international practices. Technical issues were focused on those areas where broader technical knowledge would supplement existing expertise, particularly for processes that are important for multiple disposal options. Technical issues were divided into four main categories:

- (1) Waste form properties, release, and transport
- (2) Geologic conditions and site characteristics
- (3) Performance of engineered barrier systems
- (4) Performance assessment methods

The disposal-related ISFR technical activities in fiscal year 2011 involved information gathering, corrosion and sorption experiments, assessment of alternative modeling tools, and the associated development of reports and workshops. Many of the topics researched the status of related work in other countries, which informed and was integrated into our knowledge base. In discussing this presentation, workshop participants noted the multiple benefits of working with international agencies and regulators in other countries to harmonize regulatory standards and goals, and that there is much to learn from several countries that have made recent advances in improving stakeholder confidence and obtaining siting decisions. A participant reminded the group that we have technical expertise to offer other countries as well.

3 EXTENDED STORAGE AND TRANSPORTATION/WASTE CONFIDENCE ENVIRONMENTAL IMPACT STATEMENT INFORMATION NEEDS (T. MCCARTIN)

The presenter discussed an alternate way of examining system safety in the context of the Fukushima accident by asking questions such as “What could go wrong?” and “How could that happen?” For example, we may have learned from a performance assessment that one of the worst scenarios for radionuclide release in a repository occurs when many waste packages fail at once—so, what could go wrong that would cause this to happen? Similarly, if multiple barriers tend to keep releases low, then what would subvert the barriers after a release (e.g., colloids)? In applying this rationale to waste confidence topics, we should first determine how fuel is going to behave in long-term storage, then challenge with “what could cause it to fail?” Staff should be receptive to public concerns, include and assess the scenarios about which members of the public are concerned, and share the potential negative aspects that are being studied. Staff should engage the public early and often. In a regulatory framework for extended storage, staff should examine International Atomic Energy Agency activities in this area and the need to align other organizations, such as the Nuclear Energy Agency, and assess the return on NRC involvement.

4 REPROCESSING (Y. FARAZ)

A regulatory basis is being developed from the gap analyses for reprocessing, which began before the disposal-related regulatory and technical issues analysis. The program has benefitted from information obtained during visits in the past year to the United Kingdom and France. The presenter discussed the probabilistic risk assessment (PRA) approaches that staff are considering and described a plan to visit the United Kingdom next year to work onsite with Sellafield engineers and to gain insights into their PRA approach, as well as their regulatory structure, stakeholder relations, and environmental requirements, among other factors. The presenter also shared practical tips about how to set up and optimize information-gathering trips abroad, including assistance from the NRC Office of International Programs. The suggestions included (i) provide information to the host in advance that clearly states the purpose of the visit and the subtopics of interest (with specific questions if appropriate); (ii) document insights in a trip report, but be vigilant that sensitive data are not misrepresented, especially in the U.S. media—let the regulator see drafts and comment on them to correct sensitivities; and (iii) be aware that international visits and tours of facilities are not just to gather information about a specific topic, because it is even more important to use the visit to build or strengthen a relationship between the staffs and the two organizations—in some ways, analogous to enhancing public confidence.

5 INTERNATIONAL KNOWLEDGE BASES (P. DUBREUILH)

This presentation summarized one of the main technical activities in the past year, which was to collect published information about the status of nuclear waste management programs in other countries. This activity surveyed the spent fuel and high-level waste disposal programs of 10 countries with advanced programs to learn more about their host rock media, disposal concepts and engineered barrier systems, and the status of their repository siting and stakeholder participation activities. Gathering this information improved staff insights on the various regulatory and technical aspects of the high-level waste programs and helped to define international engagement strategies or specific actions that could lead to collaboration. The presentation included an overview of a few key aspects of high-level waste disposal programs in several countries that differed significantly from the U.S. program with respect to host rock type, engineered barrier systems, and repository siting approaches. The survey identified a number of existing international groups with a common interest in specific topics and recommended more proactive and collaborative involvement with some of these groups.

6 INTERNATIONAL ENGAGEMENT STRATEGIES (J. GWO)

This presentation described the priorities, objectives, and goals of the NMSS International Program Plan and provided guidance about how staff need to propose and develop future international engagement activities. Engagement strategy planning should begin with a self-evaluation of (i) the information needed and the technical issue or technical basis that it addresses; (ii) the potential source for obtaining the information (e.g., a particular organization or program); (iii) potential engagement activities to obtain the information; (iv) a consideration of what expertise and experience we might offer in return to build a strong collaboration; and (v) how to measure the success of the endeavor (how it helped). Practical considerations include the overall relevance of an activity to the ISFR program and how it relates to an identified technical or regulatory issue or gap, an activity's ability to strengthen a professional network or to link with extended storage and/or reprocessing, and the difficulty or ease (time and cost) of obtaining the needed information. Higher level considerations for future activities include their contribution to improving performance assessment reliability and overall

staff review capabilities. The presentation also described several international engagement activities during the past year, such as workshops on several specific technical topics and plans to renew participation in DECOVALEX (Development of Coupled Models and Their Validation Against Experiments). The presentation also identified several topic areas for potential future engagement activities, which were discussed in more detail in subsequent presentations.

7 DECOVALEX (R. FEDORS)

DECOVALEX is a long-standing research collaboration in the international waste management community to improve the understanding of coupled processes (thermal, hydrological, mechanical, and chemical) by modeling field experiments from various underground research laboratories. The next 3-year phase of modeling exercises is in the planning stage and will begin in 2012. The presentation covered the advantages of participating in the DECOVALEX exercises (specifically tasks related to buffer and backfill processes) and described how this activity would fill important information and experience needs and would expand working relationships with a number of other countries and organizations. The presentation described preparation and resources needed to participate in the 2012–2015 DECOVALEX exercises.

8 WASTE PACKAGE AND WASTE FORM (T. AHN)

This presentation provided an overview of ongoing and potential international engagement activities related to two topic areas: (i) waste package and storage canister behaviors and (ii) waste form, cladding, and grid spacing properties. The presenter noted that the technical issue gaps with respect to these topics are also relevant to, and in some cases even greater for, gaps related to transportation and extended storage issues. Engagement activities that are being considered to inform waste package issues include (i) participation in an international workshop on the long-term prediction of corrosion damage in nuclear systems and (ii) a number of collaborative activities about corrosion of carbon steel, copper, titanium, and stainless steel waste package metals (France, Japan, Sweden, and Korea) and the long-term performance of a spent nuclear fuel storage container (Korea). Several of these activities potentially would involve staff exchanges and *in-situ* experiments. Information about cladding performance, a waste form issue of interest for extended storage as well as disposal, could be obtained by staff exchange or collaboration with the European Community Institute for Transuranium in Germany, which is conducting a number of high-profile studies in this area. Related engagement activities about cladding could include involvement with an International Atomic Energy Agency coordinated research project or collaborative studies with AREVA at the European Community Institute for Transuranium or with various agencies in Japan. A key use of information from all of these activities would be data and insights to support performance assessment modeling of alternative container materials and waste forms.

9 PERFORMANCE ASSESSMENT AND THE SAFETY CASE (O. PENSADO)

In July 2011, an international consultant (Galson Sciences) presented a workshop on Scenario Analysis and Performance Assessment to address questions of interest provided in advance by NRC and CNWRA staffs. The workshop identified some differences in safety approaches in other performance assessment programs, such as the use of safety functions and performance indicators as ways of dealing with safety margins and defense-in-depth (similar to subsystem requirements). Some regulators used as low as reasonably achievable concepts for safety assessment to “minimize” doses to the public and the environment. Overall, scenario development in the programs of other countries tends to be more qualitative than in the United States with assessments required for “reasonable” scenarios but not for “nonreasonable” ones, and the qualitative consideration of “what-if” scenarios (i.e., unlikely cases that may

exceed compliance limits) being implemented for insights into system performance. Consequently, the function of the probability thresholds in 10 CFR Part 63 in the United States is state of the art as a marker for the quantitative treatment of various scenarios in performance assessment. Future projects with an international component may include a benchmarking performance assessment exercise or using the modeling code SOAR to explore what-if scenarios from other programs.

10 OVERVIEW OF THE STRATEGY DISCUSSION

To facilitate staff discussion on identifying potential international engagement opportunities, staff identified a set of key strategic goals. The international engagement opportunities identified by staff need to address the overall strategic goal (to enhance nuclear waste safety) and one or more of the following strategic goals:

- Develop the efficient or effective resolution or understanding of key regulatory or technical issues
- Create more robust products (multiple viewpoints)
- Build sustainable relationships to develop trust and cooperation
- Develop and maintain an international leadership role in international organizations, such as the Nuclear Energy Agency or the International Atomic Energy Agency, or as technical experts in specific areas
- Support stakeholder confidence through open communication of regulations with international communities

11 CLOSING SUMMARY

As a concluding activity, staff identified an initial set of activities (Table 1) for further consideration.

Activity	Staff Lead	Technical Area
Cementitious buffer, backfill, or structural materials, including supercontainer safety issues and modeling	R. Pabalan	EBS Performance
Develop performance assessment leadership role through benchmarking and other modeling activities	O. Pensado	Performance Assessment
Data from analogs for performance assessment	D. Pickett	EBS Performance
Compliance determination methodology (e.g., peak of the mean, mean of the peaks)	J. Bradbury	Performance Assessment
Development or use of <i>in-situ</i> instruments as monitoring tools for performance confirmation, site characterization, benchmarking, or retrievability assurance	K. Chiang	General
High burnup fuels, hydrogen generation, copper corrosion	A. Jung	Waste Form or Waste Package

Table 1. Potential Future Activities With an International Component (continued)		
Activity	Staff Lead	Technical Area
Sorption collaboration (Nuclear Energy Agency, FUNMIG-like projects) and biosphere model	P. Bertetti	Engineered Barrier System (EBS) and Biosphere
Waste forms and degradation, waste form cladding and related issues	T. Ahn	Waste Form
Waste package corrosion, performance, monitoring, and mitigation	T. Ahn	Waste Package
Buffer and backfill performance (DECOVALEX)	R. Fedors	EBS Performance
International performance assessment treatment of disruptive or low probability events, in comparison with NRC's approaches	O. Pensado or T. Cao	Performance Assessment
International license hearings per regulations (adjudicative vs. administrative)	T. McCartin	Regulatory
Participation in SKB EBS club	R. Fedors	EBS Performance
Salt as host rock	C. Manepally	Near/Far Field
Involvement in Clay Club, with focus on buffer and host rocks	R. Fedors	EBS Performance
Stakeholder involvement, international harmonization and stakeholder confidence	M. Juckett and J. Kotra	Regulatory

APPENDIX

International Engagement Strategy Workshop
August 18, 2011, 9:00 am–4:30 pm EDT
(8:00 am–3:30 pm CDT)

NRC, Rockville, MD
Conference Room EBB–2C19

9:00 am	1.	Introduction	(Jack Davis, et al.)
9:15 am	2a.	Inventory of Regulatory and Technical Issues: Key Issues Identified by the Task 2 Team	(David Pickett)
9:35 am	2b.	Extended Storage and Transportation and Waste Confidence EIS: International Information Needs	(Tim McCartin)
9:40 am	2c.	Reprocessing: International Information Needs	(Yawar Faraz)
9:45 am	3.	International Knowledge Base: Overview of International Surveys Performed to Date	(Philippe Dubreuilh)
10:00 am	4.	International Engagement Strategies: Overview of Future Direction	(Jack Gwo)
10:20 am	<i>Break (15 min)</i>		
10:35 am	5.	DECOVALEX: Project Description, Relevance, and Benefits	(Randy Fedors)
10:50 am	6.	Waste Form and Waste Package: Projects, Relevance, and Benefits	(Tae Ahn)
11:10 am	7.	Performance Assessment and the Safety Case: Projects, Relevance, and Benefits	(Osvaldo Pensado)
11:20 am	8a.	Brainstorming on International Engagement Strategies and Alignment With Key Regulatory and Technical Issues	(All)
TBD	<i>Lunch (1 hr)</i>		
TBD	<i>Afternoon Break (15 min)</i>		
4:00 pm	9.	Summary and Action Items	(All, 30 min)