

International Decommissioning Regulatory Initiatives and U.S. Nuclear Regulatory Commission Involvement

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Abstract – *The U.S. Nuclear Regulatory Commission (NRC) plays a significant international role with respect to the decommissioning of nuclear facilities. In its international involvement, NRC has participated in technical and regulatory information exchanges, assisted in writing international safety guidance documents, and advocated positions that it felt were in the best interest of all parties in the international community.*

The primary international organizations with which the NRC interacts in decommissioning topics are the International Atomic Energy Agency (IAEA) and the Nuclear Energy Agency (NEA). Some examples of the NRC's involvement with these organizations include the IAEA Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (Joint Convention) and the NEA's Working Party on Decommissioning and Dismantling (WPDD). Both of these activities include cooperation with the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy (DOE).

In the case of the Joint Convention, this is an official international treaty. As such, a major part of the NRC's activities is the peer review process of other ratifying states' radiological waste safety programs. The preparation of the National Report addressing the U.S. program for civilian spent fuel and radioactive waste management, including decommissioning, is a major undertaking by the NRC, DOE and the EPA.

With respect to decommissioning, the approaches and organizational strategies vary from organization to organization, and from country to country, but the fundamental criteria tend to be sufficiently comparable when evaluating progress in the diverse international decommissioning activities. By working with the international community on this matter, the NRC provided the benefit of its experience in active decommissioning and preserved flexibility within the U.S. decommissioning regime by dissuading the adoption of overly prescriptive approaches to decommissioning.

The NRC has been actively involved in the preparation of international safety standards and guidance in the area of decommissioning. Examples of publications on this topic include: WS-R-3 Remediation of Areas Contaminated by Past Activities and Accidents and DS332 Release of Sites from Regulatory Control upon Termination of Practices (draft).

The NRC also has arrangements with many foreign countries which include import/export, expert advice, information exchanges, and site visits. These are done on bilateral and on multi-lateral bases. NRC has had a longstanding, biannual exchange with its French counterpart. Specific issues include polluted sites, which are equivalent to NORM sites. Perspectives regarding the implications of the Joint Convention's triennial review meetings were also exchanged. Similar exchanges have been conducted with the United Kingdom, Japan, Taiwan, and Spain.

The primary multi-lateral exchange involving the NRC is with Mexico and Canada. Decommissioning is the usual waste management topic. Recent meetings addressed decommissioning experience and regulatory developments and the Joint Convention.

Topics that are discussed with the international community include the feasibility of regional waste repositories and the impacts of the ICRP recommendations on restoration of contaminated sites.

I. INTRODUCTION

The NRC is actively engaged with the international community to achieve the following decommissioning objectives:

- a. Ensure the dissemination of information on approaches and techniques to achieve

decommissioning through the sharing and transfer of technology and experience.

- b. Establish realistic, risk-informed goals for decommissioning, as well as performance based implementation of such goals.

- c. Ensure U.S. security by encouraging and supporting accountability of materials that result from decommissioning. An example is the cooperation with the DOE's foreign research reactor fuel take back program.

There are a number of initiatives dedicated to enhance safeguards in the international "nuclear" community. The NRC's international activities provide an overall strategy, which is compatible with these other specific programs to account for radioactive materials that are approaching the end of their usefulness in peaceful applications throughout the world. Additionally, the U.S. benefits from the experience of others that may have had to deal with facility cleanups and other decommissioning considerations. By participating in international activities, the NRC is able to put forth its own approach and policy that, to some degree, affects international approaches and policies.

II. NRC'S INTERNATIONAL PROGRAM ACTIVITIES RELATING TO DECOMMISSIONING

The NRC maintains expertise in the area of commercial application of nuclear energy and materials. The NRC's Office of International Programs (OIP) is responsible for overall coordination of NRC's international activities. [1] OIP plans, develops and implements programs, in concert with other NRC offices, to carry out policies in the international arena, including export and import licensing responsibilities. It also establishes and maintains working relationships with individual countries and international nuclear organizations. Some of the interactions require liaison with the U.S. State Department; which maintains points of contact with U.S. Missions overseas.

II.A. Individual Country Interactions

The most basic level of international activity is on a country to country basis; i.e., bilateral exchanges. The NRC has historically encouraged such opportunities over the years. Programs involving mixed-oxide fuels with Russia and the disposition of solid materials with Japan and France have lead to a common understanding in dealing with these issues.

II.B. International Organizations

On a higher level are the formal interactions with the International Atomic Energy Agency (IAEA), the Nuclear Energy Agency (NEA), and to some limited extent the European Commission. Representatives of the U.S. Government; i.e., experts from NRC, DOE, and EPA, participate in drafting guidance documents, reviewing IAEA publications, performing peer reviews, and

reviewing Member States programs as part of the IAEA's Technical Co-operation Program. Although many such activities are done on an *ad hoc* basis, some standing venues exist. These include:

II.B.1. International Atomic Energy Agency

Although there are other IAEA safety standards committees, decommissioning is primarily within the scope of the Waste Safety Standards Committee (WASSC). This committee meets twice per year (in the Spring and the Fall) to endorse action plans and review and approve IAEA safety standards series documents. The NRC's Division of Waste Management and Environmental Protection (DWMEP) has been the U.S. representative to this committee in recent years. Documents reviewed within WASSC have significant impacts on many Member States, which use the standards as their own national criteria for regulating decommissioning, as well as other parts of the nuclear fuel cycle.

When standards are approved at the WASSC level, they are submitted to the Commission on Safety Standards (CSS), which compares and objectively reviews the standards provided by the WASSC and its sister committees. See Fig 1.

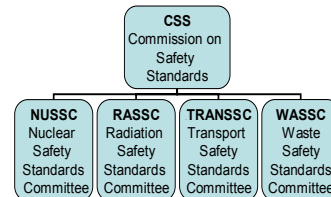


Fig. 1. IAEA Advisory Committees

The approved standards then are passed along to the higher diplomatic bodies of the IAEA, such as the General Conference and the Board of Governors. Within this framework, Member States are provided drafts of the documents, for their review and comment, prior to the official publication. These documents are not generally mandatory for any Member State, but serve the purpose of a good point of reference to use in their own national program. However, if a Member State is receiving technical assistance from the IAEA, then it is bound to

accept these IAEA standards within its own regulatory system.

The IAEA Member States are refining the regulatory approach in the IAEA safety standards to disengage decommissioning from the present perspective of considering it as a part of predisposal management. The current safety requirement, Safety Standards Series No. WS-R-2 *Predisposal Management of Radioactive Waste, Including Decommissioning* will be revised to generate a new safety requirement on decommissioning, now under preparation as DS-333 *Decommissioning of Nuclear Facilities*. A related Safety Guide DS-332 addresses release of sites from regulatory control upon termination of practices. However, it should be noted that the IAEA, like many individual Member States, treat land or site cleanup, referred to as Rehabilitation of Contaminated Areas, under its own separate safety requirement: Safety Standards Series No. WS-R-3 *Remediation of Areas Contaminated by Past Activities and Accidents*. Additional information about the IAEA's Safety Standards program on all safety topical areas, including decommissioning and clearance can be found at URL: <http://www-ns.iaea.org/standards/>

II.B.2. Nuclear Energy Agency

The Organization for Economic Development and Cooperation has a suborganization, which is the Nuclear Energy Agency. Much of the NRC interaction with the NEA on decommissioning is focused within the Radioactive Waste Management Committee (RWMC), which is currently chaired by the Deputy Director of the NRC Office of Nuclear Material Safety and Safeguards. The RWMC continues to review and direct the NEA work in the area of radioactive waste management, including the activities of three working parties under its purview, i.e., the Integration Group for the Safety Case (IGSC), the Forum on Stakeholder Confidence (FSC), and the Working Party on Management of Materials from Decommissioning and Dismantling (WPDD). The WPDD operates at the policy and regulatory level and complements the technical work of the International Co-operative Programme for the Exchange of Scientific and Technical Information Concerning Nuclear Installation Decommissioning Programmes (CPD). The CPD provides a forum for ensuring that safe, economic, and environmentally-protective options for decommissioning are employed. The CPD also reports to the RWMC, but does not involve site projects in the USA. [2] Most of the NRC's activities involving decommissioning in the NEA context are related to annual meetings and specialized workshops. The NEA publishes the proceedings and the brochures produced during these exchanges, as an aid to its Member States seeking to maintain or improve their

decommissioning regulatory systems. These proceedings are usually joint publications with the IAEA, the NEA and other organizations, such as the European Commission. [3]

II.C. Specific Examples of NRC's International Program Activities Relating To Decommissioning

Examples of the NRC's international involvements include the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (Joint Convention), and bilateral and other exchanges.

II.C.1. Joint Convention

The Joint Convention is a treaty between the IAEA and Member States, which requires ratification at the highest national level. The 2 main foci of the Joint Convention are 1) the preparation of the national report and 2) the active participation in the review process. The next revision of the national report is due in October 2005, and the review meeting is scheduled in May 2006. It was initiated as an outgrowth of the Convention on Nuclear Safety for nuclear power plants. The United States of America ratified the Joint Convention in May of 2003, and participated in the first national report review meeting held in November 2003. Thirty three Member States had ratified the Joint Convention and participated in a review meeting, which consisted of separate sessions in which each ratifier's national spent fuel and radioactive waste management programs were reviewed in detail. The overall process and experience was considered a success; however, there are 138 Member States, and many significant ones have not yet ratified the Joint Convention, including Russia, the People's Republic of China, and India. In fact, only 1 Latin American country (Argentina), 2 Asian countries (Japan, and the Republic of Korea) and 1 African country (Morocco) have ratified so far. This leaves the Joint Convention as mostly a North American and European enterprise.

The IAEA and the ratifying Member States have acknowledged this shortcoming and are planning a series of regional workshops in the under-represented continents. Expert assistance in setting up safety regulatory infrastructures, as well as assistance in the form of technology and resources, is planned as part of this promotional strategy.

The national report process consists of textual presentation of a ratifying country's national program for spent fuel and radioactive waste management. Defense and NORM wastes are excluded, unless voluntarily provided by that country. Information on active decommissioning, waste disposal and storage, and

management of disused sealed sources are required as part of the reporting process. The first U.S. National Report can be accessed at:

http://web.em.doe.gov/integrat/National_Report_05-02-03_1.pdf. The combined effort of the DOE, EPA and NRC is currently directed to revise the report for

submittal and consideration during the 2nd review meeting in May 2006. The closing plenary from the 1st review meeting recommended some improvements and clarifications in the next round. [4] Those specifically focused on decommissioning include:

- there was a growing recognition of the need for the development and implementation of integrated decommissioning and radioactive waste management plans;
- there was the need to make adequate financial provision to cover the costs;
- there was the need to ensure that adequate records were kept by the operators, of inventories and activities, throughout the operating period of the facility;
- there was the need to incorporate considerations of decommissioning into the design of a nuclear facility; and
- provisions are needed for the disposal of waste produced in the decommissioning process.

One of the observations from the meeting was the diversity in the manner in which each Member State implemented the decommissioning regulatory infrastructure. Many countries have a centralized authority for dealing with the decommissioning of nuclear facilities and practices. The U.S. situation was not typical of the mainstream. Under the Atomic Energy Act of 1954, as amended, decommissioning of materials sites has been split between Agreement States and the NRC. The Federal relinquishment of licensing authority often confuses our international counterparts. This has also made the collection and centralization of the data and information for the U.S. National Report more of a challenge, because the information required by the Joint Convention is maintained by numerous entities, some of whom are very protective of the information.

Currently, the EPA, DOE and NRC are preparing the U.S. National Report and will be addressing the major improvement areas, not only for decommissioning, but also for other areas such as emergency preparedness, inspection and enforcement, and staffing and human resource trends.

The clear message to most of the Contracting Parties was that more needed to be done in the planning, implementing and completion of decommissioning in the overall national program of nuclear safety.

It remains to be seen how well the participants in the Joint Convention process have taken the message to heart.

II.C.2. Bilaterals, Trilaterals and Other Exchanges

The NRC has hosted numerous foreign delegations to the U.S. over the years, which have included former Soviet Block countries trying to recover from the cold war nuclear buildup (not only in weapons, but also in power generation and other materials uses). However, there are a few relationships that have lasted over a number of years.

These include a bi-annual exchange with the French nuclear safety authority, DSIN, which usually covers decommissioning topics, such as the DSIN's extension of regulatory authority over "polluted sites," which refers to a class of waste legacy sites. The NRC shared its experiences with the West Valley Demonstration Project and other Complex Decommissioning Site experiences. [6] In fact, the NRC participated in a French workshop in May 2004 on decommissioning, which was hosted by the Direction Générale de la Sécurité Nucléaire et de la Radioprotection - DGSNR. The NRC discussed its efforts to evaluate previously licensed sites from uranium mills to nuclear reactors to determine if the sites met the release criteria in effect at the time of license termination. The result was that 42 formerly licensed sites were found to have residual contamination levels exceeding USNRC's criteria for unrestricted release. The NRC and its Agreement States moved to address those sites. [7] NRC staff benefited from a site visit to Brennelis, a 73 MWe, heavy water reactor undergoing decommissioning. Issues such as clearance and recycle, transparency and disposition of waste from decommissioning were discussed.

The trilateral between Canada, Mexico and the U.S., specifically the NRC, has been useful in the past in promoting exchange of information regarding security, decommissioning and the impacts of ratification of the Joint Convention. To date, Canada and the U.S. have ratified and participated in the first round of activities associated with the provisions of the Joint Convention. In recent exchanges, there has been continued sharing of information on decommissioning programs and site selection. As a result of our increased security concern, more emphasis has been placed on export/import issues, radiological material tracking and transportation issues.

Lastly, the NRC's Decommissioning Program support of the Office of International Programs' workshops in decommissioning has been a successful means of disseminating NRC's decommissioning approach to other nations helping to achieve the first 2

objectives cited in the introduction. In March 2004, the NRC provided a decommissioning workshop to the Taiwan Atomic Energy Council and Fuel Cycle and Materials Administration. In June 2005 a similar decommissioning workshop is planned for the Russian Rostekhnadzor. The NRC has also recently hosted a foreign assignee in decommissioning from the Peoples' Republic of China.

II.D. Decommissioning and the International Setting

USNRC regulates (10 CFR Part 20) the decommissioning of materials and fuel cycle facilities, research and test reactors, and power reactors, with the ultimate goal of license termination. The current USNRC dosed-based unrestricted release limit is 0.25 mSv/a (25 mRem/y) (Total Effective Dose Equivalent) to the average member of the critical group from all exposure pathways and demonstration that the residual contamination levels are ALARA.

However, many other countries use a fraction of 1 mSv/a (100 mRem/y) to the average member of the critical group, but this is the effective dose as cited in the International Commission on Radiological Protection (ICRP) publications (e.g., Publication 60 and 82). Usually 0.3 mSv/a (30 mRem/y) above background as the dose constraint for decommissioning or environmental rehabilitation of sites is typically used. Other countries maintain that the same dose constraint should be applied to both release of decommissioned or rehabilitated sites, as well as for the control of the disposition of solid materials (CDSM) (e.g., recycle of metals and equipment. The NRC has espoused a graded approach that accounts for the need to reasonably apply scarce resources when dealing with small numbers to avert doses that lie far below the recommended safe range. [5] Another aspect in which the NRC differs from other international counterparts, including the IAEA is that NRC groups decommissioning and environmental rehabilitation together from the regulatory perspective. Other countries distinguish between the two, although this does not necessarily present a fundamental inconsistency; rather an administrative distinction.

Perhaps the main areas in which NRC has been trying to foster some international harmony are in the decommissioning versus CDSM topic mentioned previously and in the concept of adjusting the baseline background for subsequent practices. The NRC has cautioned its international counterparts with respect to the approach to revise the baseline background, in the case that the terminated practice has not been able to return to the pre-operational levels. Of course, it is unrealistic to expect that the post-operational levels would not reflect some degree of residual effect from a terminated practice.

However, to add this residual contamination to the original background to result in a "new" background is of concern, as this could lead to a sequence of "adjustments" over time, which could very well lead to a resultant background much higher than the original one. This chain of incremental deterioration is in conflict with the applicable NRC regulations as stipulated in 10 CFR Part 20, Subpart E.

III. CONCLUSIONS

The advantages of the international interface provided in the area of decommissioning have long been recognized by the NRC as a 2-way path. We learn from our international counterparts, and we share our experiences in likewise fashion.

In our continued international interactions, we find common ground in areas where we still have work to do in the specific decommissioning context. These areas include:

- securing adequate institutional controls;
- complexity of site/dose modeling;
- influence from diverse stakeholders; and
- decommissioning funding.

Broader topics, which require national and international attention, that also influence decommissioning decisions include:

- feasibility of regional waste repositories;
- impacts of ICRP recommendations on rehabilitation of contaminated sites (ICRP 82);
- progress and incentives to initiate decommissioning planning early in the life cycle of a proposed activity; and
- promoting full participation in the Joint Convention process.

The NRC needs to continue its participation in these international venues to preserve our leadership role in decommissioning. In this manner, we can promote the NRC's decommissioning approach and benefit from others' decommissioning experiences.

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REFERENCES

1. NRC Website. URL: <http://www.nrc.gov/who-we-are/organization/oipfuncdesc.html>
2. OECD/NEA Website URL: <http://www.nea.fr/html/rwm/wpdd/>
3. *Joint NEA/IAEA/EC Workshop on the Regulatory Aspects of Decommissioning*. Agenzia Nazionale per la Protezione dell' Ambiente. Rome, Italy. (19-21 May, 1991).
4. IAEA Web site URL: <http://www-ns.iaea.org/downloads/rw/conventions/summary-report-first-rev-meeting-e.pdf>
5. NRC Web site URL: <http://www.nrc.gov/materials/decommissioning/decom-sites.html>
6. J. GREEVES, D. ORLANDO, J. BUCKLEY, G. GNUGNOLI, R. JOHNSON. "*NRC's Program for Remediating Polluted Sites.*" DGSNR Workshop on Polluted Sites. Paris, France. (May 2004)
7. J. GREEVES, D. ORLANDO, G. GNUGNOLI, "*Removal of Controls for Decommissioning: A Graded Approach.*" *International Conference on the Safe Decommissioning for Nuclear Activities: Assuring The Safe Termination of Practices Involving Radioactive Materials*, Berlin , Germany, 14-18 October 2002.