

**UNITED STATES DEPARTMENT OF ENERGY  
NUCLEAR MATERIALS STEWARDSHIP**

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**ABSTRACT**

The Department of Energy launched the Nuclear Materials Stewardship Initiative in January 2000 to accelerate the work of achieving integration and cutting long-term costs associated with the management of the Department's nuclear materials, with the principal focus on excess materials.

Management of nuclear materials is a fundamental and enduring responsibility that is essential to meeting the Department's national security, nonproliferation, energy, science, and environmental missions into the distant future. The effective management of nuclear materials is important for a set of reasons: 1) some materials are vital to our national defense; 2) the materials pose physical and security risks; 3) managing them is costly; and 4) costs are likely to extend well into the future.

The Department currently manages nuclear materials under eight programs, with offices in 36 different locations. Through the Nuclear Materials Stewardship Initiative, progress was during calendar year 2000 in achieving better coordination and integration of nuclear materials management responsibilities and in evaluating opportunities to further coordinate and integrate cross-program responsibilities for the treatment, storage, and disposition of excess nuclear materials. During CY 2001 the Departmental approach to nuclear materials stewardship changed consistent with the business processes followed by the new administration.

This paper reports on the progress of the Nuclear Materials Stewardship Initiative in evaluating and implementing these opportunities, and the remaining challenges in integrating the long-term management of nuclear materials.

**DEPARTMENT OF ENERGY APPROACH IN CY 2000**

The U. S. Department of Energy (DOE) formally chartered the Nuclear Materials Stewardship Initiative (NMSI) in January 2000 to address existing vulnerabilities and plan for the nation's long-term stewardship of nuclear materials. Since the late 1980's, the DOE has been transforming itself to adapt to the changing international strategic and policy arena resulting from the collapse of the Soviet Union. Mission areas have been expanded as a consequence, as have the number of programs charged to implement them.

The goal of the NMSI was to develop a "corporate strategy" for addressing all fissile materials, non-fissile materials to the extent practicable, and facilities and other infrastructure needed to meet DOE's current and future mission requirements. Prior to the NMSI, each program sought

to effectively address its specific responsibilities, but corporate integration was often difficult, and without any benefit of a strategic framework within which policy implications could be analyzed and addressed.

The NMSI was implemented under the direction of the Department's Nuclear Materials Council. Through the Nuclear Materials Council, decision making was elevated to the corporate level for the life cycle management of nuclear materials that protects national security, is safe, environmentally sound, efficient, cost-effective, and has appropriate nonproliferation-driven transparency. Figure 1 shows the functional structure employed by the NMSI.

## Nuclear Materials Stewardship Initiative Functional Structure

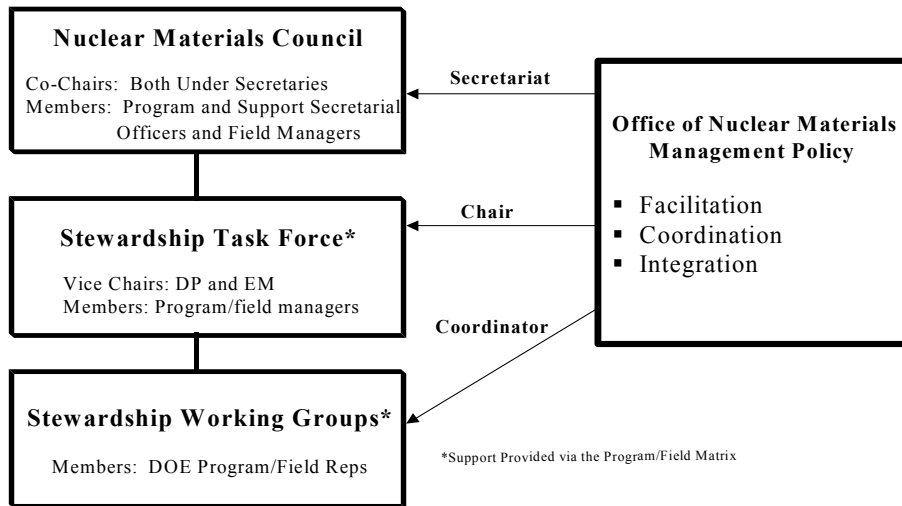


Fig. 1. Functional structure employed by the NMSI.

### DEPARTMENT OF ENERGY APPROACH AFTER CY 2000

The approach followed in CY 2000 for corporate nuclear materials stewardship worked well for the Department's leadership during the previous administration. However, the new administration, installed during early CY 2001, preferred different business processes that did not favor use of ad hoc groups to conduct departmental activities. Therefore, during CY 2001 the corporate approach became one of direct program-to-program cooperation. As a result the Nuclear Materials Stewardship Initiative became inactive and critical cross-program issues were addressed directly by the program offices. The next section will summarize the accomplishments under the NMSI followed by identification of ongoing cooperative efforts among programs to continue addressing critical issues.

## **ACCOMPLISHMENTS UNDER THE NUCLEAR MATERIALS STEWARDSHIP INITIATIVE**

The NMSI Charter has focused on three key actions during CY 2000. These were: 1) preparation of the Integrated Nuclear Materials Management Plan; 2) disposition recommendations for a select set of high priority cross-program issues; and 3) development of an approach for upgrading and integrating the Department's nuclear materials management and inventory information systems. This paper addresses the specific progress made in each of these areas and shows how the United States' approach to managing its nuclear materials is fully in concert with, and provides the leadership for, our international commitments and treaty obligations.

### **Integrated Nuclear Materials Management Plan**

The Integrated Nuclear Materials Management Plan, conveyed to Congress in July 2000, described existing conditions in the United States, presents the Department's first consolidated account of its unclassified inventory of nuclear materials and a description of how they are managed, and examines opportunities for greater integration. The Plan committed the Nuclear Materials Council to a 25-point, multi-year agenda. Substantial work on this agenda was accomplished during CY 2000. The effective management of nuclear materials is important for a set of reasons: 1) some materials are vital to our national defense; 2) the materials pose physical and security risks; 3) managing them is costly; and 4) management of materials is likely to extend well into the future. The projected outcome of the effort set forth in the plan was reduced costs, enhanced efficiencies, and a strengthened long-term management of vital nuclear materials-driven missions.

The nuclear materials covered most extensively by the Plan were plutonium and uranium. The current baseline programs are summarized below.

#### Plutonium

Plutonium materials are managed for continued national security and non-national security programmatic uses or as surplus. The major portion of national security plutonium will remain in the weapons stockpile and associated strategic reserve. Smaller quantities are required by various elements of the Stockpile Stewardship Program to support continued maintenance of the U.S. weapons stockpile. The Department's policy is to eliminate, where possible, the stockpiles of surplus plutonium and ensure the highest standards of safety and accountability.

The Department is in the process of stabilizing its surplus plutonium materials such as metals and oxides and repackaging pits to place them in safe conditions in special packaging that meets standards for long-term storage. The Department's direction has been to consolidate non-pit plutonium at the Savannah River Site (SRS) using existing storage facilities, upgraded as required, to facilitate closure of facilities at Rocky Flats.

The Department has been pursuing a hybrid approach for disposition requiring construction of three facilities at the SRS. These are: 1) a pit disassembly and conversion facility to disassemble nuclear weapons pits and to convert metal to a declassified oxide form suitable for international inspection and monitoring; 2) a facility to fabricate mixed-oxide (MOX) fuel for irradiation in

domestic commercial reactors; and 3) an immobilization facility to convert plutonium stocks not suitable for reactor fuel to a ceramic form for disposal in a geologic repository.

The costs of simultaneously building three plutonium disposition facilities together with other national security requirements make it increasingly unlikely that adequate annual funding will be forthcoming in the future. The path forward will be decided after the conclusion of a National Security Council review early this year.

### Uranium

The U.S. policy is to eliminate, where possible, the stockpiles of surplus highly enriched uranium (HEU) and ensure the highest standards of safety and accountability. The baseline program includes maintaining materials in safe interim storage (with stabilization and blend-down as needed) pending use/reuse in national defense or other programmatic applications or disposition as surplus uranium. The Department prefers to maximize the reuse of surplus uranium materials to the extent they meet (or can be processed to meet) specifications for use in the commercial nuclear fuel market. Plans for commercial use or disposal have been developed and are being implemented for surplus HEU in keeping with nonproliferation policies to make the material non-weapons-usable and to minimize the civil use of HEU. Evaluations are underway for determining potential disposition of uranium-233 (U-233), low-enriched uranium (LEU), natural uranium (NU), and depleted uranium (DU).

### **Resolution of Cross Program Issues**

In addition to development of the *Integrated Nuclear Materials Management Plan*, the second key action of the NMSI has been supporting ongoing work on a number of cross-program nuclear materials management issues including evaluation of selected surplus materials for national resource designation.

Substantive action was taken in CY 2000 and early CY 2001 on management of the Savannah River Site (SRS) americium and curium, Oak Ridge National Laboratory (ORNL) uranium 233 (U-233), and SRS Mark 18A targets as follows:

- The SRS americium and curium were declared surplus materials and will be vitrified for disposal in a geologic repository.
- The ORNL U-233 was determined to be surplus to DOE needs, but it has the potential to serve as a source for medical isotopes for cancer treatment. The Department expects to issue a request for proposals in early CY 2002 to solicit interest in isotope extraction and further processing of the U-233 to resolve storage issues and eliminate costly criticality and security controls.
- The Mark 18A targets were designated national resource materials for plutonium 244 (Pu-244) pending determination of the availability of resources for separation and retention of the Pu-244. A plan is being developed for moving the targets, in whole or in part, from the Savannah River Site between about 2004 and 2008 to the Oak Ridge National Laboratory (ORNL). The targets would be processed to separate approximately 400 grams of heavy metals from the aluminum overburden. Arrangements would be made to store this quantity at ORNL until the demand for these isotopes matched the funds available for further elemental and isotopic separation.

Prior to the suspension of the NMSI, other actions involving evaluation of cross program issues or development of decision support assets were completed including:

- Unallocated off-specification HEU – The Office of Fissile Materials Disposition and the Office of Environmental Management cosponsored a review of unallocated off-specification HEU materials and developed management and disposition options. These options and an approach for their implementation are being considered.
- Nuclear Materials Stewardship Support Groups (SSG) - The Office of Environmental Management (EM) lead a pilot project to demonstrate the benefit of establishing the SSGs as corporate assets. The pilot project achieved its objectives, but other program offices were not willing to devote resources at that time. Nevertheless, because of the benefits of the SSGs, EM is continuing to sponsor the SSGs for plutonium, non-highly enriched uranium, heavy isotopes, and non-actinide isotopes and sealed sources as EM assets available to other programs on a pay-for-service basis if SSG assets are available.
- Decision Support Tools – The Savannah River Site completed a Decision Tools Handbook describing a number of decision-making processes. The Handbook is available to anyone interested.

### **Corporate Nuclear Materials Information Management System**

The third key activity of the NMSI was the development of an Information Management Business Case Analysis. The business case for upgrading and integrating the Department's nuclear materials information management and inventory accountability systems was issued in August 2000. The analysis found that the Department can (1) make significant progress in eliminating the potential for erroneous data; (2) greatly improve basic practices through business process reengineering; and (3) reduce the various inefficiencies related to maintaining multiple disparate systems. The Business Case recommended a five-year phased approach to accomplish this task:

- Phase 1 – Meet immediate technology requirements and improve business processes
- Phase 2 – Develop/begin implementation of improved/standardized business practices
- Phase 3 – Identify/select corporate information technology solution
- Phase 4 – Implement selected information technology solution across the complex

In CY 2000 the Department's Chief Information Officer, Executive Committee on Information Management, and Nuclear Materials Council endorsed proceeding with Phase I, anticipating the need to consider the progress made in business process reengineering before a technology solution should be pursued. Phase I commenced in late CY 2000, but its progress has been slow because of insufficient funding.

### **CONTINUING CRITICAL CROSS PROGRAM ACTIVITIES**

Although the formal Departmental approach to corporate nuclear materials stewardship is inactive, some needs are recognized as critical to the Departmental obligation of materials life cycle management.

### **DOE Directives**

Departmental Nuclear Materials Stewardship directives are needed to guide proper and complete stewardship of nuclear materials. The Policy has been redrafted to specify top-level goals and requirements and has been resubmitted for approval of the Deputy Secretary. The Order has been redrafted to specify detailed requirements and corresponding Headquarters and field responsibilities and has been submitted for Departmental review. The Manual containing detailed process requirements also has been submitted for Departmental review.

### **Corporate Nuclear Materials Information Management Project**

Phase I activities continued during CY 2001 but at a limited scope and pace because of insufficient funding. The upgrade of the Nuclear Materials Management and Safeguards System hardware and software platforms has made substantial progress. Six nuclear materials information management processes were selected for review as part of the Business Process Reengineering (BPR) Task. However, the actual scope of evaluation has been limited to the Nuclear Materials Inventory Assessment process and the Surplus Materials Disposition process for which reengineered processes will be developed. In addition, emphasis has been placed on identifying definitions and practices that require standardization across DOE to improve completeness, accuracy, and timeliness of data reporting. The extent of work on the BPR and Standardization tasks in the latter part of CY 2002 is uncertain because of funding uncertainties.

### **Transportation and Package Management**

The Offices of Environmental Management and Defense Programs are cooperating to agree on strategies and develop tools to improve the efficiency and effectiveness of nuclear materials transportation assets and packaging resources.

### **Highly Enriched Uranium (HEU) Consolidation**

The Y-12 National Security Complex (NSC) is recognized as the HEU center of excellence for the DOE. Studies and projects are underway to determine and implement actions that would optimize storage and processing of HEU with emphasis on the Y-12 NSC as the focal point.

### **Non-HEU Materials**

Storage and disposition options for LEU and natural uranium, including consolidation of usable inventories, are under evaluation. These materials are currently stored in a variety of forms and containers. LEU is used for domestic and foreign research reactors, and NU is used as enrichment feed or for blending. Disposition decision packages will be prepared for these materials depending on the results of the evaluations.

### **Nuclear Materials Inventory Reporting**

In February 2001 the Secretary of Energy designated the Office of Plutonium, Uranium and Special Materials Inventory as the Department's sole point of contact for inventory data reporting and indicated that a procedure to implement the requirements would be coordinated with Headquarters and field elements prior to issuance. The procedure has been developed and is awaiting resolution of a issues related to responsibilities for reporting specific categories of data.

### **Loan/Lease Program**

In August 2001 the Secretary of Energy tasked the Office of Plutonium, Uranium and Special Materials Inventory to “obtain, validate, reconcile and maintain all pertinent inventory information pertaining to all nuclear materials, which are part of the Loan/Lease Agreement Program.” The Office will work with appropriate departmental elements to support loan/lease material management and disposition. As the first step the Office is examining existing procedures and will provide recommendations for improved implementation of the Program. In addition to data management, the Loan/Lease Program will require management of materials returned from current custodians. The Office of Plutonium, Uranium and Special Materials Inventory and the Office of Environmental Management are jointly developing recommendations for loan/lease materials management responsibilities.

### **SUMMARY**

The Department of Energy made substantial progress during CY 2000 in addressing nuclear materials stewardship issues using the functional concept of a Nuclear Materials Council, a Stewardship Task Force, and a corporate coordinating function. However, when the new administration entered office, its business models did not favor the use of ad hoc bodies to conduct cross program business. Instead, direct program-to-program interaction is preferred under the cooperative leadership of Under Secretary Gordon and Under Secretary Card. Although a formal corporate approach for nuclear materials stewardship currently is not employed, programs continue to work together successfully to address critical issues. Recent major events will be reshaping the direction and focus of program and field activities. The terrorist attacks of September 2001 have prompted reevaluation of requirements and actions for improved security of facilities and materials. The Office of Environmental Management has updated its overall objectives and is restructuring its programs to reduce budgets and accelerate achievement of major actions.