

## INTEGRATED DATA BASE FOR SPENT FUEL AND RADWASTE: INVENTORIES\*

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# INTEGRATED DATA BASE FOR SPENT FUEL AND RADWASTE: INVENTORIES

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## INTRODUCTION

The Integrated Data Base (IDB) program provides and maintains current, integrated data on spent reactor fuel and radwaste, including historical data, current inventories, projected inventories, and material characteristics. This work is sponsored jointly by DOE/NE and DOE/DP since spent fuel and radwaste derive from both commercial and defense (government) operations. The program is directed by the Resource Management and Planning Office under the DOE Deputy Assistant Secretary for Nuclear Waste Management and Fuel Cycle programs, for use by DOE Headquarters and Program Offices, Field Offices and lead sites, and supporting contractors. Integrated Data Base information is published, and is also available to other agencies and the general public. The IDB program collects, organizes, integrates, and -- where necessary -- reconciles inventory and projection (I/P) data and characteristics information to provide a coherent, self-consistent data base on spent fuel and radwaste. The DOE Resource and Management Planning Office also supports two related programs: development of the Federal Plan for Radwaste Management, and the Systems Integration and Comprehensive Program Implementation Plan. The major spent fuel and waste forms or functional sources covered by IDB are:

Reactor Fuel  
o Spent Fuel

Major Waste Categories

- o High-Level Waste
- o TRU Waste
- o Low-Level Waste

Remedial Action Programs (RAP)

- o Uranium Mill Tailings (UMTRAP)
- o Formerly Utilized Sites (FUSRAP)
- o Surplus Facilities Management Program (SFMP)
- o Grand Junction (GJRAP)

Other Wastes

- o Active Uranium Mill Tailings
- o Airborne Waste
- o Reprocessing Waste and Cladding
- o D&D of Active Sites

PROGRAM OVERVIEW

The IDB Program covers all U.S. sources and foreign fuel shipped to the U.S. Generically, spent fuel and radwaste derive from three sources:

Commercial Fuel Cycle:

- o Mining and Milling
- o Conversion and Enrichment
- o Fabrication
- o Reactor Operation
- o Decontamination and Decommissioning
- o Reprocessing and Refabrication

Institutional and Industrial (I/I):

- o Medical Applications
- o Research (Universities and private)
- o Industrial Operations

Government ("Defense") Functions:

- o Naval Reactors
- o Weapons
- o Research and Development
- o Secondary Sources (e.g., WIPP, DWPF, and TWTF)
- o Reprocessing

The IDB program includes data collection and evaluation, modeling and projecting, isotopic generation/depletion calculations via ORIGEN2, and

support activities such as waste management bibliographies and preparation of a radwaste glossary. The major published results to date have been spent fuel and radwaste inventory and projection reports. The first<sup>1</sup> was issued in 1980 and was expanded and updated in September 1981.<sup>2</sup> The latest version (DOE/NE-0017, the so-called "Blue Book"), distributed under category UC-70:

- o updates inventory data through 1980
- o gives projections to year 2000 that are
  - integrated
  - reconciled
  - consistent
  - accepted
- o provides more characteristics such as
  - volumes
  - radioactivity
  - thermal power
  - Mass of TRU elements
- o provides references for all primary data.

The last point, referencing of all primary data, is a major improvement over other published inventory compilations. It allows tracing of data back to sources and, therefore, independent verification if required. At present, data transfer is largely manual, by extraction of data from hard-copy printouts. A major objective is to mature into automated data transfer via magnetic tapes. This will allow inventory updating to be done easily, smoothly, and essentially error-free. Once set up and running, it will greatly simplify record transfers between generator sites, lead sites, and IDB. It will also assure a consistent set of data for all of the participants. The next I/P report is scheduled for September 1982.

Radioactive decays are computed via the ORIGEN2 code.<sup>3,4</sup> This code is the most widely used of all the isotopic generation and depletion codes, and is well documented. In general, this code is most used for the isotopics of spent fuel and HLW, but it is equally applicable to TRU waste and LLW.

Two radwaste bibliographies have been published by the IDB program.<sup>5,6</sup> In addition, related bibliographies have been issued by the Information Center at ORNL.<sup>7-9</sup> All of the reports in these bibliographies are in the report data base at ORNL and can be machine-searched via the standard indexing methods and by key words.

#### INVENTORIES

The summary data given in the table were taken from ref. 1, and are for December 31, 1980. The installed nuclear capacity at that time was 53.8 GW(e), with 36.0 from PWRs and 17.8 from BWRs. There were 21 uranium mills operating at that time (22 in 1981). The majority of HLW and TRU waste is derived from government functions and has not yet been placed in permanent isolation. The buried LLW is split between government and commercial sources, with the latter deriving about equally from commercial fuel cycle and I/I operations. Mill tailings, both RAP and active mills, are the greatest volume of any waste form. Other Remedial Action Programs and commercial reprocessing have not yet generated any large volumes of waste.

The oral report will also include data for 1981, both annual additions and accumulated totals. This information will be gathered after this summary was written. These data will be included in the next I/P report,<sup>10</sup> along with characteristics and projections through year 2020.

Spent fuel and radwaste inventories as of December 31, 1980

<u>Spent fuel</u>	<u>Mass, MTU</u>	<u>Activity, kCi</u>	<u>Heat, kw</u>
BWRs	2,800	3,800,000	14,000
PWRs	3,900	6,600,000	25,000
<u>High-level waste</u>	<u>Volume, m<sup>3</sup></u>	<u>Activity, kCi</u>	<u>Heat, kw</u>
Savannah River	97,000	700,000	2,100
Idaho CPP	11,000	50,000	170
Hanford	183,000	560,000	1,100
Nuclear Fuel Services	2,200	37,000	110
<u>TRU waste</u>	<u>Volume, m<sup>3</sup></u>	<u>Activity, kCi</u>	<u>TRU elements, kg</u>
DOE, buried	273,000	400	1,000
DOE, stored	61,000	1,050	800
Commercial, buried (in with LLW)		---	130
<u>Low-level waste</u>	<u>Volume, m<sup>3</sup></u>	<u>Activity, kCi</u>	<u>Land area, ha</u>
DOE sites	1,523,000	26,000	156
West Valley (closed 1975)	66,000	580	3
Maxey Flats (closed 1977)	135,000	2,400	6
Sheffield (closed 1978)	88,000	60	4
Barnwell, SC	324,000	2,000	17
Beatty, NV	87,000	300	8
Richland, WA	61,000	900	3
<u>Remedial Action Programs</u>	<u>Volume, m<sup>3</sup></u>	<u>Activity, kCi</u>	<u>No. of sites</u>
UMTRAP	19,000,000	300	25
FUSRAP	450,000	---	31
SFMP	1,560,000	---	~500
<u>Active Mill Tailings</u>	<u>Volume, m<sup>3</sup></u>	<u>Activity, kCi</u>	<u>Heat, kw</u>
21 active mills	102,000,000	900	20

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