

INTEGRATED DATA BASE PROGRAM*

MASTER

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ABSTRACT

The IDB Program provides direct support to the DOE Nuclear Waste Management and Fuel Cycle Programs and their lead sites and support contractors by providing and maintaining a current, integrated data base of spent fuel and radioactive waste inventories and projections. All major waste types (HLW, TRU, and LLW) and sources (government, commercial fuel cycle, and I/I) are included. A major data compilation was issued in September, 1981: *Spent Fuel and Radioactive Waste Inventories and Projections as of December 31, 1980*, DOE/NE-0017. This report includes chapters on Spent Fuel, HLW, TRU Waste, LLW, Remedial Action Waste, Active Uranium Mill Tailings, and Airborne Waste, plus Appendices with more detailed data in selected areas such as isotopics, radioactivity, thermal power, projections, and land usage. The LLW sections include volumes, radioactivity, thermal power, current inventories, projected inventories and characteristics, source terms, land requirements, and a breakdown in terms of government/commercial and defense/fuel cycle/I&I.

INTRODUCTION

The Integrated Data Base (IDB) Program is supported by the Resource Management and Planning Office under the DOE Deputy Assistant Secretary for Nuclear Waste Management and Fuel Cycle Programs. The IDB Program is carried out at ORNL. It provides and maintains current, integrated data on spent fuel and radwaste, including inventories and projections, for these major forms and/or sources:

- Reactor Fuel
 - o Spent Fuel
- Major Waste Forms
 - o High-Level Waste
 - o TRU Waste
 - o Low-Level Waste

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RESTRICTIONS ON THE USE OF INFORMATION CONTAINED

MSW

Remedial Action Sources

- o Uranium Mill Tailings Remedial Action Program
- o Formerly Utilized Sites Remedial Action Program
- o Surplus Facilities Management Program
- o Grand Junction Remedial Action Program

Other Sources

- o Active Uranium Mill Tailings
- o Airborne Waste
- o Reprocessing Waste
- o D&D of Active Sites (to be added)

The Resource Management and Planning Office also supports two related activities: development of the Federal Plan for Radwaste Management, and Systems Analysis; subcontractors for these two activities are the MITRE Corp. and NUS, respectively.

The IDB is an important component of DOE Waste Management and Fuel Cycle Programs. It is the official DOE data source in its area of coverage. It is used by DOE management for planning and analysis, by field offices and lead sites for overall, integrated data, and by support contractors for generic technical information. It is also used by other agencies, groups, and news media, including:

- Council on Environmental Quality
- Congressional Committees
- State Agencies
- League of Women Voters
- New Yorker and Science Magazines
- UPI articles
- NRC and EPA
- MITRE Corporation
- Kellogg Foundation.

The IDB program includes data collection and evaluation, modeling and projecting, isotopic decay calculations via ORIGEN2, and support activities such as waste management bibliographies and preparation of a radwaste glossary. The major visible results to date have been spent fuel and radwaste inventory and projection reports. The first⁽¹⁾ was issued in 1980 and was expanded and updated in September 1981.⁽²⁾ The latest version (DOE/NE-0017), distributed under category UC-70:

- o updates inventory data through 1980
- o gives projections to year 2000
- o provides improved data that are
 - integrated
 - reconciled
 - consistent
 - accepted
- o provides more characteristics such as
 - volumes
 - radioactivity
 - thermal power
 - Kg 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.

APPLICATIONS TO LLW

Integration of LLW data involves many interfaces, including:

- generators/burial grounds/lead site
- site records/SWIMS/State, EPA, NRC records
- direct LLW/secondary LLW/RAP
- Government/commercial (fuel cycle; I/I).

Overall integration of LLW data is, in general, more difficult than data for spent fuel, HLW, or TRU waste because LLW:

- has been around the longest
- is the largest volume
- comes from the most diverse sources
- receives the least controlled handling
- has the least detailed records
- comes from the greatest number of sources.

Integrated Data Base treatment of LLW data covers these areas:

- o Inventories (volume)
 - Burial site
 - State-by-State (to be added)
 - Government, commercial
 - Fuel cycle, I/I (including medical)
- o Characteristics
 - Overall activity
 - Thermal power
 - Isotopics
 - TRU element and HM content
- o Projections
 - Base-case assumptions
 - Alternatives (to be added)
 - To year 2000 (to 2020/2050 in future)

Major data inputs for inventories comes from SWIMS (Solid Waste Information Management System) for DOE burial grounds and from EGG/ID, EPA, NRC, and state agencies for commercial burial grounds. An overall Data Base Management System (DBMS) has not yet been selected, but EGG/ID is testing NOMAD on their own LLW data, and the IDB Program has started an evaluation study of applicable DBMS.

LLW data integration has required reconciliation in a number of areas, including:

- o Data overlap
 - Government vs Commercial
 - Material in transit
- o Incomplete data/estimation basis
 - Front end of the fuel cycle
 - I/I on state-by-state basis
- o Different basis for "generated" vs "buried"
 - Solidification treatment
 - Packaging
 - Gross volume vs net volume
- o Different basis for radioactivities
 - Shipping manifests
 - Decay

In some cases final resolution has not yet been made, pending a more definitive analysis. Projections of future LLW volumes and characteristics involves assumptions in these major areas, among others:

- o Growth estimates
 - Nuclear reactors
 - Nuclear fuel cycle
 - Government (defense)
 - Institutional/Industrial (I/I)
- o New sources
 - Remedial Action Programs (RAP)
 - Decontamination
 - Decommissioning
- o Secondary sources
 - Waste Isolation Pilot Plant (WIPP)
 - Transportation
 - Defense HLW treatment
- o Future regulations
 - NRC classes A, B, C
 - Disposal other than SLB.

Report DOE/NE-0017 presently includes maps (Figs. 1 and 2) and pie charts for each major waste category. Future editions will have more graphics. Chapter 6 and Appendix D of this report deal with LLW. A list of the tables given in these two sections is shown in Tables 1 and 2. Again, additional information is planned for future editions.

SUMMARY

For FY-1982, in addition to assembling and publishing a third edition of inventories and projections, the IDB program will also address these areas:

- o Automated data handling (via magnetic tapes) and data Q/A
- o Data base management system selection
- o Increased Steering Committee input
- o Expansion of interaction with DOE programs and contractors.

Other IDB program activities of interest are summarized in the following paragraphs.

The IDB Steering Committee provides generic guidance and includes both programmatic and technical representatives from each major radwaste lead site or function (Table 3). At the October 1981 meeting of this Committee, four subcommittees were formed, to address these areas:

- o Timely input of spent fuel discharge data
- o Format and basis for projections for the next Inventory/Projections report
- o Improved data flow from generator and lead sites
- o Long-term data needs and management-type questions.

Radioactive decays are computed via the ORIGEN2 code.^(3,4) 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.^(5,6) In addition, related bibliographies have been issued by the Information Center at ORNL.⁽⁷⁻⁹⁾ 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.

Fig. 1. Location and accumulated volume of LLW at principal DOE sites through 1980

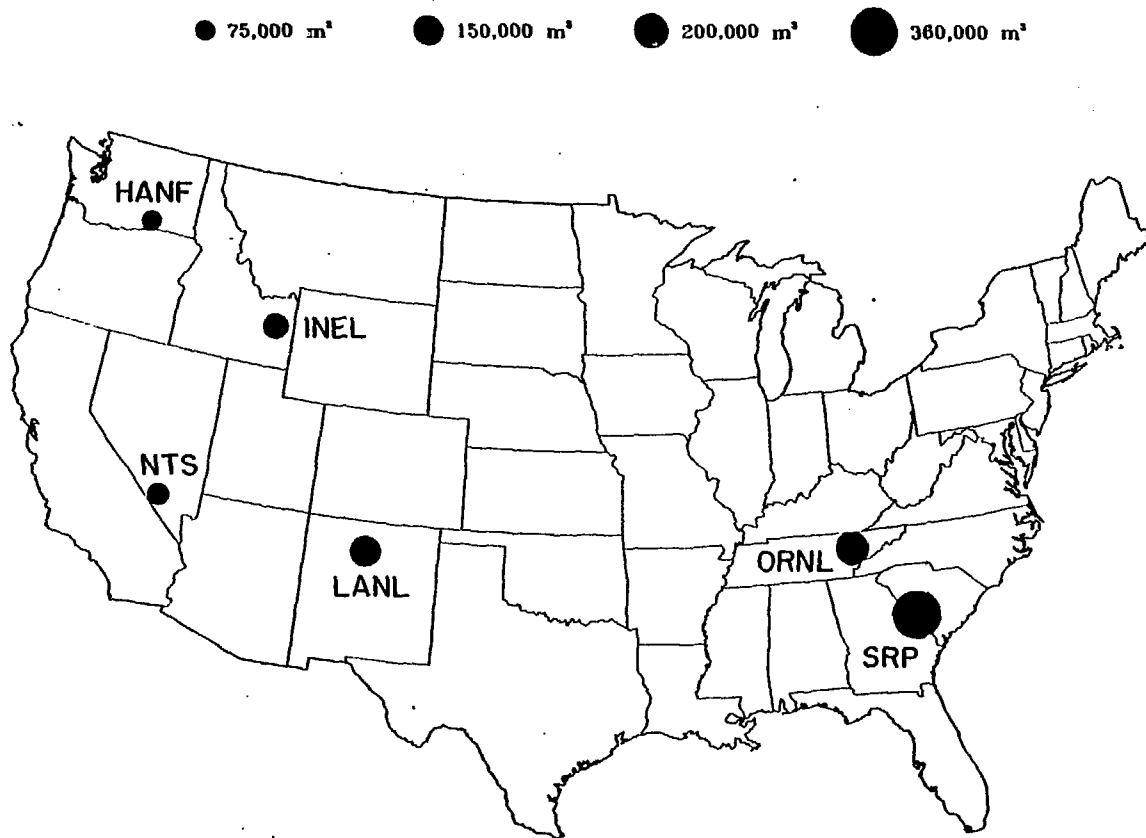


Fig. 2 Location and accumulated volume of LLW at commercial burial sites through 1980

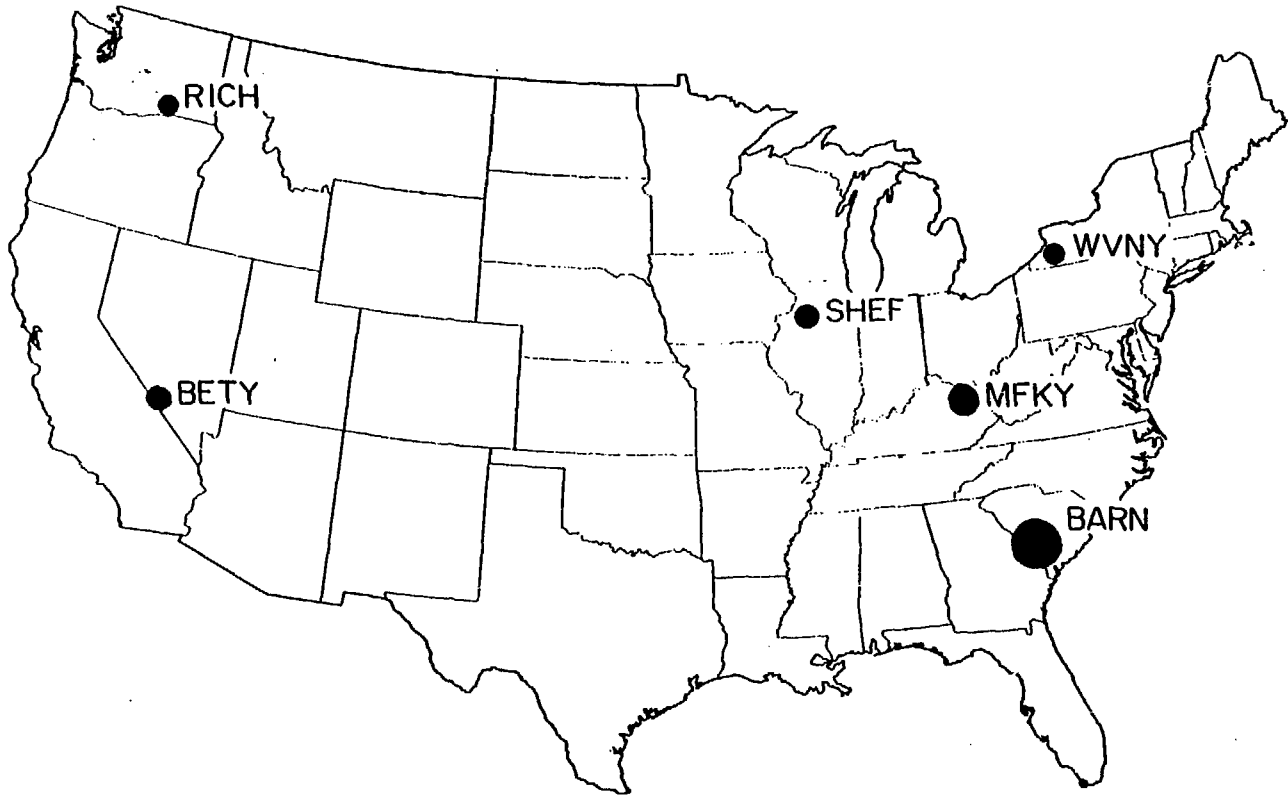


Table 1. LLW data in DOE/NE-0017, Chapter 6

- Table 6.1. Average characteristics of LLW from LWRs per 1000 MW-yr of electricity generated.
- Table 6.2. Volume of institutional and industrial LLW generated in 1979.
- Table 6.3. Inventory of LLW buried at commercial burial grounds at the end of 1980.
- Table 6.4. Inventory of buried DOE LLW at the end of 1980 by Operations Office.
- Table 6.5. Accumulated volume and radioactivity of LLW buried at specific DOE sites through 1980.
- Table 6.6. Projected amounts and characteristics of LLW from commercial fuel cycle operations.
- Table 6.7. Projected amounts and characteristics of institutional and industrial LLW.
- Table 6.8. Projected annual additions of buried LLW at DOE sites.
- Table 6.9. Status of commercial burial sites at the end of 1980.
- Table 6.10. Status and projected DOE burial site land usage.

Table 2. LLW Data in DOE/NE-0017, Appendix D

- Table D.1. Components of "wet" and "dry" waste from LWRs.
- Table D.2. Typical annual amounts of "wet" and "dry" waste from LWRs.
- Table D.3. Typical distribution of the major radionuclides in "wet" waste from LWRs.
- Table D.4. Historic and current data on the generation and disposal of LLW from LWRs.
- Table D.5. Radiological characteristics of typical institutional LLW shipped to commercial burial sites.
- Table D.6. Types of government ~~LLW~~ and annual volumes generated in 1980 listed according to DOE Operations Office.
- Table D.7. Source terms used for projection of fuel cycle LLW volumes and activities.
- Table D.8. Projected amounts of LLW from LWRs.
- Table D.9. Projected amounts of LLW from BWRs.
- Table D.10. Projected amounts of LLW from PWRs.
- Table D.11. Projected characteristics of LLW from fuel fabrication.
- Table D.12. Projected characteristics of LLW from commercial fuel enrichment operations.
- Table D.13. Projected characteristics of LLW from UF_6 conversion.
- Table D.14. Volumes of LLW generated by DOE installations (listed according to DOE Operations Office) with projections.
- Table D.15. Volumes of LLW added annually to principal DOE burial sites, with projections.

Table 3. Steering Committee for the Integrated Data Base^a

| Functional responsibility | Committee member | Technical contact | DOE office |
|-----------------------------------|-------------------------------|--|--|
| Chairman and Technical Manager | K. J. (Karl) Notz, ORNL | C. W. (Chuck) Alexander W. L. (Lloyd) Carter C. W. (Charles) Forsberg A. H. (Arlene) Kibbey G. W. (Wayne) Morrison | D. E. Large, ORO |
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| Airborne Waste | R. A. (Russ) Brown, Exxon/ID | T. R. Thomas, Exxon/ID | J. B. Whitsett, IDO |
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D. D. Wodrich, RHO

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