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THE USA NRC/RSR DATA BANK SYSTEM AND
REACTOR SAFETY RESEARCH DATA REPOSITORY (RSRDR)*

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Summary

The United States Nuclear Regulatory Commission (NRC), through its Division of Reactor Safety Research (RSR) of the Office of Nuclear Regulatory Research, has established the NRC/RSR Data Bank Program to collect, process, and make available data from the many domestic and foreign water reactor safety research programs. An increasing number of requests for data and/or calculations generated by NRC Contractors led to the initiation of the program which allows timely and direct access to water reactor safety data in a manner most useful to the user.

The program consists of three main elements: data sources, service organizations, and a data repository. Data sources include experimental facilities, both domestic and foreign, which are actively producing test data applicable to water reactor safety research and providing experimental results and literature. The service organizations are NRC contractors responsible for implementing NRC defined tasks as follows: a) identify and coordinate input from data sources; b) provide an interactive computer system (NRC/RSR Data Bank Processing System) and application support for data retrieval, processing and analysis; and c) provide measurement (collected experimental data) and computed parameters (local conditions data derived from the experimental data) to a data repository. The data repository is responsible for storage, retrieval, and dissemination, upon request, of measurement data and computed parameters. Data bank managers, appointed by NRC, select the experimental data to be included in the data bank, develop local conditions calculational methods, and

generate local conditions data. All data are available realtime to NRC and NRC-designated personnel through the data bank processing system and to others through the repository.

NRC provides financial support and overall guidance of the program.

1. The Data Bank Concept

The concept of a national data bank for storing and disseminating water reactor safety data is based on the premise that a single organization can create and operate a more efficient and cost effective information support program than could the individual facilities which generate the data. Each of the major test facilities has a specific purpose in the water reactor safety effort, but they serve a mutual goal in providing data to the overall water reactor safety research objective of a safe, acceptable nuclear industry.

The NRC/RSR Data Bank Program encompasses the water reactor safety data produced by domestic research programs as well as those produced by foreign programs with which national cooperative agreements have been established. The program operates with a central data bank interacting with NRC, the experimental facilities, and data bank repositories, which, in turn interact with an external user community. The centralization of the data provides a means of sharing the data with government and industry in a timely, reliable, cost-effective manner. The costs of developing and operating duplicate data bases and support systems are eliminated and the data dissemination burden of the experimental programs is minimized.

2. The Data and Its Sources

The NRC/RSR Data Bank System is designed to manage data pertinent to research investigating the loss of coolant and other accidents for both pressurized water reactors and boiling water reactors. Data sources include experimental programs sponsored by NRC, other government agencies, private industry, and foreign governments. Specific examples include data from: Semiscale, Loss of Fluid Test (LOFT), Two Loop Test Apparatus (TLTA), Thermal Hydraulic Test Facility (THTF), Full Length Emergency Cooling Heat Transfer Facility (FLECHT), other Heat Transfer Loops, and

Two Phase Pump Performance Facilities. These data were generated in NRC-sponsored experimental programs conducted at US Department of Energy laboratories at Idaho National Engineering Laboratory (INEL) and at the Oak Ridge National Laboratory (ORNL), at NRC-sponsored programs within Westinghouse Corporation, General Electric Company, and within other industrial facilities, domestic and foreign.

An international collaboration in a two- and three-dimensional LOCA Reflood Program between the Federal Republic of Germany (FRG), Japan, and the United States will establish new data sources for the program. Included are two (2-D) test facilities in Japan at Tokai: Cylindrical Core Test Facility (CCTF), now started, and Slab Core Test Facility (SCTF), in the planning and construction stage. The FRG collaboration includes a 3-D Upper Plenum Test Facility (UPTF), in the planning and construction stage at PKL, Erlangen, and PKL is also the source for other data. In addition, a USA-Sweden Agreement allows for the use of the MARVIKEN reactor facilities to do experimental Break Flow Tests (BFT), now providing data for the program.

Other data sources will be included in the program as indicated by the NRC/RSR overall research and development requirements.

3. Service Organizations

Several service organizations provide for data screening and parameter selection through appointed data managers: fuel behavior verification (INEL), steam water mixing (Battelle Columbus Laboratories), integral systems (INEL), heat transfer (INEL) and pump (MPR). EG&G Idaho, Inc. established at INEL a center for data bank administration, initial data processing, and dynamic, on-line access to the data by NRC personnel and contractors. The data are available to others through a repository established at the Oak Ridge National Laboratory (ORNL) specifically for public access.

The several data managers under NRC guidance select data for inclusion in the data bank and forward it to the INEL center for processing into the Data Bank Processing System (DBPS) using software developed for handling data in both batch and interactive modes. DBPS is implemented in the INEL CDC CYBER 70/76 computer environment. Data are stored on disks and on tapes.

The DBPS is sufficiently general to accommodate any type of data or applications, although it is most applicable to large quantities of scientific data. The DBPS is built around the structure of the data bank, which consists of a directory file and a data file. The directory file contains records which briefly describe the data in a specific data file entry (for example, a pressure measurement) and provides a locator for the actual data. Within the data file, each data record contains a word indicating the size of the record and a pointer to the next record in the data set. With this approach, the DBPS can locate data of interest without actually bringing the data into core. The DBPS retrieves the data piece by piece using the locators in the data file.

The INEL center notifies the NRC-authorized remote users that the data are available for on-line access and generates a copy of the data on magnetic tape to send to the data repository.

3.1 Reactor Safety Research Data Repository (RSRDR)

The Reactor Safety Research Data Repository (RSRDR) is established at the Oak Ridge National Laboratory (ORNL) as one of a cluster of information centers in the Engineering Physics Division. An integral part of the NRC/RSR Data Bank System, it serves as the archival repository and response center of the NRC/RSR Data Bank System. The Repository provides a common source of experimental data for the NRC regulatory and safety research efforts and for the nuclear power industry.

The data is in the form of raw measured data (acquired from each instrument from selected facilities and experiments) that has not been processed with the exception of conversion to engineering units and application of calibration factors. It is available on demand to NRC contractors, to contributors to the Data Bank, and to other individuals or organizations working in the field of reactor safety. A nominal cost recovery fee is charged. However, charges may be waived on determination that the data is to be used in NRC-sponsored programs, or is otherwise supplied in the best interests of the NRC mission.

The RSRDR is compiling a directory of individuals and institutions interested in information concerning the data and the NRC/RSR Data Bank Program. Anyone wishing to be included may contact RSRDR. The Repository is set up to make its information quickly available, and in a form easily handled by the requesting installation. Transmittal arrangements

can be made by contacting: Reactor Safety Research Data Repository (RSRDR), Engineering Physics Information Centers (EPIC) - 6025, Oak Ridge National Laboratory, P. O. Box X, Oak Ridge, Tennessee 37830. Telephone: 574-6176 (area code 615); or (FTS) 624-6176.

4. Conclusion

The NRC/RSR Data Bank Program specializes in water reactor safety experimental data, but it has a number of other scientific applications in which large amounts of numeric data are generated and require compiling, storage, and a means of access to make them available to multiple users. With the increased data gathering instrumentation that is being employed in upcoming experimental programs, the data bank concept and an associated processing system will become a necessity if the data are to be made available to those who need it. The concept of the NRC/RSR Data Bank Program is a good basis on which to build data bank programs in other areas.