

**BNL ALARA CENTER EXPERIENCE WITH AN  
INFORMATION EXCHANGE SYSTEM ON  
DOSE CONTROL AT NUCLEAR POWER PLANTS**

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by

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**Abstract**

The essential elements of an international information exchange system on dose control at nuclear power plants are summarized. Information was collected from literature abstracting services, by attending technical meetings, by circulating data collection forms, and through personal contacts. Data are assembled in various databases and periodically disseminated to several hundred interested participants through a variety of publications and at technical meetings. Immediate on-line access to the data is available to participants with modems, commercially available communications software, and a password that is provided by the Brookhaven National Laboratory (BNL) ALARA Center to authorized users of the system. Since January 1992, rapid access also has been provided to persons with fax machines. Some information is available for "polling" the BNL system at any time, and other data can be installed for polling on request. Most information disseminated to date has been through publications; however, new protocols, simplified by the ALARA Center staff, and the convenience of fax machines are likely to make the earlier availability of information through these mechanisms increasingly important.

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Among the original objectives of three projects started by the U.S. Nuclear Regulatory Commission (NRC) at Brookhaven National Laboratory (BNL) in 1983 were the following: (1) to identify high dose jobs and dose reduction techniques, (2) to evaluate the cost-effectiveness of available or proposed dose reduction modifications, (3) to compare U.S. and foreign experiences in dose control, and (4) to provide the NRC and the industry with information on important developments in the effective implementation of the ALARA process in nuclear power plants. These studies led to the organization of the BNL ALARA Center, which is a small but well-focused effort involving three professionals working part time and a half-time secretary. The Center has used a variety of conventional methods for collecting and disseminating information and developed some unique methods that are continuously being tested, improved, and expanded.

Figure 1 shows the ALARA Center's exchange process. We collect information from library databases (e.g., Dialog's abstracting service); by attending technical meetings, workshops, and conferences; by reviewing current literature; and from data forms that are submitted to users of the system.

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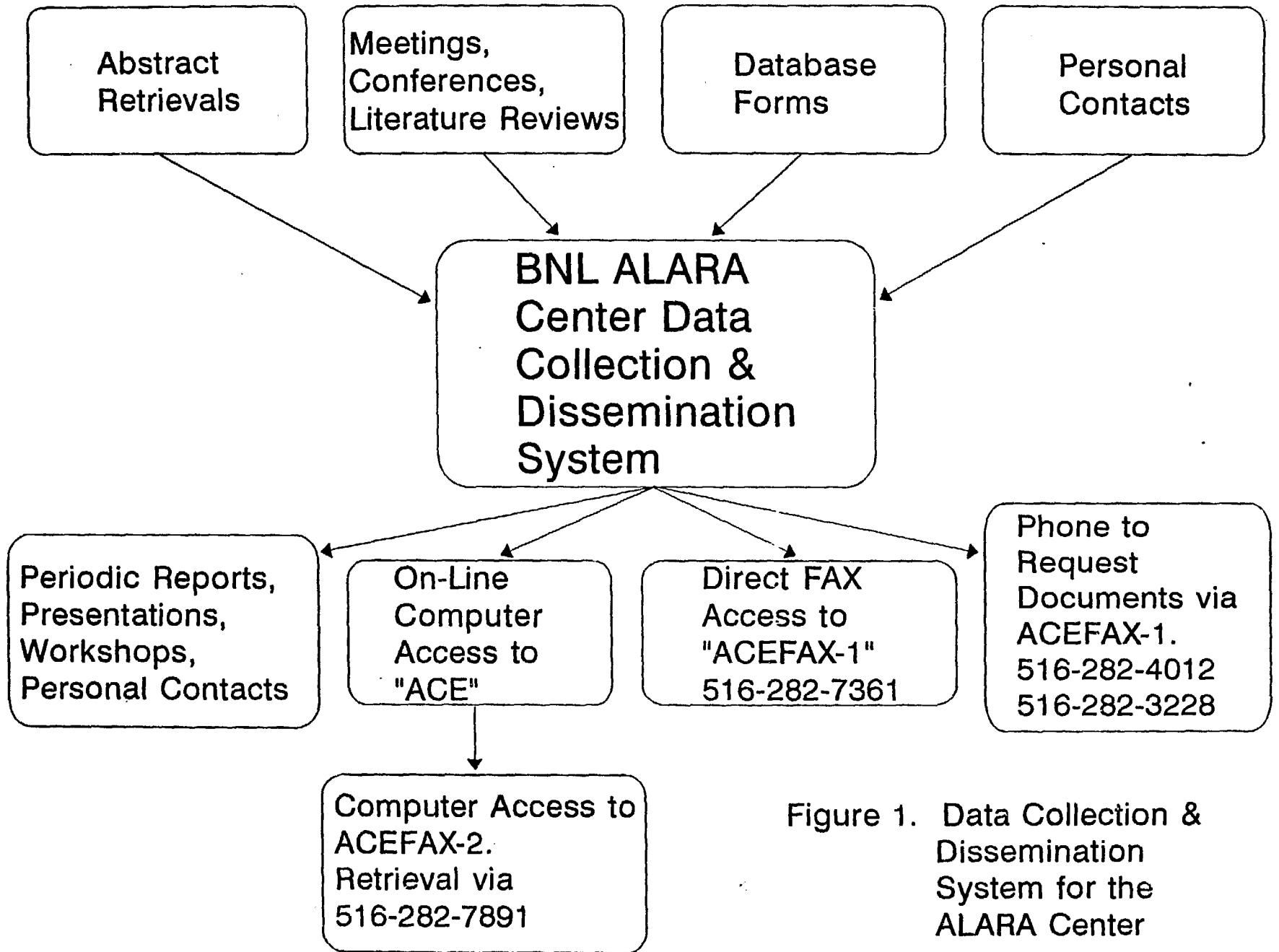


Figure 1. Data Collection & Dissemination System for the ALARA Center

The Center has three mechanisms for disseminating information. The original and most widely used are conventional publications and presentations at technical meetings. The second system, a computer-based, on-line system called the ALARA Center Exchange (ACE), was started in 1988 and further developed in 1989. This system is described in more detail in other publications [1-5] and later in this paper.

The third mechanism for information retrieval is through fax machines. Selected information, loaded into the Center's computers at all times, is directly accessible to anyone who has a fax machine with polling capability. This facility was recently implemented at the ALARA Center and is described briefly later. In this paper, we briefly summarize the capabilities and our experiences with these systems.

#### Bibliography Database

One of our conventional methods for disseminating information is the periodic (about annually) publication of a compilation of abstracts on dose control and ALARA at nuclear power plants [6]. These abstracts seem to be of considerable value, as shown by the number of persons who requested to be on our mailing list for this series of publications. Table I shows the number of bibliographies distributed by the ALARA Center for 1984-1991. In addition to this distribution, the reports are sent to about 30 libraries and laboratories throughout the world which are on the NRC's mailing list, and to 288 NRC technical staff. Each volume in this series has about 250 abstracts of published reports selected from worldwide publishers of over 100,000 journals. This bibliography provides the foundation for the information system.

**Table I. Number of Bibliographies Distributed  
by the ALARA Center**

Report	Date Published	No. Mailed
<b>Bibliography [6]</b>		
Volume 1	February 1984	19
Volume 2	February 1985	260
Volume 3	October 1983	452
Volume 4	May 1989	474
Volume 5	September 1990	432
Volume 6	October 1991	482

However, there is usually a delay of one to three years between the original publication and appearance of an abstract in the bibliography series. As a result, two additional communication channels on current improvements in dose control were developed, the "research and health physics technology," and "notes" databases which are also published on hard copy.

**Research and HP Technology Database**

This database consists of data sheets on current research projects or applied technology developments in dose control. The information in this database is gathered at technical conferences, workshops, and meetings, through personal contacts, or from information provided by participants in the exchange system. Standard data collection forms are used to gather the information. Frequently, these forms are filled out by the ALARA Center staff, and after the principal investigator or project manager reviews and approves the forms, they are inserted into the database, which is continually being updated and expanded. The information in the database is published about annually in the NUREG/CR-4409 series [7]. Each volume contains brief information on approximately 150 projects and the individuals who may be contacted for further details.

These reports are primarily distributed to contributors to the system or principal investigators on the projects. Thus, the

distribution list for these reports is more restricted than for the bibliographies, yet the number of persons on our mailing list (see Table II) is similar to that for the bibliographies.

Table II. Number of Research and Health Physics Technology Reports [7] Distributed

Report	Date Published	No. Mailed
Volume 1	December 1985	220
Volume 2	October 1986	285
Volume 3	May 1989	472
Volume 4	In progress	projected -500

One reason for limiting distribution is to provide an incentive for those who have information of interest to contribute to the collection. The ALARA Center staff encourages submissions from the user community through verbal and written invitations, but this has not been very successful. Approximately 90% of the contributors are from the Center staff, who propose a submission after attending an important presentation at a technical meeting. Contributors are generally very happy to have their work included in the collection; however, most do not have the time to submit the information. This experience has demonstrated how important it is to have qualified staff gathering this information.

The information contained in these databases is stored in a desktop computer. Information may be conveniently searched or sorted as needed, using a database management system which was developed at the ALARA Center and is based on commercial software.

### Notes Database

"Notes" is a recent database, developed at the Center in 1990-1991. Each "Note" is either a brief extract or summary of a recent article or technical presentation, or a small submission from a personal contact with bibliographical reference to its source. These are often topical items that may not be published or, if published, are not likely to appear in abstracted journals. "ALARA Notes" are published approximately quarterly, or when about 40 summaries have been prepared. This is an informal document, which is distributed according to a special ALARA Center mailing list; therefore, "ALARA Notes" is not broadly distributed through the U.S. National Technical Information System (NTIS) as is the case for the formal Nuclear Regulatory Commission NUREG/CR report series, which is used for the bibliographies, and documents from the Research and HP Technology database.

Table III illustrates the approximate distribution of the first three issues of ALARA Notes.

Table III. Number of "Notes" Reports Distributed by the ALARA Center

Report	Date Published	No. Mailed
Volume 1	January 1991	535
Volume 2	April 1991	223
Volume 3	December 1991	430

The first mailing was sent to a wide range of persons on various ALARA Center mailing lists with a form for the recipients to return if they wished to receive subsequent issues. About 40% of those on the first mailing list responded by the time Volume 2 was distributed. However, additional requests arrived after the issuance of Volume 2, partly because users distributed "ALARA Notes" throughout their organizations. Based on the favorable comments that we received, and the large number of



requests for "ALARA Notes," we feel that it is serving a very important need. The ALARA Center staff develops most of the material in the "Notes" because only a few users have offered material for inclusion although we encourage their participating which would result in an even more useful medium for exchanging information.

### Processes and Practices Databases

Two other databases are being developed called "Process" and "Practice," which integrate information on about 100 key subjects. These subjects are listed by a title that can be searched through a keyword field. A brief description of each topic and its value in dose control is given, including references and selected abstracts, and the date of the last update. When complete, the data in these databases will be published, probably in the NUREG/CR series.

These databases are closely related to the "Plants" database, which is a partial collection of data on 19 PWR and 12 BWR plants that have used the processes or practices described in our database. Based on the responses from the power plants, the list of processes and practices was organized into three groups in accordance with their efficacy in reducing radiation exposures. Table IV shows the percentage of all 31 plants, as of July 1990, that used modifications with medium impact on collective dose. Table IV is an example of the kind of information that may be retrieved from the "Plants" database when it is finally completed.

**Table IV. Processes with Medium Impact on Radiation Dose and the Percentage of Plants Using These Processes**

	<b>Processes</b>	<b>% of Plants</b>
1.	O <sub>2</sub> control in feedwater and reactor water	82
2.	Quick-disconnect insulation	68
3.	Snubber reduction	63
4.	Valve and valve-packing improvement	58
5.	Permanent platforms	58
6.	Cavity wall and other special decontamination machines	58
7.	Special shields (e.g., CRD, TIP cable)	53
8.	Automatic or semi-automatic ultrasonics	53
9.	Chemical decontamination of primary systems	47
10.	Superheating of steam generator U-tube bends for stress relief	37
11.	Passivating new piping	32
12.	Machines for automatic control rod drives	32
13.	Ultra-fine filters in the let-down system	32
14.	Refueling modifications	26
15.	Eliminate bypass manifold of reactor temperature detector	26
16.	Viewing windows (e.g., rad-waste, fork truck)	26
17.	Refueling machine	21
18.	Low, non-cobalt valve/insert replacements	16
19.	Permanent loop-valve pressurization system	11
20.	Reduced boric acid concentration or B-10 enrichment	11
21.	Electropolished steam generator channel head	5
22.	Magnetic filters	0
23.	Conoseal modifications	0

### ALARA Center Exchange (ACE)

To provide immediate access to up-to-date information in our various databases, and to make data sorting and tabulation easy, we developed an on-line telephone-accessible computer-based system that includes all of the databases described here. This system, the ALARA Center Exchange (ACE), was recently described in detail [1], so the emphasis here is on our experience with it.

The system has been on-line since March 1989. Since then, those whom we considered most interested in ACE, primarily, the nuclear power plant health physicists and those on the Center's database mailing lists were notified of its contents and availability. However, there has been less use of the on-line feature than we expected, i.e., partly because most potential users may not yet be comfortable with modems, and they may not have enough knowledge and experience of remote communications via computers. Difficulties with modems and recommendations for avoiding these difficulties are described in a section of NUREG/CR-4409, Volume 4, to be published soon [7]. This information [8] also is available on request or through the ACEFAX system described in the next section. These types of problems have been solved, if the user calls the ALARA Center to ask for help.

To overcome these difficulties and provide better understanding of the content and capabilities of ACE, a simplified system of 9 basic commands was developed which should address 90% of the user's needs. Further, users will be given a Quick Reference Card which will summarize how to use these commands to extract information from ACE. User-training workshops to be held for one-and-one-half days also are planned beginning in the spring or summer of 1992 to provide more advanced instruction. In addition, users are now encouraged to become familiar with the databases by means of the newly installed fax access system described below.

## ACEFAX-1

Most modern fax machines have a feature called "polling," which permits one machine to call another and retrieve information previously loaded. This type of system was recently implemented at the ALARA Center and is referred to as ACEFAX-1. This system is normally loaded with all the recently gathered, but yet unpublished information for "Notes." To poll the ACEFAX-1 machine, users follow the polling instructions for their fax machine using the ACEFAX-1 number (516-282-7361, plus international prefixes, if needed). The unpublished "Notes" will be printed in reverse chronology (the last "Notes" installed is printed first), permitting users to hang-up, and thereby stop transmission as soon as they have received all the "Notes" they need without duplicating previous transmissions.

Users also may call the main number at the ALARA Center, 516-282-3228, and request any or all of the documents currently on the "List of Documents on ACEFAX" (Table V). In addition, new or revised and unpublished documents from the Research (R250 through R331) and Health Physics Technology (H138 through H173) database also are available, but too numerous to list here by title. After a few minutes delay, the user will be able to "poll" the ACEFAX-1 number and receive the documents requested.

Table V. List of General Documents on ACEFAX

G1	ALARA Notes - Unpublished, Unfinished Draft
G2	List of Documents on ACEFAX
G3	The New ACE Manual (includes ACEFAX)
G4	ACE Users Quick Reference Guide
G5	Dollar worth of a Person-Rem for U.S. Utilities
G6	A Survey of Doses to Worker Groups in the Nuclear Industry
G7	Reserved for Graphical Documents of Interest

## ACEFAX-2

Users with computer access to the ALARA Center may access all the documents in the ACEFAX system, view them on the computer screen, and select them for printing on their fax machine. In this case, the ACEFAX-2 number (516-282-7891) is used in the "polling" process. The ACEFAX-2 system was designed to operate with a set of seven basic commands. The Quick Reference Card mentioned earlier also describes these commands. Detailed information and instructions on these fax systems are available [7, Vol. 4; 8]. An important reason for using the fax machine for retrieval is that it handles graphics-type material well.

## Conclusions

We find that conventional hard-copy methods for gathering and disseminating information are the most popular. However, when faster transfer of information from one source to another is needed, such as for developments in robotics, plant chemistry, cobalt reduction, and decontamination, the use of telephone, computer, and fax systems should be more helpful. Their effective use, however, is in an early and rapid stage of development. As users become more aware of the capabilities of these systems, we think they will increasingly see their value. Presently, the important questions are what information is needed and how can it best be collected for easy and rapid dissemination to the larger user group? As answers to these questions are realized, we can continue to add to the systems.

The ALARA Center welcomes suggestions and has the ability to set up and try various databases and access systems to test new ideas, as appropriate. The ALARA Center's databases include information from many countries and are serving them with hard copies of reports and access to the ACE and ACEFAX systems. We plan to continue this international collaboration through our existing systems and also, hopefully, as a regional center for the Information System on Occupational Exposure (ISOE) [9] sponsored by the Nuclear Energy Agency.

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