THE ARGONNE SAFEGUARDS TRAINING PROGRAM
A THREE YEAR HISTORY*

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ABSTRACT

During its first three years of operation the Argonne Safeguards Training Program has offered training in nuclear materials safeguards to over 200 participants from government and industry both foreign and domestic. Its offerings have ranged from a basic course intended for those who are new to the field to specialized workshops for the experienced practitioners. In addition a beginning has been made in the teaching of safeguards and nuclear materials control in existing institutions of higher learning. Developing trends will be assessed as to their effect on future training programs.

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INTRODUCTION

In the past two years since Dr. Hyman and I spoke to the Institute at the Las Vegas Meeting¹, the list of alumni of the Safeguards Training Program conducted by the Argonne Center for Educational Affairs has grown from 13 to over 200. Our primary objective has changed from the training of new people in safeguards and nuclear material management, to the exploration of techniques -- both new and old -- by those already practising in the field. This is not to say that we do not reach people who are new to the profession but merely that the majority of the participants reach us with some experience.

This is readily understandable if one considers the staffing in nuclear material control prevalent in the nuclear industry today. In the processing areas there has not been a substantial increase in the number of facilities which handle special nuclear material. Although the amount of material being processed is increasing rapidly, the number of people needed for nuclear material control is rising very slowly.

PHILOSOPHY

We have treated safeguards as a many-layered responsibility at facility, government and international levels. We teach nuclear material control as a selection of techniques which can be varied to meet various objectives -- safeguards, economics, safety of plant personnel and public. With the endorsement of the Office of Safeguards and Materials Management, USAEC, we have sought to improve the level of nuclear material control by offering our training wherever we have recognized need. Some of our participants come with a motivation for learning which stem from safeguards, economics or safety. However, we have felt that whatever the motivation, improved nuclear material control will result in better safeguards.

¹Hyman, H. H., and Kanter, M. A., Proceedings of the Tenth Annual Meeting of the Institute of Nuclear Materials Management, P. 377-86, 1969

PARTICIPATION

Who has attended the Argonne School? Our enrollment statistics are shown in Table 1. In the three years of the program,

TABLE 1

SAFEGUARDS TRAINING PROGRAM Participants 1968-71					
Year	Domestic			Foreign	Total
	Government	AEC Contractor	Industry		
FY 69	22	29	5	13	69
FY 70	23	21	14	19	77
FY 71	12	8	19	22	61
TOTAL	57	58	38	54	207

total participation has not changed significantly. However, there are definite trends in the distribution. Participation from government and AEC contractor staff has been decreasing while that from United States industry and foreign sources has been increasing.

Table 2, which categorizes the organizations who have enrolled their

TABLE 2

SAFEGUARDS TRAINING PROGRAM Organizations Participating 1968-71		
Government	Industry	Foreign
11 Field Offices - USAEC	16 AEC Contractors	11 National Organizations
3 District Offices - DNMS - AEC	13 Major nuclear suppliers	13 International Organizations
OSMM - AEC Headquarters	8 Nuclear Utilities	4 Nuclear Suppliers
OWSM - AEC Headquarters	2 Consulting Firms	4 Nuclear Utilities
SEC - AEC Headquarters	1 Accounting Firm	
ACDA	1 University	
Department of State		
Tennessee Valley Authority		
State of New York		

staff during the three years, gives some additional insight. There

has been participation from most of the United States government entities which have an interest in safeguards and materials management. We have had participation from about two-thirds of the major Division of Nuclear Materials Safeguards licensed facilities and the participation is increasing. In the past year we have seen an interest on the part of the nuclear electrical utilities and it is expected that their participation will increase as our programs become better known to them. However, the one area from which the response has been disappointing has been the public accounting and auditing firms even though we have mounted a course specifically for their needs.

The Argonne School is becoming an important source of training for new people abroad. While the International Atomic Energy Agency has set up training in-house for its new inspectors utilizing on-the-job techniques, it has not been able to offer assistance in training for nuclear material control at the governmental or facility level. Since nuclear material control is a new activity in most of the countries of the world, the Argonne School fills an increasing need. Participants from 14 countries have attended the school and their number is growing. We have had in attendance persons responsible for setting up a national safeguards system in countries with newly developing nuclear industries as well as staff from governments and industries with more established programs. As the NPT agreements come into effect in the next few years, it is expected that there will be an increase in the demand for our training from abroad.

COURSE OFFERINGS

We have now offered our basic sequence six times. It has been shortened from thirteen to eight weeks and has been changed from a single course to a four-part sequence. The first section which deals with new developments in nuclear science and technology has not been given the last two times it was offered in FY 71 because of a lack of interest. This is disappointing to

me as this is the area in which I see a great need. Since many of the staff engaged in nuclear material control have not had formal training in nuclear science and technology but rather have developed their knowledge from actual experience, they are often handicapped in making the most of their abilities. Since nuclear material control is usually a team effort involving people with technical, business and statistical backgrounds, the lack of this common formal background can inhibit the functioning of the team.

In the second sequence on measurements we are gradually shifting our emphasis to non-destructive assay techniques. Up to now we have had to deal largely in the potentiality of these techniques but we are more and more able to give training in tested methods. We have increased statistical treatment in both the measurements and the nuclear material management sections - the third sequence. We have increased our contact in that third sequence with actual industrial control systems.

We still believe in a hands-on approach. We take people to visit actual facilities; we offer laboratory sessions in chemical and non-destructive techniques; we conduct actual inventories and deal with actual computer print-outs in all types of nuclear material records, reports and audits.

In the section of the basic course on safeguards, we have tended to more emphasis on statistical analysis of the efficiency of control and on physical protection and surveillance. We have also attempted to always keep in mind the economic, legal and international background in which safeguards and nuclear material control must operate.

Our three years of experience has confirmed our original belief in a multi-disciplinary approach to safeguards. We find that a mixture of new and experienced participants representing the major areas leads to a much more effective training situation. We have encouraged all the participants to live at the Argonne Guest Facilities so that a maximum after-hours interaction takes place. As the team concept in nuclear material control continues, the value of developing communications among the disciplines will be

even more important. As an example of the breadth of experiences in our courses, we call attention to the enrollment in our course "Fundamentals of Nuclear Material Control" given this past May (Table 3).

TABLE 3
LIST OF PARTICIPANTS
SAFEGUARDS TRAINING PROGRAM

"Fundamentals of Nuclear Material Control"
May 10-21, 1971

<u>NAME</u>	<u>AFFILIATION</u>	<u>TITLE</u>
CALORI, Fausto	CNEN of Italy Rome, Italy	Staff Official
CLARKIN, Margaret	Atomic Energy Control Board Ottawa, Ontario, Canada	Chief Accountability Clerk
COLE, Leonard F.	Mound Laboratory Monsanto Research Corp. Miamisburg, Ohio	Chief Accountability Clerk
COPELAND, Grady E.	Savannah River Operations - USAEC Aiken, South Carolina	Auditor
COSTANZI, Frank	Department of Physics Kansas State University Manhattan, Kansas	Research Associate
DUCHEK, Lawrence	Commonwealth Edison Co. Maywood, Illinois	Fuels Engineer
IRVINE, R. J.	Canadian Westinghouse Co., Ltd. Port Hope, Ontario, Canada	Production Controller
LIU, Tze-Chin	Taiwan Power Company Taiwan, Republic of China	Senior Nuclear Engineer
LUTTRELL, Robert P.	Oak Ridge Operations-USAEC Oak Ridge, Tennessee	Nuclear Materials Auditor
PENNE, Livia	Commission of the European Communities (EURATOM) Luxembourg	Accountant
SUYAMA, Naohiro	Power Reactor and Nuclear Fuel Development Corp. Tokyo, Japan	Technical Staff Member
WESTBURY, R. B.	General Electric Company San Jose, California	Senior Internal Auditor

In addition to the basic sequence, we have offered short courses and workshops in statistical methods, non-destructive assay techniques and overviews for various special interest groups.

FUTURE PLANS FOR COURSES

Our program for the coming year will run at a somewhat reduced level of course offerings. There will be approximately fifteen weeks of courses as compared to the twenty offered in FY 71. Only one basic sequence will be offered instead of two in addition to a greater variety of short courses and workshops.

OTHER ACTIVITIES

A new development in the safeguards training program has been the realization that the present need for training in the United States cannot be met by the offering of formal courses alone. Much can be done in on-the-job training and self-education. We hope to make training materials in statistics, non-destructive testing, and general safeguards techniques available both this and next year. These are variously aimed at the needs of industry and government. There is also in process development of training for those who might be involved in recovery of material which might be diverted.

Future manpower needs for safeguards will have to come from new university graduates with a background in nuclear science and technology. To this end we have begun a program of the development of training aids and other instructional material which can be used by the academic community.

Our approach to the academic community began with the development of a week-long program on safeguards at the 9th Annual Faculty-Student Conference of the AUA-ANL Nuclear Engineering Education Committee held at Argonne, August 17-21, 1970. This involved participation of many Institute members. Fifteen universities were represented among the 93 attendees. We also made contact with a number of institutions through a tutorial

session sponsored by the Education Divisions of the American Nuclear Society. I personally have given seminars in the nuclear engineering departments at six universities. As a result, we are increasing the awareness of students and faculty of the need for safeguards and nuclear material control and imparting some of the basic techniques of the measured material balance.

Arrangements have been made for two pilot programs for teaching safeguards at the university level -- a full semester course in nuclear material control at Kansas State University and a mini-course in safeguards at the University of Texas at Austin. We hope to encourage one to three additional pilot projects during the coming year. In this way, we hope to see how safeguards and material management can profitably be taught in normal university curricula and to increase the awareness of graduating students to this important need.

SAFEGUARDS TRAINING AS A VANTAGE POINT

The Safeguards Training Program has provided a unique vantage point for observing safeguards developments during the past three years. It is clear that there is acceptance and understanding of the technical requirements for effective safeguards by all participants in the program regardless of their affiliation. This understanding of these requirements by those at working levels is not always evident from the public statements made by representatives of industry and government.

However, there is not yet a universal recognition of where the responsibility for safeguards lies. If the responsibility is recognized to be one which must be shared at facility, government and international levels, there should not be a long delay in the application of effective safeguards. However, if there is a tendency to avoid responsibility at any level, there may well result a loss of control of the potentially hazardous materials in the growing nuclear industry and an unnecessary threat to the general welfare.