WASH-1122

IAEA
NUCLEAR DATA SECTION
MASTER COPY

INDC(US)-11 "G"

INDC-294

RESEARCH and DEVELOPMENT for SAFEGUARDS

DECEMBER 1, 1968

Office of Safeguards and Materials Management

000306

UNITED STATES ATOMIC ENERGY COMMISSION

ABSTRACT

This document indicates the present status of active research and development programs for safeguards and summarizes the results of completed contracts. Available information concerning unclassified contracts awarded from the beginning of safeguards activities in 1955 until October 1, 1968 is included. The active contracts are being supported by the ACDA, BMwF, IAEA and the USAEC.

In addition to serving as a historical review of safeguards research and development, the document also includes the "period of contract" and contract price so that the direction of effort and the increasing expenditures can be clearly seen.

Research organizations should be able from the summaries presented to identify areas in which they have special technological competence to contribute to the new and expanding field of peaceful use safeguards.

TABLE OF CONTENTS

I. INTRODUCTION

This report summarizes the results of unclassified research and development contracts in the field of peaceful use safeguards. (A brief history of the basis and background of safeguards is given in Section VIII, page 279.) All available information regarding contracts awarded from the beginning of safeguards activities in 1955 until October 1, 1968 is included.

The Atomic Energy Act of 1946 required that all special nuclear material be owned by the United States Government. At that time a system of control over the material was established to assure, to a high degree, the detection of any loss or diversion. By material assay and accounting procedures, the system demonstrated how much material should be at any location and how much was actually on hand. As indicated in Section VIII, the Act of 1946 was extensively modified in 1954 to permit the distribution of special nuclear material to private persons. The 1954 Act also provided, in the context of agreements for cooperation between the United States and other governments, for safeguards on special nuclear material distributed abroad.

In 1957, the Statute of the International Atomic Energy Agency became effective. It specifically required that safeguards be imposed on nuclear materials used in certain international activities.

The first control efforts of the USAEC after 1954 were concerned with activities collectively known as 'nuclear materials control' which were primarily for material accountability and financial purposes. To support these activities, the USAEC awarded contracts for the development of accounting procedures and analytical methods to assay the nuclear materials.

With the establishment in the USAEC of the Office of Safeguards and Nuclear Materials Management in 1967, safeguards have emerged as a more precisely defined area of endeavor aimed at preventing and detecting the unlawful diversion of nuclear materials. While this encompasses all the activities required for nuclear materials management, it includes new equipment and techniques, discussed in this document, such as tamper-proof seals and instrumentation, methods of material tagging, identification and assay, and systems studies of the entire nuclear fuel cycle.

A few research projects are reported which, although not performed for the specific purpose of safeguards, are related to safeguards.

These summaries indicate there is really no sharp line of demarcation between research for safeguards and research for many other purposes. The project summaries indicate very clearly that safeguards encompasses such diverse disciplines as radiation chemistry, accounting, statistics, reactor physics, computer programming, and operations analysis as well as efforts in the legal, financial and political areas.

This is a specialized report prepared for the information of those concerned with safeguards and nuclear materials management. It is not intended to include the technical detail that is presented in topical, or even progress reports. It supplements "Nuclear Science Abstracts" and other abstracting documents in that it also reports work in progress. The "Period of Contract" and the contract price are included to indicate the direction and scope of safeguards R&D; such information is not usually available from technical reports and published abstracts.

The original objective of this document was to summarize the results of individual contracts which had produced topical reports covering specific areas of investigation. In most cases this approach has been satisfactory. However, certain large contracts cover such a variety of subjects that several topical reports were prepared for a single contract. In this case, summaries of the individual reports rather than the contract are given (see page 122).

One purpose of this report is to indicate the areas of research effort and the expenditures since the formal beginning of research for safeguards in 1955 with the awarding of a contract by the USAEC for an inventory control study (see page 145).

In order to most effectively direct the expenditure of funds for safeguards R&D, it is necessary that the Office of Safeguards and Materials Management be cognizant of all work in this area. One purpose of this summary document is to indicate, as mentioned above, the historical development of safeguards R&D and to establish a perspective so that areas requiring effort can be identified.

The report summaries have been grouped according to subject as much as possible. The subject matter of some reports would permit their being put in any of several subject categories; these reports have been arbitrarily assigned to a suitable category.

The active research contracts are being supported by the United States Arms Control and Disarmament Agency, the Federal Ministry for Scientific Research (Federal Republic of Germany), the International Atomic Energy Agency and the United States Atomic Energy Commission.

II. SPONSORING ORGANIZATIONS

A. ACDA - United States Arms Control and Disarmament Agency
Department of State
Washington, D. C. 20451

B. BMwF - Bundesministerium für wissenschaftliche Forschung
(Federal Ministry for Scientific Research)
Federal Republic of Germany
532 Bad Godesberg, Germany

C. IAEA - International Atomic Energy Agency
Vienna, Austria

D. USAEC- United States Atomic Energy Commission
Office of Safeguards and Materials Management
United States Atomic Energy Commission
Washington, D. C. 20545

III. SUBJECT INDEX

IV. SUMMARIES