INSTITUTO DE ENERGIA ATÔMICA - ORGANIZATION, PURPOSES AND PROGRAMME

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INTRODUCTION

The Instituto de Energia Atômica (IEA) was created on January 11th, 1956, by an agreement between the Federal Government, represented by the National Research Council (CNPq) and the Government of the State of São Paulo, represented by the University of São Paulo.

From the beginning of 1963, all rights and obligations of the CNPq were transferred to the National Nuclear Energy Commission (CNEN).

The IEA is located on the site of the São Paulo University, University City, on the south border of the city at a distance of about 12 miles from the center of the town.

Presently there are four main buildings, with a total area of about 10.000 square meters. In those buildings are located the five MWth swimming pool research reactor, the various laboratories and offices, the administration service and the library. The expansion programme for the next year includes the construction of about 30.000 square meters of new buildings. The construction of those buildings is to be started in 1963.

There are about 200 persons working in the IEA and it is hoped to double this number in three years.

OBJECTIVES

The main objectives of the IEA cover a broad field of teaching, research, development and even activities in a pilot or semi-industrial

production level.

For instance, there is at the IEA a small pilot plant to produce nuclearly pure ammonium diuranate, with an output of 600 kg per month. A plant to produce uranium and thorium compounds of nuclear purity was designed by the IEA. The design output for uranium compound is 80tons. of uranium per annum.

The radioisotope production is also one of the activities of the IEA that is carried on a basis determined by the demand. The I^{131} production is at present of 4 C per month, produced and delivered in a routine basis. And there are previsions to increase such production when there still be steady demands for it.

The routine production of labelled compounds of interest to medicine is at its beginning; but it will receive special attention in the next year.

ORGANIZATION

The IEA is under the technical and scientific direction of a board composed of five members. Two of them are nominated by the Brazilian National Nuclear Energy Commission, two by the University of São Paulo. The fifth is the Director of the IEA nominated by mutual agreement between the National Nuclear Energy Commission and the University of São Paulo.

The decisions of the Technical and Scientific Council according to plans approved by the CNEN, are carried out by the Director, who is responsible for all the administrative work of the IEA. The technical and scientific matters are proposed by a Research Council.

The Research Council is composed of the Head of Divisions and under the presidency of the Director of the IEA decides on the programmes of the IEA, and admission of scientific and technical personnel. Such decisions are always submitted for the approval of the Technical and Scientific Council.

The budget of the IEA comes from the National Nuclear Energy Commission and from the São Paulo State Government.

There are presently seven Division at the IEA:

Nuclear Physics
Reactor Physics
Radiochemistry
Radiobiology
Nuclear Engineering
Chemical Engineering
Nuclear Metallurgy

A number of Auxiliary Services and Complementary Sections are under the Directorship such as the Health Physics Service, the Electronic Service, the Training and Teaching Section, Health Service, Library and Documentation, Maintenance, Transport, Radioisotope Distribution.

The general organization of the IEA is quite flexible and it is possible, within the present structure, to change a Service or a Sector in a Division if the characteristics of its activities do require such transformation.

MAIN PROGRAMMES

In the programmes of almost all Division of the IEA researches of a pure and applied nature are carried out.

Emphasis is, nevertheless, put on applied research. This is a consequence of the shortage of personnel, so that there is barely enough people to work on the various problems associated with direct applications of nuclear energy or nuclear radiations:

a) Nuclear Physics Division

The Nuclear Physics Division is primarily engaged in the development of techniques for cross section measurements, using either a slow chopper or a crystal neutron spectrometers. Both apparatus have been designed and constructed at the IEA.

The work with crystal neutron spectrometers will be considerably expanded when the IEA receives a high precision instrument already being built and obtained through the AIEA assistance programme.

Solid state physics research is just starting with some work being done on the magnetic scattering of neutrons.

The mass spectrometer of the IEA has been extensively used, performing analysis for many Divisions.

b) Reactor Physics Division

The Reactor Physics Division, through the Reactor Operation Section is responsible for the operation and maintenance of the 5 MWth reactor, development of irradiation techniques, supervision of all irradiations and beam holes utilization. A large part of the IEA activities is centered in the reactor operation and the greatest effort is made to increase the number of reactors operators and supervisors in order to be able to increase the operation time as demanded.

The Reactor Physics Division is also responsible for the development of techniques to measure macroscopic parameters of moderating and multiplying media. The method that is being used is the one of the pulsed neutron source.

Finally there is also an Analog and Digital Computing Section where methods of calculation applicable to power reactor core design are developed.

c) Division of Nuclear Engineering

This Division deals with all problems related to the design of power reactors including economics, heat transfer, optimization, sitting of reactors. The studies, radiation damage to structural and solid moderating materials, are developed in this Division too, as well as the industrial applications of radioisotopes. A water moderated uranium di-oxide fuel element sub-critical assembly designed in this Division is in the final stage of cons truction.

d) Nuclear Metallurgy Engineering

The Division of Nuclear Metallurgy deals with all aspects of fuel element fabrication. The main objetive is to develop the techniques needed to produce fuel elements for power reactors, containing uranium or thorium either pure or alloyed. Presently the Division is mainly engaged in the production of the fuel elements for a Argonaut reactor being built in Rio de Janeiro. And also with the fabrication of the uranium di-oxyde fuel elements for a water moderated sub-critical as-

sembly referred to above.

e) Radiochemistry Division

The processing of radioisotopes is one of the major activities of the Radiochemistry Division. Routine production methods of I^{131} and P^{32} were developed and the colloidal gold and Cr^{51} isotopes are under study. The reactor pool water treatment is another branch of activity of the Radiochemistry Division, as well as a quite large amount of analytical work done using either classical or gamma spectrometric methods. Activation analysis and tracer techniques are currently used in all activities of this Division.

Till now the operation of a pilot plant for the production of nuclearly pure ammonium di-uranate, using a method developed at the IEA, is under the responsability of this Division. Later on such activities will be transferred to the Chemical Engineering Division.

Divison of Chemical Engineering

This Division was created last year and has since been engaged on the design of a pilot plant for the production of nuclear grade uranium and thorium compounds. The buildings for such plant and associated laboratories will have their construction started before the end of 1963, and will be already in about 18 months. The maximum uranium output will be of the order of 80 tons per annum.

Radiobiology Division

The Radiobiology Division has quite a large field of research. The main lines of research are the applications of isotopes in medicin production of labelled compounds and biological effects of radiation. The medical applications of radioisotopes has received special attention and through an agreement made between the IEA and the Hospital das Clinicas of the Faculty of Medicin, a large amount of research and diagnostic applications has been made. The production of labelled compounds is an early stage, but a great part of the demand for the use in the Hospital das Clinicas is already supplied by the IEA production. On the field of biological effects of radiation the work is already advancing rapidly, and extensive use of gamma radiation from the reactor is made.

Future plans

Until this year (1963) the budget of the Institute of Atomic Energy and been quite limited and serious difficulties were found to increase at a reasonably rate the personnel and equipment. In 1963 the Federal budget - given through the National Nuclear Energy Commission - and the State of São Paulo budget - given through the State Government - increased substantially. And for the next years the total budget of the IEA will increase at a rate that will permit a rapid expansion of all activities, thanks to the 3 years CNEN planning approved by the Brasilian Congress.

In the power reactor field, great mphasis will be put on the natural uranium type of reactors, using either graphite or heavy water moderator.

All aspects related to power reactor are already being developed. Special emphasis is being given to a thorough analysis of the Brazilian industry participation in the construction of a power reactor. The National Nuclear Energy Commission has assigned to the IEA. The task of constituting a group to give all assistance to industries in order to develop a nuclear industrial complex capable of meeting the large-demands of nuclear power plant construction that will arise in ten years.

The power reactor fuel element production field is also expected to have a significant development. The plants for uranium production and fuel element fabrication are in the final design stage. It is the intention to have the fuel element fabrication done at the IEA premises; but the final uranium and thorium production plants - will be located outside the University City.

The power reactor design will be of the most important programmes and an intensive training of personnel is already under way. The digital data processing equipment needed in such field was already asked for, and probably next year the IEA will have a medium scale digital computer, such as the IBM 7040 or equivalent.

Of course a special emphasis is being put on graduated and technical personnel training. Next year a building will be constructed where

the various courses will be given. The Nuclear Engineering Course will receive special attention; but short courses on radiochemistry, radiobiology, isotope application to industry, reactor operator, health physics will also be given.

It is expected that the IEA will very soon become an integrated nuclear center where all activities on training teaching pure applied and technological research, production on pilot scale of materials of interest to nuclear energy, isotope and labelled compounds production, will be fully developed in a few years.

To reach the present status it was extremely important the help the IEA received from the US Atomic Energy Commission, the International Atomic Energy Agency and the French Commissariat à l' Energie Atomique.