A New IAEA Project: Nuclear Power Training Courses

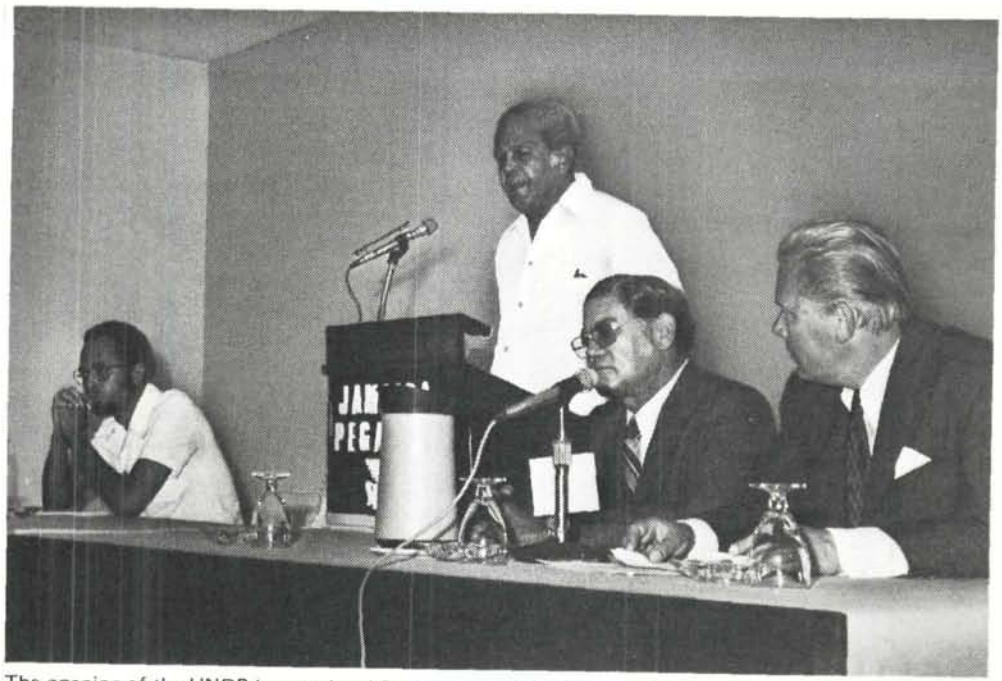
The need for nuclear power in the developing world has been highlighted by the oil price increase, so that in addition to the ten developing countries which already have nuclear power plants in operation or under construction, it can be expected that another 20 and/or 30 developing countries will seriously consider the introduction of nuclear power plants in their generating grids before 1990. With a preparation time of at least ten years to be counted on for a first project, the decisions to start preparatory work must be taken within the next few years.

Besides the major difficulty of finding financing, the most serious problem facing these developing countries is undoubtedly the **lack of trained and qualified staff.** Furthermore, the manpower implications of a decision to start a first nuclear power project are often not clearly realized. This may be partly due to a misinterpretation of the concept of a "turnkey contract" which is likely to be used for the first nuclear power project in a developing country. A turnkey contract will certainly help to reduce the responsibilities for project organization, management, surveillance and interface engineering, but it will not eliminate them. In fact, the buyer organization must expect to have spent some 100 to 150 man-years of highly qualified staff time before the contract is signed, and will thereafter spend 60 to 100 man-years per year even with the fullest possible use made of consultants at every stage. Moreover, only after the contract has been signed can the future supplier be drawn upon to provide any training of staff.

It must also be recognized that the first nuclear power project will need the type of skilled staff which is not readily available in most countries. What is needed is not nuclear scientists and physicists, but engineers with previous experience of major projects who are specialized in mechanical, electrical, construction and chemical engineering. The skills of such engineers have usually been obtained through on-the-job training, but with a first nuclear power project this has obviously not been possible and experience has shown that the opportunities for sending people abroad for training in project work are very limited.

DEVELOPMENT OF THE COURSES

Recognizing this situation, the IAEA began to initiate a programme in 1974 to provide specialized training, aimed primarily at those developing countries which were intending to initiate or accelerate nuclear power programmes. A meeting of consultants was held in September 1974 to draft a first syllabus for training courses designed specifically to provide key engineers and managers with timely and relevant training for the planning and execution of a nuclear power project. It was recognized that these courses would have to be different from any existing courses in, for instance, nuclear engineering. They had to be aimed at engineers, but also at lawyers and economists, who might have had earlier experience in responsible positions but lacked specific knowledge in the area of nuclear energy. The courses thus principally had to offer both a transfer of practical information and actual project experience, and provide only limited nuclear engineering technology.



The opening of the UNDP Interregional Seminar on *Nuclear Power Planning*, Kingston, Jamaica, in June, shows (from left): Mr. T. Byer, Energy Adviser, Jamaican Government, Chairman of the Seminar; the Hon. Allan Isaacs, Minister of Mining and Natural Resources, Jamaica; Mr. L. Crooks, UNDP Resident Representative, and Mr. R. Skjoeldebrand, IAEA. Photo: *Agency for Pub. Inf., Jamaica*

Participants in the first IAEA course on nuclear power project planning and implementation at Karlsruhe, F.R. *Germany*

It was also obvious that the courses would have to be quite long, and originally a duration of a full academic year of some 30 weeks was foreseen.

In a panel meeting in December 1974 the syllabus was further detailed and it was recommended to divide the proposed training into two parts: 1) planning a project up to the contracting stage, and 2) construction and operation management. It was decided that the first part should be given highest priority and each part was visualized as a 15 week course. (See Outline of Syllabi).

By the beginning of 1975 the Agency had received offers to host the courses from France, the Federal Republic of Germany and the USA. A time schedule was established, with a first course to be given at the Nuclear Research Centre, Karlsruhe, Federal Republic of Germany late in 1975, and four courses in 1976. Two of these four will be given at the Argonne National Laboratory, USA, and one at Karlsruhe; these three will be in English. A first course in French will be given at the Institut National des Sciences et Techniques Nucléaires, Saclay, France, in early 1976. Most of the early courses will deal with project planning, but it is hoped that a first course on construction and operation management will be given late in 1976, and that from then on increasing emphasis can be given to this second part.

For the first courses priority will be given to candidates from developing countries, but it is foreseen that in the future it will also be possible to accept trainees from industrialized countries if places are available and, of course, without cost to the Agency's technical assistance programme.

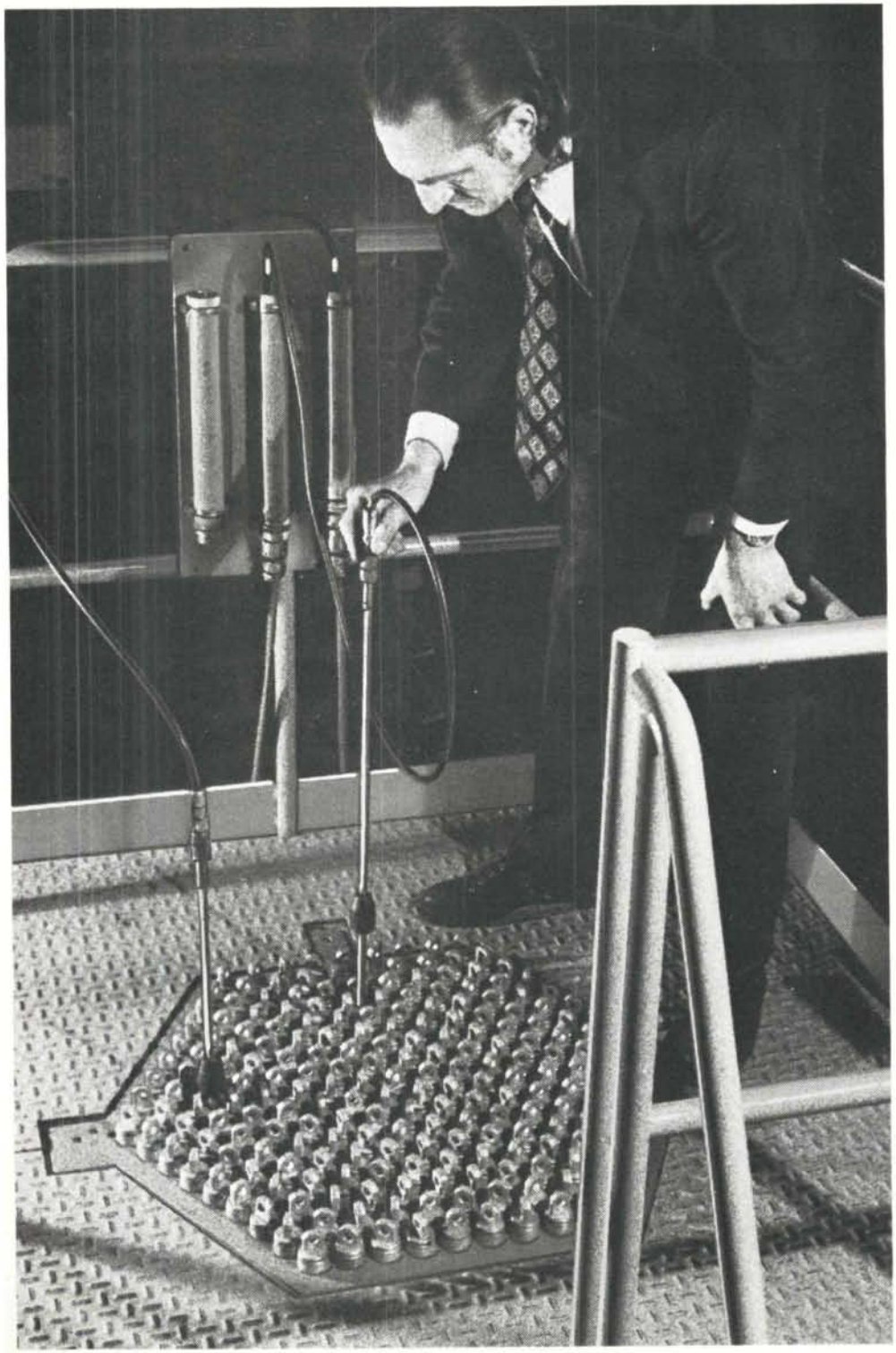
PRESENT SITUATION

The first course began at the Karlsruhe Centre in September, and the programme for the courses at Argonne and Saclay in 1976 is being finalized. The announcement of the courses has met with a very positive response, and 125 candidates from 29 countries applied for the available 80 places for the first two courses in English.

The three host Governments have put major efforts into the development of the programme. Each country has a budget for the courses of $250 000–$500 000. For the first Karlsruhe course, its directorate recruited about 100 lecturers and instructors, the majority coming from industry and Governmental authorities. The Agency has set aside a budget of $200 000 for 1975 and $500 000 per year from 1976 onwards, to cover not only the participants' stipends but also lecturers for those subject areas where it is essential to present an international viewpoint as represented by the IAEA or other international organizations (e.g. ICRP, IBRD, OECD/NEA) or to include the experience gained in other countries; such subject areas cover legislation and regulation, safety, safeguards and contracting practices. The training will also include visits to industrial plants and to nuclear power plant projects.

To provide for international advice for the courses and for continuity between the countries involved, an Advisory Committee has been set up with representatives of all host Governments and the IAEA. It is chaired by the Agency's former Deputy Director General for Technical Assistance, Mr. U. Goswami.

An inspection is made of the subcritical facility at INSTN, Saclay, France, site of one of the training ▶ courses. Photo: Pierre Jahan



FUTURE PLANS

This programme of courses on nuclear power project management constitutes a venture into a new type of training which can most appropriately be described as **"a transfer of actual experience in management and engineering"**. It has also meant very great efforts on the part of the host Governments and their institutions, to make these new courses a reality. The programme should be seen in the context of an overall training scheme in nuclear power which will be directed at all levels of those concerned in a particular country. In line with this, a series of two-week seminars on nuclear power planning has been organized for senior executives and policy-makers in Governments, ministries, planning commissions etc. The first of these seminars was held with UNDP financing in Jamaica in June 1975. There will also have to be specific and extensive training geared directly at the engineering levels of both project and regulatory groups. This must necessarily be given on regional or national bases, and should form part of the overall regional programmes which are now being formulated. A regional course, with contract arrangements and quality assurance programming as its main themes, is planned for Manila, Philippines, at the beginning of 1976.

It must, however, be recognized that even with these extensive Agency training programmes now available, only a fraction of the total training needs in the developing world can be met. The courses must be regarded primarily as a nuclei for the training, formal and on-the-job, which each country must establish for itself and conduct with the highest priority if its nuclear power plans are to be pursued with any degree of success.

Main Themes of Syllabi for Nuclear Power Project Management Courses

Part 1:

Nuclear Power Project Planning and Implementation
- *Introduction and Background*
- *Siting*
- *Radiation Safety and Protection*
- *Environmental Considerations*
- *Confirmation of a Nuclear Power Programme*
- *Regulatory Functions and Organization*
- *Other Legal Considerations*
- *Sources of Technical Assistance*
- *Characteristics of Commercially Available Reactors*
- *Pre-Contractual Stages*
- *The Contracts*
- *The Safety Analysis Report*
- *Costing and Financial Aspects*
- *Project Organization*
- *Preview of Construction, Start-up and Operation*
- *Public Relations*
- *Nuclear Plant Visits*

Part 2:

Construction and Operation Management

1. *Background Information*
   - *Nuclear Power Plants and Fuel Cycles*
   - *Safety, Safeguards and Regulatory Functions*
   - *Contracting and Financing*
2. *Project Organization and Construction Management*
   - *Project Management*
   - *Quality Assurance*
   - *Design and Engineering Review*
   - *Monitoring Procurement and Fabrication*
   - *Construction Management*
   - *Commissioning*
3. *Operations Management*
   - *Planning and Organization*
   - *Plant Operation*
   - *Maintenance, Refuelling, Modification and Inspections*
   - *Special Aspects of Nuclear Operations*
4. *Visits to Nuclear Plants*

The four Interregional Training Courses on Nuclear Power Planning and Implementation in 1976 will be:

1. **Argonne National Laboratoy, Argonne, Ill., USA:**
   6 January–16 April 1976

   Course conducted in English. Closing date for the acceptance of nominations was 1 September 1975.

2. **Institut National des Sciences et Techniques Nucléaires, Saclay, France:**
   30 March–9 July 1976

   Course conducted in French. Closing date for the acceptance of nominations was 1 November 1975.

3. **Nuclear Research Centre, Karlsruhe, Germany Fed. Rep.:**
   6 September– 17 December 1976

   Course conducted in English. Closing date for the acceptance of nominations is 1 March 1976.

4. **Argonne National Laboratory, Argonne, Ill., USA:**
   7 September–17 December 1976

   Course conducted in English. Closing date for the acceptance of nominations is 1 March 1976.

Each course will be limited to 30–40 participants. Candidates must have an adequate knowledge of the language in which the course is given. Candidates from the electric generating authorities are particularly invited to apply through their Government's Atomic Energy Commission.