POWER PROGRAMMES REVIEW

This section, which is intended to be a regular feature of the Bulletin, will contain brief reviews of the nuclear power programmes in the Member States of IAEA. Each issue of the Bulletin will carry a factual report on the programme of one Member State

NUCLEAR POWER IN ITALY

Several concrete measures have been initiated in Italy for the generation of nuclear power on a substantial scale. Two plants are already under construction and work will start soon on a third. Plans have also been announced for more stations. If the work already initiated is completed on schedule the installed capacity of nuclear power in Italy is likely to exceed 500 mw (electric) in the course of the next four years. This will constitute a sizeable proportion of the total electrical capacity in the country.

Power Demands and Sources

Before analyzing the programme in detail it would be useful to consider the country's general background of power demands and the availability of conventional power sources. The background is important as an explanation of the major emphasis that is being placed on nuclear power generation.

A measure of Italy's industrial growth is the rapid and vast increase in power consumption. Five years ago, i.e. in 1954, the annual consumption was 35.6 thousand million kwh, while in five years from now, the demand is expected to be of the order of 67 thousand million kwh. The present rate of increase in power demand is estimated at seven per cent. According to one estimate, the country's total requirements of energy in 1975 will amount to an equivalent of 83 million tons of coal. It is estimated that the indigenous energy sources will not be able to meet more than roughly one third of these total requirements.

Of the indigenous sources, coal is extremely scarce. About 90 per cent of the coal consumed in Italy at present is imported, and as a result coal prices are considerably higher in Italy than in the other industrial countries of Europe. Large quantities of fuel oil are also imported, and the present trend is to replace coal by oil wherever this is technically feasible. The only substantial source of chemical energy found within the country is natural gas, and increasing use is being made of this source.

The overall shortage of chemical fuels has made Italy's power system primarily dependent on hydro sources. At present approximately 82 per cent of the total power supply in the country comes from hydro-electric installations and about 18 per cent is derived from thermal stations using coal, oil or gas.

The best hydro-electric facilities are in northern Italy, where the Alpine curves are particularly suited to the harnessing of waters for power generation. The hydro potential in central and southern Italy is comparatively limited, but not inconsiderable, while in the islands there is not much scope for hydro power generation.

Good use has already been made of the hydro sources, and the increase that can still be made in hydro power output is certainly not large. Current annual production from hydro sources is about 35 billion kwh and it is estimated that the untapped potential can yield a little more than 15 billion kwh annually. But only about one half of the untapped potential is fit for economic utilization and at the current rate of utilization the hydro sources will have been almost fully utilized within a few years.

As already indicated, the power requirements in five years' time will be 67 thousand million kwh. Even if the existing hydro and geothermal sources are utilized to the fullest possible extent, they will not account for more than 79 per cent of the total power requirements at that time and the rest will have to be derived from coal, oil or gas or from any alternate source. Dependence on coal and oil imports would involve an increasingly heavy strain on the country's economy and it would, therefore, be imperative to find alternate sources of power. And to make that possible it is essential to make an immediate start with the development of alternate sources. This is where nuclear power is destined to play its role in the unhampered economic growth of Italy.

Five-Year Plan

After the Italian National Committee for Nuclear Research (Comitato Nazionale per le Ricerche Nucleari) was reorganized late in 1956, it prepared what can be described as a nuclear five-year plan for Italy. The plan, designed to cover the period 1957-1962, includes detailed schemes for a comprehensive development of the peaceful uses of nuclear energy, including a programme for the generation of power. The Comitato Nazionale per le Ricerche Nucleari (CNRN) promotes and co-ordinates the various activities in the field, and within the framework of its general programme certain industrial groups in Italy have formulated specific projects for nuclear power. In a paper presented at the Geneva conference last year, Professor Basilio Focaccia, the President of CNRN, dis-

closed that several companies were planning to build nuclear power stations in Italy. The details of these plans, as given by official sources, are as follows:

(i) SELNI (Società Elettronucleare Italiana), pertaining to the Edison-Volta group, which plans to build a pressurized water reactor.

(ii) So.R.I.N. (Società Ricerche Impianti Nucleari), a company founded by the Fiat and Montecatini groups, which is constructing a research centre, with a swimming pool reactor, and various laboratories for chemistry, physics and metallurgy. This centre will also be used for the training of specialized personnel, in view of the company's programme which envisages two 150 mw (e) plants: one operating with enriched uranium, the other with natural uranium. Such a programme will become effective only when the cost of power produced by these plants may actually compete with that of similar conventional stations.

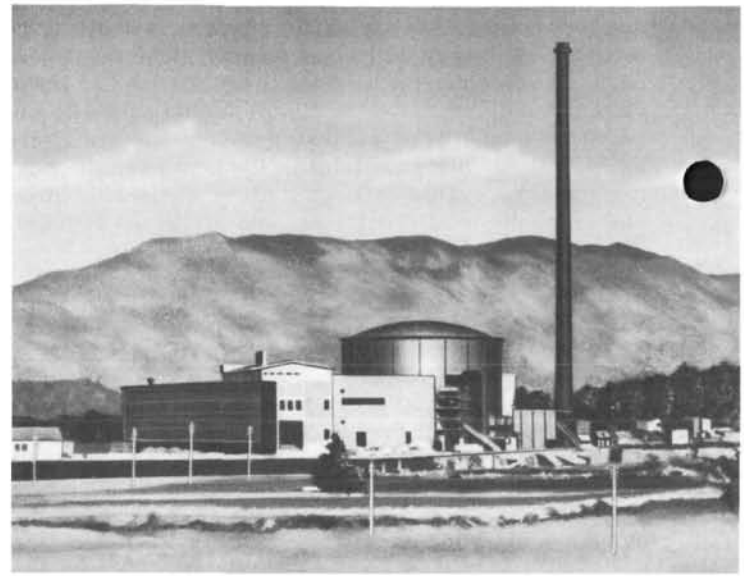
(iii) AGIP NUCLEARE - of the ENI group, which has created an organization with laboratories and technical offices in order to design and construct nuclear plants. For reactors of the natural uranium type, AGIP NUCLEARE has signed agreements both with U.K.A.E.A. and with a private manufacturing group, the Nuclear Power Plant Company. The first achievement of their efforts will be the construction for the

(iv) SIMEA /Società Meridionale Energia Atomica (75 per cent ENI + 25 per cent IRI)/ of a power station in Latina, near Rome, of 200 mw (e) of the Calder Hall type. SIMEA has signed a contract for the supply of British components for this station.

(v) SENN - Società Elettronucleare Nazionale (57.5 per cent Finelettrica, 15 per cent Finmeccanica, ten per cent Finsider, 17.5 per cent private independents). This Company was entrusted by the Italian Government with the construction in southern Italy of a 150 mw (e) nuclear plant, within the framework of a project promoted by CNRN jointly with the International Bank for Reconstruction and Development.

Professor Focaccia estimated that the completion of these projects would create 900 mw of nuclear power capacity in Italy and he pointed out that considering the imminent shortage of conventional power in the country, the programme could not be regarded as too ambitious.

The entire programme, however, has not yet taken concrete shape. Of the projects mentioned above, work is already under way on the construction of two: those being built by SIMEA and SENN. Both these plants are being built in southern Italy, the SIMEA plant at Borgo Sabotino, about 40 miles from Rome, and the other on the river Garigliano, about half-way between Rome and Naples. As indicated above, the reactor for the SIMEA plant, which will be of the Calder Hall type, is being supplied by the Nuclear Power Company of Britain. The SENN reactor will be of the boiling water enriched uranium type, supplied by International General Electric of the USA. For the SELNI project the Italian company recently signed a contract with another American firm, Westinghouse Electric International Company, which will supply a power reactor of the pressurized water type. It has now been decided that this reactor will have



An important centre for nuclear research and training of technologists for Italy's atomic energy programme is Ispra on the Lago Maggiore, less than 60 kilometres from Milan. The centre was officially inaugurated on 13 April 1959 in the presence of representatives of atomic energy authorities in many countries and the Director General of IAEA. Photograph shows the centre's research reactor, Ispra-1, a heavy water, enriched uranium reactor with a maximum output of 5 mw. It will be used for materials testing, research on separation methods and purification and utilization of fission products, studies of technological problems of power reactors, production of isotopes and experiments and research on low and medium energy nuclear phenomena

a net capacity of 160 mw (e) and not 135 mw as earlier planned. The plant will be located in northern Italy.

These three plants together will thus have a total installed capacity of 510 mw. The first two, which are already under construction, are expected to go into operation by the end of 1962. The SELNI plant is scheduled to begin operation in the spring of 1963.

Project ENSI

The project for the SENN plant is of special interest as it has grown out of an important expert study of various economic and technical factors. SENN, which was formed early in 1957, represents Govern-

ment and private industry interests as well as power producers and distributors. The company was charged with the responsibility for bringing into operation a series of nuclear power plants in southern Italy and it negotiated an agreement with the World Bank, through CNRN, for a joint study of different nuclear power plant systems and their relative suitability for southern Italy. The study project, known as ENSI, included the selection of a site for a full-scale plant, preparation of invitations for tenders, review of the tenders and an analysis of the economics of the proposed nuclear plant and a comparable conventional plant.

The World Bank had for some years been examining the economic possibilities of nuclear power and had issued a survey report in June 1956. Mr. Corbin Allardice, the World Bank adviser on atomic energy, conducted an enquiry into the possibilities offered by the present state of technical advancement for the economic utilization of nuclear energy in the industrial field. Mr. Allardice's report endorsed the view that the new source of energy must be developed in order to cope with the ever growing demands for power, and indicated Italy and Japan as the countries where a nuclear plant of about 150 mw might be competitive with a conventional plant. The Bank decided upon an examination of certain specific locations, and the first choice was Italy. In view of the special conditions in Italy, to which reference has already been made, the Bank considered that a nuclear plant might be economically competitive in the southern region of the country. The Bank and the Italian Government decided upon a detailed study, and it was agreed that the plant that would be based on this study would be built by SENN.

It is on the basis of the ENSI study report that the site for the plant has been chosen on the river Garigliano and it has been decided that the reactor will be of the boiling water type.

The choice of suitable reactor types for the Italian power programme has been a matter of some interest to CNRN. In a report last year it noted that the prevailing choice seemed largely confined to the two major types: the gas-cooled natural uranium reactor and the pressurized water-cooled enriched uranium reactor. But it pointed out that "to reduce the problem to the choice between two types .... is to over-simplify it" and called upon the Italian nuclear power industry to "strike out towards a larger range of equipment", instead of concentrating on only two types. "This in turn", said the report, "would enable Italy to acquire knowledge essential to a larger development of nuclear energy".

GUIDE TO POWER REACTORS

"The dissemination of technical and scientific information in concise form is a principal function of the International Atomic Energy Agency in its efforts to contribute to the development of the peaceful uses of atomic energy throughout the world". With these words the IAEA Director General, Mr. Sterling Cole, introduces the Agency's first major scientific publication, a directory of power reactors now in operation or under construction in various parts of the world. * Directories of other types of reactors are also in preparation by the Agency. In his foreword to the volume which has been issued, Mr. Cole says: "Some of the information now presented is issued for the first time; other information is not new but, to the best of my knowledge, extensive data covering so many power reactors presented in a uniform and systematic manner have not been published before."

The purpose of the directory is to present important details of various power projects in such a way as to provide a source of easy reference for anyone interested in the development of the peaceful uses of atomic energy, either at the technical or management level. In selecting reactor projects for inclusion in this volume, the basic criterion has been that they should be in regular operation and be producing useful electric power by the end of 1962.

All data contained in the directory have been either provided or reviewed by the authorities in the Member States concerned, and can, therefore, be considered as the best available at the present time. Thanks to the co-operation of Member States, it has also been possible to include in this volume a number of projects about which no information has hitherto been generally available and many details which have not been included in any previous publication.

Arrangement of Data

The information has been presented in a uniform manner for all reactors. With a few exceptions, six pages have been devoted to each reactor, the first of which contains general information, reactor physics data and information about the core. The second and third contain sketches of the fuel element or of the fuel element assembly, and of the horizontal and ver-

Directory of Nuclear Reactors, Vol.1. Power Reactors International Atomic Energy Agency, Vienna 1959 Price US$ 3.50