

# THE WORLD POWER CONFERENCE AND ATOMIC ENERGY

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"The Objects of the World Power Conference are the development and peaceful use of energy resources to the greatest benefit to all, both nationally and internationally, by:

- (i) Considering the potential resources and all the means of production of energy in all their aspects,
- (ii) Collecting and publishing data on energy resources and their utilization,
- (iii) Holding Conferences of those concerned in any way with surveying, developing or using energy resources."

This extract is taken from the Preamble to the Constitution of the World Power Conference which was founded in 1924 to form a link between the different branches of power and fuel technology.

Since the war of 1939-1945, it has been increasingly evident that constant and often vigorous development of the various sources of power is essential if the world is not to suffer from shortages of economic power within the foreseeable future. Most of the readily available hydro sites have been harnessed and future development is proving more and more expensive. In some of the world's great coal-fields, supplies of good quality coal at competitive prices are becoming scarce and it is becoming more and more expensive to produce coal even of inferior quality. The other important fuel for power production - oil - is only plentiful because of the vast sums of money expended by the great oil companies in surveying and drilling operations. Since, however, the great oilfields of the world are concentrated in a few areas, supplies of oil for many countries are dependent on various factors and sometimes affected by political difficulties.

## Atomic Energy as a New Form of Power

Under these conditions, the possibility that emerged after the last World War that useful power could be produced from nuclear fission led to optimistic estimates that nuclear power would prove to be the solution to the world's energy problems. Much of the energy and drive which had led to the production of the atomic bomb was directed into peaceful channels, and in the United States, the USSR, and the United Kingdom, as well as in many other countries to a lesser degree, schemes destined to lead to civil power production by nuclear means were urgently pressed forward. In the United States and possibly also in the USSR, where still abundant and economic

supplies of hydro power and coal meant that the need for an alternative source of power was not pressing, the drive was spread over a wide front of nuclear reactor types. In Britain, where the need for an alternative source of power appeared more urgent, the drive was concentrated on one reactor type and in 1955, even before the first real prototype had been operated, it was announced by the Government that large civil nuclear power stations would be built.

To understand the optimism which swept the world after the announcement that power could be produced by nuclear means, it is necessary to set out a few of the more important facts to indicate possible advantages of nuclear methods of power production compared with conventional means. The energy released during the fission of 1 lb. of uranium-235 is equal to that produced by the combustion of about 3 000 000 lb. of coal. The enriched uranium charge of a pressurized water reactor such as that installed at Shippingport in the USA will continue to produce power for three years or more without replacement. The throughput of fuel in a gas-cooled graphite moderated reactor of 500 000 kilowatts capacity is 160 metric tons of natural uranium metal per year - the corresponding consumption of coal for a station of similar size would be around 1 500 000 metric tons per year.

The experience of the last few years has somewhat tempered the initial optimism but the ultimate aim still remains, that is to construct at low capital cost a power generating station which needs only a small amount of fuel, the minimum of operating staff, and which produces power at less cost than a conventional station.

## Atomic Energy Discussed by W.P.C.

The possibility of developing this new source of power from hitherto unexploited mineral resources was of the greatest interest to the World Power Conference, and at the Fuel Economy Conference at The Hague in 1947, delegates were presented with three papers, from France, the United Kingdom and the United States, giving available details of this new source of power. In 1950, the latest developments in the use of atomic energy for power production were presented to 1 629 delegates from 53 countries in five papers, three of which were extensions of those presented in 1947. In 1956, in Vienna, 20 papers out of the 274 presented were on atomic energy for power production, the number of delegates having risen to 2 924. By this time, distinctive subjects were becoming recognized and two General Reports were

issued, one dealing with the Basic Principles and Design of Reactors and the other with Metallurgical and Chemical Problems and Protective Measures.

Since 1956, three sectional meetings of the World Power Conference have been held, at Belgrade in 1957, at Montreal in 1958 and at Madrid in 1960. At these Sectional Meetings, the programs are more specific and less ambitious than those of the Plenary Sessions held every six years. Nevertheless, each had a section devoted to the use of atomic energy for power production - in Belgrade, on the utilization of nuclear power (including economic aspects), in Montreal, outlining economic trends in the production of energy, and in Madrid, indicating methods for solving power shortage problems.

### For Discussion at Melbourne, 1962

The next Plenary Session of the W.P.C. is to be held in Melbourne, Australia, in 1962, and the Technical Program points out that "developments in this (nuclear energy) field are new and moving so rapidly that a special sub-division will be devoted to this topic".

The 1962 Conference with its theme "The Changing Pattern of Power" will undoubtedly attract great interest in a world where the change-over from conventional to nuclear fuels for power production has started in some countries and is being actively examined in others. It is generally being realized that even though a country may possess indigenous supplies of uranium or thorium minerals, the building up of a nuclear industry is a long and expensive process and the alternative of depending on countries more advanced in nuclear technology for the supply of materials, skill and know-how is costly in foreign exchange and international prestige. Many of the industrialized countries, still possessing supplies of conventional fuels, are preparing for the day when their reserves will become depleted and are embarking on training schemes to ensure a continuing supply of engineers and scientists skilled in nuclear arts. In this the industrialized countries are assisted by the rapidly increasing use of radioactive materials for industrial uses. Many of the same skills are required in this work as in the work of nuclear power generation.

Information from those countries where the need to change to nuclear power is more pressing will prove extremely helpful in ensuring that the later change-over to nuclear power generation in currently more favored countries is accomplished at minimum cost. The World Power Conference, embracing as it does all forms of power generation and utilization, should prove to be an excellent venue for the exchange of information and ideas. In Melbourne, particular interest will undoubtedly be shown in papers which give the latest indications of how far nuclear power has progressed towards parity in cost with conventional power in different areas of the world. Costs published in the past few years have suggested that nuclear power has not continued to show the promise

it did in the first optimistic estimates. The competitive position of nuclear power has also been worsened by somewhat unexpected improvements in the utilization of solid fuels, particularly coal. In the United Kingdom, for example, the time of "break-even" when nuclear power is expected to cost the same or less than power from conventional fuels has gradually receded from 1965 to 1970, or later.

A good deal of interest will also be shown in papers outlining the latest economic position of small and medium nuclear power stations which in many countries with small interconnected networks are the only stations which can be operated at the high load factors so essential for economic power production. In this connection, most countries will be eager for information on power reactors utilizing natural uranium or thorium which do not require fuel enrichment in an isotope separation plant. Apart from the gas-cooled reactors favored by the United Kingdom and France and also being installed in Italy and Japan, an important reactor in this class is the natural uranium reactor moderated and cooled by heavy water, being built at Douglas Point in Canada.

Finally, the Conference may receive a pointer towards the future of power production. There is still the possibility of a break-through in the experiments at present being carried out in the production of energy by thermonuclear means, although the promise of the early experiments has not been sustained.

### International Co-operation

Acting as it does as a forum for the exchange of technical and economic information on all that pertains to sources of energy, on the means of harnessing them and the most effective means of utilization, the World Power Conference is almost unique in bringing together people who would not normally meet. It is therefore in a position to advise various specialized international bodies on these matters. The special experience gained since the W.P.C. was founded in 1924 has led to its being granted consultative status with the following bodies:

Economic and Social Council of the United Nations (ECOSOC) - 1952

United Nations Educational, Scientific and Cultural Organization (UNESCO) - 1952

World Meteorological Organization (WMO) - 1955

International Atomic Energy Agency (IAEA) - 1959

The Conference also co-operates with many other organizations, as widely varied as the Permanent Council of the World Petroleum Congress, the World Bank and the OEEC (now the OECD) just to name a few, and is represented by observers at meetings of the Power Committee of the Economic Commissions for Europe (ECE) and for Asia and the Far East (ECAFE).

## Example of International Co-operation

The following will serve as an example of the way in which the W.P.C. has proved of value internationally. Since its foundation in 1924, the World Power Conference has concerned itself in an attempt to assess on a comparable basis the energy resources of the world. After ten years of preliminary work, the first regular issue of the Statistical Year Book of the World Power Conference was published in 1936. Publication was interrupted by the war but resumed in 1948. The international value of the collected information has been recognized and it has now been agreed that the collection of the annual statistics on fuel and power will be undertaken by the United Nations whilst the W.P.C. will continue to collect and publish basic data on energy resources.

## What of the Future?

In many of the industrialized countries of the world, the demand for power is found to double about every 10 to 15 years. As the lesser developed countries forge ahead along the path that others travelled earlier, their power requirements increase at an even faster rate. Furthermore, as the world population increases, it is becoming more and more urgent to reclaim the desert wastes for food production and ensure water supplies by artificial means. All these projects require power and the work of the World Power Conference will continue to be actively directed towards ensuring that mankind has at all times plentiful and cheap power to further the dreams of peace and plenty for all.

## CONFERENCES RELATING TO ATOMIC ENERGY

February - April 1962

Extract from the periodic publication "Atomic Energy: Conferences, Meetings, Training Courses" which is available free of charge to those specially interested from the Division of Scientific and Technical Information, IAEA, Kaerntnerring 11, Vienna I

| <i>Date</i>    | <i>Subject and Location</i>   | <i>Convening Body and/or Organizers or Sponsors</i>  | <i>Address for Enquiries</i>   |
|----------------|---|--|--|
| 4 - 7 Feb      | National Meeting of the American Institute of Chemical Engineers, including Sections on Fluid Mechanics in Chemical Reactor Design and Thermodynamics - Los Angeles, California, USA                          | American Institute of Chemical Engineers   | Mr. G. C. Szego, Program Chairman, Space Technology Laboratories, P. O. Box 95001, Los Angeles 45, California, USA                   |
| 7 - 10 Feb     | Annual Meeting of the American College of Radiology - New York, N. Y., USA  | American College of Radiology  | Mr. W. C. Stronach, Executive Director, American College of Radiology, 20 N. Wacker Drive, Chicago 6, Ill., USA                      |
| 23 - 24 Feb    | Meeting of the American Physical Society - Austin, Texas, USA   | American Physical Society  | Mr. K. K. Darrow, American Physical Society, Columbia University, New York 27, N. Y., USA  |
| 26 Feb - 2 Mar | Symposium on the Use of Radioisotopes in Soil-Plant Nutrition Studies (including the Behaviour of Radioactive Nuclides in Soils and other Geological Materials and their Passage into Plants) - Bombay, India | International Atomic Energy Agency; Food and Agricultural Organization of the United Nations | IAEA, 11 Kaerntnerring, Vienna I, Austria  |
| Spring         | 2nd Scandinavian Symposium on Food Irradiation - Stockholm, Sweden  |  | Mr. L. E. Ericson, Kungl. Tekniska Högskolan, Fack, Stockholm 70, Sweden   |
| 20 - 23 Mar    | Spring Meeting of the Institute of Metals, including Discussion on Uranium and Graphite - London, UK  | Institute of Metals  | Mr. Richard E. Moore, Secretary, The Institute of Metals, 17 Belgrave Square, London, S. W. 1, UK                                    |
| 20 - 29 Mar    | 141st Meeting of the American Chemical Society - Washington D.C., USA   | American Chemical Society  | Mr. A. T. Windstead, National Meetings Department, American Chemical Society, 1155 Sixteenth Street, N. W., Washington 6, D. C., USA |