Britain's Nuclear Power Program

Less than 16 months ago, Calder Hall, the first full-scale nuclear energy power station in the world, began to feed electric power into Britain's national grid. Now, four new and considerably more powerful stations are under construction, and sites are being explored for others. The great progress which has been made in plant design and technology, without any fundamental change in nuclear physics, is reflected in Table 1.

In March 1957, the Government revised the nuclear power program of February 1955 by virtually trebling the capacity planned for 1966, from 1500–2000 to 5000–6000 megawatts. But, thanks to the tremendous rate of advance of the last year and a half, 12 stations, the same number envisaged in 1955, will be capable of providing the new capacities.

Limitations on size receding. At first, it was thought that 19 stations would be required. Since the technical limitations on the size of nuclear power stations are rapidly receding, it is even possible that the figure of 12 with a total capacity of 6000 megawatts may not be the final number of stations operating in 1966. According to the latest information available, it is now feasible to build a single reactor capable of producing substantially more net electrical output—400 megawatts—than the first four complete stations listed in Table 1. This means that atomic power stations with a capacity of 800 megawatts can now be built and are likely to feature in the second group of stations to be constructed.

A number of factors have contributed to this development. The size of the reactor has increased, and with it the amount of uranium fuel. New welding techniques, based on the experience acquired in building Calder Hall, have made possible the increased size of the pressure vessel which houses the reactor. While in the case of Calder Hall 2-inch steel plates were the limit, it is now possible to weld 3-inch and possibly even 3½-inch plates. And the resulting increase in size of the pressure vessel has allowed core diameters to be raised from 35 feet at Calder Hall to 50 feet at Hunterston.

Table 1. Progress in plant design and technology.

Plant	Net electric output (Mw)	Heat output per reactor (Mw)	Uranium (ton)
Calder Hall	138	143.7	117
Berkeley	275	530	250
Bradwell	300	531	240
Hunterston	320	535	249
Hinkley Point	500	966	375

Table 2. Cost per unit of power generated.

Date	Nuclear (pence)	Conventional (pence)
1960	0.66	0.60
1970	0.47	0.66
1980	0.37	0.73

Cost of nuclear power will fall quickly. At the beginning, the new nuclear stations now under construction will generate electricity at a cost slightly higher than would be possible from the latest coal-fired power stations in Britain. But according to the calculations made by Sir Christopher Hinton, formerly in charge of industrial development at the United Kingdom Atomic Energy Authority, and now chairman of Britain's new Central Electricity Generating Board, the cost of electricity produced by nuclear and conventional power plants should be strictly competitive in 1962. By 1982 the cost of electricity produced by atomic power might well have fallen to half that of electricity from coal. The figures in Table 2 indicate the progress expected between 1960 and 1980. The improved efficiency of conventional generating plants will be offset by the increasing cost of mining coal.

In arriving at the calculations of the cost of nuclear electricity, allowance has been made for the fact that most of the nuclear stations from 1970 onward, like many of the conventional power stations today, have to operate on less than base-load. In fact, it is assumed that the rate of 80 percent of the 24 hours in each day during which the first nuclear stations would be operated would drop to 70 percent in 1970 and 65 percent in 1980. It is also worth stressing that all figures for electricity generated by nuclear energy have been worked out on present reactor and technological plans. Obviously, progress in fundamental research or technology may produce still more favorable results.

Research into new types of reactors. A great deal of research into new types of reactors is going on in the laboratories both of the U.K. Atomic Energy Authority and of the firms directly concerned with the construction of nuclear power plants. And intensive work is proceeding to realize the full potentialities of the gas-cooled graphite-moderated Calder Hall type of reactor which, it is visualized, will be used in stations to be built under the present program. One of the most important long-term objectives is the reduction of fuel costs by utilization of a higher proportion of the total uranium fed to the system. Recycling of the plutonium produced during the operation of the reactor might increase the burn-up rate by as much as a factor of five. In practical terms this would make 1 ton of uranium equivalent to 50,000 tons of coal, as against 10,000 tons in the case of the first Calder Hall reactor.

Perhaps the most striking feature of the rapid rate of progress in using atomic energy for peaceful purposes on a large scale in Britain is the fact that industry came in at an early stage to undertake commercial development of reactor systems designed by the U.K. Atomic Energy Authority. All power stations are being developed on a competitive basis by groups of British engineering and construction firms, supported by other companies specializing in the manufacture of the vast ranges of electronic and other measuring and ancillary equipment needed. All of them are able to call on the Atomic Energy Authority's basic knowledge, and they are thus able to accumulate a large amount of experience and to create great manufacturing capacities.

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Exchange of Agricultural Observers

The U.S. Department of Agriculture has announced that it will send six agricultural groups to the Soviet Union this summer and early fall, and that the U.S.S.R. will send a similar number to the United States. Three additional teams from each country are to be exchanged in 1959. The delegation exchange plan is in accordance with last January's agreement between the United States and the Soviet Union providing for a general program of exchanges in cultural, technical, and educational fields.

The teams going to the Soviet Union will be the first groups sponsored by the U.S. Department of Agriculture to have an opportunity to visit Russian farms, research stations, and institutions, and learn what agricultural developments have taken place in the U.S.S.R. The Russian visitors will have opportunity for similar observations in this country. Each of the U.S.–Russian delegations will be seeking specific scientific or technical knowledge. Accordingly, the membership of each American delegation has been selected from among U.S. Department of Agriculture and Land Grant institution specialists.

The U.S. delegations going to the Soviet Union in 1958, by subject interest and probable date of departure, are: agricultural economics, 25 June; agricultural crops, 5 July; soil and water use, 10 July; veterinary science, 15 July; mechanization of agriculture, 18 August; and cotton growing and plant physiology, 1 September. There are plans to

send three additional teams in 1959 in the following fields: (i) forestry, lumbering and millwork; (ii) sheep raising; and (iii) biological control of agricultural pests.

The United States expects to receive from the Soviet Union this summer teams in the following fields: irrigation and reclamation, June–July; forestry, lumbering and millwork, July-August; mechanization of agriculture, August; animal husbandry, September-October; agricultural construction and electrification, September–October; and veterinary science, October–November. In 1959 additional delegations are to be received from the U.S.S.R. as follows: (i) mixed feeds; (ii) cotton growing; and (iii) horticulture.

Grants, Fellowships, and Awards

Biology and medicine. The Division of Biological and Medical Sciences of the National Science Foundation has announced that the next closing date for receipt of basic research proposals in the life sciences is *15 September.* Proposals received prior to that date will be reviewed at the fall meetings of the foundation's advisory panels, and disposition will be made approximately 4 months after the closing date. Proposals received after the 15 September closing date will be reviewed following the winter closing date of 15 January 1959. Inquiries should be addressed to the National Science Foundation, Washington 25, D.C.

Medical writing. The editors of *Modern Medical Monographs,* a quarterly publication, have announced an award for the best unpublished manuscript for a short book on a clinical subject in the field of internal medicine. The purpose of this award, which will be known as the Modern Medical Monograph Award, is to stimulate young physicians to communicate their work in the classical form of the monograph and to achieve high standards of medical writing. The winner of the competition will receive $3500. In addition, the winning monograph, if found suitable, will be published as a book in the series *Modern Medical Monographs.* Henry M. Stratton, president of Grune and Stratton, Inc., publishers of the series, has made the award possible. The entries will be judged for style and clarity of expression by a committee of the American Medical Writers' Association, and for clinical interest and scientific value by the editors and advisory board of Modern Medical Monographs.

The author must be a graduate physician, less than 40 years of age. Single authorship is preferred, but two coauthors will be acceptable. Manuscripts should be submitted in duplicate (original and one copy) by registered mail, postmarked *no later than 1 October 1958,* to Dr. Richard H. Orr, 37 E. 67 St., New York 21, N.Y.

Neurochemistry. A postdoctoral training program in neurochemistry is being organized at Columbia University with the financial support of the National Institute of Neurological Diseases and Blindness, U.S. Public Health Service. The program is under the auspices of the departments of biochemistry and neurology at the College of Physicians and Surgeons and will be directed by David Nachmansohn and Irwin B. Wilson.

Several fellowships are available for periods of 2 to 3 years. The stipend is dependent on previous experience. A doctor's degree in chemistry, biology, or medicine is prerequisite. For application or information write to: Dr. David Nachmansohn, College of Physicians and Surgeons, Columbia University, 630 W. 168 St., New York 32, N.Y.

Nutrition. The National Vitamin Foundation invites individuals who hold doctoral degrees in medicine or one of the biological sciences and who are interested in continuing their training in nutrition, to become candidates for a National Vitamin Foundation–Russell M. Wilder fellowship. The fellowship is for 3 years and pays the recipient $4500 the first year, $5000 the second year, and $5500 the third year. It becomes effective in July or September 1959. Application forms may be obtained from the offices of the National Vitamin Foundation at 149 E. 78 St., New York 21, N.Y. Completed forms must be submitted *before 1 September.*

Science teaching. The National Science Foundation has announced that proposals are now being accepted for the support of 1959 Summer Institutes for the supplementary training of high school and college science and mathematics teachers. Universities and colleges that wish to sponsor such institutes are invited to request information from the Program Director for Summer Institutes, National Science Foundation, Washington 25, D.C. Deadline for the submission of proposals in final form is *1 August.*

One hundred and twenty-five institutes are scheduled for the summer of 1958 in 47 states, the District of Columbia, Alaska, Hawaii, and Puerto Rico. Increasing Congressional support of the program makes it desirable for the foundation to plan now to triple the number of institutes to be held during the summer of 1959.

Foundation support enables sponsoring institutions to pay stipends to participating teachers, plus allowances for dependents and travel; it also contributes toward operational costs. The number of teachers varies from institute to institute, but averages about 50. (Teachers submit applications directly to the sponsoring institution, not to the foundation.)

The number of institutes for high school and junior high school teachers will probably exceed 300 in the summer of 1959. About 10 percent of the 160,000 science and mathematics teachers in secondary schools of the country will be able to participate. It is expected that approximately 40 institutes can also be provided for some 1800 college teachers, to whom only eight institutes are available this year.

Illinois Natural History Survey

The Illinois Natural History Survey this year completes its first century of biological research. The state agency, which has its principal offices and laboratories on the University of Illinois campus in Urbana, dates its origin from 30 June 1858, when the Illinois State Natural History Society was founded at Bloomington. In 1877, research activities of the society, which through much of its existence had received state support, were taken over by the newly organized Illinois State Laboratory of Natural History. In 1917, the laboratory was united with the State Entomologist's Office, established in 1867, to form the present Illinois Natural History Survey, a division of the State Department of Registration and Education.

In the past 100 years, staff members of the state agency have made many notable contributions to biological science, especially in research relating to the renewable natural resources of Illinois. They did pioneer research on animal ecology; the biology of the Illinois River prior to and during the development of the Chicago pollution problem; populations and food habits of fishes and birds; causes of the stunting of fishes in lakes and ponds; classification, life history, and control of important insects; resistance of insects to chemicals; and control of important plant diseases.

Early well-known biologists who had research papers published by the agency include Stephen Alfred Forbes, for 48 years its chief, whose *The Lake as a Microcosm* is a classic in ecology; David Starr Jordan, author of a catalog of Illinois fishes who became president of Stanford University; Robert Ridgway, Smithsonian ornithologist and author of two volumes on Illinois birds; and Charles A. Kofoid, author of several papers on plankton who joined the University of California at Berkeley.

Current research projects of the Illinois Natural History Survey staff include