THE AUSTRALIAN ATOMIC ENERGY COMMISSION

THE FIRST TEN YEARS

1953–1963

By SIR PHILIP BAXTER

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The Research Establishment of the Australian Atomic Energy Commission at Lucas Heights, near Sydney.

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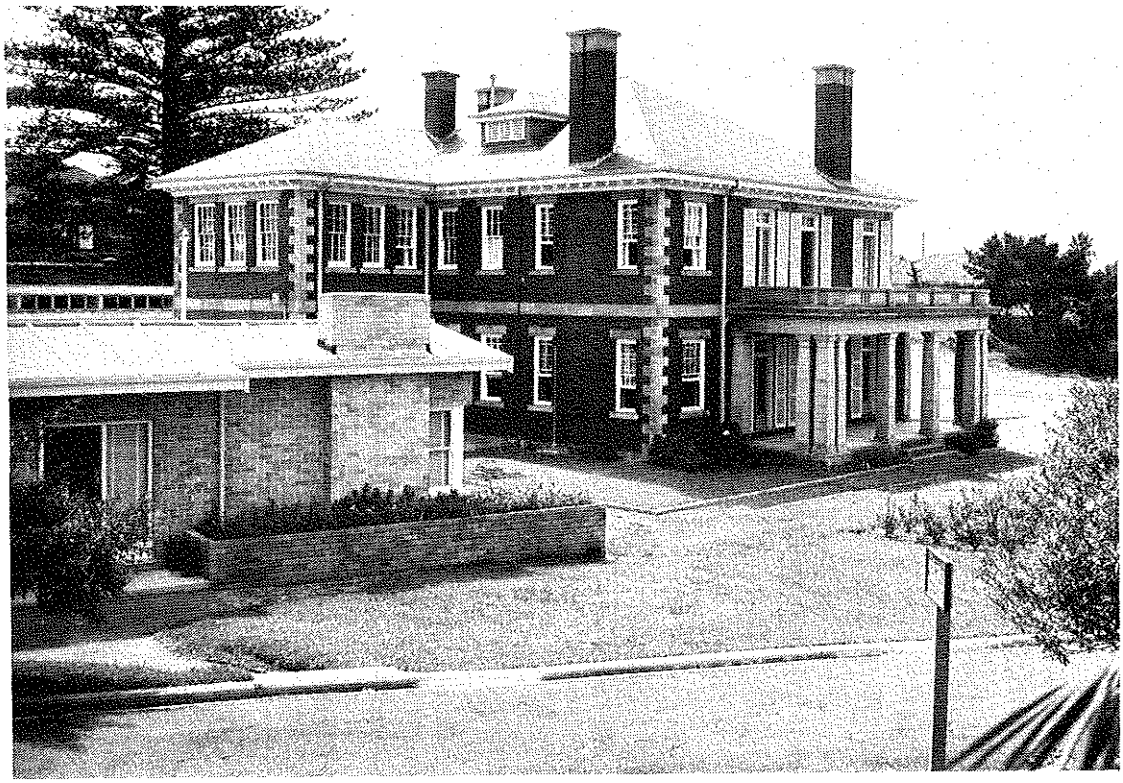
On April 15, 1953, the Royal assent was given to the Atomic Energy Act 1953. On January 6, 1963, the contract for the sale of uranium oxide from Rum Jungle to the Combined Development Agency had run its ten-year course. This, therefore, is an appropriate moment to cast a backward look at the origin of the Commission and the first decade of its activity.

The Australian Atomic Energy Commission was founded in a period of rapid development of peaceful atomic energy techniques, and also at a time when uranium was urgently needed for the defence of the western world. The most immediate and pressing task which confronted the new Commission was that of ensuring that Rum Jungle was brought into production as swiftly and efficiently as possible, and, at the same time, to seek additional supplies of uranium in Australia. In the long run, of course, the other aspects of its responsibilities were no less important — viz., so to organise matters as to enable Australia to benefit to the full from the new discoveries and the new techniques of atomic energy.

The Commission found the way well prepared. It had, as its forerunners, two committees which had previously been advising the Government on the development of atomic energy in Australia. The first was the Industrial Atomic Energy Policy Committee, set up in 1949 to examine possible industrial applications and to suggest a national program. It was composed of scientific and departmental representatives. In its later stages, this Committee decided that something more comprehensive was required, and at its own suggestion was replaced in April, 1952, by the Atomic Energy Policy Committee.

Members of the latter Committee were Mr. J. E. S. Stevens, representing the Department of Supply (Chairman), Professor L. H. Martin, representing the Department of Defence, Mr. F. Wheeler and Mr. D. Hibberd (alternates representing the Treasury), Mr. J. R. Cochrane, representing the Department of Defence Production, Dr. H. G. Raggatt, representing the Department of National Development, and Dr. F. W. White, representing the Commonwealth Scientific and Industrial Research Organisation.

It was a matter of special urgency to stimulate the production of uranium, but the Committee did not lose sight of the need of an Australian program of participation in atomic energy research and development. As a result of its recommendations the Government approved the establishment of an Atomic Energy Commission. Members of the Commission were selected in November, 1952; the first chairman was Mr. J. E. S. Stevens; vice-chairman, Professor J. P. Baxter; and the third member was Mr. H. M. Murray, General Manager of the Mount Lyell Mining and Railway Co. Ltd. The Commissioners began to exercise their functions then and there, although they did not do so formally until the passage of legislation was completed the following April. The Australian Atomic Energy Commission then set up its first office at Cliffbrook, Coogee, Sydney, with a small staff.



An early picture of Cliffbrook, the first office of the Commission. Today, a modern three-storey block is built along the far fence.

Atomic Energy Act

The Atomic Energy Act was designed to bring together in one piece of legislation all matters relating to atomic energy, to create the Commission with all necessary powers and functions, and generally to provide for the operation of the Commission as a self-contained statutory authority.

The Act imposed upon the Commission three principal responsibilities:—

To promote the search for, and mining and treatment of uranium in Australia, with power to buy and sell on behalf of the Commonwealth.

To develop practical uses of atomic energy, by carrying out and assisting research, constructing plant and equipment, and employing and training staff.

To collect and distribute information on uranium and atomic energy.

The Act has proved to be comprehensive and farsighted. No subsequent tinkering with its essential provisions has been required, in spite of changing circumstances; the only amendments have been administrative and financial.

In 1958, the number of Commissioners was increased from three to five. The members, in 1963, were Professor J. P. Baxter (Chairman), Dr. H. G. Raggatt (Deputy Chairman), Sir Leslie Martin, Mr. B. F. Dargan, and Mr. M. C. Timbs (Acting Executive Member).

Rum Jungle

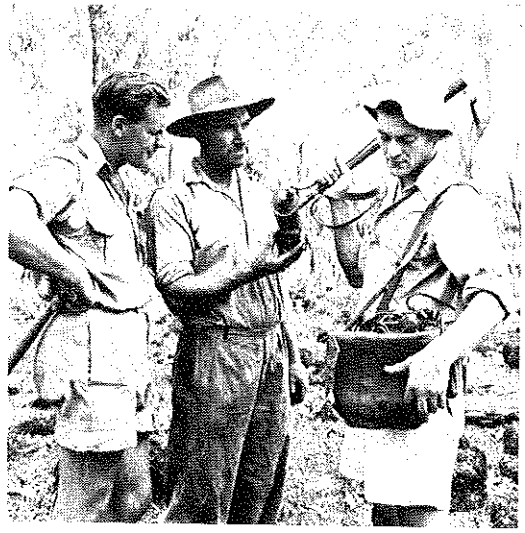
The passing of the Act in 1953 was already some years after the first discovery of radioactivity at Rum Jungle late in 1949. The field investigations had been handled by the Bureau of Mineral Resources, and responsibility for the mining and treatment operation had been given to Territory Enterprises Pty. Ltd., a subsidiary of Consolidated Zinc Pty. Ltd., formed specially for the purpose. In January, 1953, T.E.P. began operations and in 1954 the first uranium oxide was produced. The whole operation was conducted under contract to the Combined Development Agency — the joint Anglo-American procurement agency, which provided finance and technical advice for Rum Jungle.

The operation of Rum Jungle was an involved matter, rendered more difficult by urgency. Little was known at the beginning

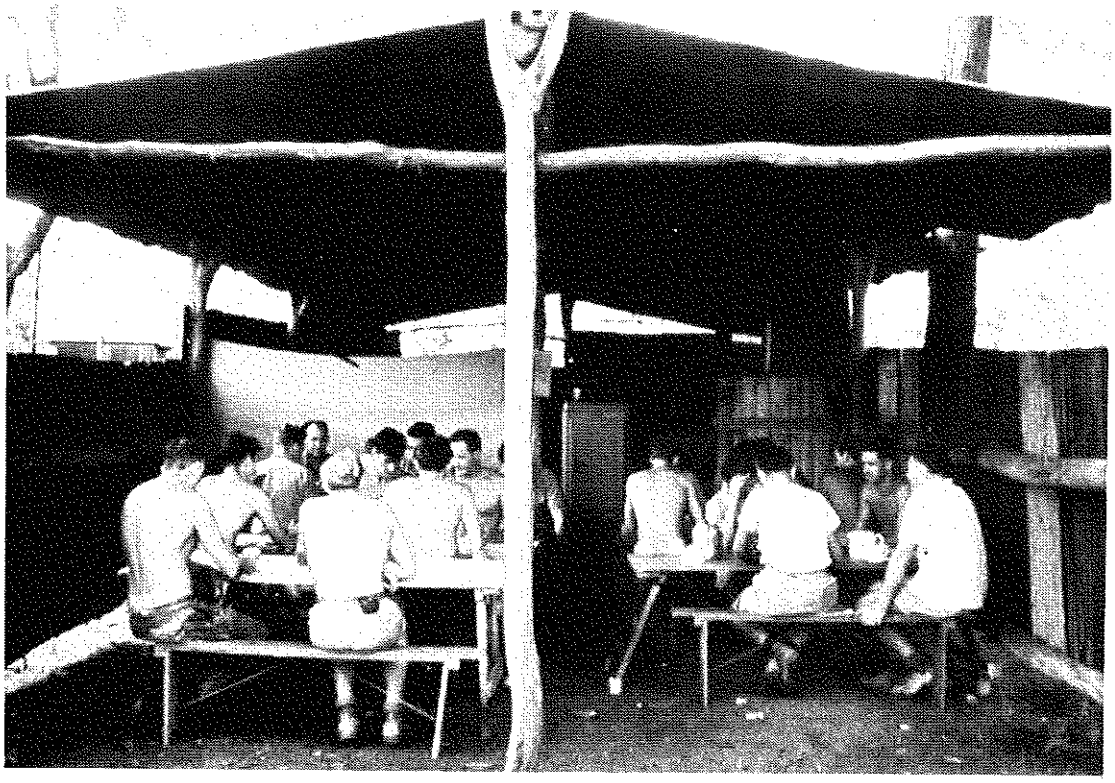
about the characteristics of the various uranium ores and the best treatment methods. The work had to be established in a remote spot many hundreds of miles from any industrial centre, and there were many technical and transport problems.

In addition to the technical side of the operations, there was the no-less-important human side to be considered. While the plant and the mine were being brought into production, the neighbouring township of Batchelor was set up to provide a green and liveable oasis in the somewhat arid country. With its churches, school and swimming pool, shopping and recreation facilities, Batchelor has demonstrated that white labour can operate successfully a venture of this kind in the tropics, provided sufficient thought is given to living conditions. The community at Batchelor has been a stable and happy one, for which credit is due to the managing company.

Rum Jungle has made a significant contribution to the progress of the Northern

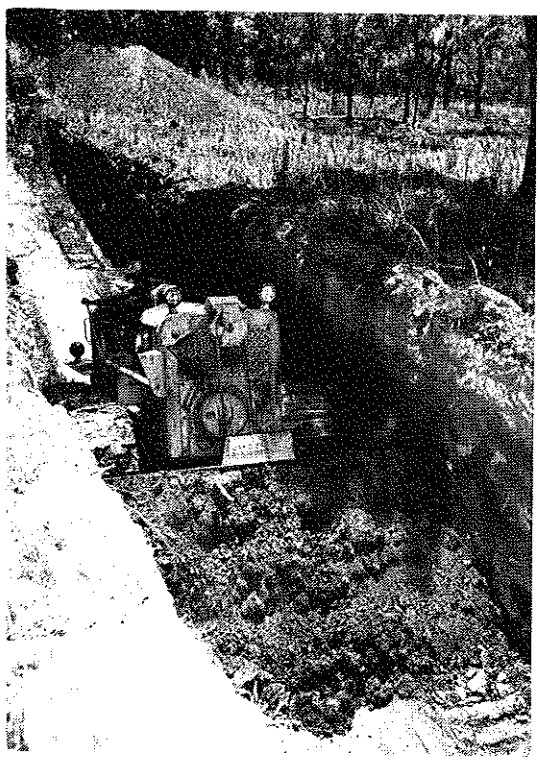


Mr. J. White (centre), who made the first discovery of uranium mineralisation at White's Prospect, Rum Jungle, Northern Territory, in 1949. B.M.R. geologists examine an ore specimen.



A B.M.R. Mess at Rum Jungle, about 1951. The Bureau of Mineral Resources carried out the early exploratory work in this area before T.E.P. took over in January, 1953.

An open cut mine at Rum Jungle showing the progressive deepening.



Bulldozing a costean in the Rum Jungle area. This technique is used to investigate the continuity of surface radioactive anomalies at shallow depths.

Territory, and the Government took this into consideration in deciding that uranium oxide should continue to be produced, and stockpiled after the completion of the contract with the Combined Development Agency.

Search for Uranium

With Rum Jungle fairly launched, the Commission also paid attention to encouraging further discoveries and promoting production. A program of aerial and ground surveys was carried out; the Bureau of Mineral Resources, which had previously initiated much of this work, collaborated closely with the Commission. The Commission evolved a policy for the purchase of uranium ore from independent producers, and a price schedule. It made recommendations on claims for rewards for uranium discoveries of economic importance. The rewards were offered by the Commonwealth Government. It also established cooperation with the States, whose Departments of Mines furnished much valuable assistance in this field. From the inception of the reward scheme until its conclusion in 1962, a total of £112,750 was paid. Among the services offered to prospectors and mining companies were technical advice, instrument service and ore sample analysis, all of which were used widely. Contracts were let by the Commission to suitable bodies for ore treatment research.

As a result of the incentives and encouragement offered, mining by companies developed successfully in two regions — Mary Kathleen in Western Queensland, and the South Alligator River area of the Northern Territory. In both these centres, uranium oxide was produced and sold under contract to the United Kingdom Atomic Energy Authority to serve as fuel for power stations. The Commission played a major part in supervising and assisting in the negotiation of these contracts. Several other companies which did not establish sufficient reserves of uranium ore to justify erection of treatment plants were able, nevertheless, to dispose of some of their good-grade ore to the Commission for treatment at Rum Jungle.

First Research Team

A feature of the Commission's activities in the early stages was that all significant atomic energy information was highly classified. There would have been only minor benefits to be obtained from an Australian research program, had it not been possible to gain access to results of leaders in the field, such as the United Kingdom and the United States. Such

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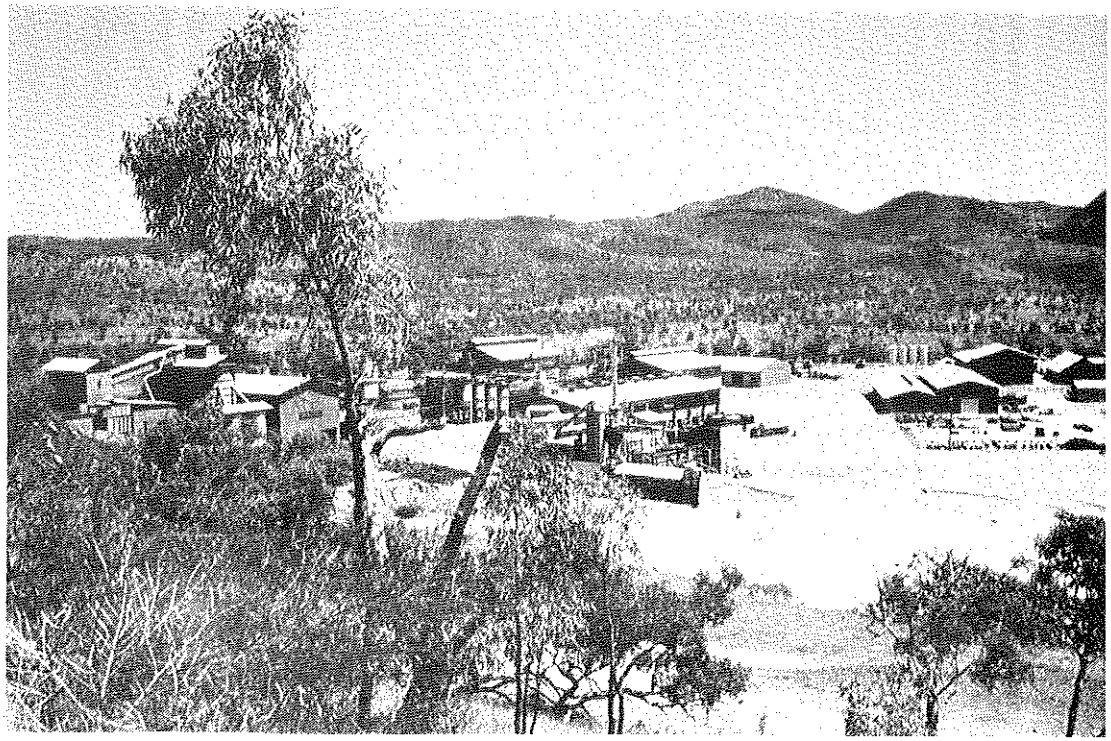
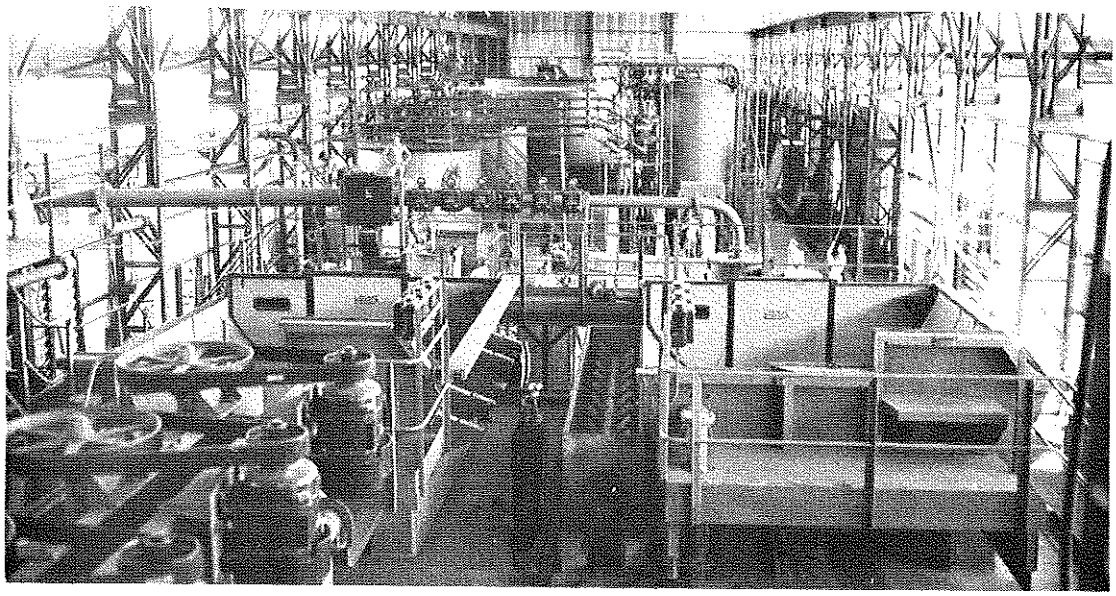


A general view of the uranium treatment plant at Mary Kathleen, northern Queensland, taken in September, 1959.



Inside the uranium ore treatment plant at Rum Jungle. The ion exchange section is at the left foreground, the precipitation section right foreground, and drum filters in background.

an arrangement was concluded with the United Kingdom in 1954, after preliminary discussions in England and Australia. As a result, the Commission was able to maintain its own research team at Harwell long before any laboratory space of its own was available. A small group from the C.S.I.R.O. had been working at Harwell since 1947, and these men joined the Commission staff and formed the nucleus of its scientific team. Australia owes a considerable debt to the United Kingdom in this matter. In addition to the work in England, the United Kingdom assisted in the setting up of the Lucas Heights Research Establishment by providing detailed plans and specifications for the reactor HIFAR, and adjoining buildings and services.

When the time came to set up laboratory space of its own, the Commission thought first of all of a site at Maroubra, which is on the coast about nine miles south of Sydney Harbour. When the Government authorised the Commission to build a high flux materials testing reactor, however, more space and solid rock foundations were required. As these were not to be found at Maroubra, Lucas Heights, some 20 miles south of Sydney, was chosen.

Research Establishment

In October, 1955, the first pegs were driven in the site at Lucas Heights, which was then virgin bush, and work began.

The buildings and equipment at the Research Establishment as it stands today are in no small degree a monument to Australian industry and Australian workmanship. Although, of course, the more specialised portions of HIFAR were imported, a great deal of the work, which was of a sort never before performed in Australia, was entrusted to Australian contractors who carried it out successfully and economically.

In the earlier years the main task was to design, build and commission the many complex buildings and facilities required for the research program and its manifold supporting services. Step by step the work has proceeded, through stages marked by the completion of such major items as HIFAR in 1958, the Engineering/Metallurgy Research Building in 1960, and the Commission's Argonaut-type reactor Moata in 1962. For the last three or four years the construction program has been tapering off, but there has been a corresponding extension of research activities as laboratories and equipment became available.

The study of reactor systems at Lucas Heights is the best way of building up a body of persons trained in the various branches of atomic energy. Two reactor systems were selected for preliminary study by the Commission — work which began at Harwell and was subsequently carried on at Lucas Heights. One was the liquid metal cooled system, the other the high-temperature gas-cooled system. It gradually became apparent that the latter was the more promising of the two, and about the end of 1958 it was decided to concentrate the effort upon it. Since then the work has progressed steadily.

The initial emphasis was on materials research — on fuel, fertile, moderator and coolant materials. The Commission, at a very early stage, selected beryllium and beryllium oxide as materials of considerable promise, and its work in this field has attracted considerable attention in other countries. Studies of fabrication methods, of basic chemistry, and of compatibility of reactor and fuel materials, made good progress.

We have now progressed to the stage where engineering research forms the pivot of the program. It is supported on the one hand by materials research, and on the other by reactor physics research, which has the reactor Moata as its principal tool.

There are, of course, many other supporting activities and services, some of which themselves involve quite substantial research. These include chemical analytical services, electronics and instrumentation, health physics and radiation biology, together with engineering and workshop services of a high standard.

Radioisotopes

In 1956, the Commission began active promotion of radioisotopes in Australia by establishing its Advisory Service. Isotopes and isotope techniques were little known at that stage in this country. Industrialists and others were keenly interested in the possibilities but were rather slow to follow them up, perhaps because the techniques were unfamiliar and appropriate staff was not always available in their organisations. However, the industrial applications of isotopes have continued steadily to gain ground and have been stimulated by the Commission's production of cobalt 60, short-lived tracers and other isotopes. A wide range of radioisotopes can now be produced at Lucas Heights; they are not only being used for medical, scientific and industrial purposes in Australia, but are also being exported.

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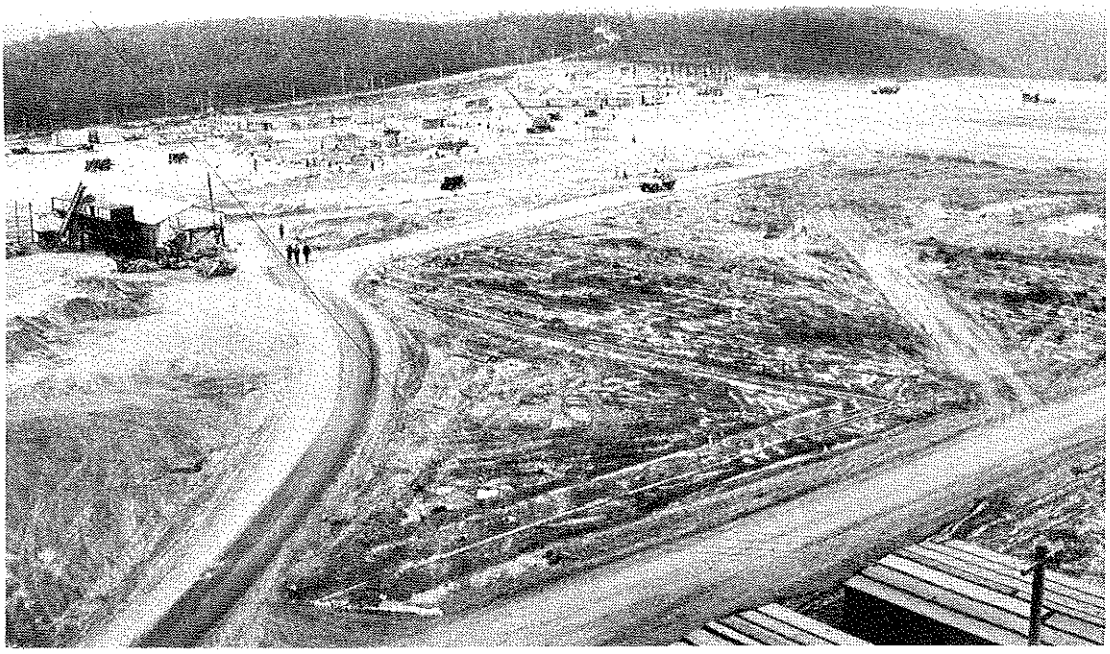
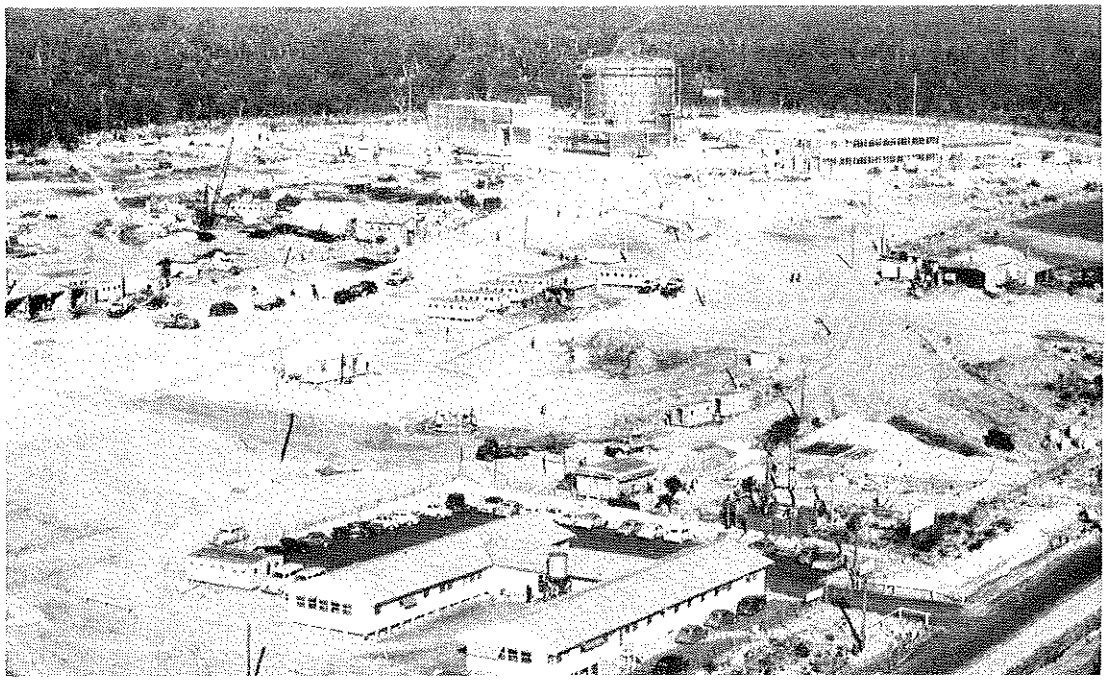
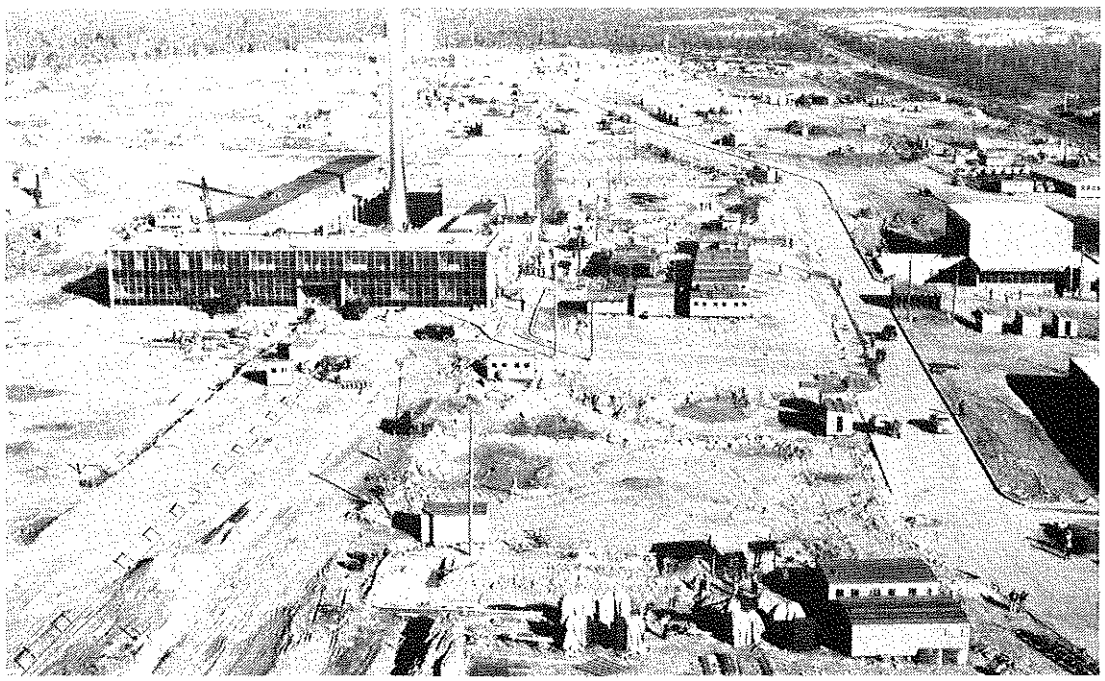


View of the Research Establishment facing towards the present main gate, 1955.

Foundations for HIFAR reactor which were commenced early in 1956.



The reactor shell nearing completion in 1957.



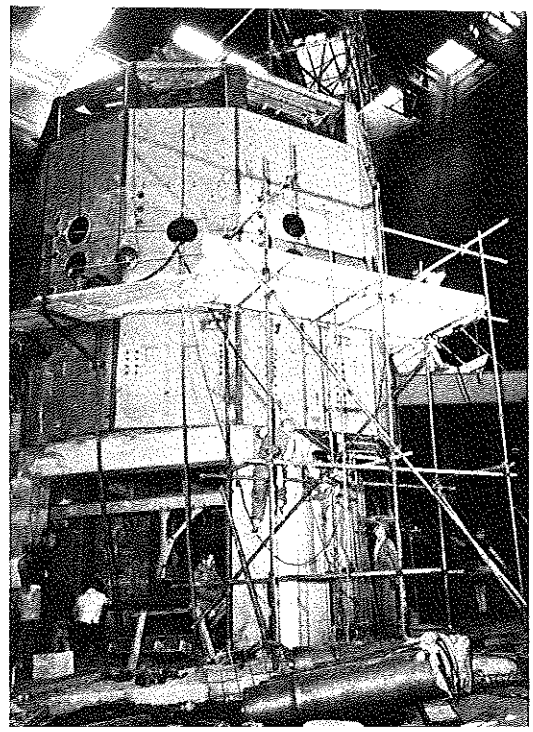
The Chemistry and Chemical Engineering Buildings during construction in 1957.

International Collaboration

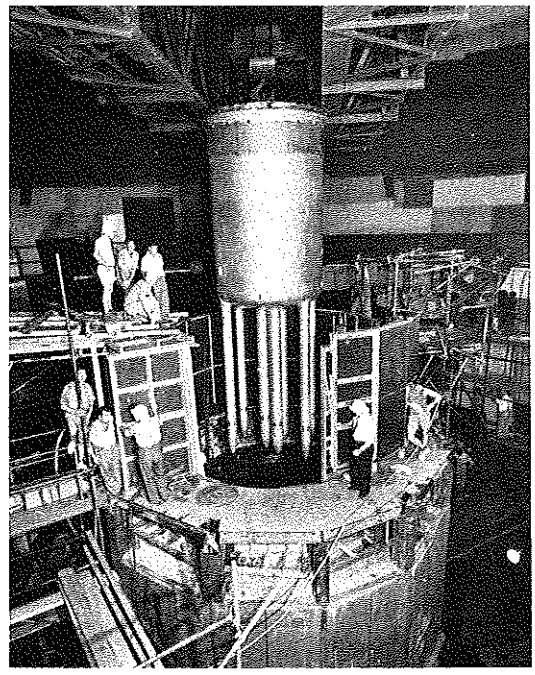
The work has been carried on with the benefit of close and friendly relations, not only with the United Kingdom but with a number of other countries. International collaboration has become quite a feature of atomic energy; besides the arrangement with the United Kingdom, Australia, in 1956, negotiated a bilateral agreement with the United States for the exchange of information and materials for the civil use of atomic energy. This arrangement set a new pattern in the United States, which previously had had a major comprehensive agreement with the United Kingdom and one with Canada, and research agreements with a large number of other countries. These research agreements did not include information or materials (such as fuel supplies) for power reactors. However, the United States agreed to provide Australia with information on power reactor technology and reactor fuel in recognition of Australia's relatively advanced position in the field.

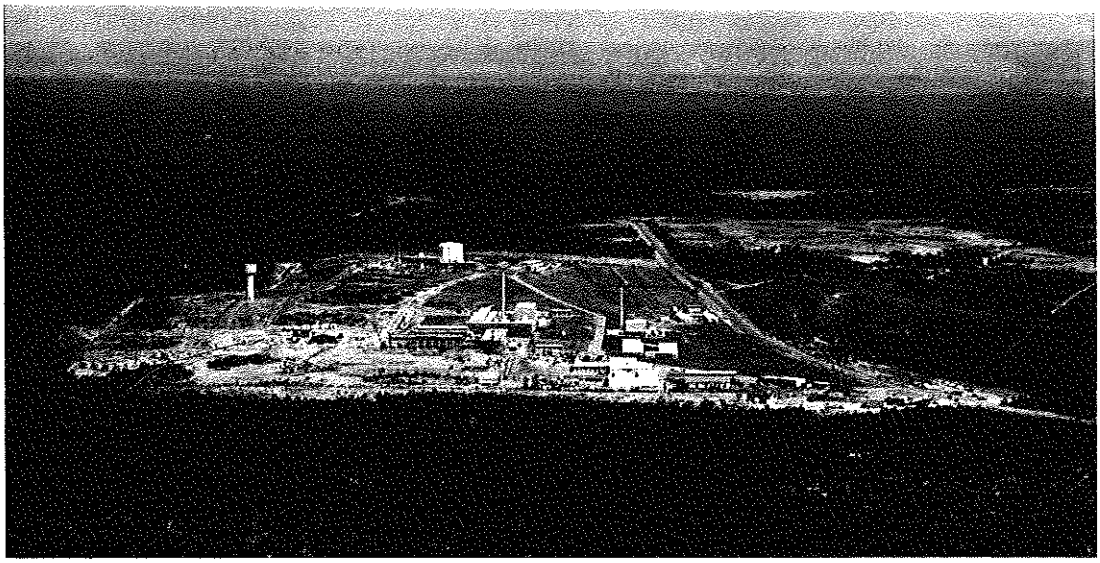
Subsequently, we concluded a similar agreement with Canada, and last year a simple agreement was made with Japan to cover sales of uranium oxide to that country. All these agreements have been most valuable in giving Australia access to the results of countries with vastly greater resources to devote to atomic energy research and development than we ourselves could hope to muster. These exchanges have, of course, been subject to commercial limitations, since it is only natural that a country which has put much work into developing a commercially valuable process should not wish to part with the results without some quid pro quo. However, without being able to match the efforts of these other countries, Australia, in its own smaller field, is producing results of definite interest and this makes the exchange far from one-sided.

Australia has taken a leading part in the International Atomic Energy Agency since that organisation was first suggested. Australia was represented on the original negotiating group which drafted the statute of the Agency, on the Preparatory Commission, and has been represented on the Board of Governors ever since. The Commission, in conjunction with the Department of External Affairs, has briefed the Australian representatives throughout on all Agency matters. The Commission has also contributed directly to the work of the Agency and members of the Commission



Two stages during the installation of HIFAR reactor inside the steel shell at the A.A.E.C. Research Establishment during 1957.





The Research Establishment at Lucas Heights as it appeared in September, 1959. This photograph clearly shows the surrounding scrub-land.

staff have participated in Agency technical missions and advisory panels.

The Commission was also well represented at the first and second Geneva Conferences. At the initial Geneva Conference in 1955, when the leading nations in the field tabled the bulk of their achievements after years of close secrecy, it was striking to observe how similar were the paths followed and the results achieved by countries which had been working quite independently of one another.

This international flavour extends right through the Commission's work, with exchanges of staff now on a regular basis and with Commission participation in frequent symposia and conferences. We have taken the initiative in organising several symposia in Australia, and we have been well represented at such meetings as the 1962 Melbourne World Power Conference.

A.I.N.S.E.

It is a prime aim of the Commission not to work exclusively within its own four walls but to spread atomic energy information as widely as possible through Australia. That is why it maintains close touch with the universities, who assist in the research program by research contracts which the Commission awards each year. That is why it took the lead in founding the Australian Institute of Nuclear Science and Engineering, for which it provided the headquarters building at Lucas Heights. All the Australian universities and the Commission contribute to the management and financing of the Institute. In its earlier stages the Commission was active in promoting training in certain fields, such as geology, for which there was a great demand in the discovery and mining of uranium. The Commission offered a limited number of undergraduate scholarships and postgraduate studentships, and although its activities in this respect are now virtually complete, the resulting graduates made a valuable contribution to Australia's development at a time of shortage.

Looking back, then, we can see a creditable achievement covering all main aspects of atomic energy in Australia. A uranium mining industry was brought into being and major contracts for the supply of uranium oxide have recently been completed, or will be completed shortly. A Research Establishment has been built and equipped and a research team of high calibre is working there. Industry is taking an interest in the applications of radioisotopes and other developments of possible interest and has learnt to come to the Commission for information and advice. By virtue of this program, Australia is recognised by the International Atomic Energy Agency as the nation most advanced in atomic energy in south-east Asia and the Pacific.

Best of all, I think, is that this program is not inward looking, but outward looking. Its influence is spreading through Australia — through the universities, the schools, and industry — and neighbouring countries are already looking towards us for advice and supplies.