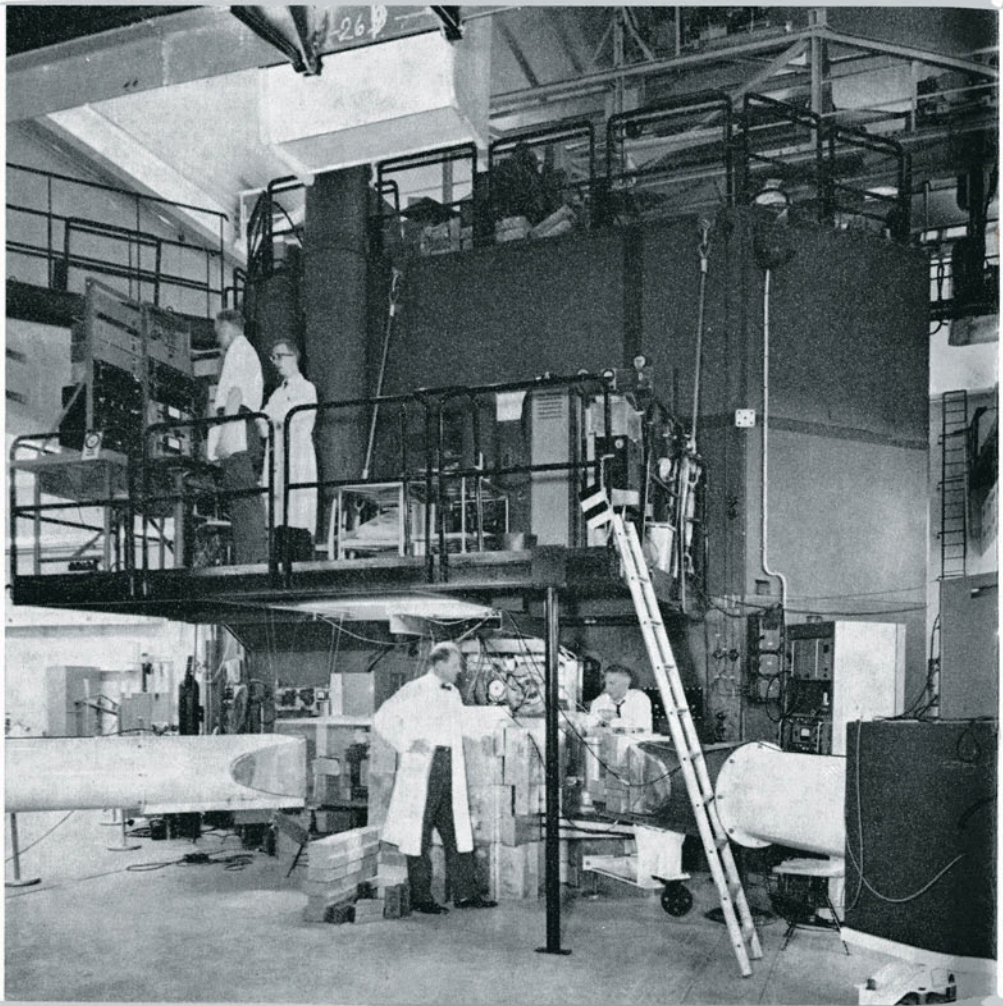
aktiebolaget

ATOMENERGI

THE SWEDISH ATOMIC ENERGY COMPANY

Sweden's first research reactor, the R 1 in Stockholm, became operational in July 1954 and has been used for experiments of fundamental importance in the development of nuclear power reactors.

The R 1 is now used for research, not only by the Atomic Energy Company, but also by the institutes of technology. The reactor supplies a large part of the radioactive isotopes produced by the Company for medicine and industry.



AB ATOMENERGI

was formed in 1947. The Government holds four-sevenths of the shares, the rest being distributed mainly among industrial companies and power undertakings.

The Head Office of the Company is in Stockholm, where the country's first research reactor R 1 is located, as well as a refinery for uranium concentrate and a factory producing reactor fuel.

In terms of employees and equipment, however, the Company's biggest plant is the research establishment **Studsvik,** on the Baltic coast some 70 miles south of Stockholm. At **Ranstad,** near Skövde in the province of Västergötland, the Company has built a uranium mill on the basis of an extraction precess developed by the Company.

The Atomic Energy Company plays a central role in the Swedish nuclear power programme through the following main tasks:

— to support the development of nuclear power technology so that the utilization of nuclear energy can be carried through by means of the country's own technical resources;

— to prepare for the introduction of more advanced reactor systems for the future;

— to study the fuel cycles of different reactor types from the extraction of raw materials to the fabrication of fuel elements, reprocessing of spent fuel and recycling of plutonium;

— to develop further the present methods for the exploiting of the very large Swedish uranium deposits;

— to make the research establishment Studsvik maximum utilized for the benefit of Swedish research, education and industrial evolution.

STUDSVIK

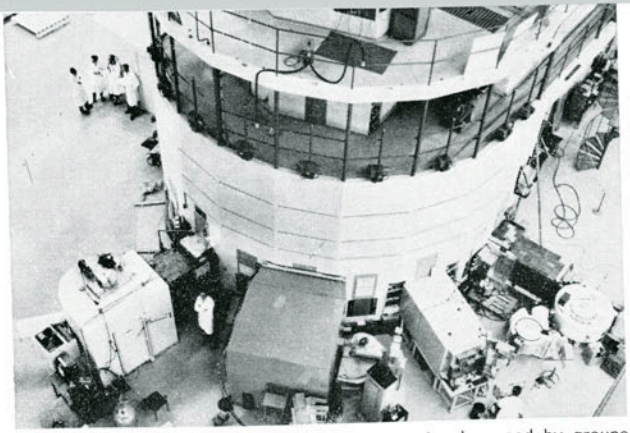
Of the Company's 1,400 employees (in 1966), some 850 are active at Studsvik, a focus of Swedish research and development and the major site for the Company's experimental programme. Since the inauguration of the R 0, the first research reactor at Studsvik and the second in the country, in september 1959 the research station has been progressively extended. The R 2 research and materials testing reactor and the R 2-0 low-power reactor were added in 1960, as well as a 5.5-MeV van de Graaff accelerator. The R 2-0 is used for radiation measurements and for preparatory work in conjunction with experiments in the R 2, while the van de Graaff accelerator is employed for physical computations and studies of fast neutrons. The latest facility at Studsvik, the FR 0 fast zero-power reactor, went critical for the first time in February 1964.

The research station includes laboratories for such disciplines as heat engineering, mechanical engineering, chemistry, active metallurgy, radiation shielding, and so forth. In 1962 the National Research Councils inaugurated their own laboratory for research, mainly in biology, chemistry, physics and medicine, use being made in particular of the radiation facilities offered by the very high neutron flux density in the R 2.

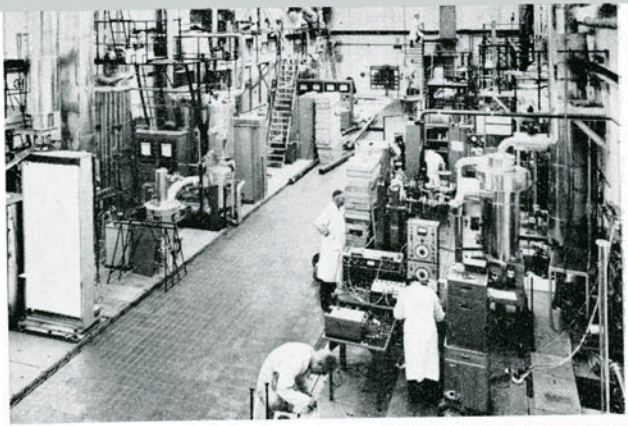
The resources of the research station are also utilized by other national and international reactor groups and organizations, but Studsvik is primarily a common asset for Swedish domestic research, training and industrial evolution. The specialized resources at Studsvik are made available for purposes outside of the specific field for which they were intended — thereby offering industry, research and medicine services in the following main sectors:

- Studies of materials: strength, physical properties, etc.
- Heat engineering and hydro-dynamic experiments and component tests
- Chemical studies, as of fluid extraction, chemistry of water, and corrosion problems under high pressures and at high temperatures
- Production of isotopes
- Analytical services involving special techniques and equipment: activation analysis, spectography, mass spectrometry, etc., and the individual determination of extremely low percentages of impurities.
- Development of special instruments and experimental equipment, including large experimental plants and complete special labs.

The Company's own scientific and technical results are published in a special report series, the **AE Series.**

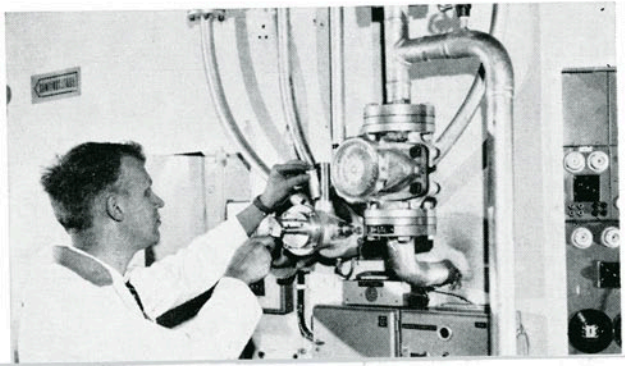


The R2 research and materials testing reactor is also used by groups from the country's universities and institutes of technology. Its unique attraction lies in the very high neutron flux density.

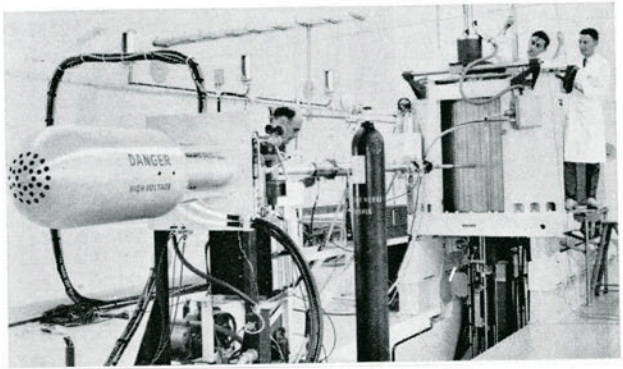


Heat engineering and hydro-dynamic experiments and component tests are carried out in the heat engineering lab — the experimental circuits shop being seen in the above picture.

The R2 reactor, like the R1 in Stockholm, is used to produce radio-active isotopes, mainly for medical diagnosis and therapy, but also for industry. Below, a sample being inserted for irradiation.



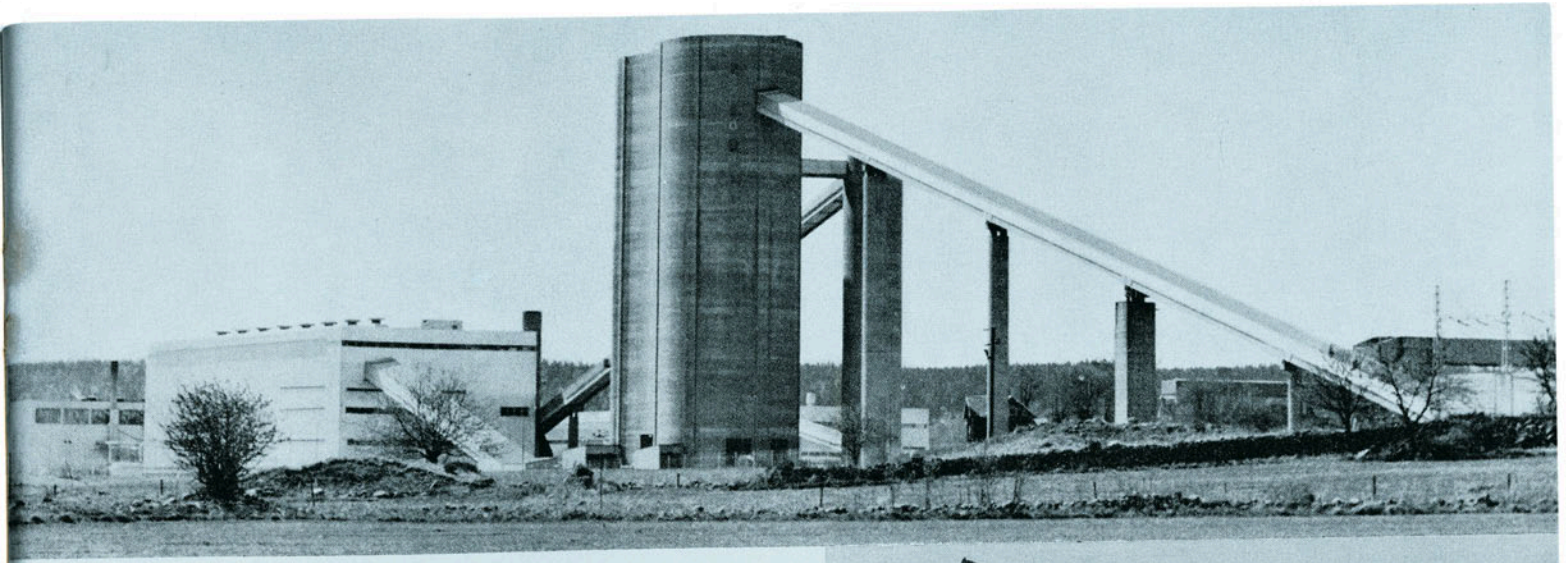
The FR 0 is intended for reactor experiments aimed at the development of future power reactors, types which produce from natural uranium more fissionable material than they themselves consume.



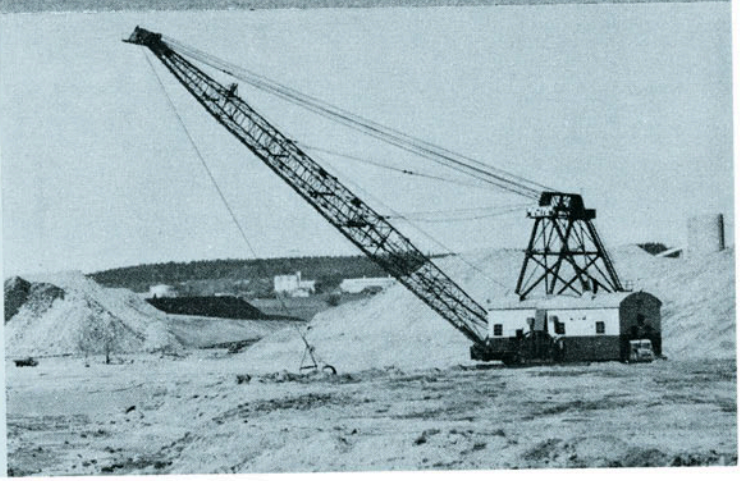
RANSTAD

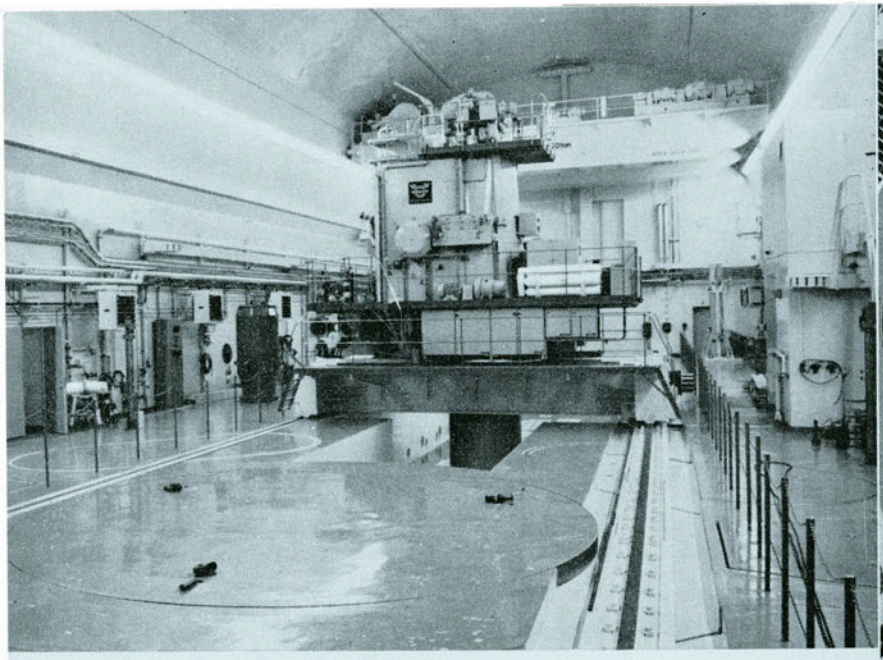
The Ranstad Mill at Billingen, south of Skövde, has been designed to produce 120 tons of uranium per annum in the form of concentrates. The raw material is alum shale. The uranium content of this shale is low, however, and the Company is working on the evolution of an extraction process which will reduce the price per ton of refined uranium. Ranstad represents one of the biggest uranium deposits in the Western world and is far and away the most important potential source of power in Sweden.

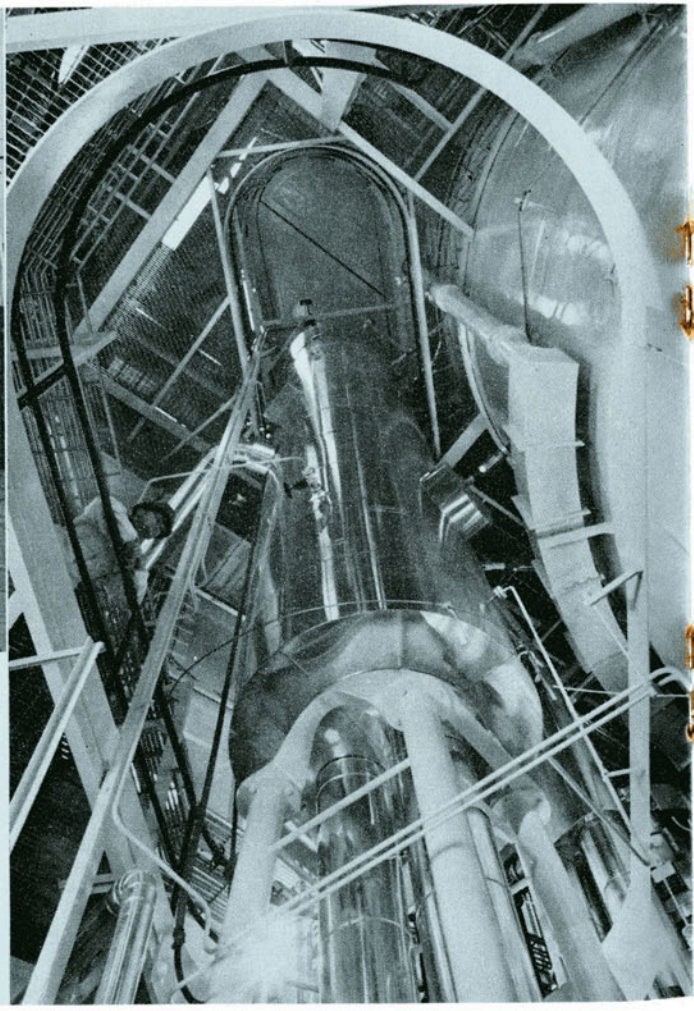
Of the 490-foot thick sedimentary formations, several hundred million years old, that Billingen comprises, 72 feet consist of various alum shales with varying contents of uranium. Within this zone there is a 12-foot thick shale layer known as the uranium-rich zone. It is this layer which provides the raw material. The layer formation is of very great horizontal extent.



The uranium plant at Ranstad consists of an open cast mine and a refining mill. The mine is dominated by a giant dragline excavator. The mill has a distinctive silhouette, with (from r to l.) the conveyor belt from the coarse crushing plant to the storage silo, the screening plant, a glimpse of the open-air ageing dump, the neutralizing plant and the electrical and steam-generating stations.







The Ågesta power station and district heating plant (65 MW) provides home heating for the 30,000 inhabitants of the Stockholm suburb of Farsta, as well as supplying power to the city mains. Furthermore, through physical and chemical experiments and studies, this reactor has yielded extensive experience which will be of inestimable value in future nuclear power projects.

ÅGESTA

The Atomic Energy Company built Ågesta in conjunction with the State Power Board and the Stockholm Electricity Authority. The Company took responsibility for the planning, design and production control of the reactor, and for the supply of fuel. ASEA acted as main contractor for the reactor portion, with a large number of Swedish firms as sub-contractors.

The Ågesta reactor, which is of pressure-vessel type, using natural uranium as fuel and heavy water as both moderator and primary coolant, is the first in the world of its kind. Construction work at Agesta started in 1957. The reactor went critical for the first time in July 1963 and commenced supplying power and heat in March 1964 after an extensive experimental programme on low power.

MARVIKEN

The Marviken power station, on Vikbolandet some 30 miles east of Norrköping, will be the second industrial nuclear power plant in Sweden. This station will be purely power producing and integrated with the State Power Board grid. Marviken is very much a development project and it is therefore that the development agency, the Atomic Energy Company, bears the main technical and financial responsibility for the reactor section of the station. The State Power Board is responsible for the buildings and the turbine equipment and stands as client to ASEA, the main contractors. At Marviken, too, the reactor fuel will be supplied by the Atomic Energy Company.

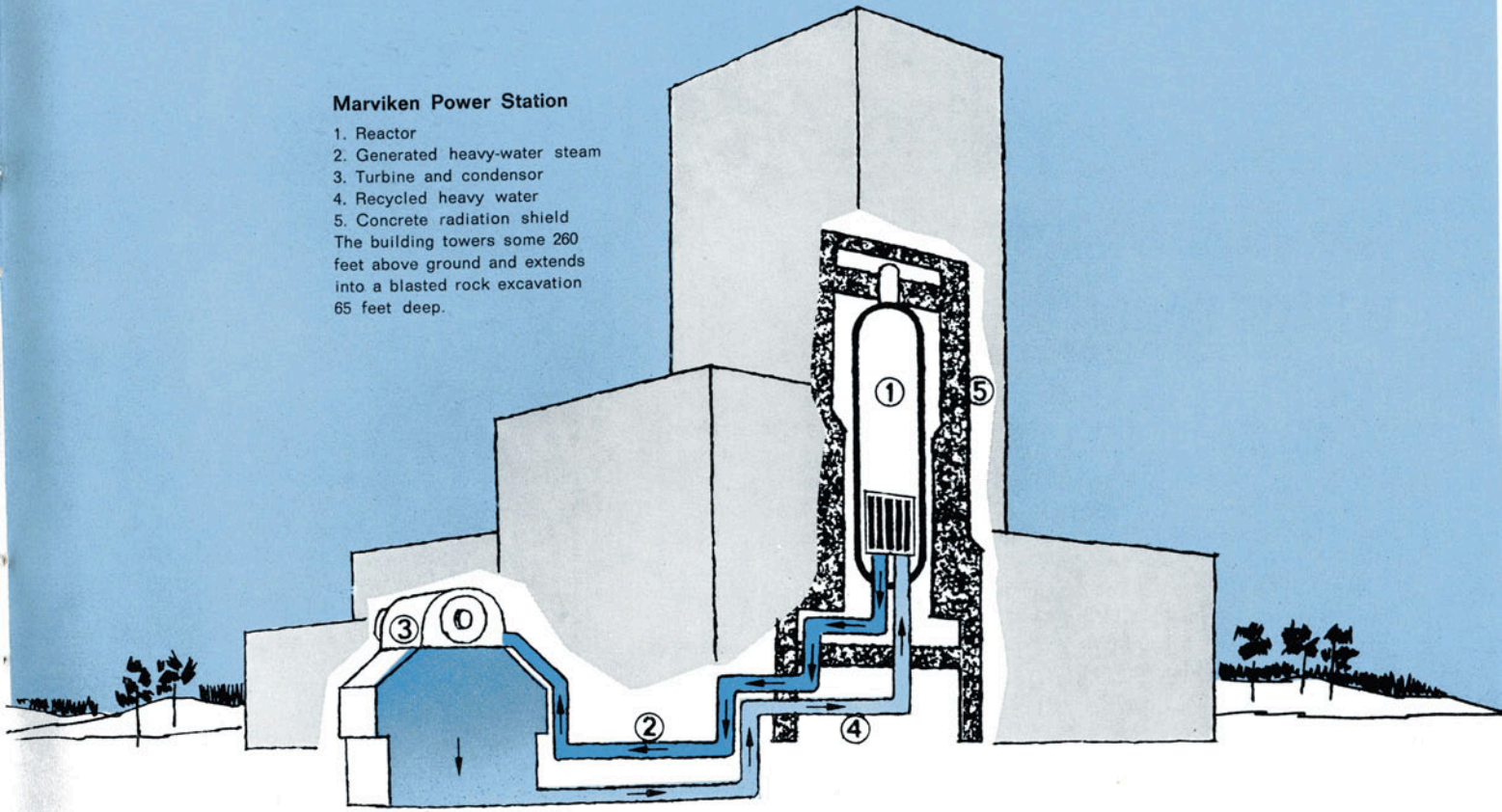
The Company's role comprises the research and development work required, not least in conjunction with the trials of **internal nuclear superheat,** in which respect Marviken is at present the biggest project in the world.

The reactor is of the boiling heavy water type. With saturated steam it will have an output of 140 MWe. When superheating is introduced at a later stage the output is expected to be 200 MWe. Operation is scheduled to commence in 1968 or 1969.

Marviken Power Station

1. Reactor
2. Generated heavy-water steam
3. Turbine and condensor
4. Recycled heavy water
5. Concrete radiation shield

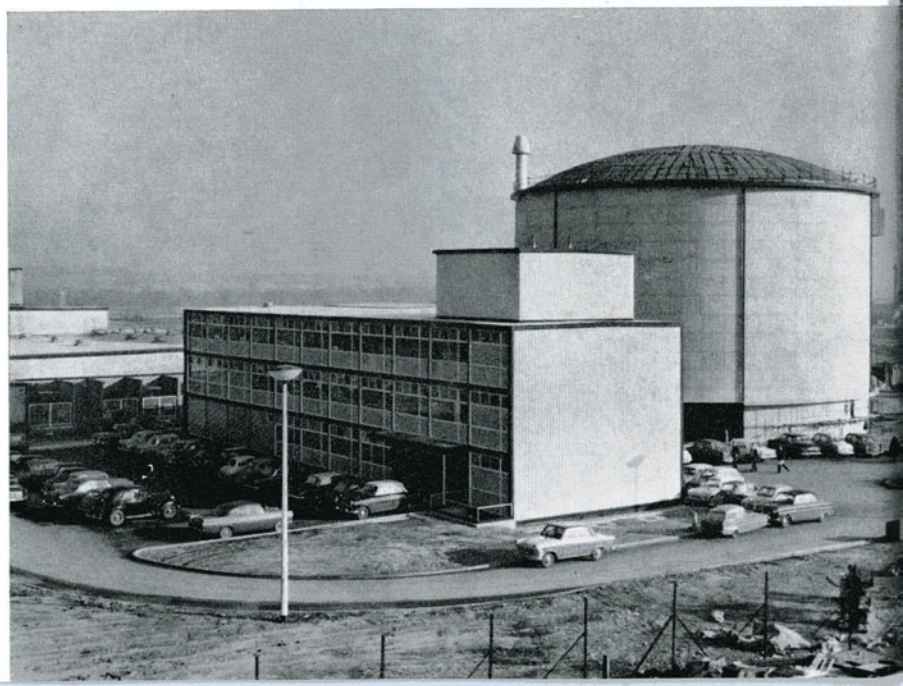
The building towers some 260 feet above ground and extends into a blasted rock excavation 65 feet deep.



international co-operation

The Atomic Energy Company takes an active part in international activities in the nuclear power field, and maintains contacts with corresponding organizations in other countries. The Company represents Sweden in the three OECD projects, Eurochemic in Belgium (a plant for the separation of plutonium from spent fuel), the boiling water reactor at Halden in Norway, and the Dragon high-temperature reactor in Britain. The Company is also active in international organizations such as IAEA (International Atomic Energy Agency) in Vienna and ENEA (European Nuclear Energy Agency, an organ of OECD).

Twelve OECD member nations, including Sweden, participate in the Dragon project at Winfrith in Southern England.

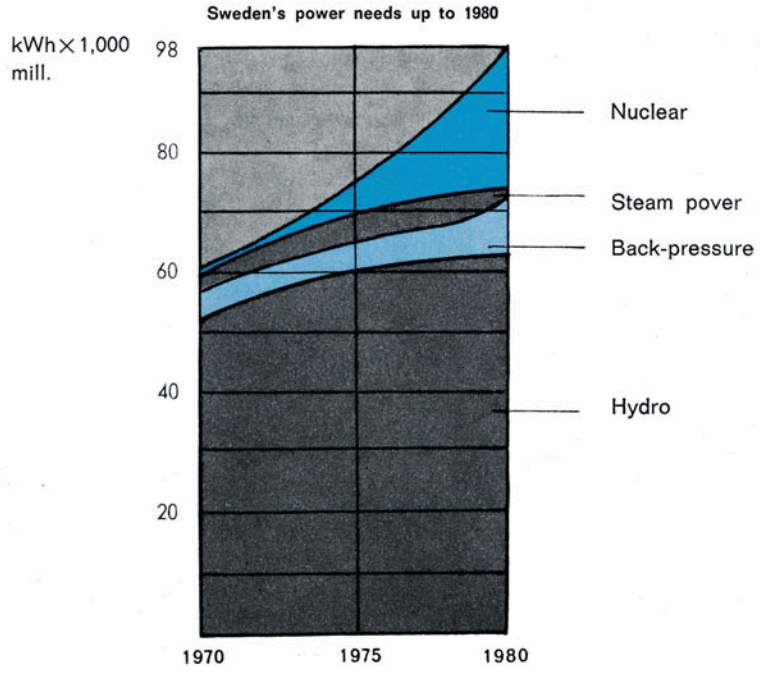


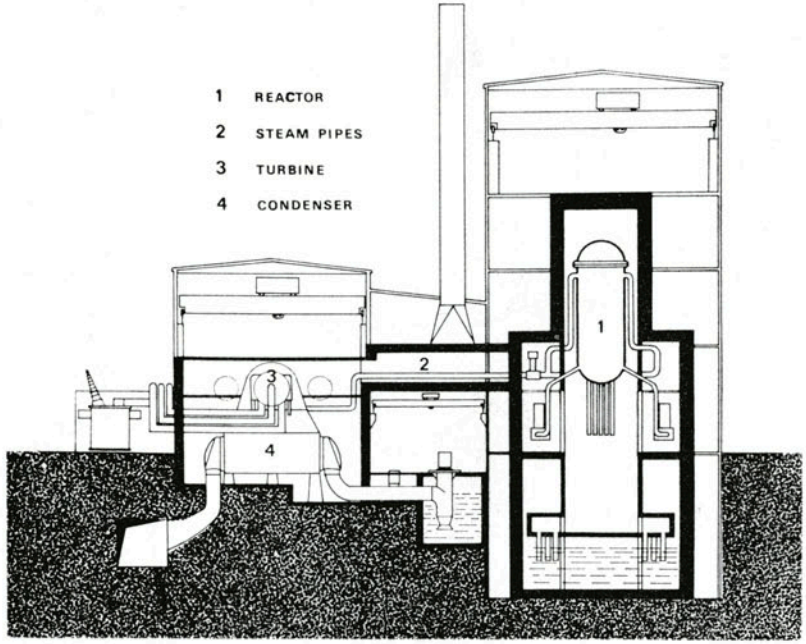
future reactor developments

Swedish development work in the field of nuclear power has been concentrated on pressure-vessel reactors, with natural or slightly enriched uranium as fuel and heavy water as both moderator and coolant. In the development of this type of reactor the experience from light water technology has been utilized. There is thus a strong family resemblance between these reactors and the resources of the Atomic Energy Company are also employed to support Swedish industrial developments in light water reactors. The most immediate project of this nature is the Oskarshamn plant commissioned by private and public power utilities, which will have an output of 400 MWe in one turbine unit and is expected to be operational by 1970.

A study ranging up to 1980, prepared by the Central Operating Management (CDL) of the Swedish power companies, envisages the installation of a further 3.000 MW, comprising both light and heavy water reactors.

The Company also has a research programme concerned with fast breeder reactors.





The Oskarshamn Nuclear Power Station, mentioned on page 13, is the first commercial nuclear power project in Sweden

AKTIEBOLAGET ATOMENERGI

The Swedish Atomic Energy Company

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Further information concerning nuclear energy in Sweden and abroad can be obtained from AB Atomenergi, Information Office, Stockholm 43, Sweden. Telephone 18 80 20.

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