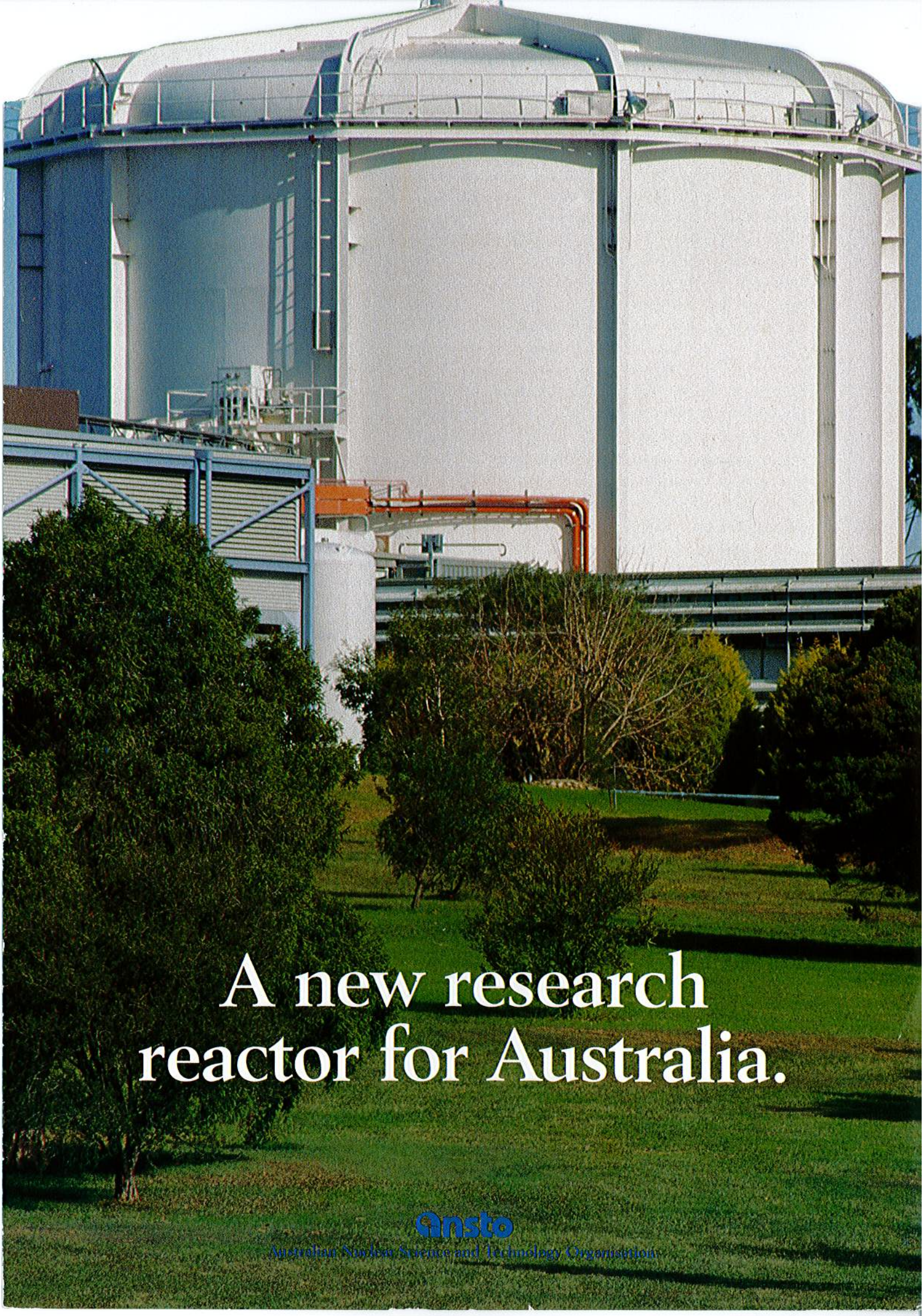


A new research reactor for Australia.

ansto

Australian Nuclear Science and Technology Organisation

Research benefits.

The new national research reactor would allow Australia to continue its world-class nuclear research in fields of direct benefit to science, industry and the community.

This research can only be carried out if Australia has a modern research reactor producing suitable sub-atomic particles (neutrons).

Like today, researchers would come from universities throughout Australia, the CSIRO, a wide variety of industries and Ansto itself.

This type of research would continue to bring many direct benefits, including —

- Better medical treatments.
- Cost savings and income to Australian industries of many millions of dollars each year.
- New products and new production techniques.
- Boosts in Australia's exports.

It would also bring even larger scientific, educational, community and industrial benefits flowing from the maintenance of vital, world-class expertise and knowledge in technological fields.

The new reactor would be designed to meet the research needs of Australian scientists and industry both now and well into the 21st century.

Some examples.

No-one can anticipate all the possible scientific, industrial and medical research uses of a new research reactor up to 50 years ahead.

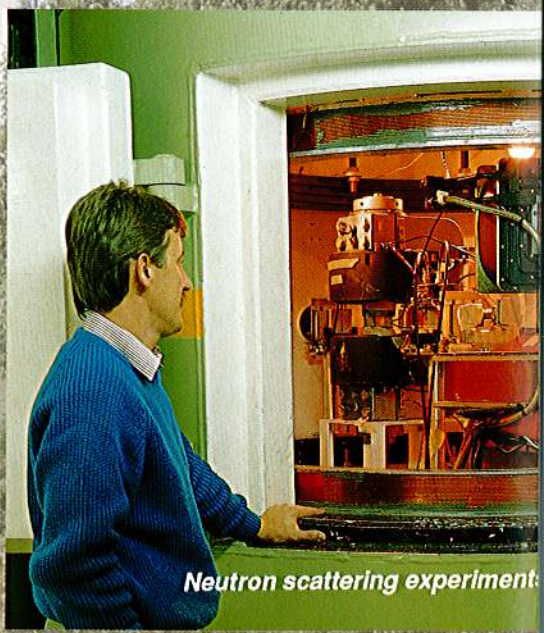
But in recent years Australian nuclear research, using the HIFAR reactor, has led to:

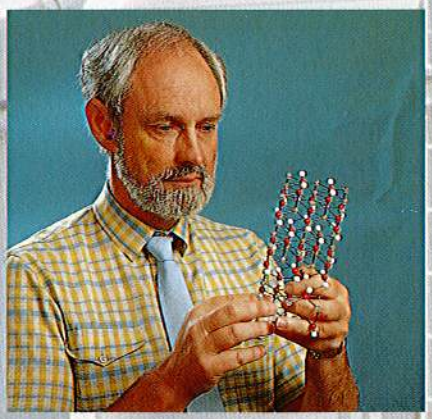
- More efficient and longer-lasting car batteries.
- New ways of determining the quality of mineral deposits for mining.
- New magnetic materials for smaller, lighter and cheaper electric motors.
- Better understanding of a key immuno-suppressant drug used by transplant patients, potentially leading to improved drugs in the future.
- Better ceramics for hard-wearing industrial components.
- New ways of immobilising radioactive wastes to protect the environment.

The reactor has also been used to:

- Analyse geological samples.
- Analyse coal to help predict the environmental impacts of coal-fired power stations.
- Detect hazardous chemicals such as PCBs.
- Assess the health effects of trace elements and pollutants.
- Match samples for crime detection.

In addition, there are many benefits from associated equipment, such as "ion implantation" to harden the surfaces of artificial hip joints.


Neutron scattering experiment



Above: Better knowledge of the structures of new ceramic and other materials.
Left: Better materials for high-technology applications, plus industrial radioisotopes to test existing applications such as jet engine parts.
Below: Radiopharmaceuticals.

Examples of other benefits.

Medical uses.

Slightly radioactive "radiopharmaceuticals", many of which can only be produced in research reactors, are commonly used by doctors to diagnose and treat serious illnesses, especially cancers.

Around half the Australian population will receive a radiopharmaceutical product during their lifetime.

Without its own reactor Australia would have to import these radiopharmaceuticals. Reliability and timeliness could not be guaranteed. Some would not be available at all.

But with a new reactor, both Australian and overseas needs would be able to be met. The demand, already worth more than $6 million per year, is growing very rapidly, enhancing export opportunities.

Australia's development of new, more effective radiopharmaceuticals would also be able to be continued.

New materials.

With a new reactor Australia would continue to build exports in innovative products.

A good example is Ansto's fast-developing export market in ultra-high purity, irradiated silicon, which is used in modern electronics like high-power switch gear for quick-start electric engines, car engine electronics, video cameras and televisions.

International nuclear issues and expertise.

Maintenance of Australia's expertise in nuclear science and technology, through the operation of our own research reactor, is essential if we are to have an effective say in international nuclear developments, nuclear safeguards and nuclear arms control.

This is especially so in the Asian region, where nuclear science and technology are developing very rapidly.

Economic costs and benefits.

Initial, "ballpark" estimates put the cost of building a new research reactor at approximately $150 million, spread over seven years (1991 Australian $). The final costs would depend on the designs adopted, the research facilities installed and unknowns such as exchange rate variations.

But these costs would be more than outweighed by the benefits. A 1991 study by the accountancy firm Coopers & Lybrand compared the financial and economic costs and benefits of the new reactor, and concluded,

"The new reactor would have a significant economic cost, but would produce a wide range of real economic benefits for Australia. We consider there is a strong case, in economic terms, for the construction of the proposed new reactor at Lucas Heights by Ansto."

Decommissioning and waste management.

The HIFAR reactor would be decommissioned (closed down and dismantled) in stages, taking advantage of the natural decay of radioactivity and overseas experience in dismantling reactors of the same design.

The first stage would be the removal of all radioactive sources and a safety surveillance program. Later stages would involve progressive dismantling of the reactor and safe storage of its components.

Spent fuel from the operation of the new reactor would be stored at the reactor site under international safeguards before being sent for reprocessing or to a permanent waste disposal facility.

Ansto has over 30 years' experience, and an excellent safety record, in the careful storage of spent reactor fuel.

Above: Highest-quality silicon for modern electronics. Left, below and right: Radiopharmaceuticals are essential in diagnosing and treating serious illnesses.

Independent Inquiry.

A Commission of Inquiry, completely independent of Ansto, is to look into the costs and benefits of building a new research reactor for Australia.
To find out more, including how you can make a submission, please contact the Inquiry's secretariat on (02) 256 0936.

Below left: New ceramic "collars" for heart pacemakers, with a matchhead for comparing the size.

Support from scientific organisations and members of all major political parties.

The Australian Science and Technology Council (ASTEC) has long recognised the need for better research reactor facilities in Australia, and has recently given the new reactor a very high priority.

In March 1992, after considering 97 submissions for major scientific projects deserving Commonwealth Government support, ASTEC recommended only seven major national research facilities, among them a new research reactor to replace HIFAR by 2002.

In June 1992 the Commonwealth Parliamentary Public Accounts Committee (PAC) — with members from all major political parties — also gave its unanimous support.

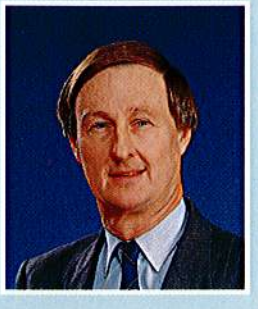
The PAC recommended funding for a new reactor, and commented,

"The Committee regards Ansto's need for additional funding as urgent, particularly for the purchase of a multi-purpose reactor to replace HIFAR."

Introduction.

The proposal for a new research reactor.

Australia's original nuclear research reactor is the HIFAR reactor run by the Australian Nuclear Science and Technology Organisation (Ansto) at Lucas Heights, south of Sydney.



This reactor, pictured on the front cover, has operated for more than 30 years with an excellent safety record, and its safety remains at the highest level.

Unfortunately, however, the HIFAR reactor is now nearing the end of its working life. Its capabilities have also been overtaken by later designs.

It has therefore been proposed that HIFAR should be replaced by a new reactor, using the very latest technologies and designs, to serve the country for the first half of the 21st century.

This brochure has been produced by Ansto to introduce you to these proposals.

In August 1992 the Government announced that an independent Commission of Inquiry is to be held into the costs and benefits of building a new research reactor in Australia. Full opportunities for community inputs will be provided.

For details on the Inquiry's terms of reference, and how you can make your comments and suggestions known, please contact the Inquiry's secretariat on (02) 256 0936.

As always, Ansto welcomes enquiries from the public about any of our activities. Please contact us if you would like to find out more about what we do, or if you would like to inspect our research facilities.

David Cook,
Executive Director, Ansto.

What is a research reactor?

As its name suggests, a research reactor is a very small nuclear reactor specially designed for scientific and industrial investigations.

A research reactor isn't used to make electricity. (It uses thousands of times less uranium fuel than a nuclear power station does.) Nor is it used for nuclear weapons research.

Its value is the fact that it is an excellent source of sub-atomic particles called neutrons.

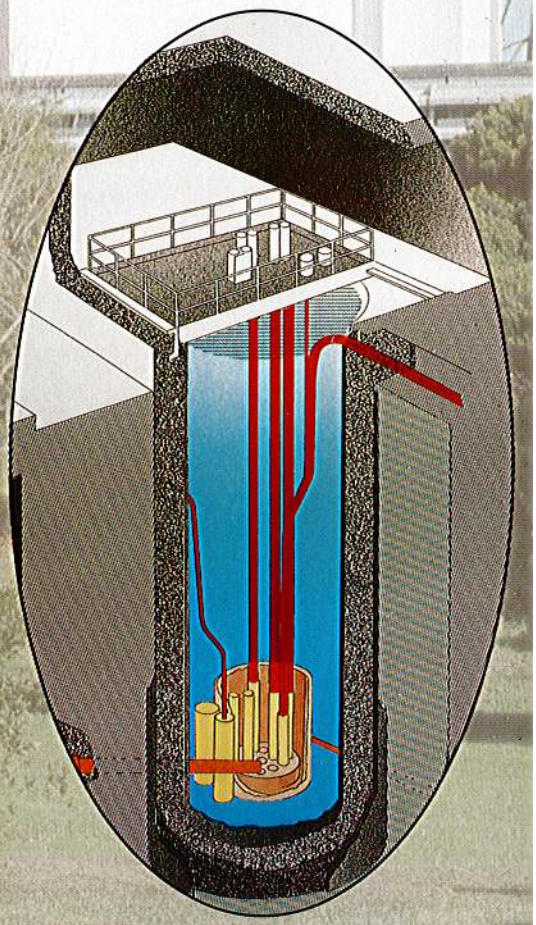
These neutrons can be directed into scientific instruments to probe deep inside samples of materials.

This gains valuable knowledge — not able to be obtained any other way — that can be used, for example, to develop lighter yet stronger materials for more advanced machinery.

A research reactor can also be used to:

- Generate "radioisotopes" for medical and industrial uses.
- Produce extremely pure materials for high technology applications.
- Irradiate samples of materials so that their "atomic fingerprints" can be measured, as a way of detecting even the smallest traces.

There are now more than 320 research reactors operating in 54 countries around the world. Most advanced countries in the south-east Asian region operate at least one research reactor. Indonesia, for example, has three.



Artist's impression of a modern research reactor.

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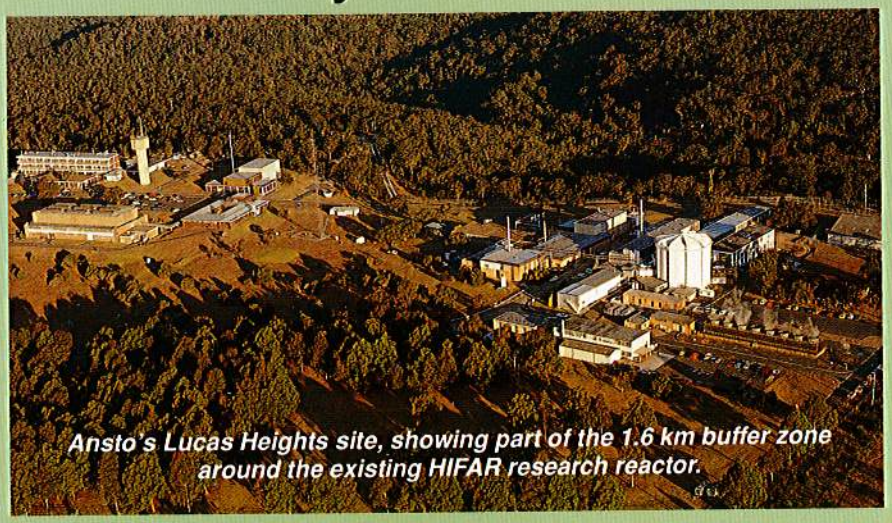
Safety and environment protection.



Ansto's Lucas Heights site, showing part of the 1.6 km buffer zone around the existing HIFAR research reactor.

Safety and environment protection are the single most important issues in designing and operating any nuclear facility — even a low-power research reactor, where the potential impacts are hundreds to thousands of times less than for electricity-generating nuclear power plants.

The HIFAR research reactor at Lucas Heights has operated with an outstanding safety record for over 30 years.

In fact, when Ansto recently enquired whether there would be any value in an epidemiological survey of its staff and residents in nearby suburbs, to check for any possible health effects, it was advised that radiation levels would need to be "several orders of magnitude" higher than those monitored before any enhanced incidence of serious illnesses could be detected. (One order of magnitude higher means multiplying by 10, two means multiplying by 100, three by 1,000, and so on.)

But far from being complacent about the safety of its reactors, Ansto is continually striving for improvements.

The new research reactor would probably be a "swimming pool" design — so called because the reactor itself would be located inside a large tank of water.

This would facilitate the most up-to-date and reliable safety measures, based on 40 years of practical, worldwide experience and assessment techniques developed since the HIFAR reactor was designed.

Its power would be less than 1% of that produced by a reactor in a typical nuclear power station.

Choosing the site.

The site for any new research reactor needs to be very carefully considered, taking account of all relevant factors, including safety and environment protection. Detailed studies would be carried out during the design of the new reactor.

One factor favouring Ansto's current Lucas Heights site is the extensive research and support facilities already there, valued at about $600 million. Another is its ready access to transport for effective, safe distribution of medical radiopharmaceuticals, which need to reach their destinations very quickly to be of any use. But other sites also need to be, and will be, considered.

The new reactor proposals, including proposed locations, would be subject to environmental assessment under the Commonwealth Environment Protection (Impact of Proposals) Act, with full opportunities for public comments, suggestions and consultations.

How you can find out more and have your say.

Ansto welcomes enquiries about any aspect of its operations. Please contact Ansto Public Affairs on (02) 717 3168 if you would like more information on what Ansto does or if you would like to inspect Ansto's Lucas Heights research facilities.

An independent Inquiry is to be held into the costs and benefits of building a new research reactor, with full opportunities for anyone who is interested to make submissions on this important issue. For details, please contact the Inquiry's secretariat on (02) 256 0936.