REPLACEMENT RESEARCH REACTOR FOR AUSTRALIA

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Abstract:

In 1992, the Australian Government commissioned a review into the need for a replacement research reactor. That review concluded that in about 5 years, if certain conditions were met, the Government could make a decision in favour of a replacement reactor.

A major milestone was achieved when, on 3 September 1997, the Australian Government announced the construction of a replacement research reactor at the site of Australia's existing research reactor HIFAR, subject to the satisfactory outcome of an environmental assessment process.

The reactor will be have the dual purpose of providing a first class facility for neutron beam research as well as providing irradiation facilities for both medical isotope production and commercial irradiations.

The project is scheduled for completion before the end of 2005.

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The Australian Nuclear Science & Technology Organisation (ANSTO), a Commonwealth Statutory Authority is located, on land owned by the Organisation, at Lucas Heights. ANSTO owns and operates national nuclear facilities which are used for nuclear related research and the provision of nuclear based products and services for its own use and the benefit of the Australian community.

A major component of ANSTO's nuclear infrastructure is the research reactor, HIFAR which began operation in 1958. HIFAR is aging and, hence on 3 September 1997, the Government announced that subject to a satisfactory environmental assessment process, ANSTO would be funded to replace HIFAR with a state-of-the-art research reactor facility at its Lucas Heights site.

Three major reviews have provided consistent advice to the Australian Government that it is appropriate to construct a replacement research reactor. These were the Australian Science and Technology Council's (ASTEC) Review of major National Research Facilities in 1992, the Research Reactor Review in 1993, and the ANSTO Strategic Review in 1994.

The ASTEC Review identified a high flux research reactor as one of seven new, major items of national scientific research infrastructure for which it recommended that government funding be provided.

The Research Reactor Review (RRR) was a wide-ranging public inquiry that addressed the question of whether Australia needed a replacement reactor. It concluded that a positive decision on a replacement reactor would be appropriate after a period of about five years if certain conditions were met.

The ANSTO Strategic Review examined the four options of closing HIFAR, Upgrading HIFAR, building a replacement reactor, or building a spallation neutron source. It identified construction of a replacement, multi-purpose research reactor as the preferred option on the basis of its suitability to satisfy the wide range of Australian requirements.

In addition, the Nuclear Safety Bureau, which has regulatory responsibilities over ANSTO's nuclear plant, made it clear in its annual report to Parliament for 1994-95 that HIFAR's safety systems would need upgrading by about 2003 if it were to be operated significantly beyond that date. This upgrading would be at substantial cost, and would necessitate HIFAR being out of service for an extended period.

It was against this background that the Government announced that it had decided to construct another nuclear research reactor as a replacement for HIFAR, and to construct this replacement reactor at Lucas Heights.

The proposed facility is intended to serve Australia's nuclear science and technology needs well into the next century. Specific objectives of the proposal are:

- to maintain and enhance Australia's nuclear technical expertise in order to provide sound advice to Government in support of nuclear policy issues of strategic national interest,

- to maintain and enhance the health care benefits provided to the community through the local production of the quantities and the comprehensive range of diagnostic and therapeutic radiopharmaceuticals needed to satisfy Australia's requirements in the coming decades,

- to provide a neutron beam research facility which is a regional centre of excellence in this unique technique which has broad applications in the biological, chemical, environmental and materials sciences,

- to provide industrial isotopes and facilities for neutron activation analysis, irradiation of materials, and neutron radiography to service the needs of agriculture and industry, particularly the electronics, minerals, and environmental industries.

- to provide facilities and programs to enhance the educational opportunities available to Australia's scientists and engineers, and

- to achieve the construction and operation of the facility in a manner that meets all health, safety, environmental and quality standards.

In order to achieve these objectives it is anticipated that the replacement reactor will have the features listed in Table 1.

Table 1: Features of Replacement Reactor

Requirement	Specification	Comparison with HIFAR
Flux (n $cm^{-2}sec^{-1}$)	$3x10^{14}$	10^{14}
	Compact core	
	Cold Source (Hot source, possibly)	HIFAR has neither cold nor hot sources.
Beam Facilities	17 experimental positions.	9 experimental positions.
	Guide hall.	No guide hall; cramped experimental space prevents some activities.
	Tangential beam ports.	Radial beams - inferior quality.
Irradiation Facilities	Bulk isotope production facilities.	Four times that of HIFAR for Mo-99 production Higher flux for Ir-192 production
	Pneumatic conveyor irradiation facilities	Same number of irradiation positions, but superior flux.
	Silicon doping	1.5 times that of HIFAR.
Fuel	Low enriched uranium.	High enriched uranium.

It is proposed to acquire the reactor facility by use of a performance specification and through a turnkey contract. This contract will include all parts of the facility except for the neutron scattering instruments. These instruments are within the budget allocation but will be acquired separately. It is envisioned that the successful bidder for the turnkey contract will have significant demonstrated capability at the design and construction of research reactors, and will be able to demonstrate the ability to deliver a high quality and quantity of Australian industry involvement.

The tender process is planned to be undertaken in two stages. In the first stage it is intended to pre-qualify reactor vendors. Worldwide advertisements will seek registrations of interest from those organisations seeking to be pre-qualified. Those that seek to be pre-qualified will be issued with a well-developed draft set of tender documents against which they will need to make the case that they are able to deliver a facility within our budget constraints, that will meet the performance requirements, and will involve an acceptable level of project risk; prior experience and use of proven designs being examples of factors that tend to reduce the level of project risk.

Out of the pre-qualification stage will come a shortlist of reactor vendors who will be invited to bid in the second stage of the tender process.

Prior to commencement of the second stage of the tender process there are two processes that ANSTO must successfully complete; an environmental assessment, and a Parliamentary Public Works Committee review.

The environmental assessment, which will involve the preparation of a full Environmental Impact Statement, is scheduled for completion at the end of 1998. The Parliamentary Public Works Committee process cannot commence until the decision on the EIS has been made but must be completed prior to the commencement of stage two of the tendering process.

Advertisements seeking registrations of interest will be issued shortly, with pre-qualification taking place prior to the end of 1998. The second stage of tendering is planned to commence during the first half of 1999.

The Nuclear Safety Bureau's requirement associated with continued operation of HIFAR beyond about 2003 has, given the commitment to replace the reactor, been converted to the need to cease operation not later than the end of 2005. It is therefore necessary to commission the replacement reactor, including its isotope production and the initial suite of beam facilities, before the end of 2005.