

AUSTRALIAN NUCLEAR FORUM

The Preservation of HIFAR

Policy

The existing remains of the shutdown reactor HIFAR should be preserved and converted to a national museum of nuclear technology. (Adopted 12/12/01, revised 2/7/12)

Summary and Conclusions

The 10 MW reactor HIFAR was operated from 1958 to 2007 and was the first nuclear reactor built in Australia. The reactor served many scientific purposes over its lifetime and was the centerpiece for the development of nuclear technology in Australia - a technology that has had a significant positive impact in this country through its medical, scientific, educational and industrial applications. In addition, the importance of HIFAR was underscored by ANSTO's replacement of the reactor by the 20 MW reactor OPAL in 2006.

HIFAR was operated by ANSTO, the Commonwealth agency dedicated to research and development in peaceful applications of nuclear technology. ANSTO did not demolish HIFAR at the end of its lifetime, but is planning to keep it basically intact until beginning demolition in 2016.. This presents a low cost opportunity to preserve HIFAR. Preservation can be assured if the enough funding is supplied by the Commonwealth.

The most useful application of a preserved HIFAR would be as a museum dedicated to the development of nuclear technology in this country and elsewhere and the unique role HIFAR has played in this process.

Considerations

1. History of HIFAR

The High flux Australian Reactor (HIFAR) first achieved criticality in 1958, began full power operation in 1960 and was permanently shutdown in 2007. It was Australia's first reactor, having a power of 10MW (thermal), enriched uranium fuel, unpressurised, heavy water moderated and cooled. HIFAR design was a refinement of one established by CP5 at Argonne in the US, and it closely duplicated the design of the more recent reactor DIDO located at Harwell, UK. A total of six DIDO type reactors were built in four different countries, with the design of HIFAR including significant design improvements to improve operability as specified by the then AAEC. At this time all of these reactors have been shutdown.

HIFAR served as the centerpiece for the Lucas Heights Research Laboratories and was the basis for much of the early research done there. It's initial purpose was for testing materials and was used as an irradiation facility in the development of SYNROC, the Australian developed medium for the storage of high-level radioactive waste. Early work on beryllium oxide moderated reactors also utilised HIFAR irradiations and later the reactor was used to carry out research in water cooled reactors. Following this phase the reactor was applied to applications and research in other nuclear related fields.

2. The Technological Significance of HIFAR

Over its lifetime HIFAR supplied millions of patient doses of nuclear medicines to Australia, New Zealand and Asia for the diagnosis of diseases such as cancer and heart disease. A majority of these were derived from ANSTO supplied technetium-99m generators. Also hundreds of tonnes of pure silicon ingots were irradiated to induce phosphorus doping for production of electronic circuit chips. In addition, approximately 25,000 mineral samples were analysed yearly through neutron activation in the reactor.

The reactor also features experimental neutron beam facilities. Typically around 15 percent of PhD candidates in the physical sciences and engineering at Australian universities used HIFAR in their research. Neutron beams are of value in all sciences where information at the

atomic or molecular level is required. Example studies include the structures of cyclosporin and vitamin B12 and solid state molecular interactions.

Reactor operation also provided opportunities to train personnel in reactor physics, radiological safety, reactor engineering and nuclear materials safeguards. These people were then employed in other related research and development projects and as a source of expertise for the government and overseas agencies such as the IAEA.

Overall nuclear technology has had a significant positive affect on Australia both domestically and internationally - facilitated primarily by the availability of the HIFAR reactor

3. Commonwealth Refusal to place HIFAR on the Heritage List

The ANF made a lengthy submission to the Commonwealth Department of The Environment and Heritage in 6/5/2004 to have HIFAR officially placed on the Commonwealth Heritage List. The criterion applied was "The place has significant heritage value because of the place's importance in demonstrating a high degree of creative or technical achievement at a particular period". This material was reviewed by the Heritage Council having members with experience in: corporate management, the Public Service, heritage policy, aboriginal studies, the FOE, the WWF, music composition and playing the didgeridoo.

A negative reply was received from DEH Minister Ian Campbell on 7/10/2005 saying that while HIFAR had heritage values he had "decided that wider considerations concerning the safe decommissioning of the reactor outweighed the retention of its Commonwealth Heritage values". Part of the reason for this rejection was ANSTO's view that the costs involved for preservation might be significant. Paradoxically another potential heritage aspect provided by the advice considered by the DEH was that HIFAR had provided a focus for the formation of the anti-nuclear movement in Australia.

(Note: Aside from the above effort, in 2007 The Institution of Engineers Australia did arrange to have a plaque dedicated to HIFAR placed outside the entry gate to the site.)

4. ANSTO's Plans for HIFAR

Following the final shutdown of HIFAR the fuel and heavy water were removed and the plant placed on a care and maintenance program. ANSTO's further plans are to dismantle the plant starting in 2016 with the aim of returning the area to a brownfield status. Currently ANSTO advertises, "Heritage tours of HIFAR to Mark (an) Historic Chapter for Australia" are being offered to the public. Further, "This national scientific treasure operated for nearly 50 years from 1958 and made a significant contribution to Australian society through the production of nuclear medicine and the advancement of scientific knowledge."

5. HIFAR as a Museum

The value of the original ANF proposal to transform the shutdown reactor building into a museum of nuclear technology still applies – for in ANSTO's own phrasing the reactor is "a scientific treasure". Moreover the structure of the containment of the facility is still sound and its accessible interior has been substantially decontaminated and could be made safe for the public. Thus, it could be converted to serve as a museum showing the general development of the technology and its uses in this and other countries over the years. The museum could also serve as a key educational tool to explain the benefits of the technology to students and the general public. The original objection made by ANSTO to have to carry the cost of preserving the facility could then be overcome through admission charges plus subsidy by the Commonwealth as required.

6 References

1. "HIFAR Reactor" R.W.S. Carlson, AAEC publication 1968.
2. "HIFAR a National Engineering Landmark", ANSTO 6/3/2007.
3. "Commonwealth Heritage List Nomination – HIFAR" Letter to J Brough from DEH.12/10/05
4. Data from ANSTO website, www.ansto.gov.au.