



Australian Government



Nuclear-based science benefiting all Australians

HIFAR Facility Licence Application Part E

Document ANSTO/06/749/5, rev. 0



ACTIVITIES TO BE UNDERTAKEN IN THE HIFAR FACILITY DURING THE POSSESS AND CONTROL PERIOD

(Rev. 0)

**Prepared By
Australian Nuclear Science and Technology Organisation**

May 2007

REVISION SHEET		Document No.: ANSTO/06/749/5, rev. 0			
		Print name, date and sign or initial			
Revision Number	Description of Revision	Prepared	Checked/ Reviewed	Approved	Agreed
0	Original issue	Simon Bastin	Steve McIntosh Moazzem Hossain Pertti Sirkka	John Rowling	Con Lyras

CONTENTS

1	PURPOSE AND SCOPE	4
2	ACTIVITIES	4
2.1	Refurbishment Projects	4
2.2	Preliminary dismantling.....	6
2.3	Sample gathering for inventory characterisation	9
2.4	Surveillance and Maintenance.....	10
3	REFERENCES	10

1 PURPOSE AND SCOPE

This document constitutes Part E of an application for a Facility Licence, made by the Australian Nuclear Science and Technology Organisation (ANSTO¹) for the HIFAR Facility, in accordance with the requirements of the ARPANS Act 1998 and Regulations 1999 as amended. [1, 2]

This document should be read in conjunction with other parts of this application.

This Application seeks to obtain a Facility Licence authorising ANSTO to Possess or Control the shutdown HIFAR Facility. This Facility is defined as a nuclear installation under the ARPANS Act.

Four types of activities will be undertaken during the period the licence is in force. This document outlines those activities.

2 ACTIVITIES

The activities to be undertaken during the possess and control period will be directed at achieving and maintaining a state of safe enclosure of the HIFAR facility. Such a state of safe enclosure will properly have regard not only to radiological safety but also to occupational health and safety and to the protection of the environment from radiological and non-radiological hazards.

The four types of activities to be undertaken during the period that this licence remains in force are:

1. Refurbishment of some systems that are required during the period that this licence remains in force;
2. Preliminary dismantling of essentially non-radioactive systems no longer required for the operation or safety of HIFAR;
3. Sample gathering for radiological inventory characterisation; and
4. Surveillance and Maintenance.

In addition to these activities, it is anticipated that some equipment (such as flasks) will be decontaminated, and set aside within the facility for possible reuse either in the facility or in another location.

All these activities will be managed in accordance with the HIFAR project management procedures and instructions. Activities will obtain internal approval, where appropriate, prior to commencement, in accordance with the OHSE Standard on Safety Approval. For most projects, this will mean obtaining SAC approval. For some very minor projects, risk assessment internal to the Division may be carried out using Safe Work Method Statement in accordance with the ANSTO OHSE Risk Management Standards and Practices. Some activities will require regulatory approval, which will be sought in accordance with ARPANS Regulation 51.

This section summarises the activities to be undertaken during the Possess and Control period. The refurbishment activities are described below, followed by the dismantling projects. The order of the preliminary dismantling and refurbishment activities has not been finalised at this time.

These planned refurbishment and preliminary dismantling activities are consistent with international best practice [see for example section 6.3 of reference [3]].

2.1 Refurbishment Projects

Refurbishment of some systems such as the power supply system and the active extract ventilation systems will be needed to keep the facility in a state of safe enclosure, particularly given that the facility will not be manned on a 24 hour basis.

The list of refurbishment projects is given below, with some details of the scope of each task.

¹ Note that Definitions of the Terms and Acronyms used throughout this document are provided in Appendix 1.

E0910 – Refurbish Electrical Power System

This project involves the design through to commissioning of a new electrical supply system to support the HIFAR Facility. The new electrical supply system will be installed, tested and commissioned while the existing EPSS continues to supply the facility and its ancillaries. The new electrical supply system will be powered up to supply the services necessary to support the facility. It will have sufficient capacity for the operation of the cranes, the active extract fans, the air conditioning system, the air compressors, the radiation detectors, the lighting and the fire detection system.

The installation of the new electrical power supply system is required to permit the safe removal of the existing equipment and to ensure that power is maintained to essential services, such as the radiation detectors and the active extraction system. Once it has been confirmed that the new electrical supply system is safely supporting the shutdown reactor, the existing EPSS is to be disconnected and dismantled.

E0914 – Refurbish Active Ventilation System

The purpose of this project is to replace and/or modify the existing active ventilation system for the Reactor Building. Tritiated hydrogen gas is likely to be trapped in the graphite reflector that surrounds the reactor aluminium tank, and this gas will gradually be released. To collect this gas and release it outside the Reactor Building, the active ventilation system will be used to produce a flow of air from the Reactor Building environment through the areas that could produce tritium and exhaust it outside the Reactor Building via the existing stack.

Following connection of the active extract system to the reactor, routine measurements of the tritium concentrations in the Reactor Building will be undertaken to ensure that the concentration is not excessive.

E0916 – Refurbish HVAC System

The purpose of this project is to replace and/or modify the existing heating, ventilation and air conditioning system for the Reactor Building.

A new air conditioning system will be installed. The existing space conditioner system is old and inappropriate for the Possess and Control period. The design of the new air conditioning system has not been finalised at this time, but may comprise a split system. The supply of fresh air into the Reactor Building would be induced by the action of the Active extract system.

The need for the air conditioning system is primarily for personnel comfort. It has the added benefit of controlling the humidity to ensure that condensation will not occur on interior surfaces, thus avoiding the potential for corrosion of metal surfaces.

E0917 – Refurbish Security System

The purpose of this project is, in conjunction with ANSTO Security, to implement the changed security requirements within and around the HIFAR Facility during the Possess and Control period (see also E0920 – Refurbish Access System below).

E0920 – Refurbish Access System

The purpose of this project is to implement the new access requirements within and around the HIFAR Facility during the Possess and Control period. Detail on this project is contained in the Security Plan.

E0927 – Refurbish Monitoring System

The purpose of this project is to implement the design through to commissioning of a new Supervisory Control and Data Acquisition System (SCADA), and associated display panel for the HIFAR Facility. The new SCADA system will monitor, record and enunciate the various Facility parameters and alarms throughout the Possess and Control period and will also provide control of the refurbished ventilation and air conditioning systems. Independently from the SCADA system, various critical parameters will be displayed on an appropriate display panel to be located at the main personnel access door of the Reactor Building and in the site ECC.

E0933 – Refurbish Communication System

This project involves the refurbishment and rationalisation of the current communications systems, which include computer cabling, the normal telephone system, the 2 digit and 3 digit telephone systems, intercoms and the public address systems.

E0934 – Refurbish Lighting System

This project involves the refurbishment of the existing Reactor Building lighting system to provide a reliable and fire safe system which will be in use during the Possess and Control period.

E0948 – Refurbish Fire Alarm System

The purpose of this project is to implement the design through to commissioning of:

- A new fire detection system for the Reactor Building, and
- Modifications to the fire detection system for the Auxiliary Plant Room

to meet the needs of the Possess and Control period.

The existing fire detection system will be replaced to ensure reliability during the estimated 10 years of the Possess and Control period and reflect the changes to the fire risks in the building [4].

In order to achieve the level of protection required, it is currently proposed that the fire protection system in the Reactor Building will provide for:

1. An aspirating smoke detection system;
2. Manual call points at the FIP (the personnel egress point) and at the vehicular access point;
3. A flame detector near the vehicular access;
4. Smoke detectors located within the ventilation system exhaust ducts; and
5. Audible and visual alarm indicators within the building.

For the Auxiliary Plant Room, it is proposed that the existing smoke detectors and manual call points within the Auxiliary Plant Room be disconnected from the existing FIP and reconnected to the new FIP in the Reactor Building.

The level of fire protection provided within the other buildings and structures of the HIFAR Facility is adequate, and no enhancement work is proposed to be undertaken in regard to the fire protection systems within these structures.

E0963 – Refurbish Instrumentation

This project involves the design through commissioning of eight new area radiation monitors and the removal of the existing health physics instrumentation within the Reactor Building.

The new radiation monitoring devices will monitor the levels of radiation within the Reactor Building throughout the Possess and Control period. As well as providing local alarm annunciation of any high radiation levels, signals from the new monitors will also be connected to the new SCADA system for permanent recording and alarm annunciation over a wider area.

Radiation levels will be displayed upon an appropriate display panel to be located at the main personnel access door of the Reactor Building.

E0972 – Install Shielding for the reactor block and No. 1 Storage Block

This project involves the installation of shielding slabs on the HIFAR and No.1 Storage Block top plates and side faces to reduce the background radiation to the required low levels. As well as reducing background radiation levels, these shielding slabs will reduce the risk of inadvertent removal of items or shielding from the HIFAR Facility or SB1.

2.2 Preliminary dismantling

The proposed preliminary dismantling projects involve all non-radioactive items that are not needed for the safety or utility of the facility during the period whilst the Possess or Control licence remains in force. Such dismantling will reduce fire hazards within and outside the reactor building, and address concerns about possible health and environmental hazards posed by redundant systems located outside the reactor building. Consistent with international practice, it is not proposed to undertake any dismantling of structures containing significant levels of radioactivity during the period of safe enclosure.

This philosophy was adopted for two main reasons: (1) to allow a period of decay to take place of the radioactive material, thus reducing the potential volumes of each category of radioactive waste

Application for the Facility Licence, "Possess or Control" for the HIFAR Facility: Planned Activities

generated in the decommissioning period which will begin after the Safe Enclosure period; and (2) not to generate any significant quantities of radioactive waste prior to the establishment of the Commonwealth Radioactive Waste Management Facility.

Some projects, upon more detailed assessment may prove to involve the removal of large items of equipment with contamination that is not practicable to remove. In any such case, the project may be delayed until decommissioning commences. This will be dealt with in the planning stages of each project, making use of surveys and assessments prior to any dismantling. Projects that might be affected by this principle are marked in the list below with an asterisk.

Indicative descriptions of the proposed work for each are provided here. The descriptions are indicative only and may be subject to change during development of the detailed design for each project. Detailed descriptions of each of these projects will be developed and included in the Safe Work Method Statement or SAC submission (and regulatory submissions/reports where appropriate) for each project.

E0902 – Remove Cooling Towers, Pond/Pipework - external to the Reactor Building

This removal, although of a significant quantity of material, does not involve contaminated items and thus can be undertaken following normal demolition practices. Removal of this equipment is considered good practice to avoid possible health and hygiene issues, and is consistent with reference [3].

E0918 – Remove Miscellaneous Items from the Reactor Building

Some of the control room instrumentation will be used as an exhibit in a museum. Following shutdown, the control room instrumentation will be removed and stored on site before being sent to the museum. Other items, such as filing cabinets, computers, desks, cupboards, etc will be removed and either re-used elsewhere on site or disposed of. Removal of this equipment is considered good practice to reduce potential fire loads within the building, and is consistent with reference [3].

E0919 – Removal of 3V8 Gasholder and Helium Circuit to the Graphite Space*

The gasholder and the circuit that provides helium to the Graphite Space (the 03 circuit) will be removed using the same techniques as are currently used for maintenance. The graphite space (between the Reactor Aluminium Tank and the Reactor Steel Tank) is currently open to the active extract and has no helium content. Therefore, this circuit is no longer needed. The equipment is expected to be non-radioactive and will generate only conventional waste. However, because of the bulk of this item, if contamination is found and is not practicable to decontaminate, this project may be deferred until decommissioning.

E0922 – Remove Fuel Element Assembly Station*

Following final closure, there will be no need to assemble fuel elements and thus the assembly station will be removed. This is expected to be non-radioactive and will generate only conventional waste. However, because of the bulk of this item, if contamination is found and is not practicable to decontaminate, this project may be deferred until decommissioning.

E0923 – Remove HIFAR 06 Circuit (Rigs Cooling)

Following shutdown, there is no heat source that requires the cooling systems and thus they can be dismantled. These cooling circuits are predominantly non-active and can be removed from the Reactor Building. When each cooling circuit is being removed, inspection and checking systems will be used to ensure that any active material on the components being removed is managed appropriately.

E0931 – Remove No.1 Storage Block Cooling System - external to Reactor Building

No items will be stored in the No. 1 Storage Block that require the cooling system, and thus it can be dismantled. This cooling circuit is predominantly non-active and can be removed from the Reactor Building. When each cooling circuit is being removed, the inspection and checking systems will be used to ensure that any active material on the components being removed is managed appropriately.

E0932 – Remove HIFAR ECCS

The Emergency Core Cooling System will be removed and disposed of. The pipework and scavenge pumps are expected to be inactive and will generate only conventional waste. However, with the D₂O

Application for the Facility Licence, "Possess or Control" for the HIFAR Facility: Planned Activities

drained from the primary circuit, the radiation levels in the D₂O Plant Room may prevent access to remove the scavenge pumps. This will be determined at the time of detailed planning of the project.

E0939 – Remove HIFAR Protection Signal System

The HIFAR Protection Signal System will also be removed. This material is non-radioactive and will generate only conventional waste. The items in the control room will be treated separately.

E0940 – Remove HIFAR Demineralised Water System

Following shutdown and installation of the new systems in the Reactor Building; the equipment and buildings outside the Reactor Building, except for the active extract system, are redundant. Thus the demineralised water system can be removed. No activity is anticipated on this equipment.

E0941 – Remove B23 Isotope Conveyor & Rigs Cooling System*

These pneumatic conveyor systems were used to convey samples of active materials to ARI. Following shutdown, there is no heat source that requires the cooling systems and thus they can be dismantled. These cooling circuits are predominantly non-active and can be removed from the Reactor Building. When each cooling circuit is being removed, checking systems will be used to ensure that any active material on the components being removed is managed appropriately. Some specific items of this system may be contaminated to an extent that is not practicable to decontaminate and if so, may be left in-situ until the decommissioning stage.

E0942 – Remove B68 Isotope Conveyor & Rig Cooling System

These pneumatic conveyor systems were used to convey activated forensic samples to B68. Following shutdown, there is no heat source that requires the cooling systems, and thus they can be dismantled. These cooling circuits are predominantly non-active and can be removed from the Reactor Building. When each cooling circuit is being removed, checking systems will be used to ensure that any active material on the components being removed is managed appropriately.

E0943 – Remove Rig Consoles & Gas Mixing System

These systems are expected to be non-active and thus can be removed following confirmation of being contamination free.

E0944 – Remove Out-of-Pile Silicon Irradiation Facilities*

These systems are expected to have very low levels of activity and thus can be removed using normal maintenance procedures. This is expected to be non-radioactive and will generate only conventional waste. However, because of the bulk of this item, if contamination is found and is not practicable to decontaminate, this project may be deferred until decommissioning

E0946 – Remove Redundant HIFAR Steel Structures

The various floors and steel support structures will be removed where they will not have any function during final decommissioning. These items are anticipated to have no contamination and thus can be removed when confirmed to be contamination free.

E0949 – Remove HIFAR CIS

The containment isolation system will not be required after shutdown and is non-active. Thus it can be removed following shutdown. Where the CIS is part of the active ventilation system, the U-tube will be replaced by a simple duct. Other penetrations through the Reactor Building will be blanked off to prevent dirt and rain entering the Reactor Building. The removal of the CIS will not be undertaken as a concerted activity but will be incidental to refurbishment and/or removal of other systems that penetrate the Reactor Building.

E0950 – Remove D₂O Plant Room Flooding System

This system is not anticipated to contain any activity and thus can be removed once confirmed to be contamination free.

E0951 – Remove Non-Active Parts of the Primary Helium Circuit

This system is expected to contain only very low levels of contamination and thus can be removed using the normal maintenance procedures. Some specific items of this system may be contaminated to an extent that is not practicable to decontaminate and if so, may be left in-situ.

E0953 – Remove HIFAR Area Buildings

Following shutdown and installation of the new systems to the Reactor Building; the equipment and buildings outside the Reactor Building, except for the active extract system, are redundant. Thus the ECR, the AUSANS room, etc can be removed. Other associated buildings (such as B40, B49) may also be demolished over time.

There is no activity in any of these pieces of equipment, except for minor activity on the beam stop for the AUSANS. Equipment without any activity can be removed using standard demolition techniques. Any equipment with small quantities of activity will have the active material removed and the residual equipment confirmed as free of contamination before it is released for general disposal.

E0958 – Remove Secondary Cooling Circuit – internal to the Reactor Building

This system is not expected to contain any activity and thus can be removed once confirmed to be contamination free. The heat exchanger and pipework in the D₂O Plant Room may be left in situ because the dose rates there may restrict access. This will be assessed in the detailed planning of this project.

E0960 – Remove Shield Cooling Circuit

Following shutdown, there is no heat source that requires the cooling systems and thus they can be dismantled.

These cooling circuits are predominantly non-active and can be removed from the Reactor Building. When each cooling circuit is being removed, checking systems will be used to ensure that any active material on the components being removed is managed appropriately.

E0961 – Remove Redundant Water Supply Circuits

These systems are non-active and can be removed as desired.

E0962 – Remove Redundant HIFAR Area Cranes

Within the Reactor Building, the polar crane will be kept for use during the final decommissioning. The other smaller cranes will be examined and where there is no anticipated future need, they will be removed. The waste will be non-radioactive conventional waste only.

E0968 – Remove HIFAR SCS

The redundant space conditioning system will be removed after the replacement air conditioning system is commissioned. The waste will be non-radioactive conventional waste only.

E0969 – Remove ECR Internal Equipment

The ECR equipment is non-radioactive and thus can be dismantled and either re-used on site or disposed of. There is no activity in any of these pieces of equipment and thus can be removed using standard demolition techniques.

2.3 Sample gathering for inventory characterisation

Sample gathering for radiological inventory characterisation may be used towards the end of the period that this licence remains in force to support and confirm inventory modelling and inventory estimation from similar facilities. Radiological safety issues will be relevant to this activity and will be controlled by good planning, independent review by the Safety Assessment Committee of proposed tasks, in-situ dust and/or gas collection where appropriate, health physics coverage and appropriate dedicated radiation monitoring where appropriate.

A preliminary assessment plan for the nuclide inventory in the reactor block and Storage Block No. 1 (SB1) has been prepared [5]. The purpose of the characterisation plan is to provide a preliminary guide and overview of the planning, organisation and work required to determine the amounts of radioactivity remaining in those parts of the HIFAR Facility that are to be dismantled as part of decommissioning.

The plan describes the characterisation work, which comprises the following steps:

- Review of historical information
- Implementation of calculation methods

Application for the Facility Licence, "Possess or Control" for the HIFAR Facility: Planned Activities

- Preparation of the sampling and analysis plan based on an appropriate statistical approach
- Performance of in-situ measurements and analysis,
- Performance of sampling and analysis of those samples (where required to add confidence to the other characterisation measures),
- Review and evaluation of data obtained
- Comparison of calculated results and measured data

The nuclide and item inventory in the HIFAR Facility and in SB1 will be assessed in two phases: a preliminary assessment will be undertaken early in the Possess and Control period, followed by a detailed assessment later in this period.

The detailed assessment will occur after the redundant non-active equipment has been removed from the Reactor Building. This delay in undertaking the survey will ensure the activity being measured is the longer life isotopes. In addition, the removal of redundant equipment will increase the space available for the characterisation activities, which may include taking samples as well as measurements.

2.4 Surveillance and Maintenance

These activities are described in the Safety Analysis Report (Part C) and in Part B(8) of this licence application.

3 REFERENCES

- 1 Australian Radiation Protection and Nuclear Safety (ARPANS) Act 1998
- 2 Australian Radiation Protection and Nuclear Safety (ARPANS) Regulations 1999
- 3 Safety Reports Series No. 26, Safe Enclosure of Nuclear Facilities during Deferred Dismantling, IAEA, 2002
- 4 Concept Report New Fire Protection System, HJMS No. E0948, file 06/1168, rev 0.
- 5 HES Project E0967 - Preliminary Characterisation Report and Plan for preparing the Final Characterisation Report