Technical Meeting "Legal and Regulatory Aspects of Decommissioning of Research Reactors"

Research Reactor Demonstration Decommissioning Project (R2D2P)

Manila, Philippines, 26-30 June 2006

Practical Case

1. Background

The Philippine Research Reactor (PRR1) is an open pool type research reactor owned and operated by the Philippine Nuclear Research Institute (PNRI). The PRR1 is the only nuclear research reactor in the Philippines. The PRR1 is located in Quezon City, a part of the Metropolitan Manila area. The reactor was originally of General Electric design and started operation in 1963 at 1 MW with a plate type core, but was converted to use TRIGA fuel rods and to operate at 3 MW in the 1980s. The PRR1 was shut down in 1988 because of a water leak in the pool liner before it could be regularly operated as a TRIGA reactor.

The reactor is still shut down, no longer especially because of the leak, but because of bigger safety issues related to aging, the inability of some old reactor components to meet modern requirements, and to the recent discovery of major earthquake potential from a fault only a few kilometers from the site.

The PRR1 is has decided to decommission the reactor due to the unsufficient financial resources.

2. PRR-1 Shutdown History

The PRR-1 began operating in 1963 as a 1 MW open-pool general-purpose General-Electric research reactor provided by the U.S.A. under the Atoms for Peace program. It used MTR-type aluminium plate fuel and operated uneventfully at 1 MW until the late 1970s, when aging started to become a problem. Shortly after successful re-start and testing of the PRR-1 up to 3 MW in 1988, the reactor pool liner sprung a serious leak. The leak began the shutdown extending to the present. The last time the PRR1 was operated was on 30 March 1988.

Major corrosion of the pool liner was discovered when the reactor pool was completely drained in 1992. Other major aging problems were also discovered, especially in the reactor core support structure. The pool liner was repaired and some of the aging components were rehabilitated during 1992-1997.

The reactor never had an ageing management programme and Funds were not sufficient to rehabilitate the rest of the reactor. Some factors became important while the reactor was shut down: (i) All spent fuel were shipped out in 1999 (ii) Lease on the site expired, (iii) Site now believed to be more seismically dangerous than anticipated in 1960s, and (iii) PNRI created new regulatory program.

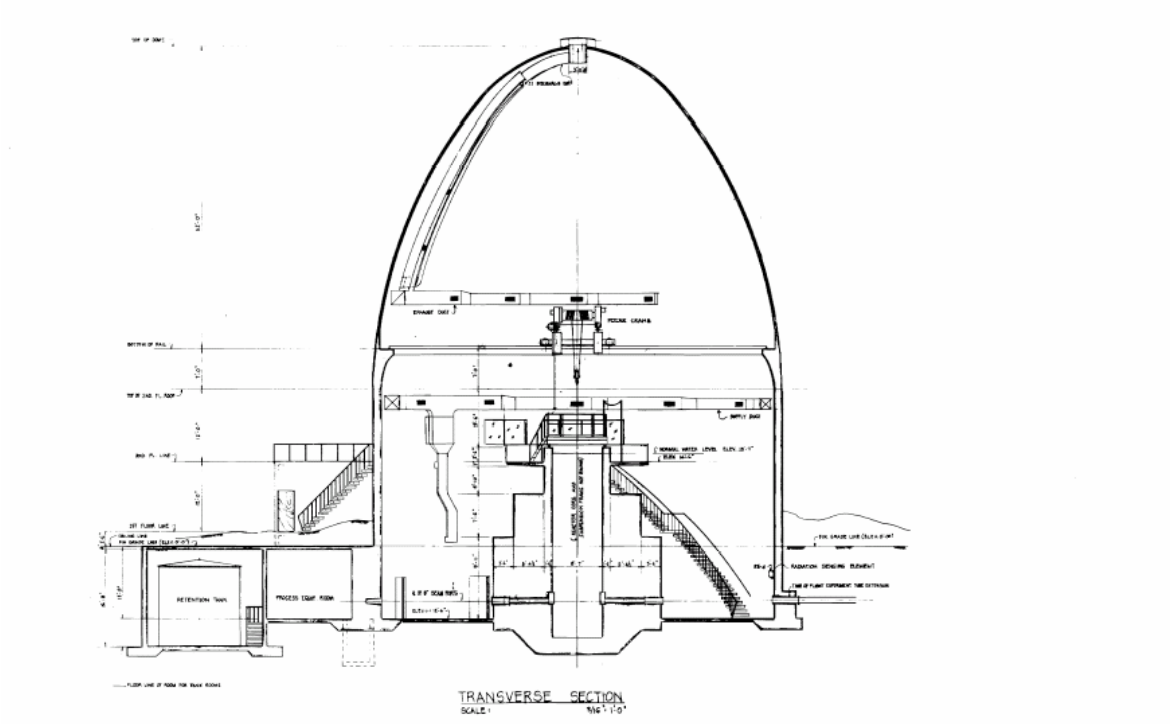
The reactor has been losing experienced personnel since the shutdown to retirement, resignation, or assignment to other duties. The number remaining is still sufficient for shutdown conditions, but is clearly not sufficient for operation. There is no recruitment or replacement programme.

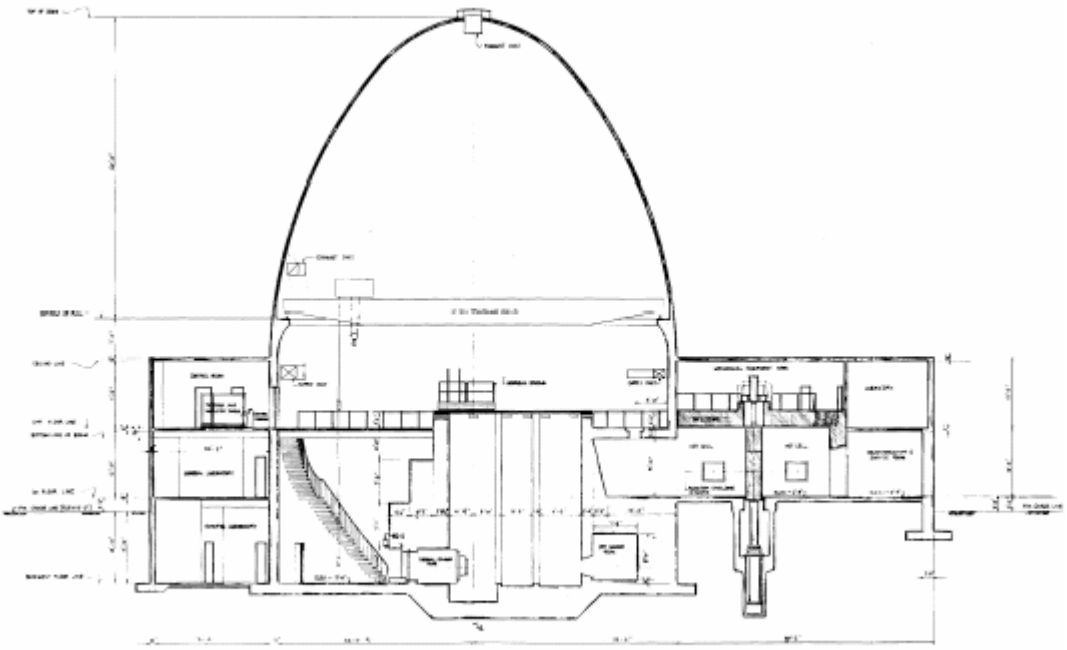
There is no formal quality assurance program in place. However, approval of the Director through the Safety Committee is required for any non-routine activity, including new experiments. This will probably change after the PNRI's internal regulatory reorganization.

Primarily, a lack of funding to solve other serious safety and ageing problems that were discovered when the reactor was " temporarily" shut down to solve a pool liner leak was the reason for the decision for final shutdown an decommissioning of the reactor.

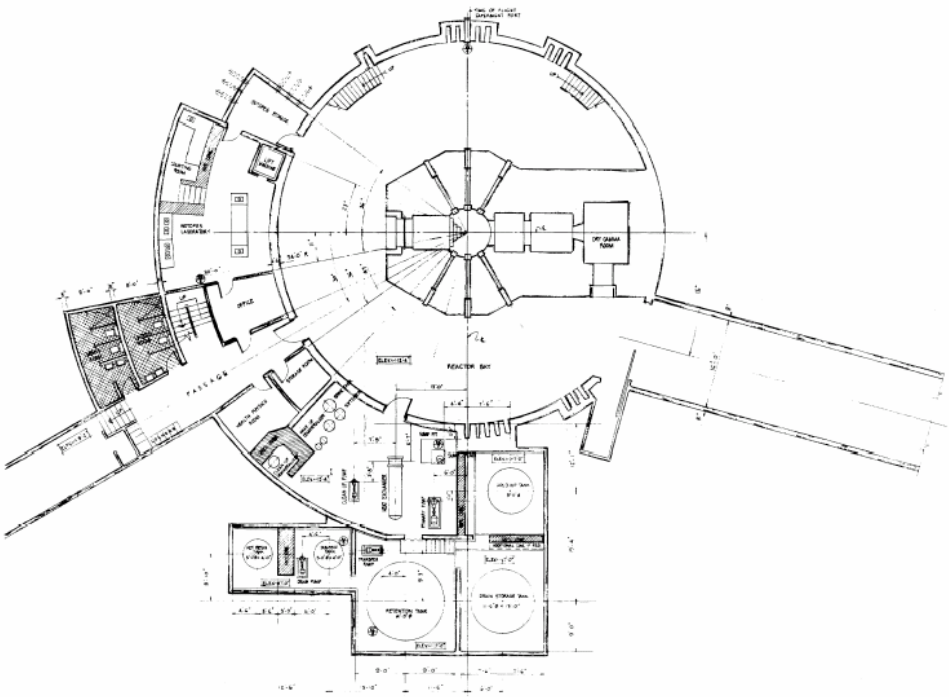
The PRR-1 does not have a preliminary decommissioning plan and the operator plans to develop it.

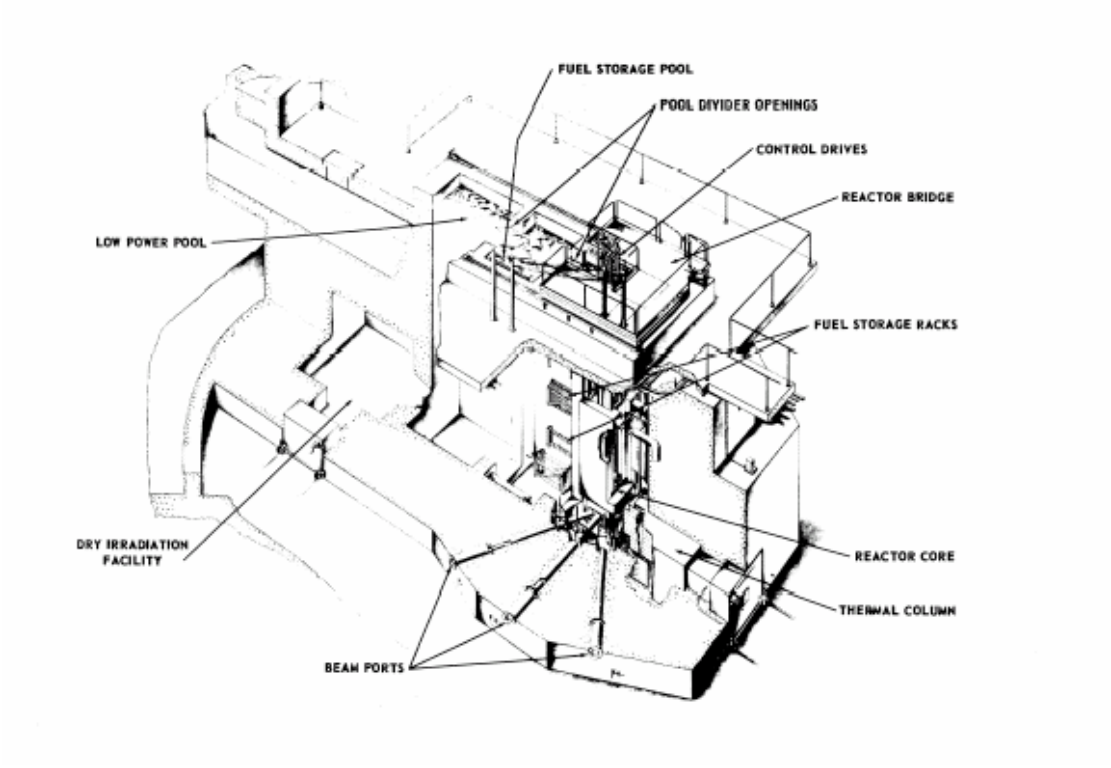
It will depend to a large extent on what the future plans of the owner are for the site. (The owner of the site is the University of the Philippines, not the PNRI.) The plans have changed through the years, from a commercial complex to a science park.

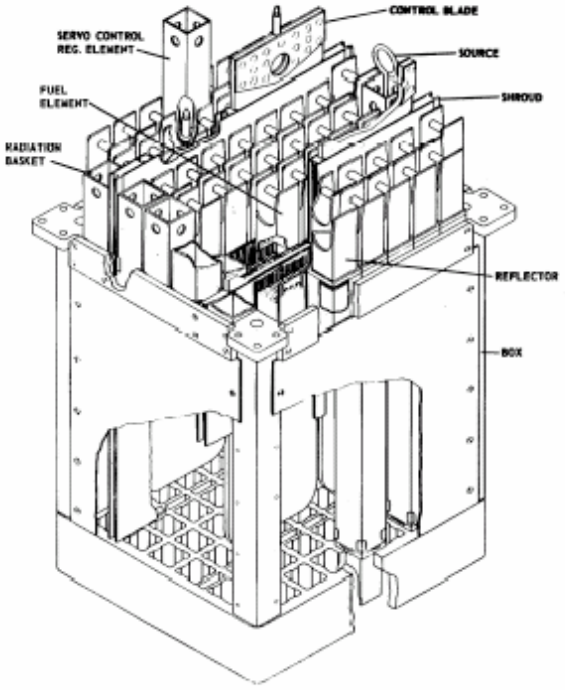




LONGITUDINAL SECTION







OPEN POOL REACTOR CORE

3. Spent Fuel

All 50 plate-type fuel assemblies generated previous to TRIGA conversion were shipped back to U.S.A. in 1999 including the low-enriched ones.

The only irradiated fuel remaining in the facility are the TRIGA rods used during startup testing, and these were operated only to a total of 15 MWhours in 1988. Aside from the spent fuel, the PRR1 generated radioactive material only through neutron activation. (The facility had no fuel test rigs.) Very little residual radioactivity remains, as the reactor's structural material is almost entirely aluminum. Much of the residual activity is in a few stainless steel bolts used in the core box, in a small lead shield that used to be between the core and the thermal column, and in the concrete around the thermal column and the beam tubes.

Except for the fuel, there is no longer a preventive maintenance program for reactor components such as the instrumentation and cooling systems. These components are still installed and undisturbed, but because they have not been used since 1988, they are no longer considered usable even if the reactor is rehabilitated.

4. Radioactive Waste Management

The PNRI has not yet defined a national waste disposal site, but there is a project to do so. The small amount of radioactive waste produced by the operation of the PRR1 is currently stored onsite in an area managed by the PNRI's radiation protection unit. The water purity in the tank holding the irradiated fuel elements is maintained to the specifications required to prevent corrosion. This is easier to do now with the reactor shut down than when it was operational, because the tank can be covered and the reactor building kept completely closed, limiting water contamination from atmospheric dust. Except for periodic water sampling, the storage tank is accessed only during the annual IAEA safeguards inspection.

3. Legal and Regulatory Framework

The Philippine legislation that created the PNRI (originally as the Philippine Atomic Energy Commission or PAEC, modified by later legislation) made that agency the national regulatory body for nuclear facilities. However, the law also specifically exempted nuclear facilities operated by the PNRI itself from licensing. These facilities have always been regulated by the agency's internal Safety Committee.

There is an ongoing effort to transfer the regulation of these nuclear facilities to the agency's Nuclear Regulations, Licensing, and Safeguards Division (NRLSD). This is intended to provide a measure of independence between the regulator and the operator of the nuclear facilities. NRSLD was established cconsists of the following Units:

- Standards Development Unit
- Licensing, Review, and Evaluation Unit
- Inspection and Enforcement Unit
- Safeguards Unit
- Radiological Impact Assessment Unit

At present there are two National Regulatory Authorities in the Philippines:

- Philippine Nuclear Research Institute (PNRI), Department of Science and Technology (DOST) is the national authority responsible for the regulation, licensing and safeguards of radioactive materials and atomic energy facilities.
- Bureau of Health Devices and Technology (BHDT), Department of Health (DOH) is the national agency in charge of radiation protection and safety of the ionizing and non-ionizing radiation emitted from electrical/electronic devices.

Regulatory Control Program of PNRI Facilities/Laboratories

The Internal Regulatory Control Program of PNRI Facilities/Laboratories was established thru PNRI Office Order 002 Series of 2004 and in accordance with the PNRI Policy Instruction No.02 Series of 2001 entitled Radiological Health and Safety Policy. The purpose of this Program is to set up an internal authorization process for PNRI nuclear and radiation facilities and laboratories. The Program will be implemented for the Philippine Research Reactor (PRR-1), Co-60 Multi-Purpose Irradiation Facility, Radioisotope Dispensing Laboratory, Radioactive Wastes Management and Interim Storage Facility, Secondary Standard Dosimetry Laboratory and other PNRI research laboratories where radioactive materials are used and handled. The Nuclear Regulations, Licensing, & Safeguards Division (NRLSD) was tasked to take the responsibilities to implement the Program.

Preparatory activities were undertaken by NRLSD for the implementation of the Internal Regulatory Control Program. Relevant Parts of the Code of PNRI Regulations, guidance documents and IAEA reference materials were reviewed and compiled in preparation for the implementation of the Program. The Regulatory Guide for the Preparation of Application for the Authorization of PNRI Nuclear and Radiation Facilities and Laboratories was developed in accordance with the PNRI Policy Instruction No. 02 Series of 2001 – Radiological Health and Safety Policy, a Regulatory Control Program for PNRI Nuclear and Radiation Facilities and Laboratories and with PNRI Office Order No. 002, entitled "Regulatory Control Program for PNRI Nuclear and Radiation Facilities and Laboratories". The proposed Regulatory Guide is still under review for revision to include new subsections such as safety assessment and security plan.

In-house training program for the regulatory staff are being conducted in preparation for the in-coming regulatory review activities. It includes the following areas of training:

1. Basic Safety Standards (BSS)
2. Safe Transport of Radioactive Materials
3. Code of Conduct on the Safety and Security of Radioactive Sources
4. Safety Assessment of Radiation Facilities and Laboratories

Furthermore, a PNRI Special Order organizing a Task Force to review and evaluate applications for authorization of PNRI facilities/Laboratories was issued. The Task Force took charge of the development of application form for authorization of PNRI Facilities/Laboratories.

The application form for authorization of the research reactor (PRR-1) requires the following major items:

1. Radiation Control Programme which requires that PRR-1's radiation protection and monitoring system to remain in operable condition during the period of extended shutdown and eventual decommissioning.

2. A Safety Analysis Report (SAR) for the justification of the design which is to be the basis for the safe extended shutdown and decommissioning of the research reactor.

   The SAR should provide the following:

   (a.) General description of the facility
   (b.) Safety objectives
   (c.) Site characteristics
   (d.) Buildings and structures
   (e.) Reactor Description and Design
   (f.) Reactor coolant systems and connected systems
   (g.) Engineered safety features
   (h.) Instrumentation and control
   (i.) Electric power
   (j.) Auxiliary systems
   (k.) Radiological safety procedure
   (l.) Conduct of activities during extended shutdown
   (m.) Administrative and surveillance requirements
   (n.) Quality assurance

3. A Decommissioning Plan which addresses the following:

   (a.) a description of the experience, resources, responsibilities and structure of the decommissioning organization, including the technical qualification/skills of the staff;
   (b.) an assessment of the availability of special services, engineering and decommissioning techniques required, including any decontamination, dismantling and cutting technology as well as remotely operated equipment needed to complete decommissioning safely;

(c.) an assessment of the amount, type and location of residual radioactive and hazardous non-radioactive materials in the nuclear reactor installation, including calculational methods and measurements to be used to determine the inventory of each;

(d.) a description of the waste management practices, such as:

- identification and characterization of sources, types and volumes of waste;
- criteria for segregating materials;
- proposed program for waste processing, storage, or transport to radioactive waste management facility of radioactive waste packages or disused sources;
- the potential to reuse and recycle materials;
- anticipated discharges of radioactive and hazardous non-radioactive materials to the environment

In preparation for the incoming review of applications for authorization which are expected to be received by the NRLSD on June 30, 2006, a Standard Review Plan (SRP) for this purpose is currently under preparation. This SRP will use checklists as tools in the review and evaluation of applications. The NRLSD Task Force prepared the necessary checklists following the order of required items in the application forms for authorization.

The processes in the implementation of the Internal Regulatory Control Program, i.e. Processing of Applications for Authorization and Related Documents and Compliance Monitoring of PNRI Radiation Facilities and Laboratories are illustrated in the flowcharts shown in Figures 1 and 2.

Tasks

The participants will split into four groups – two dealing with the legal framework and two with the regulatory framework for decommissioning of the reactor.

- Groups A and B (legal framework) will identify primary legal issues arising from the PRR-1 decommissioning efforts, referencing the specific provisions of applicable instruments, guidance documents and any other relevant material. The group should suggest and prioritize possible approaches/steps to resolve those issues.
- Group C and D (regulatory framework) will identify primary regulatory issues (e.g. development and review of a decommissioning plan) arising from the PRR-1 decommissioning efforts, referencing the specific provisions of applicable instruments, guidance documents and any other relevant material. The group should suggest and prioritize possible approaches/steps to resolve those issues.

At the end of the practical session (Friday) each group will be given the opportunity to make 15 minutes presentation.