STATUS OF DECOMMISSIONING AT PRR-1

Safety Assessment for Decommissioning

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Preparation of a Decommissioning Plan

(basics of decommissioning)

- Basically, the format and content of the decommissioning plan follows IAEA safety reports series no.45, standard format and content for safety related decommissioning documents, july 2005, sti/pub/1214.
- The alternative decommissioning strategies that are normally considered in decommissioning a nuclear research reactor are described in IAEA Safety Reports Series No. 50, Decommissioning Strategies for Facilities Using Radioactive Material, March 2007, STI/PUB/1281.
- The alternatives are immediate dismantling, deferred dismantling, and entombment.
- Deferred dismantling has become the decommissioning strategy not by deliberate choice but by default.
- Immediate dismantling is no longer an option because of the time that has passed since 1988; in any case funding will not be available for at least a few years more.

- Other alternative of entombment is not considered acceptable because the site is inside a university campus in a highly urbanized part of Metro Manila.
- The PNRI has decided that the end state of decommissioning is to be unrestricted release from regulatory control, because the site will eventually be returned for re-use to its owner, the University of the Philippines.
- the facility will not be dismantled down to a “green field”.
- The reactor building is considered to be architecturally significant, and its shell is to be preserved.
- The building can be refurbished to serve a non-nuclear purpose after its release from regulatory control.

Transition

(from operation to decommissioning-main issues to be addressed)

- The PNRI will be responsible for the entire decommissioning process, including hazards characterization, development of the decommissioning plan, performing dismantling and decontamination, and waste disposal. Unlike in some other countries, the Philippines does not have specialized organizations that can be commissioned to undertake any of those jobs.
- The PNRI has a limited amount of resources, both in manpower and funding. Using its present resources (including some local and foreign assistance that it normally receives), the PNRI can probably only undertake the decommissioning process up to the development of the decommissioning plan and some minor dismantling and decontamination. Going further into major dismantling and decontamination (such as of the bioshield) and providing for waste disposal or storage will need the infusion of resources much beyond what the PNRI usually has.

- The PNRI has no experience in the decommissioning of a large nuclear facility, and its present management structure is that of a small government bureaucracy that does scientific research and provides some technical services, which may not be well suited to the management of a large project.

Repair of Reactor building and its facilities

(other relevant issues that need to be addressed)

- As part of the transition phase of the decommissioning of PRR-1, the PNRI has also focus on the preservation of the reactor building and its facilities.
  - To maintain the integrity of good house keeping while decommissioning process is on-going.
  - To wait for budgetary funds.

PNRI Phase 1 Tasks – Costs

		Labor (Man-Days)	Non-Labor (Pesos)
	Fuel Security	100	15,000,000
	Resolve Fuel storage		
	Safeguards and Security		
	Assets Repair and Preservation		
	Building		
1	Fix leaking roofs	10	1,000,000
	Eliminate puddles inside the building		
	Painting the dome	5	500,000
	Structural Aging Management Program, e.g. dome, foundations		
1	Check handrails and stairs for corrosion		
	Mechanical		
	Crane inspection	10	100,000
	lubricate mechanical components e.g the rolling door, crane elements		
	Electrical and Lighting		
	Electrical repair and upgrades	100	2,000,000
5	Genset	5	200,000
	Install bulbs (long life) and inspect wiring		
	Ventilation and Airconditioning	5	500,000
	Ventilation for interventions - blowers, local trunks etc		
2	Ventilation in work areas		
	Water and Drainage	10	100,000
	Install sump high level alarm		
	Safety		
2	Fire risk reduction/prevention - install central alarms (detection, supression)	10	500,000
1	Fire risk reduction in more frequently accessed areas (East, West Wings)		100,000
2	Emergency light, exit signs. Emergency egress & communication sys.	5	
	Cleanup		
2	Inspect and clean out drainage system		
2	Cleanout of systems - e.g. tanks with residual liquids	30	

1	Remove remaining diesel fuel	5	100,000
1	Identify chemical hazards, e.g. from old paint (Industrial hygiene!)	2	
3	Remove trees fallen and those that could fall - trees/roots roots near foundations and drai	5	
1	Remove signs of human habitation from area around cooling towers	5	
1	Clear the Junk indoors and out	50 per room	
4	Remove falling ceilings in west wing etc (ageing management)	5	100,000
5	Scrub the place (and sample the water)	20	
5	Maintaining connecting spaces		
5	Address dust problem		
1	Make "visible progress" e.g. liquidate the cooling towers as scrap	5	-200,000
	sketches of movement paths for waste based on preliminary categorization		

Surveillance and Maintenance

	Environmental sampling	10	
	Biota		
1	Sample the groundwater, e.g. manhole and grating points		
1	Soil samples in potentially contaminated areas e.g. near coolant component junk in yard		
	Routine environmental monitoring		
1	Re-establish routine radiation protection programs where warranted	50	
1	Ensure provision of dosimetry service		
	Refresher training on radiological and conventional protection		
1	Establishing & maintaining zoning and access		
	Access control		
	Provide regular cleaning and routine maintenance		
	Contamination barriers		

Procedures, Records, and Information Management

1	Identify where operational procedures are needed		
	All draft procedures to be issued need to be issued, i.e site requirements		
	Simple "eg one page" procedures for routine practices - with signatures showing "sign off"		
	Surveillance (op) procedures		
	Checking drawings for completeness and marking up, if necessary		
	Records compilation organization and retention including interviews etc (scanning)		
	Logs documenting material movements		
	Digitizing old drawings and documents	1500	includes continuous service of a senior rec

Characterization

1	Complete preliminary survey to identify "hot spots"....	400	

laboratory packaging requirements for samples
Lab samples and wide area gamma surveys to confirm
work "smart" e.g.sample below valves, areas likely contaminated
Samples from ventilation ducts, e.g. at accessible points from catwalk
Wall samples at reasonable height above the reactor floor
Some sampling near the beam ports
Obtain a few (shallow) drill samples from inside the bioshield and from under

Organization

Team should assess task outputs, e.g. survey results and other input as a group
Team meetings should occur on regular basis, e.g. weekly
Team tasks should have priority over other "routine" job requirements - authority of the teamleader
Team members' attendance or that of an approved alternate obligatory
Issues not resolved in team dsicussion should be escalated - Deputy Head

Planning for Phase 2 (dismantlement of heat transport sys.)

identify work sequence
estimate asset recovery values
safety assessment
authorization
clearance methodology and training

"TOTAL" REQUIREMENT (Priorities 1 and 2)	522 man-days	P15,000,000

Characterization Survey

(how will you do this?)

Objective:

- The objective of performing a characterization of the PRR-1 is to obtain reliable data on the quantity, type, location, distribution, and physical and chemical states of radionuclides and other hazards in the facility through field survey, sampling and laboratory analysis.
- The data should be appropriate for use in planning the decommissioning of the facility such that decontamination and dismantling procedures and techniques may be properly delineated,
- the safety of the workers and the public may be properly provided for,
- hazardous waste may be properly disposed of or managed,
- regulatory requirements may be met, and
- costs may be properly estimated.
- other non-radiological hazards that may be encountered during decommissioning will also be characterized.

Work Plan

- Prepare layout drawings and descriptions of past use of the facility
- Prepare the instruments and sampling tools that will be used in the survey
- Classify the locations and items according to a scale of possible radiological contamination.
- Identify non-contaminated locations and items
- Obtain approval from the regulatory body to do the survey
- Systematically survey every identified location and item in the facility for radiation
  - Perform an initial radiation protection survey of the location or item.
  - Perform an in-situ wide-area gamma survey
  - data gathered by the survey will be numbered and cross-referenced and placed in a computerized database such that all measurements will be traceable to location, time, instrument, and measurer
  - survey plan for each particular location or item that anticipates the specifics of the above steps will be prepared and approved in advance,
  - in-situ radiological survey, note the location and nature of non-radiological hazards in the facility
- Prepare a hazards characterization report presenting the results of the survey

Cost Estimates

(how these have been prepared)

- This would be the next step after the characterization of the facility.
- Probably during the writing of the decontamination and dismantling procedures.

Decommissioning Technologies

(technologies applied or expected to be applied)

1. Survey equipment
   - Gamma spectrometer with sensitive NaI(Tl) detector for wide-area radiation measurements;
   - Scaler/rate meters with appropriate detectors for scanning for alpha, beta and gamma contamination of surfaces.
   - Procedures will be written for:
     - a. Wide-area gamma survey;
     - b. Surface contamination survey;
       - 1. Gamma;
       - 2. Beta
       - 3. Alpha;
     - c. Non-radiological hazard identification

1. Sample-taking equipment

- Work will be done by the reactor staff to obtain and test a diamond coring system. This equipment will primarily be used to obtain core samples from biological shield concrete, but can also be used to obtain cores from other hard materials.
- The equipment will be obtained through IAEA technical assistance
- Procedures will be written for:
  - a. Surface samples;
    - 1. Smear / Swipe;
    - 2. Paint / Coatings / Surface deposits;
  - b. Subsurface samples;
    - 1. Cracks and cavities;
    - 2. Cores (using diamond coring equipment)

3. Laboratory Equipment

- Work will be done by the specialists in laboratory analysis in the task force to obtain, assemble, test and calibrate the following instruments to perform laboratory radionuclide analysis:
  - a. HPGe gamma spectrometer. This instrument will be used to identify and quantify gamma emitting radionuclides. The entire equipment, except for the host computer and shielding, will be obtained through IAEA technical assistance. The host computer will be obtained through DOST-GIA assistance; the shielding is already available at the PNRI. This spectrometer will be set up in a clean air-conditioned room controlled by the reactor staff.
  - b. Liquid scintillation counter. This instrument will be used to identify and quantify beta and alpha-emitting radionuclides. One or more of the liquid scintillation counters already existing in the PNRI will be used.

- c. Alpha/beta/gamma sample counter. This instrument will be used for the gross radiation counting of samples (typically smears and swipes) taken from the facility. The radiation protection unit of the PNRI will provide the counter.

- Work will be done by the reactor staff to prepare a suitable counting room to house the HPGe gamma spectrometer (the other instruments will be used where they are already installed).
- Work will also be done by the reactor staff to prepare a sample preparation room and a sample storage room.

- Procedures will be written for:
  - a. Radionuclide identification and quantification using gamma spectroscopy with the HPGe system available to the task force;
  - b. Radionuclide identification and quantification using the liquid scintillation systems available to the task force;
  - c. Gross counting of smear/swipe samples using the counters available to the task force;
  - d. Sample preparation (as required by specific instruments);
  - e. Preparation and use of calibration standards (separate procedures for each instrument type).

SUMMARY OF ACTIVITIES THAT HAVE BEEN DONE AND ON-GOING

1. Characterization hazard
   a) Field Survey
      - The equipments have been purchased and sent by IAEA
      - Much of the work procedures have been written in particular for scanning alpha, beta and gamma contamination
      - There are areas in the Reactor building that were already hand-scanned by means of a wide area monitoring.
      - Written field survey reports are not complete.
   b) Sampling
      - The equipments have been purchased locally such as the core drilling machine and its accessories
      - Much of the work procedures have been written in particular for metal, concrete, soil, paint and airborne monitoring.
      - There are areas in the reactor that have taken samples, located in the process room, tank room, reactor bay and areas near the cooling tower
      - Written sampling reports are not complete.

c) Laboratory Analysis

- The equipment have been purchased
- Much of the work procedures have been written in particular for the calibration standards for the gamma spectrometry system and its efficiency.
- There are samples that were already analyzed and on-hand results are available through excel format.
- Written laboratory analysis results are not complete.