eco-atomic consultants ltd

[Form 2 (to be reported to Committee on Countermeasures for Contaminated Water Treatment and to be disclosed to public)

Technology Information	
Area	2 (and all others) (Select the number from "Areas of Technologies Requested")
Title	2C **Use 'Design for Decommissioning' Approaches**
Submitted by	eco-atomic consultants ltd

1. Overview of Technologies (features, specification, functions, owners, etc.)

The management of contaminated water at the Fukushima Daichii site will require the construction of new equipment, structures, systems and buildings. All of this new construction will have a limited life and all will, one day, come to the end of that useful life. In order to shorten the overall time spent decommissioning it is necessary to design new equipment and systems so this they can themselves be easily and quickly decommissioned.

Some important aspects of this 'DfD' approach relevant to Fukushima Daichii are:

i) When any new equipment is proposed consider whether it is justified given that it also adds to the future decommissioning liability – Is it essential? Can it be designed to contain less material (which will eventually become waste)? Can it be designed to be re-used or recycled afterwards? What are the full implications of having to deal with it as a liability at the end of its life?

ii) Prefer re-useable, re-configurable, flexible, multifunction technologies over disposable, static and single use technologies; For example make radiation shield walls with lead bricks or steel plate rather than casting concrete; prefer wireless communication technologies over fixed cable technologies; use modular buildings ('Portakabins') for accommodation.

iii) Keep structures and systems that fulfil different functions independent so that they can be decommissioned as soon as their function is complete without affecting the function of other structures and systems around them: e.g. Use modular design with high capacity provided by multiple units in parallel so that capacity can be reduced progressively by taking whole units out of service; Do not make buildings structurally interdependent; route utilities and services outside of functional buildings so that they do not have to be de-energised in order for a building to be demolished;

iv) Put in place arrangements to maximise the amount of material that will not become

radioactive waste once used on the site: design equipment to stay clean, to be easily decontaminable and to be capable of monitoring over its entire exposed surface; consider using strippable coatings (e.g. Spraylat coatings) on all surfaces that may be exposed to radioactive contamination (especially the inside of radioactive containment booths and tanks); agree regulatory guidelines that are easy to apply in practice for releasing material from the site as non-radioactive; protect clean excavated soil using geotextile membranes to avoid mixing with contaminated ground.

v) Develop a vision of the future use of the site and any valuable re-usable assets so that high-value and strategically important elements can be protected: e.g. the Fukushima Daichii connection to the electricity grid is a high value attribute, as is the harbour – should the areas around these structures be protected from use as disposal areas for radioactive waste so that a future potential for re-use of the site for energy generation is preserved? If new storage tanks for cooling water could be re-used for general industrial use afterwards, can they be designed for easy removal, cleaning and relocation when they are no longer needed?

Note that the long term vision underlying DfD is a positive one and this can be constructive in developing team morale when they are reminded that they are working towards an outcome that gives the site a positive value in contrast to its current state as a dangerous liability for the community.

2. Notes (Please provide following information if possible.)

- *Technology readiness level (including cases of application, not limited to nuclear industry, time line for application)*

Design for Decommissioning is still a relatively new design discipline. Some documents are available to help (see references below). You might consider including in your design teams staff with experience of decommissioning and using training based on the principles described in the references listed below.

- *Challenges*

Project priorities will often mean that little time is available to consider the impact one decommissioning of choices now. This can be addressed by assigning a senior member of the team to keep a watching brief that future decommissioning issues are addressed in good time and by preparing suitable guidance and plans so that the key specific issues for the project are identified and widely shared in the team.

- *Others (referential information on patent if any)*

IAEA 1988 Factors Relevant to the Recycling or Reuse of Components Arising from the Decommissioning and Refurbishment of Nuclear Facilities, Technical Report Series No. 293

IAEA 1997 Design and construction of nuclear power plants to facilitate decommissioning, Technical Reports Series No. 382

IAEA 2006 Redevelopment of Nuclear Facilities after Decommissioning, Technical report series 444.

Hicks, David I; Crittenden, Barry D & Warhurst, Alyson C (2000) Design for Decommissioning: Addressing the future closure of chemical sites in the design of new plant. Trans IChemE Part B - Process Safety and Environmental Protection, Vol. 78, No B6, pp. 465-479.

Hicks DI, (2000) Chemical Plant Design for Decommissioning. University of Bath (attached as appendix)