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

| Technology Information | |
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| Area | 3 (Select the number from “Areas of Technologies Requested”) |
| Title | Process design and optimisation for removal of activity from Harbour |
| Submitted by | UK National Nuclear Laboratory (NNL) |

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

There is an ongoing and increasing issue with “soluble” activity which has leaked into Fukushima Harbour increasing the overall background activity here. There is also an opportunity to deal with this issue in the short term, as this activity has not significantly strayed beyond the Harbour as yet.

Process modelling methods can be used to evaluate a range of technologies to understand the likely success of a number of liquor clean up technologies currently available, based around ion exchangers and selective adsorbers, to optimise the process to ensure that clean up is undertaken as quickly as possible and to mesh this with an understanding of the activity hold up within the Harbour environment.

NNL have a wide ranging experience in designing and optimising technologies for clean up of significantly active aqueous liquors, particularly around the immobilisation of caesium, strontium and alpha activity. Models are already available that predict performance of a range of media and deployment technologies, which have been used to optimise performance of the sorbent material, and performance of the deployment technology – so that the decontamination process is effective throughout the volume to be treated, with as little secondary waste as possible, and with as low an environmental and public impact as possible.

This approach is also regularly used in combination with modelling of active ponds and silos where an understanding of activity hold up on solid phases is essential and the issues associated with effluent management in complex environments with a mixture of aqueous and particulate phases.

NNL, in addition to a working knowledge of the full range of materials that currently might be applied to this problem, including both natural and synthetic materials, interact with external manufacturers of specialist synthetic products that can be used to overcome practical complexities associated with the in-situ treatment of the Harbour water (such as particulate management).

NNL is able to apply the evaluation capability to help assess materials and processes from other suppliers, to help optimise them, and to provide information to allow regulators and operators to understand the implications of any process on the operators and on the public. Part of this capability could be a web-based tool to allow different process options to be evaluated by the operator and regulator.

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

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

This will vary depending on the technologies being evaluated. Some of the technologies (e.g. ion exchange and fixed bed filtration) are very mature, both within the nuclear industry and outside, some technologies will be at much earlier readiness levels. Undertaking this work has in the past been used to clarify the actual TRL of process designs.

The modelling approach however is well-established and well-used. It is also well-trusted by the UK regulator and UK nuclear site operators.

- Challenges

The main challenge faced in this work is to provide a simple “quick pass” evaluation of a range of technologies that can be trusted to provide a “level playing field” between different deployment technologies, in advance of attempting to model the detailed environment of the Harbour. However, NNL has experience of undertaking this type of evaluation and has the technical experience to be able to assist in making a judgement when there are a diverse range of deployment options.

- Others (referential information on patent if any)

The modeling work proposed is separate to any patent issues that might arise as a result of any materials or processes suggested in the evaluation.

【Areas of Technologies Requested】

(1) Accumulation of contaminated water (Storage Tanks, etc.)
(2) Treatment of contaminated water (Tritium, etc.)
(3) Removal of radioactive materials from the seawater in the harbor
(4) Management of contaminated water inside the buildings
(5) Management measures to block groundwater from flowing into the site
(6) Understanding the groundwater flow