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

Technology Information	
Area	Option 2
Title	Treatment of contaminated water (Tritium, etc.)
Submitted by	Energy*Solutions* Services Inc.

1.0 Introduction; Summary of the Problem

There are currently a large number of onsite sources of contaminated water on the Fukushima site. Some of these streams are highly contaminated with various radionuclides and others that only contain relatively low amounts of contamination. To treat these different sources, there are several different stream specific treatment options.

1.1 Overview of the technology

This proposal offers to treat significant tritium contamination using a mobile treatment skid. Using a combination of Mechanical Vapor Recompression (MVR) and Kinectrics CECE process areas of significant tritium contamination can be remediated on site and integrated with the existing ALPS installation.

1.2 Features

Currently, the accumulation of tritium contaminated water is a major concern. The state of technology is not amenable to economical treatment of low levels of tritium contaminated water at a large scale. We are proposing a multi-staged approach to address this shortfall.

The approach proposed here will use a nuclearized MVR unit to distill a volume of water in the most energy efficient way possible. The distillate from this system will be very low in dissolved nuclides and other contaminants such as NaCl but will still contain a sizeable fraction of tritium. The concentrate from MVR will be passed through the ALPS for treatment.

The benefit of using the MVR is that it can handle a wide variety of waters of varying levels of contamination Indiscriminately, while generating a stable clean distillate. The process of tritium removal relies on having a stream whose primary contaminate is only tritium, this is where the MVR will work wonderfully, as the only species that will pass readily into the distillate are water and tritiated water.

The cleaned distillate from the MVR will be fed to Kinectrics CECE process. Each coupled pair of MVR and CECE would process approximately 5 m3/day, returning a small tritium enriched stream (~0.16 m3/day) for appropriate disposition.

Direct tritium remediation is a relatively slow and extremely expensive process. It has throughput limitations and usually performs better on more concentrated tritium feed, with very low contamination from other species. This proposed treatment provides a solution for these common issues. By focusing on only the high concentration challenge areas, the treatment shifts the burden of tritium removal to a much smaller processing rate, at which there are established techniques for handling such streams. The greatest value and effectiveness are elicited from the technology. Furthermore, the smallest possible amount of equipment would be used, resulting in a significant cost reduction.

1.3 Functions

There are three separate processes that serve specific functions in the waste processing scheme. The MVR performs as a thermally efficient distillation column and serves the purpose of generating a flow of low Total Dissolved Solids (TDS) water that is easily handled by the

CECE process to reduce tritium levels. The brine (or the reject from the MVR) is handled by the existing ALPS system that has already been deployed and is an established technique. The TRT is used to remove smaller quantities of highly contaminated tritium waters after being conditioned by the MVR. This tritium depleted water is then fed back in to the ALPS system for final polishing.

1.4 Owners

EnergySolutions has licensed the ALPS technology and has commercial arrangements in place to offer the MVR and Kinectrics CECE via a similar license agreement.

2.0 Technology Readiness Levels

The MNRS (the ES ALPS technology) and CECE have broad experience in handling nuclear materials. MVR has been used industrially, and high hazard military applications, for decades to treat very high salt waste streams. The newest generation of MVR to achieves high throughput, excellent energy economy 80% less consumption than traditional evaporation, and robust reliability. Additionally a version of mechanical vapor recompression was used to process water during the incident at Three Mile Island Incident.

【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