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

Technology Information	
Area	Option 6
Title	Understanding the groundwater flow
Submitted by	Energy*Solutions* Services Inc.

1.0 Problem Summary

On reviewing measures to prevent groundwater flow into the buildings, TEPCO is working on groundwater flow at the site and reviewing the effects of the countermeasures taken. To conduct a quantitative and sufficiently accurate review, it is crucial to gather more geological and groundwater-related data.

It is important to continuously monitor data on groundwater levels around the buildings, groundwater flow and water quality. The number of observation holes need to be increased and sampling need to be conducted more frequently. Further accurate analyses of the groundwater flow at the site and groundwater inflow to the reactor buildings etc. should be conducted.

However, many challenges in terms of time and resources rely on adequate data, since for example it takes a certain period of time to dig an observation hole by boring (approximately 1 week/ approximately 30m-hole), and space to dig these holes at the site is limited. For these reasons, technologies to measure geological data (geological structure, permeability) and groundwater data (water level, water pressure, flow speed) through methods other than boring are requested.

2.0 Overview of the technology

Energy*Solutions* has been monitoring ground water and tank leakage at the Hanford reservation for 8 years. Monitoring in this location poses significant challenges due to nature adjacent buildings, legacy piping and underground holding tanks. Similar to Fukushima, tanks have at Hanford have leaked over time. To accurate monitor groundwater and plume patterns, new technology for horizontal access has been successfully utilized.

Horizontal push technology uses a hydraulic hammer to penetrate the soil. Drilling is avoided, thus alleviating airborne debris or fugitive dust. Dependent upon soil density, push technology can reach depths of 200+ feet. As the hole is developed it is automatically lined with pipe segments to keep the hole open for access and monitoring. Samples can be drawn quickly without concern for cross contamination at higher ground levels.

Two direct push units at Hanford are affixed to both a rubber tired back hoe and a tracked crawler unit. The third option is a stand mounted hammer that allows for extreme angles. Each setup accommodate minimal interface with personnel, thus limiting personnel exposure. The crawler unit itself can be operated remotely, however, casings need to be loaded manually.

Appendix 6.1 contains a presentation on the hydraulic push technology utilized by Energy*Solutions* and partners WRPS.

2.1 Owners

The hydraulic push technology is a commercially available item that has been engineered and modified for use in nuclear applications. Modification design and fabrication of plate adapters and angle anchors are Energy*Solutions*'.

3.0 Technology Readiness Levels

The hydraulic push technology is readily available. Energy*Solutions* personnel are available to train operators locally and support operations at Fukushima as needed.

【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