HOMER: A Holistic Modular Extendable Repository Design Concept for High Level Nuclear Waste

HOMER is a repository technology that does not suffer from any of the technical drawbacks that have hobbled the proposed Yucca repository from its inception, clouding its viability even if there were a national consensus to build and commission it.

Unlike Yucca:

- HOMER will serve both as an aging facility and as a repository. Yucca needs a stand-alone aging facility that will be a massive fuel storage site subject to the risk of damage from earthquakes and 9/11 type of threats.
- HOMER is designed to accept dry storage canisters that are being loaded today (and over the past 30 years) in as-is state: Yucca requires all canisters to be cut open and repackaged into small canisters at a huge cost in treasure and in radiation dose to the environment.
- HOMER is an open and inspectable repository design, which means it is possible to obtain regulatory certification for a million-year service life based on a well-crafted surveillance plan. Yucca is a closed repository concept that requires the regulator to certify for a million years without verifiable scientific data: a fatal technical flaw that makes Yucca essentially un-licensable.
- HOMER is readily extensible and thus has inexhaustible capacity. Yucca is a fixed capacity repository whose capacity is insufficient to even accept the current inventory of fuel in the U.S.
- HOMER can be deployed virtually at any location on any terrain in the U.S. – no mountain or caverns needed.

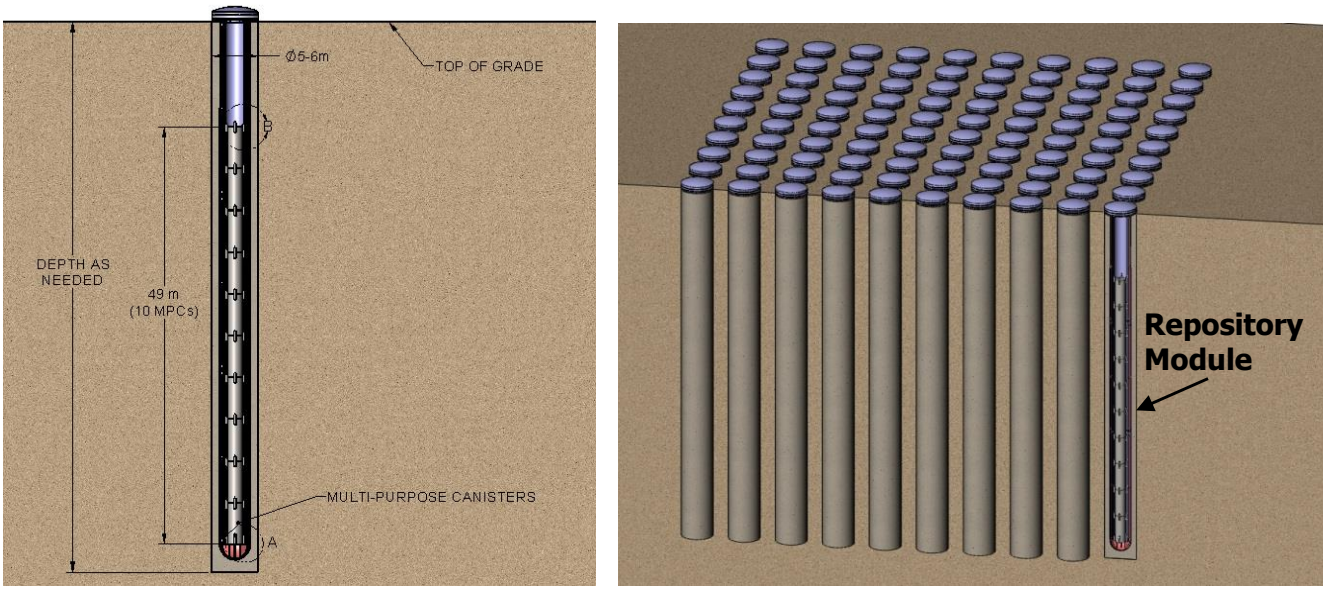

FIGURE 1: Cut-Away Views of Holtec's Modular HOMER Systems (left) and a Single Repository Module

Principal Features of HOMER:

This Holtec Technical Information Bulletin is copyrighted by Holtec International. All innovative design features of the device described herein are subject to intellectual property protection under U.S. and international laws on patent rights. For more information, contact j.russell@holtec.com; 856-797-0900 Ext. 3655, www.holtecinternational.com; 1/2014 Rev 2

- HOMER is designed to store up to 10 canisters in each vertical underground cavity approximately 10 feet in diameter and over 300 feet deep. The cavity is sequestered from the surrounding subgrade by multiple layers of alloy shells (with capped bottoms), each with proven resistance to degradation under a wide range of soil conditions. The interstitial spaces between the shells are inertized with an inert gas for protection against corrosion and to serve as the tell-tale monitor of any change in the shells' integrity by instruments located on ground.
- The aging facility and the repository are one and the same: The repository begins its life as an Aging facility for the first 100 or more years. As the facility is deep underground, there are large safety margins against earthquakes and other extreme environmental and man-made phenomena, including 9/11 style terrorist attacks.
- The protection of the fuel against degradation is ensured by the gravity-driven (hence purely passive) cooling of the stored canisters. Thus, the storage system during its aging period is also maintenance-free.
- The HOMER is modular and additional cavities can be added as required; therefore, the capital outlay will be spread out over time as the repository is extended.
- All construction activity will occur from the ground level or above. No underground human activity during construction or in-service surveillance will be required. This is an inherently safe and cost effective feature of HOMER.
- Because the repository consists of an array of independent cavities, each cavity can be independently accessed without disturbing others.
- Because the robust barrier is of a relatively small diameter and is thick walled, it is physically capable of withstanding large soil pressures without collapsing. Thus, the long-term (unforeseeable) hazards of subgrade instability are addressed.
- The canisters in which the fuel has been and is being packaged in the United States and many other countries can be directly interred in the repository without any need for (expensive and dose intensive) repackaging.
- Because the repository cavity will remain directly accessible for the duration of its convective mode of operation, which may last a century or longer, there will be the opportunity to survey the integrity of the system (particularly the barrier barrel) and to gather data. Thus, at the time of its conversion to the burial mode, there will be credible performance data to extrapolate and prognosticate its ability to maintain isolation over the desired service life.
- After the aging period is over and the heat emission rate from the canisters has attenuated to minimal levels, then the cavity can be plugged with an inert polymer and capped to serve as a geological disposal site. Until then, the canisters remain retrievable, giving the country, if a future technology so enables, in a useful manner. Today's waste will become tomorrow's bullion!

This Holtec Technical Information Bulletin is copyrighted by Holtec International. All innovative design features of the device described herein are subject to intellectual property protection under U.S. and international laws on patent rights. For more information, contact j.russell@holtec.com; 856-797-0900 Ext. 3655, www.holtecinternational.com; 1/2014 Rev 2