AND™- Adaptive Nuclear Disposal™

NuclearSAFE Technologies LLC

Disposal Technologies for the Complete Nuclear Waste Ecosystem

Today, **37 years** and **$41Billion** after the initial attempt to solve the waste problem at Yucca Mt, the US congress is still grappling with the disposal problem for nuclear waste in all its forms. Recent US Congressional hearings on the safety and disposal of the waste has brought to the forefront the Congress' new concept of "**Consolidated Interim Disposal**", ***CID***, an idea in which the waste is temporarily stored safely in such a manner that until Yucca Mt and other means can be deployed and; if in the long term **NO** consensus on storage is obtained the ***CID*** becomes the ***defacto*** nuclear waste disposal for the long term. **This interim concept is not new**; however, it has a new name in the Congress. In the recent hearings in May 2019 this new acronym has been stated as a means to assuage the different and opposed parties in an effort to resolve the waste problem with special emphasis and reference to Yucca Mt.

The **Adaptive Nuclear Disposal™** system by NST LLC has been developed to master the complexity of nuclear waste disposal within the US and around the world. Every year thousands of metric tons of high-level and low-level waste and hundreds of millions of gallons of radioactive waste are collecting around the world adding to the accumulating quantities at ever increasing costs in the BILLIONS of dollars to store and protect these dangerous waste forms. At NST we have reduced these complications by engineering and implementing operations that are scalable, dependable and deployable to reduce the effects of this waste by sequestering it for the short term and the long term.

The **Adaptive Nuclear Disposal™** concept has been presented and detailed in the specifications and the claims in USPTO filings by Dr. Henry Crichlow starting in **1997** and have been elaborated upon and expanded by further patents since 1998. These patents fully disclose these original technologies and their applications to the complexities of storage and retrieval of HLW and LLW. Improvements to these technologies continue today. Publications and presentations in North America have detailed the **AND™** approach and its derivative technologies which have been shown to be eminently achievable, cost effective, safe and scalable across the complete nuclear waste ecosystem.

Since the initial information on this method became public in the late 1990s, a distinguished group of investigators/researchers and technically recognized individuals have published embodiments of various elements of the **AND™** solution and its derivatives, thus codifying the validity and potential implementation of the mechanism as a means of solving the HLW and LLW waste problem. Some of these researchers are: Ewing (Stanford U.), Swift (Sandia), Muller (Berkeley U.), Denton (Los Alamos), Birkholzer (Lawrence Berkeley), Zoback (Stanford U.), Sassani (Los Alamos), Perry (Los Alamos), Kuhlman (Sandia), Kelley (Batelle), Yudintsev (Russia), Caporuscio (Los Alamos), Zheng (Lawrence Berkeley), Stauffer (Los Alamos), Dittrich (Los Alamos).

The **Adaptive Nuclear Disposal™** approach can be a means to jump-start the long-term storage/disposal process. By selecting appropriate sites in deep passive geologic basins and establishing one or more "**Consolidated Interim Disposal**" sites as suggested in the US Congress, a number of deep, horizontal

wellbores can be drilled in the next few years so that significant quantities of HLW materials can be emplaced in the lateral sections of these cased wellbores for long-term storage/retrieval.

In addition, the **Adaptive Nuclear Disposal™** processes have been deliberately engineered to take advantage of current directional drilling technology, available drilling equipment, and the wide range of materials used in the worldwide drilling industry supply chain. In addition, The **Adaptive Nuclear Disposal™** capsule systems and containment systems are purposely designed to take advantage of the retrieval tools and methods that are routinely used in completion/workover operations, and which are conducted every day in oil and gas wellbores throughout the worldwide petroleum industry. In these operations, tools, downhole instruments, packers, pumps and a variety of tubular goods are placed in the wellbores and successfully retrieved.

If the final outcome warrants it, the emplaced waste capsules in these deep, horizontal wellbores could easily be left in place for permanent disposal. After all, having a horizontal wellbore within an impermeable, solid (tombstone-quality) rock formation that is located a minimum of at least 10,000 feet (about 2 miles) below the surface seems to be the epitome of the type "geologic repository" needed for the minimum 10,000 years of isolation.

If or when, Yucca Mountain is eventually licensed for waste disposal, by NST LLC constructing an **Adaptive Nuclear Disposal™** type deep, horizontal wellbore system and emplacing waste material in these wellbores, a fair comparison can be made of the efficacies, economics and sustainability of both methods so that the federal government (and the taxpayers who are stakeholders) can have the benefit of going ahead with the better option.

Adaptive Nuclear Disposal™ processes.

Graphics from US patents, technical presentations and published websites below, illustrate the NuclearSAFE emplacement and retrieval processes beginning in 1997.

Patents - 1997

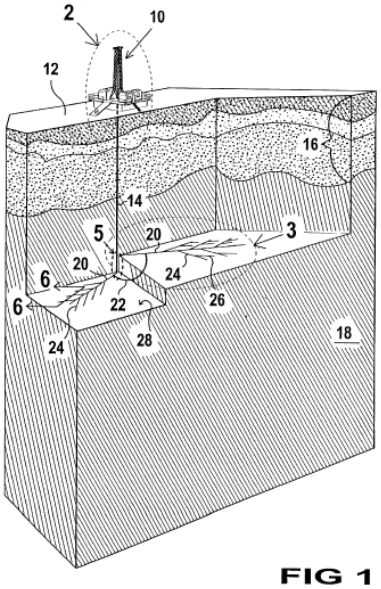


FIG 1

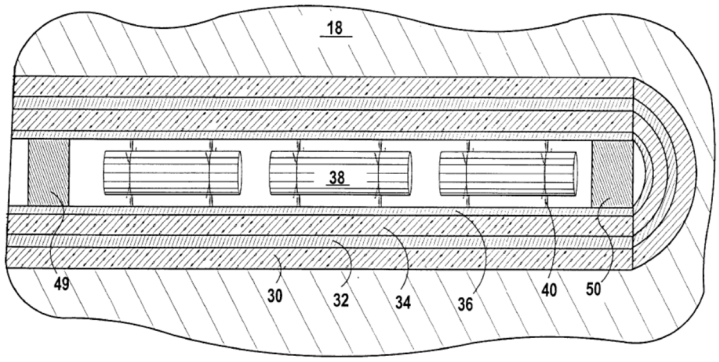


FIG 7

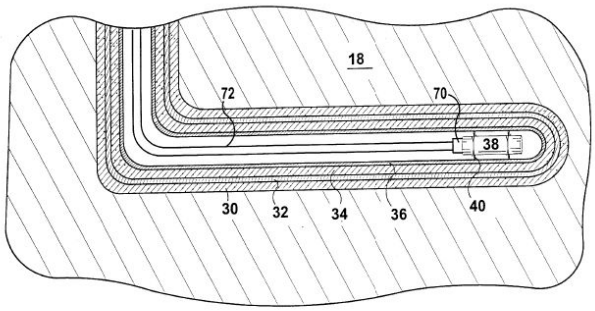


FIG 11

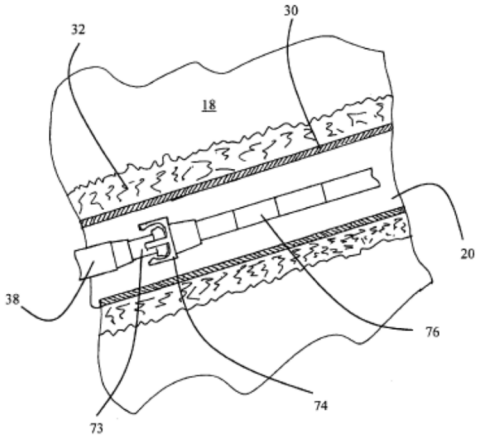
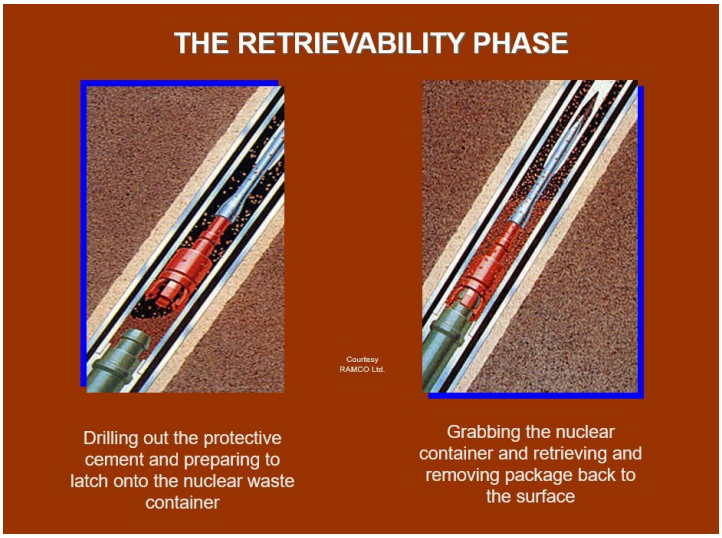


FIG 12



Regina, Canada Technical Environmental Meeting