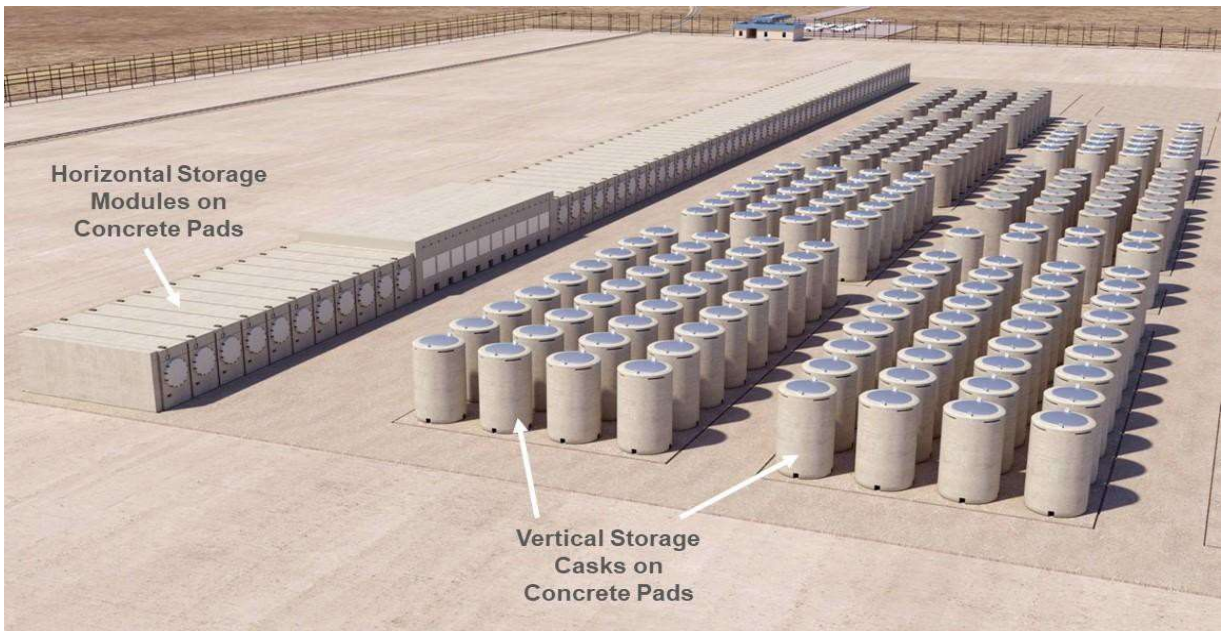
7. 4 Conceptual Design for the CISF

Two types of dry storage systems for spent nuclear fuel (SNF) can be deduced for deployment at the proposed CISF: cask-based systems and canister-based systems. The canister-based systems are further broken into vertical configuration and horizontal configuration. Consideration of all these systems suggests that a number of CISF design alternatives or permutations for long-term interim storage of SNF is possible and can therefore be explored.

Waste generators SNF management plans are the input of the CISF project. For instance, Eskom has taken a decision that the HI-STAR100 canister-based metallic casks and the canister-based concrete casks (NUHOMS or equivalent) procured for on-site storage will also be used for the long-term storage of SNF at the CISF. According to Eskom's decision, the CISF will be designed to accommodate only canister-based SNF storage technologies. It is therefore assumed that SNF currently stored in CASTOR X/28 metal casks will be transferred to canister-based concrete storage systems prior to off-site transportation to the CISF.

NRWDI is focusing on the Aboveground Concrete Casks and Modules (ACCM) storage system design concept. This concept is an aboveground storage of spent fuel in vertical concrete casks and horizontal concrete modules. It represents the current method of storage at most of the reactor-site independent spent fuel storage installations around the world. Dual-purpose canisters are stored in a heavily reinforced vertical concrete overpack (large vertical cylindrical cask) or horizontal storage module (a rectangular prism) as shown in the figure below.



This storage system uses a dual-purpose canister (DPC) where SNF assemblies are placed into a welded sealed metal container which provides the primary confinement boundary for the SNF. The DPC is placed in different overpacks or casks, which provide radiation shielding and physical protection, during canister transportation, transfer, or storage. A typical PWR canister will hold 24 to 37 PWR SNF assemblies.

Physical protection and radiation shielding of the DPC is provided by the concrete or metal storage overpack during storage. The storage overpack has a bolted lid. Cooling of the DPC is provided by passive heat transfer through natural convention by air vents built into the overpack. To make sure they don't become blocked, the overpack air vents need to be checked on a regular basis. The metal storage overpack provides passive heat transfer by conduction through the overpack body. To make sure overpack temperatures don't rise to levels that might damage the system materials, some systems also employ a temperature monitoring system. The overpacks are stored outdoors on a thick concrete pad.

The figure below illustrates the conceptual layout of the CISF.