QUESTION 2C. We've talked about our current reactors, but what about the new class of reactors that are just starting construction in the United States? Are those "Gen III+" reactors safer than the Fukushima Daiichi reactors? Can you explain the safety advantages?

ANSWER.

The NRC has not completed any study that would compare the safety of the "GEN III+" reactors to the safety of the Fukushima Daiichi reactors. However, the "GEN III+" reactors do contain additional or innovative features that are different from the design of the Daiichi reactors and are intended to provide added reliability to system availability or to enhance the safety of the proposed design. "GEN III+" reactors can be divided into two categories – passive designs or evolutionary designs. A couple of examples of the design enhancements for each category are given below.

Passive designs

The most significant innovation of Gen III+ systems over second-generation designs is the incorporation of passive safety features that do not require active controls or operator intervention. Instead they rely on gravity or natural convection to mitigate the impact of abnormal events. For example, the AP1000 is equipped with reactor and containment cooling systems that employ water tanks, which can be emptied into the reactor vessel and into containment to flood in and around the reactor vessel. These systems provide cooling such that the reactor will remain in a safe condition for 72 hours without any external power or significant operator actions.

Another system advantage in some GEN III + designs is the use of a passive isolation condenser system. The ESBWR has a passive isolation condenser system that will remove heat from the reactor after it is shut down with no electrical power. Combined with its passive containment cooling system that removes heat from the containment, the system permits 72 hours of no operator actions and no external power for the power plant to remain in a safe mode. Additionally, part of the passive system is a gravity-driven cooling system which provides return water to the reactor core.

Evolutionary Designs

Evolutionary designs contain innovative enhancements or increased redundancy to existing reactor designs. For example, the EPR and USAPWR designs provide additional trains of both emergency AC power and emergency core cooling to enhance the availability and reliability of essential safety systems. Specifically, the major safety systems consist of four trains (instead of the current designs that provide only 2 full capacity trains), each capable of performing the entire safety function on its own. Each safety system is physically separated from the others and they are located in separate parts of the plant and have their own protection features. This reduces the likelihood of simultaneous failure of all the safety systems due to internal or external events, such as fire, flooding or airplane crash.

Another example is the use of containment refueling water storage. In the refueling water storage tank, which is the water source for the emergency core coolant system, is located outside the containment vessel. Its location makes it vulnerable to loss or damage from natural phenomena such as earthquakes, tornadoes, floods, etc. The placement of the refueling water inside containment effectively minimizes the potential for loss of this essential water source for core cooling. It also provides another heat and pressure removing feature for the containment to mitigate the potential for overpressurization of the containment building.

Finally, all the “GEN III+” designs contain some design features to mitigate a postulated severe accident such as core melt either by flooding the reactor cavity space immediately surrounding the reactor vessel with water to submerge the reactor vessel or by providing some form of core spreading devise, commonly referred to as a core catcher so that substantial releases of radioactivity are mitigated.