Nuclear Information and Resource Service
1424 16th Street NW Suite 404
Washington, DC 20036
Tel 202 328 0002 http://www.nirs.org

Cracking at South Texas Nuclear Station Jolts Entire Industry

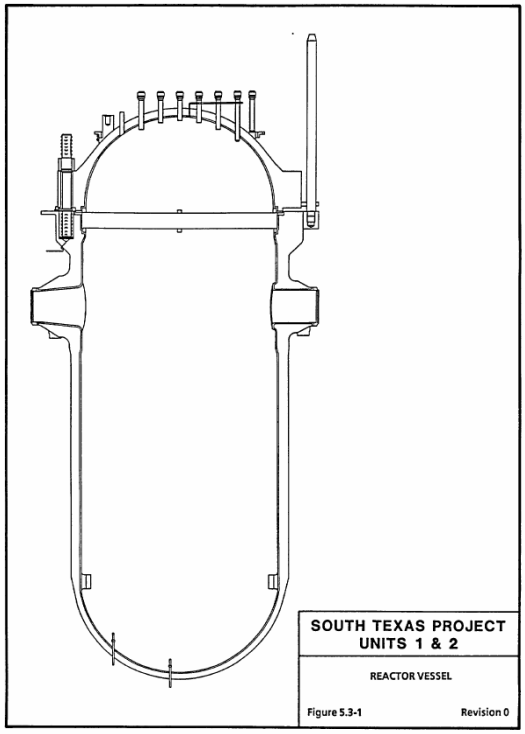
July 2003

On April 12, 2003 with one of the two units at South Texas Project nuclear power station near Bay City, Texas shut down for routine refueling, an inspection of the bottom of a major safety component, the reactor pressure vessel, found cracking in two bottom-mounted instrumentation penetration nozzles. The unanticipated cracking was discovered after small crystalline deposits of leaking reactor coolant were visually discovered around the penetration nozzles.

The structural integrity of the reactor pressure vessel during station operation is paramount to public health and safety. Current federal regulations set a zero tolerance on any leakage of the pressurized boundary. The vessel, much like a giant pressure cooker, houses the highly radioactive reactor core where internal pressures exceed 2000 pounds per square inch and the operational temperature of the coolant water can exceed 600° Fahrenheit. Failure of the vessel's integrity can result in a Loss-Of-Coolant-Accident and run the risk of a meltdown accident with a catastrophic release of radiation to the environment.

In a subsequent bulletin to the nuclear industry issued by the Nuclear Regulatory Commission (NRC), the federal agency expressed its concern with "the high consequences associated with loss of integrity of bottom head nozzles."

The "first-of-a-kind" cracking at South Texas is another in a series of mounting surprises that plague an aging nuclear power industry and its federal regulator. In fact, the cracking in a relatively young South Texas reactor may indicate that the industry and its regulator are falling behind an event-driven curve of unanticipated and significant safety problems that are emerging faster than can be recognized and effectively managed.



Cracking occurred in instrument penetration nozzles through the bottom of the vessel.

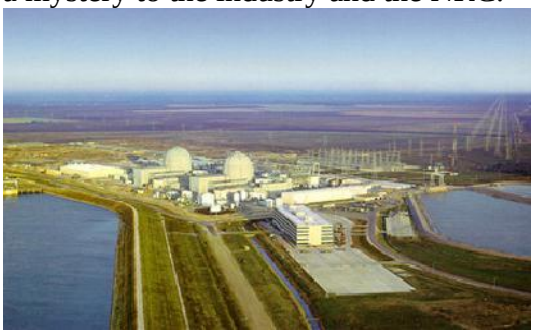
The same age–related phenomenon has already turned up in other areas of the reactor pressure vessel. Unanticipated

circumferential cracking around top-mounted control rod penetration nozzles was discovered just two years earlier at the Oconee-2 and -3 nuclear power stations in South Carolina. Just last year, operators at Ohio's Davis-Besse nuclear power station found extensive corrosion through the top of the reactor pressure vessel. Highly corrosive borated coolant leaking through cracked control rod drive penetration nozzles had eaten a football-size cavity through 6.75 inches of carbon steel in a previously un-inspected area of the vessel head, leaving only the thin corrosive- resistant stainless steel inner liner, a mere 3/16th of an inch thick. The stressed liner had bulged out into the cavity due to the tremendous internal pressure. Analysis concluded that the vessel would likely have ruptured within 12 months of continued reactor operation. In the event that the liner had burst, the resulting Loss-Of-Coolant-Accident could have been far worse than the 1979 Three Mile Island nuclear accident. Other U.S. reactors discovered cracking in top mounted vessel head penetrations. Some opted an expensive replacement of the entire vessel head with a new component rather than repair the nozzles.

A typical Pressurized Water Reactor (PWR), such as South Texas Project, has several dozen such penetration nozzles located through the vessel bottom which are made of a nickel alloy long known to be susceptible to cracking, leaking and more worrisome breaking. As reactors age, the stations become more vulnerable to cracking and breaking, thus requiring more frequent inspections. Other than a bare metal visual inspection, a more thorough inspection is complicated by the lack of an effective inspection technology for the multi-layered metals, welds and components that meld at the vessel bottom. Extremely tight and even microscopic through-wall cracks are of significant concern where a component can break before any telltale leakage is noticed, throwing the reactor into a cascade of failures and a catastrophic accident.

An unprecedented patching of the cracked nozzles was completed at South Texas in mid-June 2003. The cracked nozzle segments were cut out and replaced with what is thought to be a more crack resistant Alloy 690.

The actual cause and rate of growth of the cracking and leakage largely remains a mystery to the industry and the NRC.



South Texas Project

The affected material, Alloy 600—still in extensive use throughout the reactors' high pressure system in steam generator tubes, vessel head penetrations, vessel welds, and piping—was once promised as durable for the entire operational life of the reactor. It is now confirmed to be prone to early cracking and failure in vital reactor safety components.

WHAT YOU CAN DO

--Support NIRS in shutting down an aging and increasingly dangerous nuclear power industry.

--Write Congress calling for an end to taxpayer funded corporate welfare to extend and expand the nuclear industry.

See http://www.nirs.org for more details