SAFETY DEFICIENCIES AT BROWNS FERRY NUCLEAR POWER COMPLEX

The Tennessee Valley Authority's (TVA) Browns Ferry nuclear power complex is composed of three aging reactors of obsolete design replete with safety deficiencies. Despite having spent $1.8 Billion to restart the long-shuttered Browns Ferry-1 reactor in 2007, TVA could not address the fundamental design problems with these reactors.

Perhaps even worse, TVA did not address the safety deficiencies it could have addressed: namely the ability to meet fire protection regulations promulgated by the Nuclear Regulatory Commission (NRC) in 1981 because of a near-catastrophic fire in 1975 at the same Browns Ferry-1. Inexplicably, the NRC did not require Browns Ferry-1 to meet its legal obligations to comply with the fire protection regulations before allowing it to restart. Indeed, a critical document demonstrating this NRC negligence was not released to the public until it was discovered by NIRS after the restart had been approved.

FIRE PROTECTION

Fire risk and fire code violations were overlooked by NRC in its approval of the restart of Browns Ferry-1, which was site of the original March 22, 1975 fire--the same fire that was responsible for promulgation of the safe shutdown fire code (10 CFR 50.48 and 10 CFR 50 Appendix R, section iii.g.2)

A prescriptive fire code was put in place for U.S. nuclear power stations following the fire at Alabama's Browns Ferry nuclear power station on March 22, 1975 to provide the best assurance that no single fire can destroy the reactor control room's ability to safely shutdown the reactor following a significant fire.

The Browns Ferry fire was started by an employee using a candle flame to check for air leaks along electrical cable trays under the reactor control room, initially igniting polyurethane foam insulating material around electrical cable used for control, power and instrumentation equipment to shut down the reactor from the control room, the preferred method for controlling the reactor. The fire quickly spread from the cable spreading room into the reactor building. The fire burned out of control for seven and half hours destroying over 1600 electrical cables including 628 safety-related cable systems.

The fire demonstrated that a high number of electrical circuit failures can occur in a relatively short period of time--in this case within 15 minutes from the ignition of the foam material. It further demonstrated that the federal government's hands-off approach for enforcement policy contributed to the non-regulation of fire protection requirements at nuclear power stations and was a principle contributing factor to the seriousness and near catastrophe of the fire. Station nuclear engineers privately confided a catastrophic release of radiation was avoided only by "sheer luck."

NRC began promulgating stricter fire protection codes as result of the Browns Ferry fire and, in a rulemaking highly contested by the nuclear industry, codified detailed and prescriptive fire protection requirements in 1981. The new rule, among other requirements, specifically required passive fire protection features (qualified and rated fire barriers, minimum separation requirements and automated fire suppression and detection) to limit fire damage done to electrical circuits for equipment so that capability to shut down the plant safely from the control room is ensured.

By 1992, well after Browns Ferry-1's shutdown in 1985, the industry was in widespread non-compliance with the fire code because of bogus fire barriers materials that did not meet requirements and failure to incorporate the minimum separation requirement.

NRC's permission to restart Unit I was based on "enforcement discretion" of these fire protection violations. Instead of protecting the safe shutdown electrical cable with qualified fire barriers, smoke detectors and automated sprinkler systems or minimum separation requirements between redundant electrical circuits when they appear in the same fire zone, NRC is allowing TVA (and other reactor operators) to proceed in violation of fire code by substituting largely unreviewed and unapproved compensatory actions that would allow the operator to conduct "operator manual actions." These allow circuits to burn in a fire with subsequent loss of control room operation and instead send plant employees throughout the reactor complex to those end pieces of safe shutdown equipment to manually pull switches, circuit breakers, open or close valves. These operators could encounter and even be delayed or halted by smoke, fire, radiation, even bad guys in case of sabotage, which make completion of their tasks uncertain and not an appropriate substitute for preferred control room operation preserved through qualified passive design.

A document not released by the NRC prior to restart indicates that NRC staff notes that TVA mischaracterized fire zones where redundant electrical circuits appear in the same fire zone. The document states "Manual actions are also permitted when using alternate shutdown in accordance with III.G.3." This corresponds to federal fire protection law for nuclear power stations 10 CFR 50 Appendix R III.G.2 and III.G.3) III.G.2 requires and prioritizes that when electric circuits for redundant safe shutdown equipment appear in the same fire zone of a nuclear power station, one train is required to be protected by one of three passive fire protection features 1) a qualified three-hour rated fire barrier; 2) a qualified 1-hour rated fire barrier used in conjunction with smoke detectors and automated suppression or; 3) a minimum separation of 20-ft between redundant circuitry with no intervening combustible used in conjunction with automated suppression and smoke detectors.

This is to assure that no single fire will knock out control room operations for the safe shutdown of the reactor as occurred during the Browns Ferry fire on March 23, 1975.

The operator can provide NRC with an alternate shutdown strategy through the formalized exemption process for a safety evaluation. TVA did not submit the proposed operator manual actions to the exemption and safety review process as required by law.

Section 3.1.5 of this document states "Section 3 of the licensee FPR (fire protection report) proposes to use the same safe shutdown methods used in Units 2 and 3." It goes on to say later in that paragraph that Unit 1 relies on OMA (operator manual actions) to accomplish post fire safe shutdown. In other words, TVA has abandoned bringing the unit into compliance with fire code as required. They did not apply for the exemption and receive the staff scrutiny for safety and ability to pull off these operator manual actions successfully.

As a result, NRC allowed them to restart under "enforcement discretion" as has already been applied to Browns Ferry Units 2 and 3. However, these unapproved and largely unreviewed operator manual actions are illegal.

THE BROWNS FERRY DESIGN IS DANGEROUSLY ANTIQUATED

All three Browns Ferry units use a General Electric Mark 1 containment design that has long been controversial. In 1976, three top GE engineers publicly resigned from the company and testified before Congress that the GE BWR was "dangerous" and not a "quality product."

http://www.time.com/time/magazine/article/0,9171,918045,00.html

The GE BWR Mark I containment was mistakenly designed and constructed to be undersized. As a result if there is an accident the containment system is very likely to fail and rupture. This could very easily be compared as "America's Chernobyl" design. According to NRC's then Director of Nuclear Reactor Regulation Harold Denton in 1985, there is something like a 90% chance of containment failure of this containment under accident conditions. The chances were high enough that NRC advised and industry back-fitted the Mark I with a vent system to deliberately defeat containment from the control room in order to save it. In the event that Browns Ferry has an over-pressurization accident, operators are faced with the decision to deliberately vent the containment structure through the Direct Torus Vent System (DTVS) which bypasses the radiation filtration system and sends radiation directly to the atmosphere through a "controlled release." They then preserve the option to close the controlled release rather than blow the roof off.

The Atomic Energy Commission (now the NRC) abandoned licensing the Mark I in 1972.

VULNERABLE ELEVATED NUCLEAR WASTE STORAGE POOL

In the GE Mark I design, the irradiated fuel pool, containing billions of curies of high-level atomic waste, sits atop the reactor building, outside primary containment and vulnerable to attack according to both NRC documents (2001) and the National Academy of Sciences (2005).

The NRC paper documents that there are no significant structures that would prevent an aircraft from penetrating the high-level nuclear waste storage pool for the Mark I and Mark II BWR. The consequences of draining down the fuel pool would be a catastrophic nuclear waste fire outside containment spreading a radioactive pall out hundreds of miles and inducing tens of thousands of fatal cancers.

A coalition of groups petitioned the NRC in 2005 requesting emergency enforcement action on the vulnerability of the Mark I and II elevated nuclear waste storage pool. The coalition's petition to the NRC was denied. *–June 2007*

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