
# INVESTIGATE THE NRC

## Dangerous GE Mark I and Mark II reactor containments

**Reckless endangerment of the public health and safety** by the continued operation of aging and fundamentally flawed General Electric Mark I and Mark II boiling water reactors without an adequate and timely resolution for dangerously unreliable containment systems that are in violation of licensing agreements to be an "*essentially leak-tight barrier against the uncontrolled releases of radioactivity*" in the event of a nuclear accident.

All nuclear power plants in the United States were licensed to operate under a General Design Criteria (10 CFR 50 Appendix A) including the requirement that "*Reactor containment and associated systems shall be provided to establish an essentially leak-tight barrier against the uncontrolled release of radioactivity to the environment* ."[General Design Criterion 16]

The 1960's vintage Mark I containment system is a prototype designed, constructed and licensed to rely largely on two large interconnected iron structures for the "pressure suppression" of the immense thermal energy, steam pressure and radioactivity generated in a nuclear accident. The "drywell" initially receives the heat and pressure releases off of the reactor core within the pressure vessel and routes it through large diameter piping to the larger hollow "wetwell" or "torus" component which is filled with one million gallons of water intended to quench the steam pressure and scrub out and retain most of the radioactivity. The 1970's vintage Mark II containment system design is an adaption of the same "pressure suppression" concept that has incorporated more reinforced concrete structures into the design and construction.

In 1972, a senior reactor safety official with the U.S. Atomic Energy Commission (AEC) advised the federal agency to cease operations and any further licensing of the GE Mark I boiling water reactor because the containment structure by design, construction and operation is too small and vulnerable to failure during an accident involving the structure's over-pressurization with highly radioactive steam. The safety official's concerns and recommendation were dismissed by the AEC as counter-productive to the promotion and continued development of nuclear power in the United States and abroad.

In 1974, the AEC was abolished by Congress for a conflict-of-interest that pitted the promotion of nuclear power against its safety oversight mission. The AEC's nuclear power oversight role was taken up by the newly established US Nuclear Regulatory Commission (NRC). However, the NRC continued to approve the licensing for 16 additional Mark I reactors and 8 Mark II reactors with similarly vulnerable containments bringing the total to 32 units operating in the USA.

In June 1986, a senior safety official for NRC, Dr. Harold Denton, identified that there was a 90% chance of failure of the Mark I containment structure if the flawed component was challenged by severe reactor accident.

In 1989, the NRC requested that all Mark I operators in the US voluntarily modify the containment design to install a "reliable hardened vent system" on a vulnerable containment component (the wet well). During a reactor accident, operators have the option to deliberately defeat "the essentially leak-tight" feature of containment by venting extreme pressure and heat directly to the atmosphere rather than permanently rupture the unreliable radiation containment system during the accident. The water in the "wet well" supplies the reactor's emergency core cooling system to control against a core meltdown. The regulatory maneuver however effectively circumvented the public's due process and review by independent experts in a hearing on the experimental changes that in fact were mischaracterized by industry and agency as of minor public safety consequence.

In 1992, the operators of the FitzPatrick nuclear power plant (NY) refused to install the hardened vent citing cost-benefit analysis. The NRC approved the company's alternative venting strategy through a pre-existing duct work from the reactor containment to an adjacent building, exploding unhardened ductwork, and blowing the exterior doors to outside environment at ground level without regard for a spark and potentially explosive hydrogen in the release.

In 1992, the Commission approved a staff proposal to not apply the General Design Criteria including GDC 16 to all reactors with construction permits issued prior to May 21, 1971. This post-licensing waiver from the design criteria includes most but not all GE Mark I and Mark II reactors where an "essentially leak tight barrier against the uncontrolled release of radioactivity into the environment" applies.

By 1992, Tokyo Electric Power Company had installed the same "reliable hardened vent" system at Fukushima Daiichi in Japan as was requested by NRC on its US GE Mark I units.

From March 11-14, 2011, as the result of an earthquake and tsunami the Fukushima Dai-Ichi nuclear power station experienced the prolonged loss of offsite and onsite emergency electrical power to reactor safety systems causing extensive reactor core damage and multiple hydrogen explosions in Units 1, 2 and 3 all operational at the time and demonstrated a 100% failure rate for the Mark I containment system and back-fitted experimental hardened vent system with catastrophic releases of radioactivity in the ongoing contamination of the environment.

In April 2011, the NRC indicated that there was no danger from the continued operation of US Mark I boiling water reactors and that there was no need to take immediate action to suspend operations of the dangerously old and substandard Fukushima-style reactors.

In July 2011, the NRC initiated a Japan Lessons Learned Task Force and by November 2012, "in light of substantial increase in the overall protection of public health and safety" the NRC staff recommended that all Mark I and Mark II operators be ordered to install enhanced severe accident capable hardened vents on containment systems and additionally be required to install a high-capacity engineered radiation filtration system on the new vent line to reasonably assure that a substantial amount of the harmful radiation might be filtered out and contained after opening the containment vent line during a nuclear accident.

On March 19, 2013, the Commission by majority vote declined to follow its own staff recommendation to install the high-capacity radiation filters on new containment vents. Instead, the Commissioners issued an Order for all Mark I and Mark II operators to install the enhanced severe accident capable system that vents containment system on the "wetwell" component by no later than June 15, 2018 and a second vent on the "drywell" component by no later than June 15, 2019. The Commission declined to order the installation of the radiation filter to reasonably restore containment integrity during venting operations. Instead, the Commission has indefinitely deferred implementation filtration strategy to a contentious "cost adjusted" rulemaking process that at earliest, if at all, would not be operational before 2021.

On June 4, 2013, the French company AREVA and Hitachi GE jointly announced that it is installing severe accident capable hardened containment vents with high-capacity radiation filters on all Japanese boiling water reactor reactors as part of a restart plan to be completed in 2014 and 2015. Japanese authorities are requiring the installation before restart for the control and containment of radioactive releases during any venting operation of explosive hydrogen gas, extreme temperature and steam pressure generated during an accident. However, here in the US, all Mark I and II reactors continue to operate without reliable containment systems and without any such containment modifications in violation of their basic licensing agreement for "an essentially leak-tight barrier against the uncontrolled release of radioactivity to the environment" in the event of a nuclear accident.

The contrast of the two regulatory approaches essentially exposes the Nuclear Regulatory Commission's bias to shield the same vulnerable technology from safety regulations to promote an industry production and financial agenda.

Therefore, we call for the "special investigation" of the NRC and nuclear industry wrong-doing to include:

- The NRC and nuclear industry's reactor so-called "safety analysis" as used to justify that the continued operation of dangerous GE reactors in the US with unreliable containment structures and the significant delay for corrective actions does not present an "undue risk to public health and safety";
- The NRC policy of non-enforcement of apparent industry violations of their licensing agreements for the design and construction of "essentially leak-tight containment structures against the uncontrolled release of radioactivity"; and
- Contradictory and inconsistent NRC policy changes and oversight of licensing agreements for Mark I and Mark II reactors with unreliable containment structures that places public health and safety at undue risk.

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