Letters

The TMI-2 explosion

The article "Root Causes of the Three Mile Island Accident" (*NN*, Mar. 2019, p.29) was well written but did not include new findings that prove [valve operations] caused an explosion at TMI-2 following the partial meltdown of the reactor. The plant's operators were unaware that their actions caused an explosion in the reac-tor building, since the safety analysis and their training did not consider the prob-ability of explosions. If a similar accident occurred today, operators would not safely respond to prevent an explosion, since regulations do not yet address this new finding.

The TMI-2 explosion was similar to the Fukushima explosions. In both accidents, operators unknowingly performed actions that caused explosions. In addition, many smaller explosions have been unknowingly ignited throughout the reactor fleet since the 1950s. The quantity of gases in the systems dictates explosion magnitudes.

The facts are clear: Hydrogen exploded at TMI-2, and 40 years of reporting that a fire followed the nuclear reactor meltdown stands corrected. Proof of this statement is documented in a 2019 paper of mine from the American Society of Mechanical Engineers' *Journal of Nuclear Engineering and Radiation Science* titled "The Autoignition of Nuclear Reactor Power Plant Explosions." This research proves that there is a common cause for most reactor system explosions: Pump and valve operations cause fluid transients that compress flammable hydrogen and oxygen, causing them to explode.

In previous publications, I, like others, have expressed my belief that previous reports on the TMI-2 fire were correct. However, my reevaluations of nuclear power plant explosions show that the Fukushima and TMI-2 accidents were remarkably similar with respect to combustion scenarios.

During these two accidents, nuclear reactor meltdowns occurred: A partial meltdown occurred at TMI-2 to melt half of the fuel, and complete meltdowns occurred at Fukushima to melt the fuel and breach the reactor pressure vessels of several reactors. During these meltdowns, large volumes of hydrogen were released to the reactor buildings to mix with air. In each case, an explosive condition was generated, and all that was needed was a spark source.

My new theory explains two ignition sources for both accidents: (1) During small initial explosions in reactors, hydrogen and oxygen formed and exploded as water contacted the molten core, and (2) during subsequent explosions, coolant pumps added water to control meltdown temperatures, and gases were compressed to autoignition temperatures; when the hot gases exited the reactor, they ignited flammable gases in the containment building.

At TMI, a reactor building explosion coincided with a safety valve opening that blasted hot gases into the reactor building to ignite an explosion. At Fukushima, reactor water additions were coincident to several explosions in reactor buildings. In fact, one explosion occurred within minutes of starting water additions. Several explosions in buildings shared a common ignition mechanism: Fluid transients compressed and heated flammable gases, causing them to explode, similar to combustion in a diesel engine.

Was there a fire or an explosion at TMI? The TMI containment building pressure spiked, and "the chart shows that . . . two peaks occurred. The narrow range goes off scale" (NUREG 0600, Nuclear Regulatory Commission). This narrow pressure peak proves that an explosion occurred at TMI-2.

The fundamental physics of nuclear power plant explosions have been misunderstood since the 1950s. Future explosions can be stopped.

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LETTERS TO THE EDITOR on any aspect of the contents of *Nuclear News*—or on related nuclear industry issues—are welcome. Letters (which should not exceed 700 words and may be subject to editing for length/clarity) should be addressed to:

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