Ms. coolant water boiled away, the reactor’s fuel

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S. History II19 march 2004Three Mile IslandThree Mile Island is a nuclear power plant located in Harrisburg, PA. Ithad two pressurized water reactors. One in which began its service in 1974and is the best performing reactor in the US. However its other reactor isalmost brand new and suffered a server nuke clear meltdown. March 28th 1979at approximately 4: 00 a. m. a minor malfunction created a rise intemperature to the primary coolant.

The reactor shut down as a safety result. In no time a pilot-operatedrelief valve (PORV) on the reactor’s cooling system opened but did notclose. This caused reactor coolant water to leak out and soon drained thetank of its coolant (Wikipeia). As a effect of the lost coolant, highpressure pumps pushed replacement water into the reactor system. Water andsteam then escaped through its relief valve as cooling water surged to thereactor. In this type of situation, the operators were trained to reduce theflow of the replacement water. Their training told them that thepressurizer water level was the only dependable indication of the amount ofcooling water in the system. Because the pressuriser level was increasing, they thought the reactor system was too full of water They were told to doall they could to keep the pressuriser from filling with water.

If itfilled, they could not control pressure in the cooling system and it mightrupture. Operators responded by reducing the flow of replacement water. Steam thenformed in the reactor cooling system. Pumping a mixture of steam and watercaused the reactor cooling pumps to vibrate. If the severe vibrations couldhave damaged the pumps they would made them unusable,

so the operators shutdown the pumps. This ended the forced cooling of the reactor.

However, as reactor coolant water boiled away, the reactor’s fuel core wasuncovered and became even hotter. The fuel rods were damaged and releasedradioactive material into the cooling water. At 6: 22 am operators closed ablock valve between the relief valve and the pressuriser. This actionstopped the loss of coolant water through the relief valve. However, superheated steam and gases blocked the flow of water through the corecooling system (Wikipeia).

By late afternoon, operators began high-pressureinjection of water into the reactor cooling system to increase pressure andto collapse steam bubbles. By 7: 50 pm, they restored forced cooling of thereactor when they were able to restart one reactor coolant pump. They hadcondensed steam so that the pump could run without severe vibrations. FromMarch 29 and 30, operators used a system of pipes and compressors to movethe gas to waste gas decay tanks(Wikipeia).

The compressors leaked, andsome radioactive gas was released to the environmentAfter an anxious month, on 27 April operators established naturalconvection circulation of coolant. The reactor core was being cooled by thenatural movement of water rather than by mechanical pumping. The plant wasin “ cold shutdown”. The cleanup of the damaged nuclear reactor system at TMI-2 took nearly12 years and cost approximately $973 million. The Plant surfaces had to bedecontaminated. Any water used and stored during the cleanup had to beprocessed. And about 100 tones of damaged

uranium fuel had to be removedfrom the reactor vessel — all without hazard to cleanup workers or thepublic. (Wikipeia)OpinionI see Three Mile Island as history repeating itself; It reminded me alot of the Titanic.

The crew on titanic and in the operators room weretold that an accident was nearly impossible so that when something happenedthey didn’t know how to react properly or knew entirely what was going on. However, they responded with there instincts which only made the problemworse. Unlike the Titanic though, no one died in Three Mile Island. The Three Mile Island incident was in a way a good lesion to the US inworking with nuclear generated power. We saw that it is a force of naturethat is very powerful. Its dangers are very real, anything could happen, and if something did happen when using the nuclear power many could die.

Wesaw that we should not assume anything in a time of delicate decisionshttp://en. wikipeia. com/wiki/Three_Mile_Island, Wikipeia, Joan , lastmodified 02: 19, 15 Mar 2004The plant’s main feedwater pumps in the secondary non-nuclear coolingsystem failed at about 4: 00 a.

m. on March 28, 1979. This failure was due toeither a mechanical or electrical failure and prevented the steamgenerators from removing heat. First the turbine, then the reactorautomatically shut down. Immediately, the pressure in the primary system(the nuclear portion of the plant) began to increase. In order to preventthat pressure from becoming excessive, the pressurizer relief valve (avalve located at the top of the pressurizer) opened. The valve should haveclosed when the pressure decreased by a certain

amount, but it did not. Signals available to the operator failed to show that the valve was stillopen.

As a result, the stuck-open valve caused the pressure to continue todecrease in the system. Meanwhile, another problem appeared elsewhere in the plant. The emergencyfeedwater system (backup to main feedwater) was tested 42 hours prior tothe accident. As part of the test, a valve is closed and then reopened atthe end of the test. But this time, through either an administrative orhuman error, the valve was not reopened — preventing the emergencyfeedwater system from functioning. The valve was discovered closed abouteight minutes into the accident. Once it was reopened, the emergencyfeedwater system began to work correctly, allowing cooling water to flowinto the steam generators. As the system pressure in the primary system continued to decrease, voids(areas where no water is present) began to form in portions of the systemother than the pressurizer.

Because of these voids, the water in the systemwas redistributed and the pressurizer became full of water. The levelindicator, which tells the operator the amount of coolant capable of heatremoval, incorrectly indicated the system was full of water. Thus, theoperator stopped adding water. He was unaware that, because of the stuckvalve, the indicator could, and in this instance did, provide falsereadings. After almost eighty minutes of slow temperature rise the primary loop pumpsbegin to shudder as steam rather than water began to pass through them. Thepumps were shut down, and it was believed that natural circulation wouldcontinue the water movement.

Steam in the system locked the primary loop, and as the water stopped circulating it was converted to steam inincreasing amounts. After around 130 minutes since the first malfunction, the top of the reactor core was exposed and the heat and steam drove areaction involving hydrogen and other radioactive gases with the zirconiumrod cladding. The quench tank ruptured, and radioactive coolant began toleak out into the general containment building. At 6 a. m. there was a shiftchange in the control room.

A new arrival noticed that the temperature inthe holding tanks was excessive and used a backup valve to shut off thecoolant venting. Around 250, 000 gallons (950 m) of coolant had alreadybeen lost from the primary loop. It was not until 165 minutes after thestart of the problem that radiation alarms activated as contaminated waterreached detectors, by which time the radiation levels in the primarycoolant water were around 300 times expected levels.