

Three Mile Island

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Introduction

On March 28, 1979, near Middletown PA, a series of failure events occurred at the Three Mile Island Unit 2 reactor. Instruments were not reading correctly at the plant, which did not allow operators to understand the severity of the disaster taking place. This caused the most serious accident in U.S commercial nuclear power plant operating history. (Energy.gov, 2022) This incident brought some major changes to the U.S at the time such as emergency response planning, reactor operating training, radiation protection, and much more. All of these changes were made in an effort to enhance reactor safety around the country. (U.S.NRC.gov)



Figure 1: Three Mile Island

What Happened

- Around 4 am a minor malfunction in the secondary cooling circuit of the reactor caused the temperature in the primary cooling unit to rise.
- Shutdown occurred in less than one second.
- A pressure relief valve failed to close.
- Gauges did not reflect the valve failing.
- The open valve allowed coolant to drain, therefore heat was not being removed from the reactor.
- Radioactive gasses from the cooling system built up in an auxiliary tank.
- Operators used a series of pipes and compressors to move the gas to waste decay tanks.
- Compressors leaked and released radioactive gases into the environment.
- (World Nuclear Association, 2022)

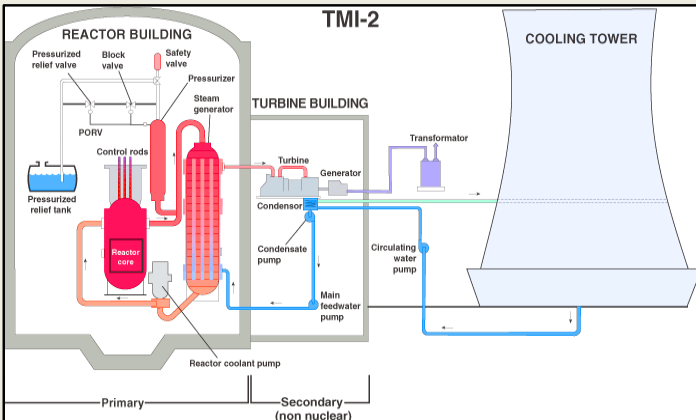


Figure 2: Reactor 2

Health Impacts

The approximately 30,000 people around the second reactor during the accident are estimated to have received an average radiation dose of only about 1 millirem above the usual background dose. (World Nuclear Association, 2022)

- Exposure from a chest X ray is around 6 millirem
- The map below pictures that some areas experienced between 400 – 1666 mSv of gamma doses.

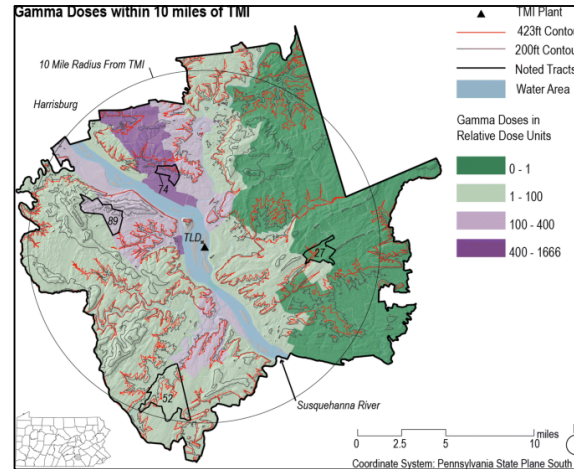


Figure 3: Gamma Exposure

- 50 mSv or less is "safe" received in a short period of time.
- Anything above 100 mSv increases the probability of cancer.
- 1,000 mSv creates a definite risk that cancer will develop many years later.
- (Datesman, 2020)

Comparisons

- The International Nuclear Event Scale (INES) judges the scale of nuclear events.
- This scale is based on impacts on people and the environment.
- Chernobyl was ranked a 7 which is the highest possible rating.
- Fukushima Daiichi crisis was also rated a 7.
- Three mile island was rated a 5. (Patel, 2022)

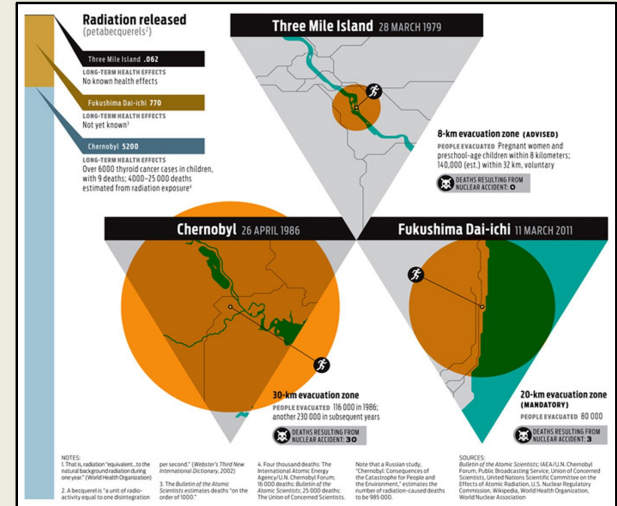


Figure 5: Comparisons

Present Day

- The decommissioning process will not be fully completed until 2079
- Spent fuel was last known to be in the process of being removed to dry storage by the end of summer 2022.
- According to the U.S Census, 9,533 people live in Middletown, PA today.
- The complete decommission is projected to take decades.
- (Mitchell, 2022)



Figure 4: Cooling Towers Now

Conclusion

The spill event that occurred at Three Mile Island was a point of realization for the United States in many ways including:

- Emergency response times.
- Proper operator training.
- Workspace safety.
- Radiation protection.

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