

Thomas O'Neill  
Global Health Disaster Preparedness and Response  
Dr. Gershon  
February 12, 2023

## **The 1986 Chernobyl Power Plant Meltdown: A Case Study**

### **Introduction**

In 1986 the core of Reactor 4 of the Chernobyl power plant in Pripyat (now Ukraine) exploded and almost became the worst disaster Europe had ever seen. In its worst case scenario, for hundreds of thousands of years large parts of Europe would have been completely uninhabitable, and millions of people would have been killed in the 3-5 megaton blast.<sup>6</sup>

### **Facts of the Case**

The Chernobyl power plant was a disaster waiting to happen. It suffered from both a flawed design and under-trained staff. In the very early morning of April 26th 1986, Reactor 4 exploded, "releasing more than 400 times more radiation into the atmosphere than the atomic bomb dropped at Hiroshima."<sup>6</sup> Ahead of the explosion, operators at the plant turned off an automatic shutdown switch, and once a problem was observed, they inserted the control rods as a failsafe.<sup>4</sup> The rods however had a design defect that resulted in enormously increased reactivity instead of reduced. The resulting pressure building in the core was enough to partially detach the 1000 ton cover plate.<sup>3</sup> Two back to back explosions launched highly radioactive pieces of the core out of and among the complex.

### **Epidemiological Aspects**

One worker at the plant died in the explosion, with another following shortly after. Over the next few weeks 28 more workers died from acute radiation sickness (ARS), many of them were firemen who initially attempted to put out the fire, and 106 more workers were successfully treated for ARS over the coming months and years.<sup>1</sup> Over the next few years at least 6,000 children who lived nearby when the explosion happened developed thyroid cancer. Overall, over 220,000 people needed to be evacuated and permanently resettled elsewhere because the radioactivity to the surrounding countryside was so severe.<sup>5</sup>

### **Event Management**

Initially to fight the blaze, hundreds of tons of water were pumped into the reactor basement. Afterwards 5,000 tons of a mixture of lead, boron, sand, clay, and dolomite were dumped into the still burning reactor in order to put it out and to stop the spread of some of the radioactive particles.<sup>2</sup> It was then realized that the superheated sludge that was created in order to put out the fire was quickly melting through the floor. Once it did, it would come into contact with the water in the basement and create an instantaneous steam explosion that would be strong enough to completely level Minsk which was 300 kilometers away.<sup>6</sup> Three men volunteered to go into the radioactive water in the basement and activate the drainage valves. The water was drained and the continent-wide disaster was averted. All three men lived.

## **Communication**

Communication during and after this event was intentionally poor. As part of a coverup of the meltdown by the Soviet government, the people in Pripyat were not even evacuated until later that week. The government only started releasing official statements about the meltdown after the international press had found out and started reporting on it. The Kremlin remained very tight-lipped about the disaster even after the initial danger had passed which led to outrage by the Soviet press. The subsequent protests and growing mistrust between the people of the Soviet Union and the government is believed to have had a significant role in the dissolution of the Soviet Union in 1991.<sup>2</sup>

## **Summary**

What could have been the worst disaster in modern history was thankfully prevented by the quick thinking of the physicists and engineers working on containment, and the potential sacrifice three volunteers made to go into the irradiated water underneath the exploded reactor. There are many lessons that can be learned from the Chernobyl meltdown. Safety regulations must be made by experts and rigorously followed and updated. Training for staff at nuclear power plants must also be held to a higher standard, and should focus on disaster scenario preparedness. It is absolutely vital for government agencies to communicate and be honest with the public. The health and wellbeing of the citizens of countries must be held as the utmost priority, and covering up information that could put them in harm's way is unforgivable. Thankfully many reforms have been implemented because of the Chernobyl meltdown and even after the Fukushima meltdown, no other civilian nuclear disaster has been so dangerous.

## Works Cited

1. *Backgrounder on Chernobyl nuclear power plant accident*. NRC Web. (2022). Retrieved February 12, 2023, from <https://www.nrc.gov/reading-rm/doc-collections/fact-sheets/chernobyl-bg.html>
2. Burrige, T. (2016, April 26). *Chernobyl's legacy 30 Years on*. BBC News. Retrieved February 12, 2023, from <https://www.bbc.com/news/world-europe-36115240>
3. *Chernobyl Accident 1986*. Chernobyl | Chernobyl Accident | Chernobyl Disaster - World Nuclear Association. (2022, April). Retrieved February 12, 2023, from <https://world-nuclear.org/information-library/safety-and-security/safety-of-plants/chernobyl-accident.aspx>
4. *Chernobyl Appendix 1 - Sequence of Events*. Chernobyl Appendix 1: Sequence of Events - World Nuclear Association. (2019). Retrieved February 12, 2023, from <https://world-nuclear.org/information-library/safety-and-security/safety-of-plants/appendices/chernobyl-accident-appendix-1-sequence-of-events.aspx>
5. *The Chernobyl accident*. United Nations : Scientific Committee on the Effects of Atomic Radiation. (n.d.). Retrieved February 12, 2023, from <https://www.unscear.org/unscear/en/areas-of-work/chernobyl.html>
6. *The real story of the Chernobyl divers*. Sky HISTORY TV channel. (n.d.). Retrieved February 12, 2023, from <https://www.history.co.uk/article/the-real-story-of-the-chernobyl-divers#:~:text=Nuclear%20physicist%20Vassili%20Nesterenko%20declared,hundreds%20of%20thousands%20of%20years.>