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Chernobyl: The Soviets' Guide to Creating a Meltdown

The name "Chernobyl" is one that brings fear to many, even in our modern times. It is famous for being the site of the most catastrophic meltdown in the history of nuclear power plants, and unfortunately, that statement alone is all it takes for people to immediately fear and resent the very thought of nuclear energy. While it goes without saying that the incident on April 26, 1986 at the Chernobyl IV reactor was terrible, the extreme and unrealistic conditions behind the event are seldom explored by the public. For starters, the Chernobyl reactor was a light-water cooled, graphite moderated reactor with 2% enriched uranium with boron-carbide control rods,[1] initially designed to be used by the Soviet military to generate plutonium, and decided by bureaucrats to be put into civilian use in spite of various warnings about the stability of the Chernobyl reactor design from scientists dating back to the early 1960's. The type of reactor used was unlike the LWR and CANDU designs more commonly used around the world. Known by the USSR as an RBMK reactor, this design had a history of design flaws and safety contraventions that would not be allowed in other powerful nations like the U.S. and Canada. One particularly significant flaw was the lack of a containment enclosure that would otherwise prevent material from a possible steam or hydrogen gas explosion from contaminating the environment. As if that wasn't enough, the construction of Chernobyl IV was rushed, allowing the reactor to go online ahead of schedule at the expense of avoiding an important safety procedure that would have examined backup electrical power for emergency cooling. Ignoring this test caused a one minute delay before backup power would be provided to the cooling system – a critical amount of time when dealing with such a delicate chemical process as a nuclear reactor. Unknowingly, the delayed incorporation of this backup procedure would lead to the demise of Chernobyl, as the disaster

occurred while an electrical system designed to cover that one minute time interval was in the process of being tested. Thus far, these flaws are lessons specific to the Chernobyl incident as a result of its unique, and definitely uncommon (in most other countries) design process. However, the human error and response to the situation proved to be a more generic demonstration that can be applied in many contexts where nuclear chaos ensues. Besides the design flaws involved with the Chernobyl IV reactor, the training and performance of the operators in the plant proved to be a wake-up call for the importance of proper operation in nuclear power plants everywhere. The original backup electric system test was scheduled to take place on the day of April 25, 1986, but was delayed to around midnight on April 26, when the team of operators initially trained for the test would be off-duty, due to issues with the regional power agency, during which resulted in a demand to lower the power level of the reactor. Unfortunately, it was lowered too much, leading to Xenon poisoning in the reactor, with the power agency being unaware of the occurrences. That night, the test was performed by untrained night time operators, who proceeded to ignore plant specifications and safety,[2] and were unaware of Xenon poisoning in the reactor. This led to a series of steam and hydrogen explosions that ended up exposing the reactor core, allowing for the release of harmful radiation. In an attempt to cover up the incident, the event was kept a secret by the Soviets, who refused to even alert nearby towns and cities for days before Swedish nuclear engineers identified abnormal levels of radiation in the atmosphere and found out the source was from Ukraine based on the isotopes observed in the atmosphere. Even after the Soviets acknowledged the incident, first responders were clueless in how to handle the situation, as they had no prior experience with radioactivity, nor were there tools available for them to use to measure levels of radioactivity. Even though the Soviets acknowledged the incident at Chernobyl, some nearby towns were still unaware, and it took weeks to alert residents and get them evacuated. These events demonstrate the importance of proper training and communication that can severely compound upon the effects of any nuclear incident if not taken seriously.

References

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