Donald C. Cook Nuclear Plant

Few people living in and around South Bend, Indiana know that there is a nuclear power plant less than 50 miles from where they live. The Donald C. Cook Nuclear Power Plant is located north of the city of Bridgman, along the shoreline of Lake Michigan. The Cook power plants began operation in the mid 1970s and have been supplying clean, pollution-free electricity to millions of households since then.

Comprising of two units of the commonly used Pressurized water reactors, the net amount of power that the plant can produce reaches up to 2100 megawatts when operating in full capacity. Like most pressurized water reactors, the Cook nuclear power plants use enriched Uranium (U-235) as fuel and their primary cooling source is water which is provided in abundance by the Lake Michigan.

Owned by the American Electric Power, the plant is operated by Indiana Michigan Power and regulated by a United States governmental body, the Nuclear Regulatory Commission (NRC). The NRC performs regular and stringent tests on all nuclear power plants in the country to ensure their safe operation.

How safe is the Cook nuclear power plant?

In the event of natural disasters: The Cook plant is situated along the shore of Lake Michigan and therefore tsunamis do not pose any danger to the reactors. The other possible dangers include that from tornadoes, earthquakes and floods. The NRC requires all nuclear power plants to be built taking in consideration the severity of natural disasters that are most likely to affect them. Water tight doors, elevation of equipment above potential flood levels and special engineered flood barriers along with the emergency core cooling systems allow for the reactors to be prepared for the most likely event of a flood from Lake Michigan. Regular in-depth seismic analysis is performed by the NRC to keep the reactors in check for a disaster involving an earthquake. According to the NRC's June 2008 (*Source: nrc.gov*) estimate of the risk each year of an earthquake intense enough to cause core damage to the Cook reactors was 1 in 83,333. In the event of a tornado, the Cook plant has been designed to go into an automatic safe shut down mode. All structures and equipment in the plant have been designed to withstand severe ground motion and flooding.

In the event of hostile actions or equipment failure: Both reactors at the Cook plant house two large-sized emergency backup diesel generators. These generators start automatically if power is lost and provide an alternative and efficient way for heat removal from the core of the reactors. This also ensures that hydrogen buildup does not occur post reactor shut down and hence a *Fukushima-type* accident cannot occur at the Cook plants. These generators are located in seismically secure rooms, nine feet above the mean lake level. Another supplemental diesel generator to serve either units is also installed at 23 feet above mean lake level (*Source: Indiana Michigan Power)*.

Another potential equipment failure could be the loss of water in the spent fuel pool. A spent fuel pool is a pool of water close to the reactor main body that houses the spent fuel taken out of the reactors to let them cool and decay to safe radiation levels. In the unlikely event of loss of water to the pool, high-capacity pumps installed at the reactor site can supply the water and efficiently remove heat from the spent fuel.

All the nuclear plants in the United States are required by law to build a reactor containment structure made of lead and concrete that safely houses the reactor. It is the place where all the nuclear reactions to generate heat and energy take place and doesn't allow any radiation to escape or reach other components. In an event of a complete fuel meltdown, the reactor containment building would prevent a *Chernobyl-type* accident to occur.

Moreover, based on the 'defense-in-depth' design, the Cook plant comprises of multiple physical barriers and multiple backup safety systems to ensure safety under all operating conditions. In collaboration with the NRC, the plant also organizes frequent drills to comply with the commission's stringent safety protocols.

Major accidents at the Cook nuclear power plant

The reactors at the Cook plant have been operational for almost fifty years now. In the meantime, the plant has suffered six major accidents involving three fatalities, none of which were a consequence of radiation poisoning.

- In 1976, two workers were killed in a re-circulation pit by asphyxiation from argon gas used to support welding on stainless steel piping (*Source: NRC: Information Notice No. 85-87)*.
- On July 13, 1990, one person was killed by electrocution and three others suffered severe burn injuries from a switch gear explosion *(Source: Wikipedia)*.
- In September, 1997, NRC inspections were done in the engineering area and satisfactory operation of the emergency core cooling systems could not be established. As a result, both units at the Cook plant were shut down for approximately three years *(Source: NRC doc: Tran-M119830).*
- In 2003, an automatic shutdown of Unit 1 happened due to a transformer fire and it resulted in the release of some cooling oil in the Lake Michigan *(Source: AEP News releases).*
- On April 24, 2003, a massive intrusion of fish led to a manual shut down of both the units for several weeks.
- On September 20, 2008, severe turbine vibrations caused damage to the first unit's main turbine and generator. A fire broke out in the generator of Unit 1 as a consequence. However, no radiation was released and Unit 2 continued to operate at full power *(Source: Wikipedia).*

It has to taken into account that none of the accidents led to any radiation release to the environment. In the event of any incident at the reactors, the engineered safety features were fully operative and carried out their respective jobs to prevent the release of radiation. All the personnel working at the reactor site are also fully trained to deal with any accidents and maintain the reactor at safe operating levels at all times.

To know more about the Cook nuclear power plants, plan a visit to their visitor center: http://www.cookinfo.com/VisitorCenter.aspx.