A Fail-Safe Cooling System; A Novel Passive Nuclear Safety Design for Nuclear Power Plants

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The purpose of this experiment was to develop an alternative cooling system to replace the aging 5,900 acres of cooling canals at FPL's Turkey Point Nuclear Power Plant in South Florida. The most significant challenges the aging cooling system faces are that of temperature and salinity, which are caused by an increase in global temperatures and sea-level rise. This project for the nuclear power plant was constructed upon several cooling methods, including a heat-exchange unit, adiabatic cooling, and the use of cool artesian well-water.□□ The testing of trials is what made this system so accurate. The system was tested with temperature and salinity readings that are realistic and taken at the Turkey Point Nuclear Power plant, therefore allowing for a valid Delta T, and salinity readings. The results of the fail-safe passive cooling system were an average temperature decrease of 10.3 Celsius, in 30 seconds. The results of the salinity decrease were 0.005 SG throughout the 30-second system. The use of the novel fail-safe passive cooling system can provide the Turkey Point Nuclear Power Plant with a cooling system that can tackle the issues that are negatively impacting the stability of the canals, as well as protect the power plant in the event of a total loss of power or catastrophic emergency. □□ This new cooling system is engineered to protect both the surrounding community and the environment. It can help rejuvenate sea-life in the area which is home to estuaries and over 6,000 endangered American Crocodiles. By using groundwater systems like that of the Floridan aquifers, other nuclear power plants around the world may also benefit from this fail-safe passive cooling system, protecting communities and saving the environment.