After the 2011 earthquake and resulting tsunami in Eastern Japan, the globe has become aware of the peril presented by nuclear reactors in the wake of natural disasters. During the incident, Fukushima Nuclear Plant experienced severe damage, spreading nuclear material into the water, air, and surrounding areas. The large displacement of water could cause wave heights of 65-82 feet on the eastern coast of North America (Figure 1). 

**Methodology**

Selection and Feasibility of site:
The Fukushima reactors were located 32 feet above sea level when 50 feet of water hit the location during the tsunami in 2011[1,2]. 2,719 MW of energy generation was destroyed[2]. The selection of the site for this project was based on the following criteria: high nuclear capacity, close proximity to the coast, and low elevation. Turkey Point Nuclear Generation Plant located in Homestead Florida met all of these criteria. The plant currently generates about 1,604 MW through their reactors which are located between 15 to 20 feet above sea level[3]. It is the 6th largest nuclear plant in the US, and the largest plant in Florida, providing power to the entire southern part of the state[4].

The feasibility of a natural disaster occurring in southern Florida is relatively high. The Florida coastline is located in an area of high risk to hurricanes and sea level rise which could easily cause damage and promote leakage from the plant. Hurricane Irma hit the Gulf of Mexico in 2017, and generated wave heights of 19 feet, which would have been in range of hitting the Turkey Point generators had it hit the eastern side of Florida[5]. The area is also at risk of experiencing the effects of continental shelf collapse (Figure 2), which could bring a range of unprecedented tsunami wave heights[6]. A mega-tsunami could also occur from a flank collapse of the Cumbre Vieja Volcan in the Canary Islands. The large displacement of water could cause wave heights of 65-82 feet on the eastern coast of North America (Figure 2).

During the incident, Fukushima Nuclear Plant experienced severe damage, spreading nuclear material into the water, air, and surrounding areas. The large displacement of water could cause wave heights of 65-82 feet on the eastern coast of North America (Figure 2). 

**Results and Conclusion**

In the days following a hypothetical natural disaster, contaminated water would travel up the eastern coast of Florida transported by the gulf stream. This puts valuable beaches in poorly ventilated areas at risk of being contaminated. The Gulf Stream is one of the main surface currents that carry nuclear material throughout the ocean. The Fukushima nuclear disaster has shown that radioactive currents and therefore expose large portions of the human population, even outside of the affected region, to radioactivity.

**References**


**Data Sources:**


**Figure 1:** Location of the 2011 earthquake in Japan. **Figure 2:** Continental Shelf of Florida. **Figure 3:** Image of Gulf Stream. **Figure 4:** Spread of Nuclear Material in the Ocean Over Time to radioactive currents and therefore expose large portions of the human population, even outside of the affected region, to radioactivity. Figure 7 shows 4 coral reefs and 34 square km of protected national marine sanctuary that would be in the direct path of the nuclear material flowing out of the cove. This would contaminate already endangered corals and valuable shallow water ecosystems. This analysis exemplifies the timeliness of the effects of leakage from a coastal nuclear plant on surrounding environments and communities after a natural disaster. Within days, the radioactive current would spread throughout the coast of Florida and North America. Looking outside the area analyzed, the Gulf Stream could potentially carry the radioactive surface water across the Atlantic Ocean to Iceland, Europe or Africa. A large complication of nuclear contamination within the ocean is that it is extremely difficult to clean up post disaster. Amounts of radioactive multiples over time, as nuclear material decays and cannot dissipate on its own. The only way to contain it is to move or transport all of the affected water and contaminated sediments and biota. Realistically, prevention is the safest protection from nuclear accidents. In a time where the US should be moving away from fossil fuels, many look to nuclear as a cleaner alternative. It is only “clean” until it is no longer contained. Possible disaster prevention methods include: moving nuclear plants inland or to a higher elevation, or altogether decreasing the use of nuclear energy.

**Figure 1:** Location of the 2011 earthquake in Japan. **Figure 2:** Continental Shelf of Florida. **Figure 3:** Image of Gulf Stream. **Figure 4:** Spread of Nuclear Material in the Ocean Over Time.

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