

In light of the recent hurricane events, compare the reliability of the electricity supply generated by nuclear power to other sources of electricity which support the grid.

Hurricane Harvey made landfall two times in south Texas during August 2017 and provides an excellent case study on the reliability of electrical power generation during and after a major natural disaster. Hurricane Harvey resulted in approximately 82 deaths, caused an estimated \$125 billion in damages, and affected nearly 13 million people directly as a hurricane in Texas through Louisiana, and Mississippi; and indirectly through flooding as far away as Tennessee, and Kentucky. Flooding forced approximately 39,000 people out of their homes. In the wake of this major natural disaster, the impact on the local electrical supply received little attention.

There were two nuclear reactors at the South Texas Project plant near Houston with a rated capacity of 1280 MW that supplied power across the region. The plant is located approximately 10 miles from the Gulf Coast and 40 miles South-West from downtown Houston. The plant was on the high wind side of the Hurricane Harvey path. During the hurricane, both reactors were operating at full capacity despite wind gusts that peaked at 130 mph as Harvey made landfall. This level of reliability in the mist of such a large natural disaster should not surprise those familiar with nuclear reactor designs and severe weather planning.

Based on federal law (10 CFR Appendix A, Part 50), nuclear reactors are required to be designed to withstand all design basis accidents. To achieve that design criteria, the South Texas nuclear plant has steel-reinforced concrete containment with 4-foot thick walls. The buildings housing the two reactors, vital equipment and used fuel have steel-reinforced concrete walls up to 7 feet thick, which are built to withstand any category hurricane or tornado. It can even withstand a plane flying directly into it.

The plant implemented its severe weather protocols as planned and completed hurricane preparations ahead of Category 4 Hurricane Harvey striking the Texas Gulf Coast on August 25th. Standard protocols or procedures detail how each applicable nuclear power plant prepares for a hurricane emergency. Site staff are responsible for numerous preparations including:

- Survey of storm conditions available that may include the path, wind speed, projected storm surge and rain fall;

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- Inspecting the plant, moving or securing equipment that could become projectiles in strong winds, checking doors, and secure water feeds;
- Checking diesel fuel tanks to ensure at least seven days' supply to run the generators; and
- Initiating regular update reports on the site's condition to the Nuclear Regulatory Commission before the hurricane arrives.

The robust plant design coupled with the precautionary measures help to ensure the safety and reliability of the nuclear reactors. In the event a reactor needs to be shut down during or after a hurricane, emergency diesel generators will immediately start to operate, in order to supply electric energy to the site's safety systems. Operators can also manually shut off the reactor as a preemptive measure, or may scale back power if the need for power decreases. The later could easily occur as buildings become flooded and power lines are down.

Solar power is largely considered a cheap and clean energy generation method. However, when the sky turns dark during a hurricane, there is no solar power generation. Solar panels on houses or in fields would likely be damaged during a Category 4 hurricane. Flooding in the area would destroy any batteries storing solar energy that were below the water level. The damaged solar panels or shorted circuitry would not produce power after the hurricane has passed. The damaged solar panels and batteries that cannot be repaired are discarded. Discarded solar panels contain dangerous elements such as lead, chromium, and cadmium. A dirty little secret of the clean energy is that solar panels create 300 times more toxic waste per unit of energy than nuclear power plants.

Hurricane Harvey produced 130+ mph winds on land. It would seem that windmills could utilize this abundance of available natural energy to produce power. However, windmills typically operate on wind speeds from approximately 7 mph to 55 mph. When the wind speed is outside the operating range, the blades are allowed to free spin to reduce damage. The Wind Farms in south Texas were on the lower wind side of Hurricane Harvey and were spared from damage. In fact, reports indicate the Wind Farm turbines continued operating, or shut down due to self-preservation or local power grid failure as designed. The wind turbines are designed for hurricane Category 3 winds. The Category 4 Hurricane Harvey could have produced significant damage to the wind turbines had they been in a different location, such as near the South Texas Project plant.

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Hurricane Harvey disrupted oil and natural gas refinery operations in the south Texas region. Refinery operations is related to oil and natural gas fired electrical production plants. Without the refineries, the power plants and individual consumers compete for limited resources. Refineries in the local Houston area along the Gulf Coast were shut down at the ahead of hurricane. These local refineries amount to approximately one third of the capacity of the entire nation, and were down for more than a week. The closure of the port of Houston had a major short-term impact on imports and exports, most notably oil. Whereas it requires electricity to operate the oil and natural gas refineries, it was necessary to reconnect these plants to a large-scale stable power supply as soon as possible. With the South Texas Project plant operating, the recovery efforts could focus on infrastructure instead of power generation.

As seen from the effects of Hurricane Harvey, nuclear reactors prove to be more reliable in natural disaster situations than any other power source. Although there are other methods of producing energy, with some being more efficient than others, nuclear reactors should be valued above anything. “Whether its hurricanes, floods, earthquakes, heat waves or severe cold, nuclear performs more reliably than anything else. There’s no better reason to retain our nuclear fleet, and even expand it, to give us a diverse energy mix that can handle any natural disaster that can occur.” (Conca, James)

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