The Resilience of Nuclear Energy: Hurricane Harvey and the South Texas Project Nuclear Plant

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On Thursday, August 24th, Hurricane Harvey began its path of destruction in Texas and the southern United States, causing damages estimated to be between $150-$180 billion, figures that do not reveal the entire story of how much impact the hurricane had on the state of Texas and the greater Gulf Coast region. Harvey wreaked havoc on Texas' energy industry and infrastructure, severely disrupting the state's oil refining and export activities, as well as much of its power generation capacity. In this chaos, the South Texas Nuclear Project Electric Generating Station--even as it stood directly in the path of Harvey--continued to operate at full power, prominently serving as a testament to the unparalleled resilience of nuclear power.

Harvey's Impact: Disruption of Energy in Texas and Beyond

The Gulf Coast is known as the heart of America's oil and gas industry. Because the Gulf Coast produces and refines much of the United States' crude oil, disruptions to the refineries in the Gulf Coast can create shockwaves throughout the country and the world.

Prior to Hurricane Harvey, refineries in the Corpus Christi region were shut down to prevent damage, and a couple of days after the hurricane, many refineries in the Houston area were also forcibly shut down as a result of flooding. All in all, roughly 2.2 million barrels per day of refining capacity was lost as a result of the hurricane, representing 45% of the Texas Gulf Coast's capacity and 20% of the capacity of the broader Gulf Coast region. As the Gulf of Mexico is known to be prone to storms, operators follow preset procedures to limit the impact that such events can have on operations. However, Hurricane Harvey was unlike the many storms that preceded it because it resulted in significant shutdowns of onshore oil and gas production, particularly in the Eagle Ford shale formation. It was estimated that the refineries forced offline by Harvey comprise 15% of total refining capacity in the U.S. and 3% of global crude demand.

In addition, Harvey also forced the Houston and Corpus Christi ports to shut down, and the entire Gulf was essentially closed to vessel traffic. Texas's total crude export capacity is estimated to be around 2.5 million barrels per day. Of that total capacity, the two ports that were shut down comprise approximately 1.8 million barrels per day, or approximately 72% of the total export capacity. As a result of such developments, countries that depend heavily on U.S. crude exports will be forced to find other, likely costlier alternatives. Harvey's impact on the region's oil industry through losses in potential revenue is massive, but the resultant rise in the price of oil could reverberate beyond the region.

During this time, when oil refineries and shale operations were being shut down, wind farms were also shut down and solar farms failed to generate any meaningful power as there was little to no sunlight. Wind turbine technology is not designed to handle sustained wind speeds greater than 55 mph, and turbines were automatically shut down when the wind speeds surpassed 55 mph. Unlike the oil refineries and production operations, however, wind farms take much longer to bring back online. Texas will not have wind power operating at full capacity for some time after Harvey. Among all these power generation sources that failed during Harvey, one source of power remained online at full capacity during the entirety of the disaster: nuclear.

Nuclear's Unmatched Resilience and Other Attributes

Despite persistent warnings from anti-nuclear groups to shut down any and all nuclear plants in the area in preparation for Harvey, the two reactors at the South Texas Project (STP) plant were kept up and running with no safety concerns. The two reactors at the STP plant have a 2,700 MW capacity that can provide power to 2 million customers in Texas, and this power generation was crucial to the recovery efforts in Texas following Harvey.

The South Texas Project Nuclear Operating Company indicated that for the duration of Hurricane Harvey, 175 workers remained on-site to ensure the safety of the plant. STP operates under well-defined Nuclear Regulatory Commission guidelines and internal procedures. Unlike nearby refineries, the plant has not experienced any flooding issues. The company noted that their plant is housed inside of a 1.2 meter thick wall, and that the buildings housing the reactors, vital equipment, and used fuel have steel-reinforced concrete walls that are 1.2-2.1 meters thick. These design features allow the entire plant to be waterproof, and the buildings housing the safety equipment are raised to an elevation of 12.5 meters to be flood-proof. The STP plant in Texas is an example of how safe and reliable nuclear power can be, as well as evidence that nuclear is arguably the only source of energy that is sufficiently resilient to persist through a natural disaster of Harvey's magnitude and provide uninterrupted power for the relief efforts following it.

While the nuclear accident at the Fukushima Daiichi site in Japan has caused many leaders and citizens around the world to fear nuclear power as an unsafe method of power generation, examples of disasters like Hurricane Sandy of 2012 and Hurricane Harvey show how effective and safe a nuclear plant can be when operated and managed properly.

Less than two weeks since Harvey devastated Texas, meteorologists have projected another high-impact hurricane, Hurricane Irma, to make landfall and be even deadlier than Harvey. Irma has the strongest winds of any hurricane to form in the open Atlantic, with sustained wind speeds reaching as high as 295 kilometers per hour. While it may seem like an unfortunate coincidence that the southern part of the U.S. is experiencing so many natural disasters within a short time span, computer simulations show that rising temperatures are responsible for the increased frequency and strength of these natural disasters. These simulations provide evidence that Hurricane Irma's unprecedented strength is a result of warming waters in the Atlantic. As a tropical cyclone grows stronger, it churns the ocean, bringing deeper water to the surface. This deeper water is generally much colder than the surface water temperature, thereby cutting off the energy supply of the cyclone and preventing it from growing stronger. However, due to the deeper water becoming increasingly warmer, these cyclones are gaining strength to become potent hurricanes rather than fizzling out as tropical storms. The link between the rise in global temperatures and the growing prevalence of extreme weather phenomena serves as an additional rationale for the deployment of nuclear.

In the midst of the severe destruction and disruption caused by disasters such as Harvey and

Irma, nuclear power's resilience and other positive characteristics shine through. Facing the prospect of increased frequency and intensity of hurricanes and other severe weather, the world must seriously and intently consider nuclear power as an essential means to meet its energy needs, not only to survive these disasters, but to ultimately address and mitigate them.

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