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DEVELOPING A POWER SYSTEM RESILIENCE PLANNING FRAMEWORK TO ENSURE ENERGY SECURITY FOR CRITICAL RESOURCES DURING POWER OUTAGES

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Uninterrupted electricity supply is an essential resource for the US economy. Critical infrastructures such as hospitals and fire stations heavily rely on electricity. However, current trends in weather related events such as polar vortex and tornadoes impact the continuous power supply. When power outages occur, electric utilities try to shed part of the load. These could have both economic impact and power outage to the consumers including critical loads such as hospitals and fire stations. Existing metrics cannot differentiate critical loads and other normal loads during load shedding. For example, 100 kWh of power loss to a hospital and 100kWh of power loss to normal households are considered the same. In this work a metric-based framework is proposed to prioritize critical and important loads. A new quantitative metric called Cumulative Value of Expected Energy Not Served is proposed to value the load based on the criticality. The proposed metric incorporates several types of loads and estimates the total monetary value of expected energy not served. Total value of expected energy not served is determined using survey methods and probability theory. This value can be used to prioritize the critical loads. The developed metric framework could capture the resilience of electric grid effectively. Further, it can give high priority for critical loads therefore energy security for these resources is increased.