

## Hurricane Matthew Power System Challenges and Lessons Learned at Southeastern Regional Medical Center in Lumberton, NC

Powered for Patients is pleased to have teamed up with Southeastern Health along with facility managers from Southeastern Regional Medical Center in Lumberton, North Carolina to chronicle the story of Hurricane Matthew's impact on the hospital's emergency power supply system. This brief report identifies initial lessons learned in safeguarding emergency power. A full exploration of lessons learned at this and other healthcare facilities will take place as part of the Powered for Patients North Carolina Stakeholder Engagement Initiative.



### Timeline of Events

Southeastern Regional Medical Center, a private, non-profit hospital located in Lumberton, North Carolina, had prepared as well as it could for Hurricane Matthew.

Initial forecasts had the storm making landfall well to the south but a change in the storm track brought the hurricane much closer to Lumberton. The actual wind speeds and rainfall were double the original projection. Massive flooding that claimed numerous lives in North Carolina shut down an 18-mile stretch of Interstate 95 for four days and several portions for two weeks. Diverted motorists were forced into Lumberton and many descended on Southeastern Regional Medical Center, seeking shelter and food in one of the few facilities with emergency power in the impacted area.

# Timeline of Events Surrounding Failure of Emergency Power System Components at Southeastern Regional Medical Center



On Friday, October 7, the day before landfall, the emergency power supply system had been tested a final time and all five generators were operating properly. The hospital's two 10,000-gallon fuel tanks, enough supply to keep the five generators operating for four days, had been topped off.



On Saturday, October 8, as landfall occurred, trees were brought down, and power was quickly lost. It would remain out for over four days. Seconds after utility power was lost, the hospital's emergency power supply system kicked into action.

Within six hours, Generator # 1 lost one of its two turbo charger units, generating a smoke condition and forcing facility managers to shut the unit down and transfer the load to the remaining four generators.

The failure of Generator # 1 prompted an immediate call by hospital facility managers to the hospital's generator service provider. Due to flooding, the service provider was unable to travel to the hospital for four days. A faster response in this instance would not have enabled Generator # 1 to be repaired in a timely fashion since the replacement part it needed had to be ordered from Belgium.



On Sunday, October 9th, when the local utility was unable to provide an estimated time of restoration given the extensive damage to utility infrastructure, the hospital requested deployment of temporary generators from the state of North Carolina and FEMA as a precaution.

US Army Corps of Engineers personnel shown during the operation to augment emergency power at Southeastern Regional Medical Center following Hurricane Matthew.



On Wednesday, October 12<sup>th</sup>, after operating for nearly 96 hours, the thermostat on Generator # 4 malfunctioned, disabling the unit and suddenly placing the load of four generators on the three remaining units. Hospital facilities staff were not able to shed emergency power

load fast enough and the three remaining, overstretched generators shut down, resulting in a total loss of emergency power.

Backup batteries on respirators and other life sustaining equipment operated throughout the hospital. Within minutes, facility staff shed additional emergency power load before quickly restarting the three remaining generators.

The loss of the turbo charger unit in Generator # 1 hadn't rendered the generator completely inoperable so facility managers restarted it to augment the diminished backup power capacity. Operating without its turbo charger created smoke, triggering a fear that a fire had broken out at the hospital.

Despite load shedding, and temporarily restarting generator # 1, the hospital evacuated pediatric ICU patients given concerns over the stability of emergency power.

The generator with the failed thermostat was repaired within two hours, enabling generator # 1 to be taken back out of service, and providing the hospital with four operating generators, ensuring enough emergency power for the remaining patients until utility power was restored.

Later in the day on October 12<sup>th</sup>, FEMA and North Carolina state officials advanced their work to deploy temporary generators to the hospital as Duke Energy raced to restore utility power. A determination between FEMA and state officials was made that a state generator was closer to the hospital so it was dispatched to the hospital along with members of a National Guard unit trained in generator installation. In the

late afternoon of October 12<sup>th</sup>, a temporary generator had been wired to the facility's electrical system. In the end, Duke Energy was able to restore utility power at 10:30 pm and the temporary generator was never started.

# Six Key Emergency Power System Lessons Learned from Hurricane Matthew

## Lesson # 1: Loss of Water and Wastewater Service Intensified Crisis – The extreme flooding triggered by Hurricane



Matthew submerged city pump stations for municipal water and waste water treatment utilities serving Southeastern Regional Medical Center. This created a serious crisis for facility managers who had to tap three shallow wells on hospital grounds until a water tanker and pumps could be dispatched to resume temporary water service. In the interim, hospital personnel hauled 55-gallon drums filled with water throughout the hospital to enable toilets to be flushed.

**Lesson Learned:** The emergency power capabilities for water and waste water utilities, and the vulnerability of these units from flooding, should be assessed by these utilities and the hospitals who depend on them so contingency plans can

be developed to address a loss of either vital service.

## Lesson # 2: Failure of Hard-to-Replace Spare Generator Part Crippled Generator

for Two Weeks - The turbo charge component of Generator Unit # 1 failed hours after utility power was lost on October 8, 2016, despite having been tested the previous day. This part had to be ordered from a supplier in Belgium, resulting in a two-week delay until the generator was running properly. (The remaining four gen sets provided reduced backup power for the hospital for four days until a fourth unit was disabled due to a mechanical malfunction).



**Lesson Learned:** Work with your generator service provider to identify critical spare parts for gen sets and have these parts either on site or with your generator service provider.

## Lesson # 3: Hospital Impacted by Surge of At-Risk Citizens Dependent on Electric Powered Medical Devices – Citizens



living near Southeastern Regional Medical Center who rely on electric-powered medical equipment surged to the hospital in the hours after the loss of utility power as the batteries on their medical equipment were drained. This placed an added burden on hospital personnel already working with reduced resources. (Citizens without medical needs also showed up at the hospital to charge cell phones when they saw lights being powered by emergency generators).

**Lesson Learned:** Greater coordination in meeting the needs of at-risk citizens relying on electric powered medical devices will enhance post-disaster support for these citizens. The HHS/ASPR emPOWER map is an important tool that can assist on this front. It is available at <http://empowermap.phe.gov>. In addition,

greater efforts to encourage at-risk citizens to identify alternative means of backup power should be made.

## Lesson # 4: Limited Backup Power Was Insufficient to Meet Critical Needs – The power outage for Southeastern Re-



gional Medical Center lasted for approximately 100 hours. During this time frame, two of the hospital's five generators failed due to mechanical problems, seriously limiting available back up power for critical loads. Facility managers realized that not having a service elevator on emergency power presented serious challenges. Similarly, the lack of emergency power for the hospital's trash compactor also was a challenge. Had Hurricane Matthew struck during August or September, the lack of air conditioning in the hospital would have become a serious problem, leading hospital facility managers to realize the importance of connecting some HVAC capacity to emergency power.

**Lesson Learned:** Increase emergency power capabilities to meet additional critical equipment and HVAC needs.

## Lesson # 5: Limited Communications Capabilities Hampered Ability to Communicate with Government and Community



Facility managers at Southeastern Regional Medical Center had limited cell phone service, land line service and internet connectivity, leaving texting as the main means of communication with employees and people outside the hospital. This hampered efforts to communicate with and between government officials. It also presented a major challenge in communicating with hospital staff members. (The hospital utilized Facebook as its main means of distributing messages for employees and the public through a staff member from a remote location with WiFi access from their home.)

**Lesson Learned:** Hospitals should be equipped with at least two satellite phones that have internet connectivity. A mass notification system should be employed to enable better communication with hospital employees.

## Lesson # 6: Lack of Timely Information About Road Closures Delayed Deployment of Emergency Power Service Team



When Southeastern Health's facility manager contacted his generator service provider on Saturday, October 8<sup>th</sup> to address the failed turbo charger in Generator # 1, the service provider was unable to deploy to the hospital to assess the problem due to flooding. The technician would not arrive until four days later when a second generator failure required his attention. In this instance, road closures and the lack of awareness of which roads were closed delayed the delivery of necessary spare parts to restore the second failed generator.

**Lesson Learned:** Greater information sharing about road closures and stepped up coordination between hospital facility personnel, its generator service provider and emergency management officials could have enabled government personnel to assist the generator service provider in arriving at the hospital well before he was able to arrive on his own. As noted above, in this case an earlier arrival would not have changed the outcome since the part needed for Generator # 1 had to be ordered from Belgium. However, going forward, this type of enhanced information sharing and coordination should be encouraged to better leverage government resources in helping critical private sector service providers overcome obstacles when seeking to provide service to impacted clients.



US Army Corps of Engineers personnel shown during the delivery and installation of a temporary replacement generator at Southeastern Regional Medical Center following Hurricane Matthew.

A full exploration of lessons learned with respect to emergency power and power restoration for North Carolina's critical healthcare facilities will take place as part of the Powered for Patients North Carolina Stakeholder Engagement Initiative. Organizations interested in participating in the Stakeholder Engagement Initiative are encouraged to contact Powered for Patients Project Director Eric Cote at [cote@poweredforpatients.org](mailto:cote@poweredforpatients.org) or by calling 202-810-0125.