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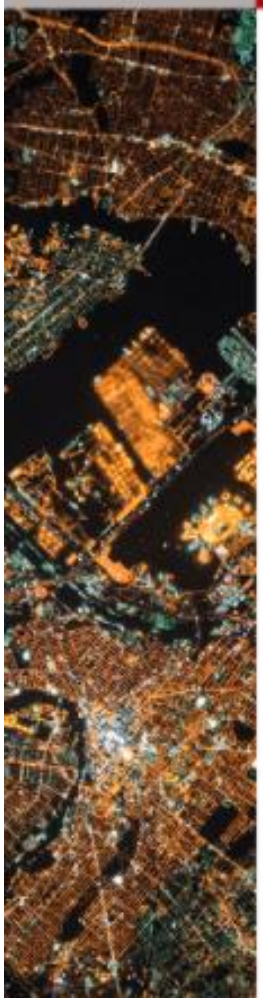

Practice Advances

National Action Needed to Strengthen the Emergency Power Infrastructure

Eric Cote[1]

[1]Project Director, Powered for Patients, cote@poweredforpatients.org

[*see Author Capsule Bio below*]

As climate change fuels more intense natural disasters, power outages are increasing in frequency and duration. In California, record wildfires have created a new power outage threat exemplified by Public Safety Power Shutoffs (PSPS), a pre-emptive measure by California's electric utilities to shut power off to wide swaths of California to minimize the risk of wildfires sparked by utility lines.

Regardless of the cause, worsening power outages are subjecting emergency power systems to some of the greatest tests they've faced; in many cases, generators are failing under these harsher conditions.

During PSPS events in California in 2019, two hospitals and five skilled nursing facilities suffered generator failures. Hurricane Sandy triggered the failure of emergency power systems in six New York City-area hospitals, forcing the emergency evacuation of four of these facilities. Generator failures in the aftermath of Hurricane Katrina were blamed for patient fatalities.

When FEMA and the U.S. Army Corps of Engineers arrived in Puerto Rico to launch the post-Hurricane Maria temporary power mission in 2017, they discovered that nearly 100 generators used in a variety of critical facilities had irreparably failed. Many were seriously outdated, and others had not been sufficiently maintained. By the end of their mission, nearly 1,500 federally owned or leased generators had been deployed across the island, representing the largest temporary power deployment in FEMA history. This record-breaking deployment pushed the FEMA fleet beyond its limits, and requests for deployment of smaller generators could not be fulfilled.

The consequences of these generator failures have been severe—even deadly—in some cases, and the impact of generator shortages following Hurricane Maria worsened an already dire situation. Yet disaster planners and emergency power experts agree that a much larger disaster, such as an Electro Magnetic Pulse (EMP) attack or a catastrophic earthquake in southern California or the New Madrid zone, would produce a power outage of unprecedented proportion that could stretch for weeks and even months.

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One certainty in such an event would be an unprecedented number of generator failures in hospitals and other critical facilities, an outcome that would quickly exhaust the combined resources of government and the private sector. Seriously outdated generators would likely fail first and even newer generators would face serious challenges after unprecedented periods of uninterrupted operation. Facilities relying on a single generator would be especially vulnerable to generator failures given the lack of redundant emergency power. Another challenge will be keeping generators that continue to operate sufficiently fueled.

These varied threats will force governors and other elected leaders to make painful life and death rationing decisions. Would a pediatric hospital be prioritized over a water treatment plant serving hundreds of thousands? What about a 911 call center versus an evacuation shelter?

Today, no national strategy exists to facilitate the highly consequential energy rationing decisions associated with catastrophic power outages. The lack of an overall strategy also deprives the nation of the playbook needed to equitably and strategically allocate limited emergency power resources while rapidly accelerating generator production. The nation saw the consequences of ventilator shortages in the early days of the COVID-19 pandemic which triggered implementation of the Defense Production Act for the first time in decades.

Heeding the painful lesson of ventilator shortages by developing a national strategy to manage severe emergency power shortages would represent a crucial and historic critical infrastructure investment.

Roadmap for A National Emergency Power Preparedness Strategy

Important elements of a national emergency power preparedness strategy can be drawn in part from initiatives led by Powered for Patients, a 501(c)(3) non-profit created to address the lessons learned from hospital emergency power failures in previous disasters. The organization is currently leading a multi-year emergency power preparedness initiative for the Los Angeles County Emergency Medical Services (EMS) Agency. The innovative project seeks to ensure that county and municipal agencies, along with electric utilities and critical healthcare facilities, are employing best practices in minimizing threats to emergency power and expediting improved government, utility, and private sector response when threats to emergency power arise during power outages.

The California project builds on previous Powered for Patients' work with the Rhode Island Emergency Management Agency (RIEMA), which launched a similar initiative in 2016. The objective was to enhance emergency power threat reporting and response protocols for Rhode Island's 15 hospitals. The project led to the publication of *Protecting Patients When Disaster Strikes*[1], an adaptable and

1 *Protecting Patients When Disaster Strikes* Playbook

well received playbook on emergency power preparedness.

These two projects benefited from the guidance offered by *Roadmap to Resiliency*, a white paper on emergency power preparedness co-authored by Powered for Patients' founder Eric Cote and Jonathan Flannery, Senior Director of Advocacy for the American Society for Healthcare Engineering, a personal membership group of the American Hospital Association.[2]

Roadmap to Resiliency assessed numerous examples of emergency power failures in previous disasters and detailed the key elements of a national emergency power preparedness strategy, which include:

- Assessing emergency power vulnerability in critical infrastructure facilities based on generator age and the lack of redundant emergency power
- Minimizing risk to emergency power through adoption of best practices in the maintenance and operation of emergency power systems
- Enhancing collaboration and information sharing among emergency power users, government agencies with access to temporary generators and utilities, including the adoption of an early warning system to accelerate emergency power threat notification and response
- Automating early warning through deployment of advanced generator monitoring technology that provides real time, automated e-mail and text notifications to designated personnel when emergency power faces a threat during power outages

Many of these *Roadmap to Resiliency* recommendations were embodied in the Los Angeles County and Rhode Island initiatives.

In Rhode Island, Powered for Patients evaluated the generator threat reporting and response protocols for hospitals and determined that hospitals were required to notify staff from the Rhode Island Department of Health (RIDOH) any time the facility went on or off generator power. Powered for Patients identified a shortcoming in this approach, noting that if a facility was fulfilling this requirement in a situation in which its emergency power system had failed, RIDOH would lose a valuable opportunity to get a head start on evacuation planning or effecting expedited power restoration for the facility. To address this shortcoming, Powered for Patients recommended modifying the protocol to require hospitals to alert a RIDOH official at the first sign of a serious threat to emergency power during a power outage. The definition of a serious threat was defined as a mechanical problem with a generator or low fuel levels that required a call to a service or fuel provider.

2 *Roadmap to Resiliency*

The new protocol was adopted on a voluntary basis by all Rhode Island hospitals, and it was incorporated in *Protecting Patients When Disaster Strike.* This playbook also included a number of best practices largely drawn from FEMA guidance documents on how to minimize the risk of emergency power failures.

Best Practices in Emergency Power Preparedness: The Los Angeles County Project

Powered for Patients' Los Angeles County project built on the success of the Rhode Island initiative and implemented key recommendations in *Roadmap to Resiliency.* The project also allowed Powered for Patients to push the envelope in emergency power preparedness through the development of new best practices.

Among them was the completion of a census of the emergency power systems in all 80 Los Angeles County hospitals that participate in the HHS Hospital Preparedness Program. The census revealed a seriously outdated generator fleet with 87 out of the 271 generators, or 32 percent, being older than 30 years of age, the expected useful life of a generator.[3] The census also identified 15 acute care hospitals that relied on a single-generator and found that the percentage of outdated generators in these single-generator facilities was double the percentage of outdated generators across all hospitals. Nine of these single generator hospitals, or 64 percent, had generators over 30 years of age, including three with generators between 40 and 49 years of age, three with generators between 50 and 59 years of age and one with a generator over 60 years old. The presence of outdated generators was a serious concern to county officials, especially for single generator hospitals with no redundant emergency power.

To address the threat of outdated generators in these facilities, Powered for Patients recommended creation of a risk rating of hospital emergency power systems to help the EMS Agency better anticipate which hospitals' emergency power systems may be at greater risk of failure, and which failures would represent the greatest threat to patients. Facilities with relatively high-risk ratings would include single generator facilities, two-generator facilities with outdated generators and facilities with a below average onsite fuel storage capacity. Single generator facilities, which lack a source of redundant emergency power, would also be flagged for higher risk since the loss of emergency power in such a facility would pose a much greater risk of emergency evacuation than a facility with multiple, redundant generators.

3 The expected useful life of generators and other components of emergency power systems was detailed in a Life Expectancy Table on page 14 of *Roadmap to Resiliency*, a white paper co-authored by Eric Cote, founder of Powered for Patients and Jonathan Flannery, Senior Director of Advocacy for the American Society of Healthcare Engineering, a personal membership group of the American Hospital Association.

Similar to its Rhode Island recommendations, Powered for Patients advocated the adoption of an early warning protocol in Los Angeles County. However, the approach recommended in Los Angeles County included the groundbreaking deployment of the automated, real time emergency power monitoring technology specified in *Roadmap to Resiliency*.

This deployment was made possible in part through a $300,000 investment by the Department of Homeland Security in 2018 in a Powered for Patients initiative to spur advances in generator monitoring technology that would provide an early warning to government officials and utilities when critical facilities face a threat to emergency power during an outage. An outcome of the project was the P.I.O.N.E.E.R.® Tool, which provides automated, real-time alerts to designated individuals anytime a hospital generator experiences a mechanical problem during a power outage. P.I.O.N.E.E.R., which stands for Power Information Needed to Expedite Emergency Response, marks a major improvement in situational awareness to enable accelerated deployment of government generators and provide a valuable head start in planning for a potential hospital evacuation. The early warnings will also give utilities the opportunity to quickly assess options for prioritized power restoration including switching feeder lines to a hospital in cases where two lines exist and one of them is still able to provide power to the hospital.

In June 2021, the Los Angeles County EMS Agency offered funding for the deployment of P.I.O.N.E.E.R. to the county's 14 single-generator hospitals that participate in the HHS Hospital Preparedness Program. As of December 2021, two of the 14 facilities had done so and outreach to the remaining hospitals is underway. These initial deployments represent the first time a U.S. hospital is making automated, real-time generator threat alerts available to government emergency managers.

Another novel approach in Los Angeles County was the creation of an Emergency Power Industry Working Group, a Powered for Patients recommendation to provide a formal structure for enhanced pre- and post-disaster coordination between government agencies and the generator service, fuel, and rental industry. Stepped-up coordination will facilitate faster responses by government officials in addressing obstacles impeding the ability of generator service, fuel, and rental providers to quickly meet the needs of healthcare clients during an outage. The Working Group would also facilitate close collaboration to support deployment decisions involving government or private sector emergency power assets during an outage. This is an especially important process in Los Angeles County given the sizeable fleet of temporary generators owned collectively by Los Angeles County government and the cities of Los Angeles and Long Beach.

A Warning for the Nation's Emergency Power Fleet

Emergency managers and public health officials across the country should take note of the recent census of emergency power systems in Los Angeles County

hospitals. To the extent that the number of outdated generators in single-generator hospitals in Los Angeles County reflects equipment shortcomings across the country, Powered for Patients estimates that as many as 809 acute care hospitals in the United States operate with a single generator with 518 of these facilities relying on a generator over 30 years of age.[4] There are no federal or state requirements that limit the age of a hospital generator as long as the generator passes periodic testing. However, these tests do not approximate the actual challenge an aging generator would face if it were required to operate continuously over an extended timeframe.

The Table 1 extrapolates the findings in Los Angeles County relative to generator age and details the projected number of generators by age category in the estimated 809 single generator, acute care hospitals in the U.S. To the extent that these age characteristics are reflective of generator ages in other single generator critical infrastructure facilities, such as water and wastewater treatment facilities, 911 call centers and other public safety facilities, the magnitude of this problem is even greater.

Table 1. Extrapolating Los Angeles County hospital single generator and generator age data to the national level

Hospital Age Range	Number Generators in Los Angeles Single Generator Acute Care Hospitals	Percent of Total	Projected Number of Generators in Single Generator Acute Care Hospitals in United States
0 to 9 years	3	20.0%	161
10 to 19 years	1	6.6%	53
20 to 29 years	2	13.3%	107
30 to 39 years	2	13.3%	107
40 to 49 years	3	20.0%	161
50 to 59 years	3	20.0%	161
60 to 69 years	1	6.6%	53
TOTAL NUMBER HOSPITALS:	15		809

4 The census of hospital emergency power systems in Los Angeles County recently completed by Powered for Patients identified 15 single generator, acute care hospitals, which represents approximately 17 percent of the acute care hospitals in Los Angeles County. The census also determined the age of each hospital generator. The Centers for Medicare and Medicaid Services (CMS) estimates that there are 4,749 acute care hospitals in the U.S. If the number of single generator hospitals in Los Angeles County and the ages of these generators are extrapolated across the U.S., there would be 809 single generator hospitals in the country, with 518 of these facilities relying on a generator 30 years old or older.

Federal and State Laws on Healthcare Emergency Power Vulnerability

Key elements of the work Powered for Patients implemented in Los Angeles County and Rhode Island reflect the intent of federal and state policy makers who have enacted various laws and regulations to help boost emergency power preparedness in critical healthcare facilities. Notable examples include the CMS Emergency Preparedness Rule, enacted in November 2017, the federal Disaster Recovery Reform Act of 2018, and Florida's highly stringent emergency power requirements for nursing homes.

When officials at the U.S. Department of Health and Human Services and the Centers for Medicare and Medicaid Services (CMS) first proposed the CMS Emergency Preparedness Rule in December 2013, the Rule sought to identify generators more likely to fail during an outage. The proposed approach was to make the four-hour generator test hospitals had to conduct every three years an annual obligation. The rationale was that if hospital generators had to be tested for a four-hour period every year instead of only once every three years, more generators prone to mechanical problems would fail the annual test. This would help identify problem generators that could be replaced or repaired before a disaster struck. The hospital industry strongly opposed this measure, arguing that a four-hour test conducted annually was not a cost-effective way to identify generators at greater risk of failure. HHS officials ultimately scrapped that proposal.

The debate would probably have turned out differently if there was greater awareness of the number of single generator hospitals in the country and the percentage of these facilities relying on outdated generators. There was no distinction in the proposed rule between hospitals with ten generators and those with a single generator, nor a focus on risks facing patients in a hospital with no redundant emergency power. Again, if more were known at the time about the number of seriously outdated generators in single-generator hospitals, the proposed rule might have addressed this vulnerability.

Greater awareness of seriously outdated hospital generators will hopefully change the debate when updates to the CMS Emergency Preparedness Rule are considered or when other regulations or laws are proposed. When Powered for Patients briefs government officials about the number of outdated generators in single-generator hospitals, they are often incredulous. It is imperative that responsible officials take a closer look at this issue and develop regulatory approaches to ensure patient safety in these facilities. For example, a requirement could be considered to require single generator hospitals with older generators to install generator monitoring systems, like Power P.I.O.N.E.E.R. This would broaden the number of hospital personnel, service providers and designated government points of contact who receive real time alerts when an older generator in a single-generator hospital experiences a mechanical problem while operating.

Conclusion

The American Society for Civil Engineering's Report Card for America's Infrastructure grades the state of national infrastructure. At present, healthcare is not among the infrastructure categories graded. Powered for Patients has made an important contribution on this front, documenting the number of seriously outdated generators currently in use in Los Angeles County hospitals, extrapolating those findings to broader geographic areas, proposing common sense solutions, and integrating action with emergency responders in the appropriate jurisdictions.

Work undertaken in Los Angeles County and Rhode Island represent a model that other states can follow to significantly bolster emergency power preparedness, not only for critical healthcare facilities but for all types of critical infrastructure. To this end, the $1.2 trillion infrastructure bill President Biden signed into law in November 2021 may represent the greatest opportunity to date to secure federal funding for the development of a comprehensive national emergency power preparedness strategy. The measure provides billions of dollars in funding for grants to utilities and states from the U.S. Department of Energy to reduce the likelihood and consequences of power outages. Portions of this funding can also be used to help states enhance Energy Security Plans.

Either of these funding channels could enable jurisdictions to implement the steps recommended in *Roadmap to Resiliency* and undertake programs similar to the work that Powered for Patients has advanced in Los Angeles County and Rhode Island. The infrastructure bill also provides funding for the deployment of monitoring and control technologies to minimize the impact of power outages, a provision that could support broader deployment of the Power P.I.O.N.E.E.R. Tool to monitor emergency power systems in critical infrastructure facilities.

A national emergency power preparedness strategy is imperative. Achieving success on this vital mission will require a commitment by the U.S. Department of Energy to use the new tools provided in the Infrastructure Bill to help close the gap the nation faces in emergency power preparedness.

Capsule Bio

Eric Cote is Project Director for Powered for Patients, a 501(c)(3) non-profit that addresses lessons learned from hospital emergency power failures in disasters. The organization has developed cutting-edge approaches to safeguard emergency power and accelerate government, utility, and private sector responses when emergency power is threatened. As a former senior advisor and press secretary to a governor and member of Congress, Mr. Cote has strong understanding of public policy and message development—skills that have enhanced his effectiveness as

an advocate for improved emergency power preparedness. In 2014, with funding from the U.S. Department of Health and Human Services, Office of the Assistant Secretary for Preparedness and Response (ASPR), Powered for Patients convened its inaugural stakeholder meeting in Washington, D.C. Since that initial funding, major Powered for Patients initiatives have included a FEMA-funded stakeholder engagement project with the Rhode Island Emergency Management Agency and work with the American Hospital Association and the American Society for Healthcare Engineering. The latter culminated in the publication of *Roadmap to Resiliency*, a white paper on advanced technologies and best practices to improve hospital resiliency by safeguarding emergency power. In addition to other core initiatives, he is working in support of a CDC-funded effort led by the Association of State and Territorial Health Officials (ASTHO) to develop new approaches to address the emergency power needs of individuals who rely on electric-powered medical devices in their homes during power outages.