Case Study: Generator Failure During Power Outage following Hurricane Isaias Underscores Heightened Risk to Patients in Single Generator Facilities

Incident Highlights:

Impacted Facility:
Jeanne Jugan Residence, 43-patient Skilled Nursing Facility in Pawtucket, RI

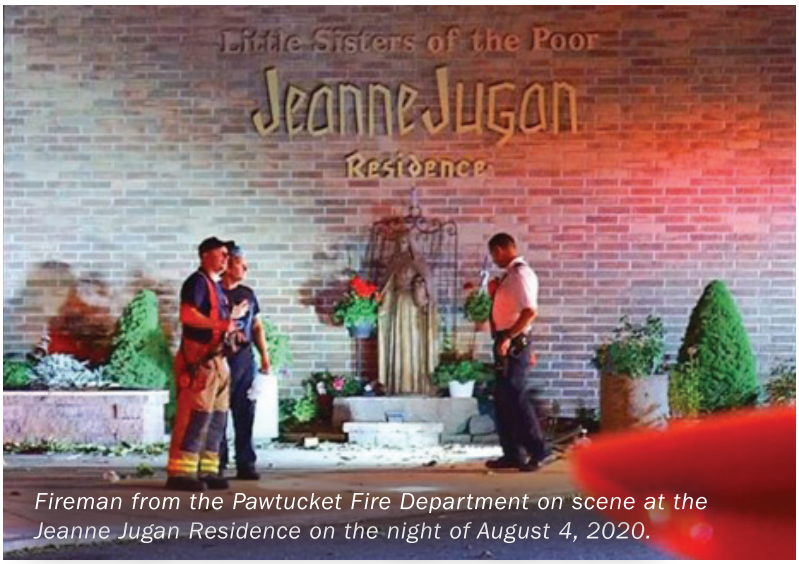
Date of Incident:
August 4, 2020

Cause of Power Outage:
Hurricane Isaias

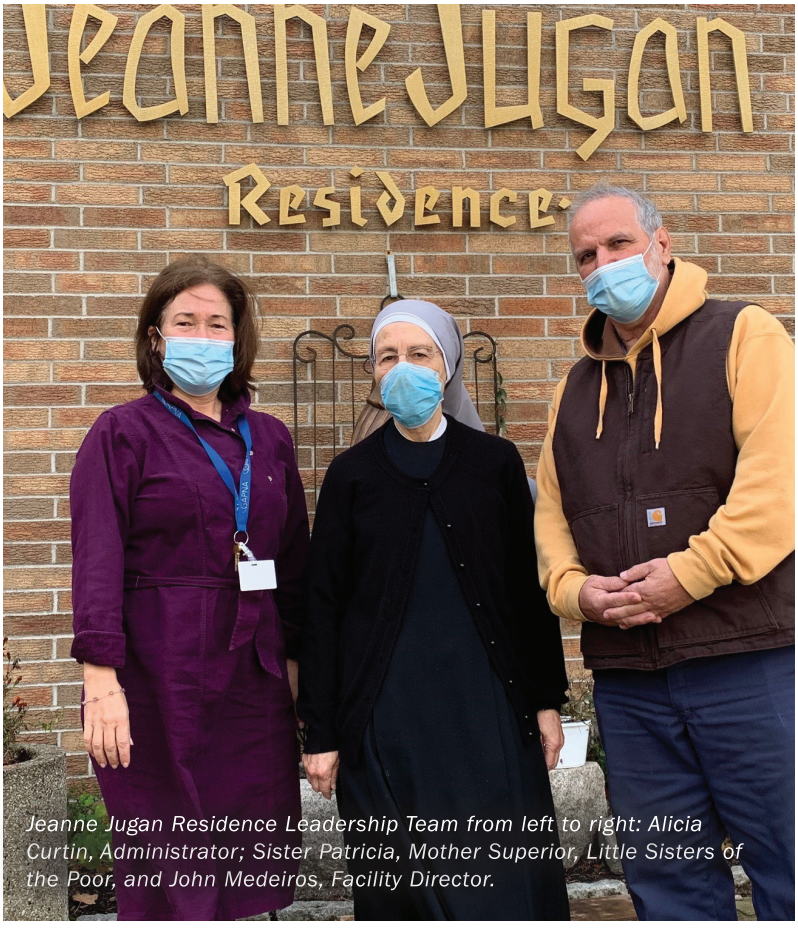
Emergency Power System:
Single, 42-year old, 300 kW generator

Mode of Generator Failure:
Failed relay switch disabled cooling fan, triggering generator overheating and catastrophic failure

Patient Impact:
Multiple elderly patients dependent on electric-powered oxygen concentrators and CPAP machines were transferred from facility during an emergency evacuation ordered by the Pawtucket Fire Department. No injuries occurred.



Fireman from the Pawtucket Fire Department on scene at the Jeanne Jugan Residence on the night of August 4, 2020.



Jeanne Jugan Residence Leadership Team from left to right: Alicia Curtin, Administrator; Sister Patricia, Mother Superior, Little Sisters of the Poor, and John Medeiros, Facility Director.

Emergency Power Lessons Learned:

Lesson #1: Use of a generator well beyond its expected useful life puts a facility at serious risk as older generators lack modern features such as an automatic shutdown when the lack of sufficient coolant fluid is detected.

Lesson #2: Lack of knowledge about availability of replacement devices for electricity-dependent patients from the local fire department delayed a decision to shut down a dangerously overheating generator, leading to a catastrophic, unrepairable and extremely costly generator failure.

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Recommended Best Practices:

Based on the lessons learned from the emergency power failure at the Jeanne Jugan Residence on August 4, 2020, Powered for Patients is recommending adoption of the following best practices for all hospitals and skilled nursing facilities that operate with a single generator:

- Deployment of the P.I.O.N.E.E.R. tool to provide real time alerts to emergency managers, public health officials and utilities when a serious mechanical threat to emergency power unfolds. P.I.O.N.E.E.R. stands for Power Information Needed to Expedite Emergency Response. With real time alerts, government officials, utilities and service providers can accelerate their response to impacted facilities. P.I.O.N.E.E.R. tool deployment is especially important for any facility with a single generator that is 25 years or older as these older models often lack automatic shutoff devices that can prevent serious damage to a generator when certain malfunctions occur. The P.I.O.N.E.E.R. tool can monitor these critical functions on older generators and provide real time warning when an alarm threshold is triggered that warrants shutting down a generator to prevent irreversible damage.

- Clinical staff should maintain a current list of all electricity-dependent patients that identifies patients by name, room number and type of electric-powered medical device. This information can inform evacuation planning and deployment of necessary back up equipment.

- A facility's emergency management coordinator should liaise with local fire department, public health officials and emergency managers to determine availability of emergency generators, portable oxygen tanks and other equipment that could be deployed to a facility to avert or delay the need for evacuation.

Initial temporary generator provided to the Jeanne Jugan Residence provided by the Rhode Island emergency management agency.


Rack of portable oxygen tanks that were among those brought to the Jeanne Jugan Residence by the Pawtucket Fire Department to replace the battery-powered tanks used by residents following their facility's loss of emergency power.


Ambulances from the Pawtucket Fire Department and surrounding communities stand by to assist with the evacuation of residents from the Jeanne Jugan Residence on the night of August 4, 2020

Takeaways from Key Players:

Alicia Curtin, Administrator of the Jeanne Jugan Residence, credits the RI Department of Health, the Healthcare Coalition of Rhode Island, which helped create the Rhode Island Long Term Care Mutual Aid Plan, and the Pawtucket Emergency Management Agency for helping to prepare facility staff for the emergency they faced on August 4, 2020 through past exercises and training. She also lauded these organizations, along with the Pawtucket Fire Department, for their support on the night of the incident.

- "Our entire staff pulled together during this incident and worked tirelessly to protect our patients at a time when they were vulnerable," said Curtin. "We couldn't have responded the way we did if it weren't for the training and support we received in becoming a better prepared facility and we certainly wouldn't have been able to manage the incident as effectively without the support from these agencies and their leaders."

- Sister Patricia added to Curtin's gratitude, singling out several individuals for praise. "On behalf of our patients and our staff, I want to thank Alysia Mihalakos from the Department of Health, Dawn Lewis from the Healthcare Coalition of Rhode Island and Dave Deloge from the Pawtucket EMA for their hard work in responding to us at a time of great need. Their professionalism and dedication is deeply appreciated."

- Sister Patricia noted that the support from these three extended beyond the incident with hot washes to assess lessons learned facilitated by Dawn Lewis with engagement from Mihalakos and Deloge. "We all took a hard look at what worked well and what we could do better next time. I know these lessons will help inform future training and exercises so other nursing homes can learn from our difficult experience."

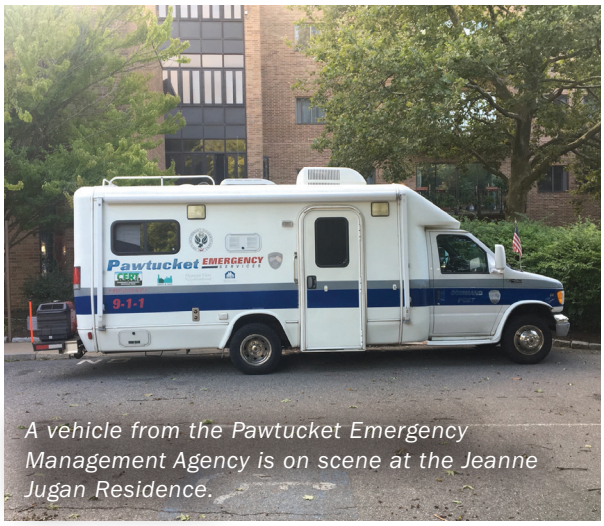
Team of firefighters from the Pawtucket Fire Department that responded multiple times to the Jeanne Jugan Residence on August 4, 2020 after a power outage caused by Hurricane Isaias led to the failure of the nursing home's only generator. The loss of emergency power triggered an emergency evacuation of 11 elderly patients who were relying on electric-powered oxygen concentrators and CPAP machines. Each of these firefighters were involved in carrying elderly residents in special evacuation chairs down darkened stairwells during the evacuation. From left to right: Firefighter Steve Bejma, Firefighter Shawn Bailey, Firefighter Adam Dauplaise, Firefighter Scott McDonald, Battalion Chief David Carraio, Captain Paul Guay and Firefighter Kevin Keenan.

Status of Replacement of Generator at Jeanne Jugan Residence:

As of October 2020, two months after the loss of the facility's only generator, a temporary 350 kW generator continued meeting the facility's emergency power needs pending installation of a permanent replacement. John Medeiros and facility administrators have been working with an electrical engineering contractor to develop a new emergency power design for the facility.

A key consideration in sizing the new generator is meeting the requirements of the CMS Emergency Preparedness Rule which took effect in November 2017. The rule was developed by the Centers for Medicare and Medicaid Services (CMS) to address lessons learned in previous natural disasters that triggered emergency power failures which, in some cases, led to patient fatalities. Among the requirements of the CMS Emergency Preparedness Rule is that hospitals and skilled nursing facilities have some portion of their HVAC system connected to emergency power to ensure that temperatures in patient care areas never exceed 81 degrees during a power outage.

The Jeanne Jugan Residence sought to achieve compliance with the CMS Emergency Preparedness Rule by having an HVAC unit in the first-floor auditorium connected to emergency power. Among the positive outcomes in an otherwise unfortunate incident for the facility will be a modern emergency power system that will provide emergency power support for the entire HVAC system. This enhancement will eliminate the need to bring residents into the auditorium for cooling purposes since air conditioning in individual patient rooms will be supported by emergency power.



A vehicle from the Pawtucket Emergency Management Agency is on scene at the Jeanne Jugan Residence.

Small portable generators like this one from the City of Pawtucket provided emergency lighting for the Jeanne Jugan Residence after its generator failed.


Hurricane Isaias damage in Rhode Island

Detailed Timeline of Power Outage and Subsequent Generator Failure following Hurricane Isaias that Triggered an Emergency Evacuation at a Single Generator Skilled Nursing Facility in Pawtucket, RI

On August 4, 2020, as Hurricane Isaias barreled up the east coast, tropical force winds triggered widespread power outages in Rhode Island, cutting power to over 140,000 residents. Among those impacted were the 42 patients at the Jeanne Jugan Residence, a skilled nursing facility in Pawtucket, RI operated by Sisters of the Poor that relied on a single, 42-year old 300 kW generator. At the time of the incident, COVID was still a major risk factor and extreme care had been taken to avoid any coronavirus infections among the residents.

Hurricane Isaias damage in Rhode Island

The following timeline chronicles the key events during the power outage that culminated with an emergency evacuation of 11 elderly, electricity-dependent patients. Times noted are approximate based on interviews with facility administrators, the incident commander from the Pawtucket Fire Department and the service managers from Superior Generator, the generator service provider for the facility, and Superior Electric, the electrical contractor for the facility.

4:30 PM Power is lost at the Jeanne Jugan Residence

Single, 300 kW Caterpillar generator comes on-line within 10 seconds

6:00 PM A relay switch that controls the generator's radiator cooling fan fails, preventing the radiator from cooling the generator, triggering a dangerous sequence of events. The radiator is located outside the building along Anthony Avenue, a residential street abutting the nursing home.

6:15 PM As the temperature of the radiator fluid continues rising dangerously without the benefit of the cooling fan, the pressure exerted by the overheating radiator fluid blows the cap off the radiator, spewing radiator fluid and creating an intense amount of steam.

6:20 PM A resident of Anthony Avenue calls the Pawtucket Fire Department to report what appears to be a fire at the Jeanne Jugan Residence.

6:25 PM

Pawtucket Fire Department responds to the scene, led by Battalion Chief David Carraio. Laurence "Skip" Crouse, the Deputy Maintenance Supervisor, is notified that the fire department is on the scene and goes to the generator to assess the situation. Crause notifies the generator service provider and his boss, Maintenance Supervisor John Medeiros, who leaves his home to return to the facility.

7:07 PM

(actual confirmed arrival time) – A technician from Superior Generator arrives on scene. Maintenance Supervisor John Medeiros arrives shortly thereafter.

Technician begins working to try and restart radiator cooling fan but is unable to make repair. Recommends shutting off the generator to prevent further overheating and allow more time to make repair. Battalion Chief Cairrao echoes this recommendation to minimize the amount of steam on Anthony Avenue, the residential street adjacent to the nursing home.

Due to concerns about electricity-dependent patients, maintenance staff are unwilling to shut off emergency power.

7:15 PM

A second call is made to the Pawtucket Fire Department from an Anthony Avenue resident reporting continuing smoke, bringing Battalion Chief Cairrao back to the scene. He reiterates the suggestion that emergency power be shut off and advises facility administrators to prepare to implement their emergecy response plan in the event of a loss of emergency power.

7:30 PM

Maintenance Supervisor John Medeiros contacts his electrical contractor, Superior Electric, to advise of the failing generator and request assistance in repairing the generator's failed electrical switch.

7:50 PM

The third call is made to the Pawtucket Fire Department from an Anthony Avenue resident reporting intensifying smoke billowing from the radiator area outside the Jeanne Jugan Residence. The thick smoke made it impossible to open windows on the building's upper floors where the lack of air conditioning amid high temperatures and elevated humidity made for an uncomfortable environment and exacerbated breathing challenges for the oxygen dependent residents.

8:00 PM

Battalion Chief Cairrao makes his third and final visit to the nursing home and immediately knows that the smoke at this point is not just the steam from the failed radiator but generator oil burning as the generator's temperature continues to rise dangerously without the benefit of any cooling fluid.

8:00 PM CONTINUED

Cairrao and John Medeiros walk up stairs to speak with facility administrators to determine the impact shutting off the generator would have on patients. Moments after starting this discussion, the generator reached an estimated 225 degrees, triggering a catastrophic and irreversible failure that cut emergency power to the facility.

Pawtucket Fire Department Battalion Chief Dave Carraio. Carraio led the department's response to the Jeanne Jugan Residence during three separate calls to the facility on the night of August 4, 2020.

Exit lighting transitioned to battery power as nurses and staff moved room to room, turning on battery powered lanterns and calming patients. Backup batteries on oxygen concentrators kicked in, maintaining oxygen for a number of residents. The 3-hour life of the batteries added urgency to the situation and accelerated evacuation planning.

Administrators and staff began contacting officials from the RI Department of Health to initiate the Long Term Care Mutual Aid Plan, triggering calls between state officials, facility administrators and National Grid, the state's electric utility.

Small portable generators on fire trucks that had responded enabled emergency lighting to be brought into a large function room on the facility's first floor, which became a staging area for patients who would later be evacuated.

As the conversations between facility administrators and state officials continued, Battalion Chief Cairrao asked for details about the emergency response plan and how many power dependent patients the facility had. Administrators said they had a list of these patients and could contact nearby nursing homes to receive their evacuated patients who would be transported by private ambulances available through the mutual aid program. Concerns about exposing patients to COVID during the evacuation process were paramount.

"At this point, it was just me and one other engine company on scene," said Cairrao. "The clock was ticking in terms of the patients on oxygen and I was growing concerned that it was going to take too long to implement the evacuation plan with private ambulances. I made the decision to order a first alarm response."

Within minutes, 3 engine companies, with 9 fire fighters including a ladder truck, along with three ambulances were on site, bringing the total number

8:00 PM CONTINUED

of firefighters on scene to 19. Cairrao also ordered ten additional municipal ambulances and all available portable oxygen tanks to the facility.
The Pawtucket Fire Department and the city's public safety director both tried to contact National Grid to alert them to the failed generator and request prioritized restoration for the facility. Given the number of power outages across the state, it took 18 minutes for the fire department's dispatch center to get through but they were put on hold. Cairrao contacted Tina Goncalves, Pawtucket's public safety director and asked her to contact National Grid. She was able to get in touch with National Grid through an emergency NGRID phone number made available to her and she made the request for expedited restoration. By this time, if not before, National Grid had likely heard from state health officials about the failed generator at the nursing home with a request for prioritized restoration.

Firefighters began evacuating patients to the first-floor function room and the nursing home's battery-powered oxygen tanks were replaced one by one with portable oxygen tanks from the Pawtucket Fire Department. Calls organizing by the Rhode Island Department of Health continued, and the administrator asked Cairrao to join one of the discussions.

With the assets he needed on hand to handle the evacuation, Cairrao decided he wouldn't wait for private ambulances to arrive. Firefighters and EMTs began evacuating the oxygen-dependent patients to nearby hospitals. "My biggest concern was getting these patients to a facility where I knew they could have an unlimited supply of oxygen," said Cairrao.

8:30 PM

Electricians from Superior Electric arrive at the Jeanne Jugan Residence and learn that the facility's generator suffered a catastrophic failure a short while earlier. They provide input to John Medeiros, Battalion Chief Cairrao and others about the size of the temporary generator needed to meet the facility's emergency power needs.

9:00 PM

As efforts to locate a temporary generator continue, Superior Electric contacts personnel from Graybar Electrical Supply, which opens a nearby distribution facility to provide electricians with the cabling needed to connect whatever temporary generator will be deployed to the nursing home.

10:00 PM

A Superior Electric team member heads to the nearby distribution facility to pick up electrical supplies while his colleague begins preparations to install a temporary generator as efforts by Pawtucket and state officials to locate a generator intensify.

August 5, 2020

12:20 AM

Battalion Chief Cairrao leaves the facility. He credits the administrators and staff of the Jeanne Jugan Residence for their response to the emergency. “Everybody was great to work with during a very difficult situation,” said Cairrao. “For me, the key take away from this incident is that you have to really know your emergency response plan and be able to implement it very quickly.”

2:00 AM

A 100 kW temporary generator from the RI Emergency Management Agency arrives on site.

Electricians from Superior Electric begin work connecting generator to the facility’s electrical panel.

2:17 AM

National Grid restores power to the facility

4:30 AM

Electricians from Superior Electric complete installation of the temporary 100 kw generator from RIEMA. Upon testing generator, electricians realized that they had wired the generator to the wrong rotation settings. They begin the rewiring process.

5:00 AM

Electricians completed the rewiring process, restoring partial emergency power availability for the facility.

For more information about this case study, or other work by Powered for Patients, please contact:

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