POWERED For Patients™
Advancing Backup Power & Power Restoration for Critical Healthcare Facilities

Emergency Power Reliability Considerations for Emergency Managers and Public Health Officials Regarding Hospitals and Skilled Nursing Facilities Treating Coronavirus Patients – March 11, 2020

As federal, state and local public health officials and emergency managers collaborate with hospitals and skilled nursing facilities in the collective battle to tackle the coronavirus threat, Powered for Patients is providing the following guidance relating to critical healthcare facilities whose emergency power system relies on a single generator.

Powered for Patients has continued to monitor news reports about a potential shortage of respirators should the scale of the outbreak reach a level where tens of thousands of Americans need respirators. Hopefully things won't get to that point but emergency managers and public health leaders need to prepare for all possibilities. On this front, Powered for Patients has provided guidance material to federal, state and local public health officials about the risk associated with emergency power systems that rely on a single generator through their national organizations (NEMA, IAEM, ASTHO, NACCHO).

While a respirator can be operated manually by clinicians to keep a patient alive, this is only done for short periods of time in extreme situations when utility or emergency power is not available. As such, emergency power reliability becomes an even more important issue if there is widespread use of respirators in hard hit areas of the country.

An estimated 16% of U.S. hospitals use only a single generator and nearly all Skilled Nursing Facilities (SNFs), including those licensed to provide respirator care for patients, rely on a single generator. Facilities relying on a single generator for emergency power support have no redundant emergency power in the event that their single generator fails. This represents an increased risk that should be considered by public health officials and those operating hospitals and SNFs with single generator emergency power systems.

It's important to note that with proper maintenance, single generators may have a low risk of failure. Yet, the consequences of losing emergency power in a facility with a single generator are for more serious than the loss of a single generator in a facility with multiple generators.

Testing Recommendation

Facilities currently treating or slated to receive Coronavirus patients should consider testing their emergency power system prior to receiving patients (or prior to receiving additional patients.) This suggestion reflects a lesson learned this past fall in California. In the face of a warning from Southern California Edison (SCE) of a pending Public Safety Power Shutoff (PSPS), a hospital took the pro-active step of testing its two generators. The test triggered the failure of one of the hospital's two generators and repair of the failed unit took a significant amount of time. Fortunately in this case, the PSPS was never triggered so the facility continued operating on utility power.

During a second SCE Public Safety Power Shutoff last year, a hospital just outside of Los Angeles County suffered a failure of its emergency power system. Thankfully in this case, the hospital was served by two lines from SCE and the utility was able to maintain utility power to the hospital through the secondary line. Failures of emergency power during last year's Public Safety Power Shut Offs were not limited to

hospitals. During a Pacific Gas & Electric shut off, five sub-acute skilled nursing facilities licensed to provide respirator care suffered failures of emergency power. These hospital and nursing home emergency power system failures underscore the reality that even with proper maintenance and testing, emergency power systems can and do fail.

A test of an emergency power system prior to receiving a coronavirus patient can provide peace of mind that a facility's emergency power system is working properly. Should this test trigger a failure, a facility has the opportunity to quickly address the problem with its service provider while utility power is still available.

Best Practices in Safeguarding Emergency Power

In 2017, Powered for Patients, in conjunction with the Rhode Island Emergency Management Agency, published *Protecting Patients When Disaster Strikes*, an emergency power resilience Playbook that detailed the critical steps key stakeholders can take to safeguard emergency power and expedite prioritized power restoration when emergency power failures cannot be avoided. This Playbook includes information from FEMA Guidance Document P-1019 that includes a checklist of steps facility managers can take before, during and after disasters to minimize the risk of an emergency power system failure. The Playbook also includes a spare parts inventory and fuel consumption checklist that facility managers can use to stay on top of fuel supply and help ensure that sufficient generator supplies and consumables are on hand at a facility at all times. Both of these resources are provided in the pages below.

Any individuals needing additional information about emergency power resilience can contact Powered for Patients Project Director Eric Cote at cote@poweredforpatients.org or by calling 401-374-8500.

Table D-1 Checklist for Emergency Planning Prior to Emergency or Disaster for Emergency Power Supply System from FEMA P-1019 Guidebook

1. **Combustion Air Intake and Exhaust Systems**
   - ☐ a. Louvers Operational with no restricted movement and no obstructions
   - ☐ b. Rain cap has no restricted movement
   - ☐ c. Exhaust piping has no foreign object blockage, i.e., bird and rodent nesting, condensation drained
2. **Batteries**
   - ☐ a. Batteries installed in conditioned air space to avoid temperature extremes
   - ☐ b. Interconnecting cables sized to compensate for voltage drop
   - ☐ c. Charging system operational and alarms tested
   - ☐ d. Specific gravity and voltages checked and acceptable
   - ☐ e. Cable connections corrosion free and tight on both ends
3. **Generator set controller**
   - ☐ a. All lock-out faults investigated, corrected, and cleared
   - ☐ b. AUTO start engaged
4. **Output circuit breakers**
   - ☐ a. Closed or ready and able to close if electrically operated
5. **Load cables**
   - ☐ a. Clean and terminations checked for proper spacing and torque
6. **Engine block, generator space heaters, circulating pump(s)**
   - ☐ a. Operational and circulating warm coolant and oil (if equipped with pump)
7. **Fuel Delivery System**
   - ☐ a. Fuel quality tested and storage vessels maintained to prevent water accumulation and bacterial growth
   - ☐ b. Storage vessels, including day tanks, topped to appropriate levels
   - ☐ c. Fuel transfer pumps powered by emergency system and periodically tested
   - ☐ d. Preferred customer agreements in place with fuel suppliers to assure delivery
8. **Engine oil**
   - ☐ a. Low run time, capable of at least 48-hours continuous run time
   - ☐ b. Level proper
   - ☐ c. Scheduled Oil Sample results reviewed and proper actions taken
   - ☐ d. Spare oil and delivery methods, i.e. funnels, pumps, drum carts, etc. nearby
   - ☐ e. Leaks inspected and corrected
9. **Consumables - 10-day supply (minimum) in on-site storage**
   - ☐ a. Fuel filters
   - ☐ b. Oil filters
   - ☐ c. Air filters
   - ☐ d. Oil
   - ☐ e. Coolant
10. **Local, state, and federal authorities and service organizations**
    - ☐ a. Emergency plans developed
    - ☐ b. Road maintenance crews aware and in agreement that site's public access is critical and shall be maintained at all times to allow emergency vehicle passage
    - ☐ c. Aware and in agreement that fuel delivery and engine generator set parts and service organizations are to be considered and labeled as emergency vehicles with authorized site passage
11. **Communications**
    - ☐ a. Portable cell towers available and capable of being placed and made operational in short time
    - ☐ b. Site two-way radios and cell phones charged and fully operational
    - ☐ c. Site data reception and transmission systems inspected and proper operation tested with remote facilities and personnel
12. **Generator**
    - ☐ a. Windings clean
    - ☐ b. Space heaters operational
    - ☐ c. Bearings properly greased
    - ☐ d. Air intake and exhaust air paths cleaned of dirt, debris and obstructions
13. **Cooling System**
    - ☐ a. Proper levels
    - ☐ b. Leaks inspected and corrected as needed

D-2 Emergency Power Supply System Checklist for Operating During Emergency from FEMA P-1019 Guidebook

1. Combustion Air Intake

- ☐ a. Louvers Operational with no restricted movement and no obstructions

2. Output Circuit Breakers

- ☐ a. Closed or ready and able to close if electricity operated

3. Fuel Delivery System

- ☐ a. Fuel quality tested and storage vessels maintained to prevent water accumulation and bacterial growth
- ☐ b. Storage vessels, including day tanks, topped to appropriate levels
- ☐ c. Fuel transfer pumps powered by emergency system and periodically tested
- ☐ d. Water separators drained

4. Engine oil

- ☐ a. Level checked periodically and determined proper

5. Consumables – Restock to 10 day supply (minimum) in on-site storage

- ☐ a. Fuel filters
- ☐ b. Oil filters
- ☐ c. Air filters
- ☐ d. Oil
- ☐ e. Coolant

6. Local, State and Federal Authorities and Service Organizations

- ☐ a. Emergency plans implemented
- ☐ b. Road maintenance crews maintaining site's public access
- ☐ c. Fuel delivery and engine generator set parts and service organizations allowed site access
- ☐ d. Service organizations implementing emergency plans to assure effective support staffing is available and capable

7. Communications

- ☐ a. Portable cell towers available and capable of being placed and made operational in short time
- ☐ b. Site two-way radios and cell phones charged and fully operational
- ☐ c. Site data reception and transmission systems properly operating

8. Generator

- ☐ a. Winding temperatures acceptable
- ☐ b. Bearings properly greased
- ☐ c. Air intake and exhaust air paths cleared of debris and obstructions
- ☐ d. Stable output voltage and frequency
- ☐ e. Ensure safe and easy access to Generators, Switchgear, Transfer Switches & Fuel Systems. Make sure that all debris is cleared from around your emergency power generators. Also, move or remove vehicles, trash compactors, containers, and other items that may block access to personnel and service trucks, including fuel providers.
- ☐ f. Behind fuel system problems, cooling system failures are the second most common source of failure during extended run times. Be sure that coolant is topped off to the proper level and that all hoses are free of leaks. Ensure that radiators are free of debris and that the radiator fan is working properly.
- ☐ g. Make sure that generators, switchgear, transfer switches and pumps are all in the On and/or Auto setting.

9. Condition Monitoring

- ☐ a. Receiving data
- ☐ b. Results normal

D-3 Emergency Power Supply System Checklist for Recovery Following Emergency from FEMA P-1019 Guidebook

1. Combustion Air Intake and Exhaust Systems
- ☐ a. Louvers closed and no obstructions
- ☐ b. Rain cap closed
- ☐ c. Exhaust piping inspected and drain condensation
- ☐ d. Inspect for wet stacking and develop corrective action plan

2. Batteries
- ☐ a. Charging system operational and alarms tested
- ☐ b. Specific gravity and voltages checked and accepted
- ☐ c. Cable connections corrosion free and tight on both ends

3. Generator set controller
- ☐ a. All lock-out faults investigated, corrected and cleared
- ☐ b. AUTO start engaged

4. Output circuit breakers
- ☐ a. Closed or ready and able to close if electrically operated

5. Load cables
- ☐ a. Cleaned and terminations checked for proper spacing and torque

6. Engine block, generator space heaters, circulating pump(s)
- ☐ a. Operational and circulating warm coolant and oil (if equipped with a pump)

7. Fuel delivery system
- ☐ a. Fuel quality tested and storage vessels maintained to prevent water accumulation and bacterial growth
- ☐ b. Storage vessels, including day tanks, topped to appropriate levels

8. Engine Oil
- ☐ a. Change oil and filter(s) and sample as needed
- ☐ b. Level proper

9. Consumables - Re-stock 10 day supply (minimum) in on-site storage
- ☐ a. Fuel filters
- ☐ b. Oil filters
- ☐ c. Air filters
- ☐ d. Oil
- ☐ e. Coolant

10. Local, State and Federal Authorities and Service Organizations
- ☐ a. Emergency plans reviewed and improved
- ☐ b. Road maintenance crews remove debris and repair damage to allow site access
- ☐ c. Service organization emergency plans reviewed and improved

11. Communications
- ☐ a. Portable cell towers retracted, maintained and properly stored
- ☐ b. Site two-way radios and cell phones charged and fully operational
- ☐ c. Site data reception and transmission systems inspected and proper operation tested with remote facilities and personnel

12. Insulation system test conducted and results analyzed to detect erosion
- ☐ a. Space heaters operational
- ☐ b. Air intake and exhaust air paths cleared of debris and obstructions
- ☐ c. Air gap between rotor pole and stator measured at 12:00, 3:00, 6:00, and 9:00 positions, recorded, and analyzed to detect bearing wear or misalignment
- ☐ d. Excitation system inspected and tested
- ☐ e. Voltage regulator connections inspected and properly torqued
- ☐ f. Insulation system test conducted and results analyzed to detect erosion properly operating

13. Cooling System
- ☐ a. Proper levels
- ☐ b. Drain, flush and replace coolant as needed
- ☐ c. Inspect and correct leaks

Inventory of Key Generator Parts & Fuel Consumption Rates

Key Part	Manufacturer	KW Rating	# of Units on Hand (as of ___/___/___) Pre-Disaster	Fuel Consumption per hour under full load	Size of tank supplying fuel	# of Units on Hand (as of ___/___/___) Post-Disaster
Generator # ___						
Thermostat (Engine)						
Thermostat (Water Heater Jacket)						
Motor Starter						
Fuse (multiple sizes)						
Water Heater Jacket						
Fanbelt(s)						
Heater Hose						
Fuel filter						
Fuel Water Separator Filter						
Oil filter						
Air filter						
Oil						
Coolant						
Generator # ___						
Thermostat (Engine)						
Thermostat (Water Heater Jacket)						
Motor Starter						
Fuse (multiple sizes)						
Water Heater Jacket						
Fanbelt(s)						
Heater Hose						
Fuel filter						
Fuel Water Separator Filter						
Oil filter						
Air filter						
Oil						
Coolant						
Generator # ___						
Thermostat (Engine)						
Thermostat (Water Heater Jacket)						
Motor Starter						
Fuse (multiple sizes)						
Water Heater Jacket						
Fanbelt(s)						
Heater Hose						
Fuel filter						
Fuel Water Separator Filter						
Oil filter						
Air filter						
Oil						
Coolant						
Automatic Transfer Switch						

Parts Ordering:

Parts Department Contact Information:

Point of Contact: ______________________________ Phone Number: ______________________________

Cell phone: ______________________________ Email: ______________________________

Secondary Point of Contact: ______________________________ Phone Number: ______________________________

Cell phone: ______________________________ Email: ______________________________

NOTE: For facilities with more than three generators, copy this form to document parts inventory for additional generators.