Homeland Security
Science and Technology

TechNote

U.S. Department of Homeland Security
SAVER
System Assessment and Validation for Emergency Responders

The U.S. Department of Homeland Security (DHS) established the System Assessment and Validation for Emergency Responders (SAVER) Program to assist emergency responders making procurement decisions.

Located within the Science and Technology Directorate (S&T) of DHS, the SAVER Program conducts unbiased operational tests on commercial equipment and systems and provides those results along with other relevant equipment information to the emergency response community in an operationally useful form. SAVER provides information on equipment that falls within the categories listed in the DHS Authorized Equipment List (AEL).

Information provided by the SAVER Program will be shared nationally with the responder community providing life- and cost-saving assets to federal, state, and local responders.

The SAVER Program is supported by a network of technical agents who perform assessment and validation activities. Further, SAVER focuses primarily on two main questions for the emergency responder community: "What equipment is available?" and "How does it perform?"

For more information on this and other technologies, please see the SAVER Web site or contact the SAVER Program Support Office.

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SPAWAR
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This SAVER TechNote was prepared by the Space and Naval Warfare Systems Center, Charleston, for the SAVER Program.

Generators for Emergency Response

After an incident, electric power may be unavailable at the incident scene and surrounding area for days or even weeks. Generators can replace damaged electrical power infrastructure or provide deployable electric power for responders.

Applications

Generators can provide power to base camps, emergency operation centers (EOCs), call centers, and community emergency shelters. They are also used to support fire response, emergency medical response, mass care, and law enforcement operations. Permanently installed generators provide backup power for emergency response infrastructure while mobile or portable units provide deployable power for remote or field operations. Small, one or two man portable generators (2.5-10 kW) are frequently used as part of an initial response to operate power tools, lighting, and communications equipment. These small generators are usually gasoline powered. Medium generators (40–300 kW) are used for applications such as powering entire buildings or base camps and usually have a reciprocating engine fueled by gasoline, diesel, or natural gas. Diesel engines are longer lasting, more fuel-efficient, more reliable, and require fewer overhauls than gasoline engines. Natural gas powered units require connection to a natural gas pipeline, which is not available in all areas and may not be functional in time of a disaster. This makes natural gas powered generators less desirable for emergency response. Large generators (over 300 kW) are used to power industrial plants, hospitals, and even small towns, and are typically permanently installed in a backup or standby configuration.

Operators check a 180 kW power generator used for powering an EOC.
Source: Marvin Nauman/ FEMA photo

Features

A generator has three main components: the engine, electrical generator, and fuel tank. A generator will also have an engine speed regulator and a generator voltage regulator to control the electricity output. Other important features are sound attenuation, fuel tank capacity, safety shutdown systems, and transport configuration.

Sound Attenuation: When large engines are used for generators, noise can be an issue. A sound-attenuated enclosure around the whole system is desirable to keep noise to an acceptable level.

Fuel Tank Size: A large, integral fuel tank is also useful as it can provide 1–3 days running time at rated capacity and reduce the refueling frequency.

Automatic Shutdown: Most units have automatic shutdown systems for low oil pressure, overheating, over speeding, and low fuel. These shutdown systems can prevent costly damage to the unit.

Transport Configuration: Most generators are equipped with "lifting eyes" to easily facilitate loading, unloading, and handling by crane.

"Lifting Eyes" on the top and sides of these generators provide attachment points for crane rigging.
Source: Melissa Ann Janssen/FEMA Photo

Performance Considerations:
Several issues must be addressed when deploying a generator to provide temporary electric power. The proper size generator must be selected to meet the expected electrical load, generators must be placed where they are accessible for refueling and where the exhaust fumes and noise will not cause problems, and provisions must be made for adequate fuel supplies.

Size: The generator must be sized correctly for the anticipated load. Some generators feature output selectors to match the power output to the type of circuit to be powered. In addition, an electrician using additional hardware will usually be required to make the electrical connections if the generator is being connected in place of commercial power.

Mobility: Trailer or skid-mounting enhances mobility. brings them to the scene. Trailer-mounted units can be easily maneuvered into place with the truck or truck tractor that Skid-mounted units may require a large forklift or crane to load, unload, and place the unit.

Fuel Considerations: Due to the cost of purchasing, transporting, and storing fuel, fuel consumption is of prime concern. Diesel generator sets operated at their peak efficiency point can produce 13–14 kilowatt-hours of electricity for each gallon of diesel fuel consumed. For example, a 40 kW generator can consume approximately 4 gallons of fuel per hour or up to 96 gallons of fuel per day. Likewise, a 300 kW generator can burn 22 gallons per hour or 528 gallons per day. Fuel consumption represents a substantial expense and a need for additional planning to ensure that adequate fuel supplies will be available in an emergency. The logistical issues of supplying a large generator with fuel are often overlooked.

Diesel fuel has a finite shelf-life and deteriorates with age; therefore, consideration should be given to the size of the fuel tank. Fuel tanks that are exposed to extreme daily temperature variations can cause fuel to degrade more rapidly. This degradation is worse in large tanks that are less than full. Where large tanks are required, it is recommended that fuel be periodically pumped out and replaced with fresh fuel. Tanks should be kept full when possible as airspace within the fuel tank promotes condensation that can add to the contaminant levels.

Maintenance: Generators require periodic maintenance to ensure they are ready when needed. A maintenance plan should follow the generator manufacturer's recommendations and typically includes running the generator under load, checking electrical output, checking fluid levels, changing fluids when needed, and checking battery electrolyte and voltage.

Additional Information

National Fire Protection Association (NFPA) NFPA 110 Standard for Emergency and Standby Power Systems 2005 Edition. http://www.nfpa.org/

The InterAgency Board. (2007). Standardized Equipment List. http://www.iab.gov

Target Capabilities List. U.S. Department of Homeland Security. September 2007 https://www.llis.dhs.gov/getFile.cfm?id=26724