

# Power Up, When Necessary; Selecting the Right Generator for Water and Wastewater Utilities

**A**s we have seen over the past couple of years, overhead electrical lines in Kansas are at the mercy of Mother Nature. The problem is often widespread as ice storms have covered broad swaths of the state. Other outages due to downed power lines have impacted smaller areas, such as those caused by tornadoes or excessive straight-line winds that hit areas of northern Kansas in 2010. There are several other reasons that power might be interrupted to water and wastewater facilities in Kansas. The central question however always is, “When will power be restored?” It may take hours or it could take weeks before power is restored. The re-establishment of power to water and wastewater plants facilities is vital in returning to normal conditions and providing essential services to protect the public health and safety. Since the time needed to restore electrical power can be long and uncertain, the question is if your water or wastewater utility is prepared.

## “We need a generator, NOW!”

Suppose a storm hits; power is estimated to be out for four days. The city or RWD needs a generator to produce and process water. This is not the time to be learning about what size or type of generator is needed. That’s something that should be taken care of BEFORE the emergency hits.

The questions are numerous. Does the system need a portable generator, a stationary generator, or both? How



Tree limbs, downed by heavy coatings of ice, cause many power outages during winter months in Kansas. This photo was taken in Seneca, KS in December 2007.

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many stationary generators will the system need? If a portable generator is chosen, how will it be moved from site to site? Could the city or RWD share a portable generator with a neighboring system? Depending on the water or wastewater utility’s set up, a city or

RWD may be able to provide minimal functions with only one portable generator. Re-locating a single generator to multiple sites might work for some utilities in order to maintain minimal services. Regardless, the first step for every city or RWD is to choose the right generator for the job.

## Power and sizing requirements

Obtaining a generator that will meet all the power needs is one of the most critical steps when purchasing a generator. Whether considering a portable or stationary unit, the generator has to match the power requirements. Determining the exact

Many portable generators are available as rentals. This unit was rented by a rural water district in Kansas in December 2007. KRWA has helped locate and coordinate the rental of many such units for cities and RWDDs during severe weather emergencies.



size of the generator to acquire is often difficult; this requires a number of considerations and factors. First, is it going to be a single-phase or three-phase unit? Most water and wastewater facilities generally require three-phase power. Always check with a qualified electrician before purchasing a generator. A qualified electrician who is familiar with local building codes should also make the connection from generator to the electrical distribution system.

One of the most common mistakes made is obtaining a generator that is under-sized. The misunderstanding often is that it can be smaller because a back-up generator will not be running all the time. A unit that is too small risks damaging the generator, but it can also create hazardous situations. The low power output can easily damage electrical equipment that the generator is supplying power for. That limits the ability to operate the facility at levels needed. The key to remember in purchasing a generator is “more is better than less”.

It is essential to always review the power needs so that the correct size of unit is obtained. Make a list of all items that will need to be powered by the generator. Sizing the generator for power requires the operator’s knowledge of the equipment to be operated at the water or wastewater

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plant. It will be necessary to determine the voltage requirements of the facility where power is to be supplied. Some generators will have switches that allow the generator to supply different voltages. This information can be found on the nameplates on the equipment to be operated. The amperage draw on each piece of equipment must be known. This is important because generators operating continuously at thirty percent to forty percent less than the rated load can lead to engine damage. Generators can be sized best if it can be a direct match with the transformer provided by the power company. Due to the lack of power company transformer service

information, it would necessary to determine the KW generator needed by summing the horsepower requirements on all plant equipment that would be used. Since some equipment may not be efficiently designed, it would be prudent to add twenty percent additional power to account for power adjustment factors. For a temporary installation a good rule to go by is to size a generator from 1.5 to 2.0 times the total horsepower requirements.

There are additional considerations in selecting a generator. What should the fuel type be? Gasoline, diesel, propane and natural gas are the most popular types. Select a fuel that will be readily available for your generator.

If it is determined that a portable generator will best suit the utility, make sure the proper conductor for your generator size is available. The conductor must be sized to carry the current required by the installation. And always remember to seek the assistance of a qualified electrician.

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### Safety

The National Electric Code requires that a connected generator be isolated from utility power. That requirement is intended to protect the installer from unanticipated line power and the electric utility workers from power that might be fed back into the electrical utility by a generator. Main disconnect breakers should never be used to isolate power sources. They are not designed for that purpose and can malfunction. A stationary generator must have a transfer switch. If using a portable generator and there is no transfer switch, the line power must be disconnected at the main breaker to ensure isolation. If line power is OFF because of damage to power company transmission lines, the generator installer must always assume that power is live. A generator from down the street may be back feeding to other locations or the power company may become active while the installer is connecting the generator. It is advisable by many sources to remove the electrical meter prior to making any generator connection for this reason.



Just moving from site to site to repair power lines often requires more equipment than of just the power utility. The photo above was taken in central Kansas in December 2007.

Always practice lock-out, tag-out procedures on all connections regardless if they are live or not.

### Training

KRWA has prepared a form that can be used to assist cities and RWDs as they consider the purchase of generators. It is available for download on the KRWA Web site at [www.krwa.net](http://www.krwa.net), the under "Online Resources" and then "Downloads." The form may also be handy when calling for emergency assistance to locate a generator. And as always,

watch the KRWA Web site at [www.krwa.net](http://www.krwa.net), and then under "Training" for upcoming training sessions on electrical safety and emergency planning.

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*Operator Certification.*

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