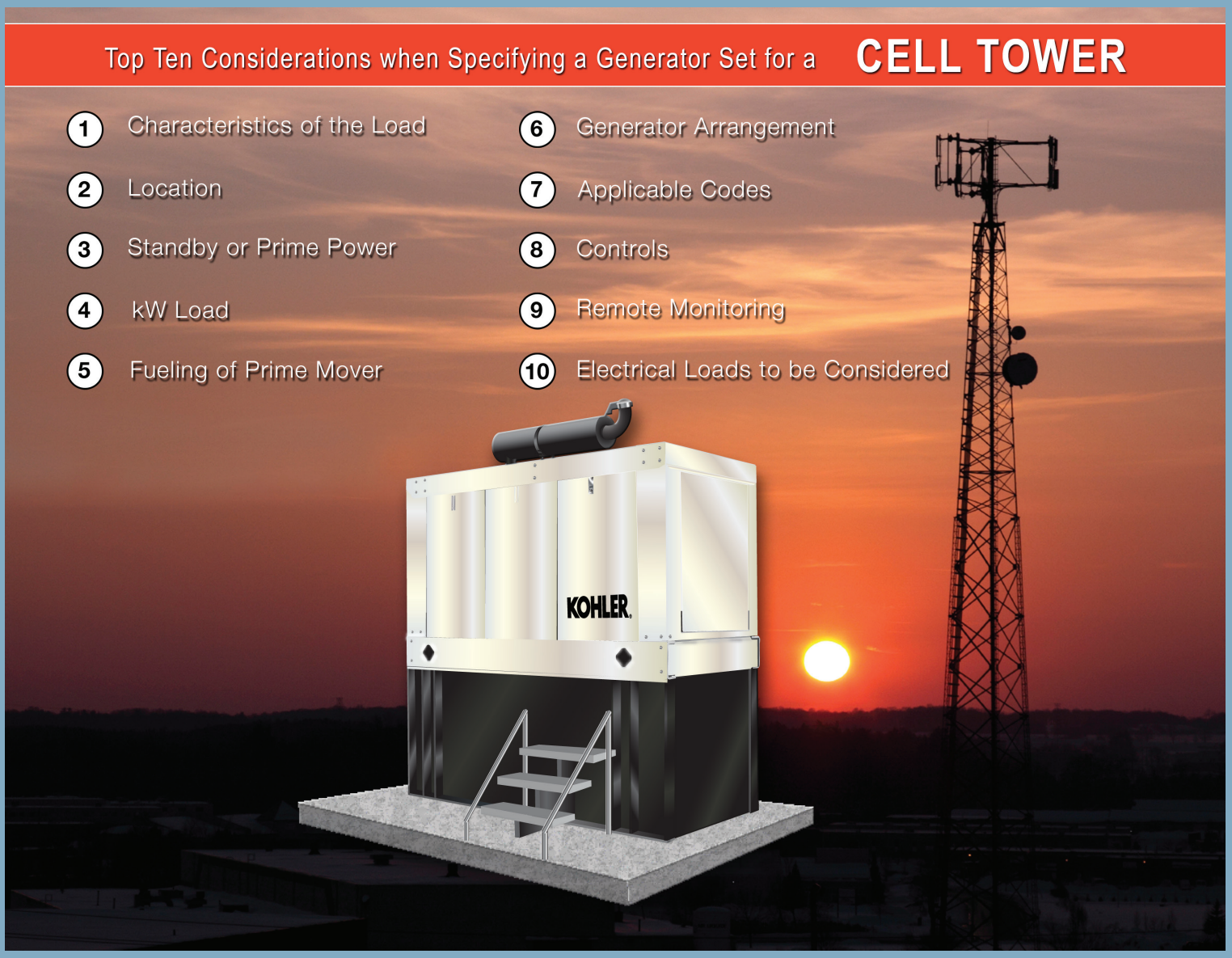
SPECIFYING A GENERATOR SET FOR TELECOMMUNICATION CELL TOWERS

Buckeye Power Sales
Reliable Power Professionals Since 1947

The telecommunications market has revolutionized our ability to communicate, both in business and personally. Mobile devices are becoming our preferred method of communicating with each other. These devices rely on a network of cell towers that track users as they move from the transmission range of one tower to another. Many tower sites are fitted with prime power and standby generators to ensure power during utility outage. This Information Sheet discusses the characteristics of cell tower loads and how they influence the specifications of cell tower generator sets used in both standby and primary power applications.

1.0 CHARACTERISTICS OF THE LOAD:

Any power interruption to a cell tower site can have a significant impact on a life or business. Absolutely no power interruption is acceptable. Therefore, when primary power becomes unavailable, the load will be supplied by an Uninterruptible Power Supply, or UPS, system that will keep current flowing while a generator starts and runs up to speed. UPS systems include rectifiers and inverters that require a clean electrical power supply with good harmonics and a smooth sine wave. Other loads will include tower lights, and air conditioning and heating to keep transmission equipment within a specified ambient temperature range.



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2.0 LOCATION:

Telecommunications providers compete with each other to provide the widest possible coverage to users. This requires building cell towers in both urban and remote rural locations. Environmental elements in some locations will require adjusting – or derating - a unit's power output to accommodate extreme conditions.

Locations in mountainous areas may require such derations to allow for less combustion air at higher altitudes. Cold weather locations may require winterization packages on generator enclosures. Dusty conditions may require additional air filtration. Coastal conditions may require protection against salt corrosion.

Location also can influence other issues:

- Humidity – Coastal sets in Gulf States may require anti-condensation heaters in alternators.
- High Wind – States such as Florida that are prone to hurricanes have codes covering the equipment's ability to withstand high winds generated by such storms.
- Seismic Areas – Many states with higher than average seismal activity require equipment to meet seismic codescodes.

3.0 STANDBY OR PRIME POWER:

Regular standby systems assume normal electric power comes from a utility. Standby generators start automatically when utility power fails and transfer power from the utility load to the generators through an Automatic Transfer Switch or ATS.

Prime power installations assume no power comes from a utility. They frequently use two generator sets – one to provide power and one to provide standby power if the first fails. Each set also usually alternates between being the prime and standby sources. ATS transfers power between the two sets and also switches their duty cycles from standby to prime and back. Remote installations usually are fitted with prime power installations. Prime power generators that must run continuously through lengthy maintenance cycles are fitted with lubricating oil makeup systems.

4.0 KW LOAD:

A typical cell tower load ranges between 15 kW and 60 kW. Actual transmission equipment require much less power, but adding air conditioning, lighting and heating increases the load.

5.0 FUELING OF PRIME MOVER:

Choosing a fuel source for the prime mover can be influenced by any of the following:

- Site location – the ability to get fuel to the site. Natural gas is available in urban areas while propane or diesel fuel can be stored in remote areas.
- Environment – Some local codes may restrict bulk diesel storage.
- Fuel Storage – Diesel sets will be required by code to have UL-approved, base mounted fuel tanks with a capacity determined by the user. LPG tanks also must meet specific codes and large enough for users' requirements.

6.0 GENERATOR ARRANGEMENT:

Cell tower sites typically are supplied according to the following arrangement:

- Canopy - Sites with modules too small to accommodate the generator are fitted with enclosed generator sets.
- Set Enclosures – The specifying engineer will have to consider noise codes acceptable in urban areas. Normally, a weather protective enclosure is acceptable, but in some urban areas, the enclosure will have to be sound attenuated. If the site is remote, consideration should be given to a winterization package, including moving louvers and snow hoods.
- Footprint – In urban areas where land values are high, the smallest footprint is recommended.
- Sub-Base – Most generator sets are fitted on a sub base with vibration isolators between the generator assembly and the base. Extra vibration isolation may be required in sensitive areas such as hospital installations.

7.0 APPLICABLE CODES:

There are many federal, state and local codes that have to be considered when specifying a generator set. They include:

- EPA – Emergency generators in the U.S. must comply with Environmental Protection Agency exhaust emission regulations for stationary emergency generators. Earlier Tier engine models are acceptable without exhaust after-treatment devices due to the low number of hours they will operate. However, any daily or other non-emergency duty of more than 100 hours annually will require compliance with the latest EPA regulations.
- Any other state or local ordinances, including the NFPA.

8.0 CONTROLS:

The system engineer will specify the generator has to be started automatically when a sensor detects the primary power source is not available. Transfer of the load will be via an Automatic Transfer Switch. The ATS will have delay-start and stop timers to avoid the set starting and stopping frequently through periods of erratic power supply.

9.0 REMOTE MONITORING:

Cell towers form part of a network that is controlled and monitored from a central location. Generator controls frequently are equipped with remote monitoring systems that watch all the vital operating parameters of the generator set.

10.0 ELECTRICAL LOADS TO BE CONSIDERED:

The generator end of a generator set in a cell tower application should be specified to consider the following:

- Starting Loads – Starting electric motors can produce high starting skVAs. The system engineer will have to calculate if the generator automatic voltage regulator, or AVR, should be a permanent magnet generator, or PMG, to absorb voltage drop caused by motor loads.
- SCR Loads – Inverters, rectifiers and other transmission equipment can result in a higher percentage of Silicone Controlled Rectifier loads, or SCR. This can require higher capacity alternator ends, more closely controlled AVRs or both to ensure the electrical output stays within the load's ability to absorb any harmonic distortion.

To fulfill our commitment to be the leading supplier in the power generation industry, the Buckeye Power Sales team ensures they are always up-to-date with the current power industry standards as well as industry trends. As a service, our Information Sheets are circulated on a regular basis to existing and potential power customers to maintain their awareness of changes and developments in standards, codes and technology within the power industry.

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