



## Your Reliable Guide for Power Solutions

To fulfill our commitment to be the leading supplier in the power generation industry, the Total Energy Systems, LLC. 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.

### Specifying a Generator Set for Telecommunication Cell Towers

#### Introduction:

The Telecommunication's market has revolutionized our ability to communicate, both in business and personally as mobile devices are becoming our preferred method of communicating with each other. Mobile devices rely on a network of cell towers that track the users as they move from the transmission range of one tower to another. Many tower sites are fitted with a standby, or prime power generator to ensure power during a utility outage.

*This Information Sheet discusses the characteristics of cell tower loads, and how they influence the specification of a generator set being used on a cell tower in both a standby and primary power application: (Continued over)*

## Top Ten Considerations when Specifying a Generator Set for a CELL TOWER

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### 1.0 Characteristics of the Load:

Any power interruption to a cell tower site can have a significant life and/or economic impact, with absolutely no power interruption being acceptable. Therefore, when the primary power becomes unavailable, the load will be supplied by an UPS system while the generator starts and runs up to speed.

UPS systems include rectifiers and inverters that require a clean electrical supply with good harmonics and a smooth sine wave. Other loads will include tower lights, air conditioning and heating to keep the transmission equipment within the specified ambient temperature.

### 2.0 Location:

Telecommunications providers compete with each other regarding the level of coverage they provide, as such cell towers in a network providing full coverage will have to be erected in urban and remote rural locations.

Locations in mountainous areas will require derations of the prime mover for allow for less combustion air at higher altitudes, cold weather locations can require winterization packages on the generator enclosure, dusty conditions may require additional air filtration, and coastal conditions may require corrosion protection against salt.

Location can also influence other issues such as:

- Humidity - Coastal sets in Gulf States may require anti-condensations heaters in the alternator.
- High Wind Withstand Codes - States like Florida, prone to hurricanes, have codes covering a equipment's ability to withstand high winds such as those generated by hurricanes.
- Seismic Areas - Many states with higher than average seismic activity require equipment to meet seismic codes.

### 3.0 Standby or Prime Power:

A regular standby system assumes the normal power source is the utility supply. The generator will start automatically when the utility power fails, transferring power from the load to the generator through an ATS (Automatic Transfer Switch).

Prime power installations assume no utility supply, and will frequently have two generator sets supplying power running alternatively and acting as a standby power source should the running set fail. Remote installations usually are fitted with prime power systems. Prime power generator systems that have to run continuously through lengthy maintenance cycles are fitted with lubricating oil make-up systems. Transfer of power from set to the other is via an ATS, with the duty cycle from standby to prime power switching between the units.

### 4.0 kW Load:

A typical cell tower load ranges from 15 to 60 kW. The actual transmission equipment takes much less power, but the addition of air-conditioning, lighting and heating increases the overall site load.

### 5.0 Fueling of Prime Mover:

The prime mover selected can be influenced by any of the following factors:

- Site location - The ability to get fuel to the site. Natural gas is more available in urban areas, while propane and diesel can be stored in remote areas.
- Environment - Some local codes may put restrictions on bulk diesel tank storage.
- Fuel Storage - Diesel sets will be specified to have UL approved based mounted fuel tanks with sufficient capacity as set by the user. LPG tanks will be supplied also to code with sufficient capacity for LPG powered sets.

### 6.0 Generator Arrangement:

Cell tower sites typically are supplied to the following arrangement:

- Canopy - Sites with modules too small to accommodate the generator are fitted with enclosed generators 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, considerations should be given to a winterization package including motorized louvers and snow hoods.
- Foot Print - 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 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, including:

- EPA - In the US, emergency generators must comply with EPA exhaust emission regulations for stationary emergency generators with concession that earlier Tier engine models are acceptable (without exhaust after-treatment devices) due to low number of hours they will operate. However, any daily or other 'non-emergency' duty of over 100 hours annually will require compliance with the latest EPA regulations.
- Any and all local or state ordinances including 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 longer available. Transfer of the load will be via an ATS. The ATS will have delay start and stop timers to avoid the set starting and stopping frequently through periods of utility erratic supply.

### 9.0 Remote Monitoring:

Cell towers form part of a network that is controlled and monitored from a central location. Frequently the generator controls are equipped with remote monitoring systems that monitors 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 AVR should be a PMG (Permanent Magnet Generator) to absorb voltage drop caused by motor loads.
- SCR Loads - Inverters, rectifiers and other transmission equipment can result in a higher percentage of SCR (Silicon Controlled Rectifier) loads. This can require higher capacity alternator ends, and/or closer controlled AVRs to ensure the electrical output stays within the loads ability to absorb any harmonic distortion.

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