Options for Cooling Communications Sites

HVAC equipment operating on alternate power sources can improve site survivability and allows protection of back-up power systems themselves.

by Susan E. Merrell

As power failures and brownouts become more frequent, and the electricity power supply becomes more unreliable and expensive, telecommunications providers and site managers are searching for alternative sources of primary and back-up power. Air-conditioning and venting requirements must be considered when looking at the various alternatives.

Power failures or brown-outs

Back-up batteries chosen with enough capacity to operate electronic equipment during an electrical failure or brownout normally keep telecommunications equipment powered and operating for several hours or more. All too often, for lack of sufficient battery and inverter capacity, or for lack of dc-powered HVAC equipment, air conditioning or venting is sacrificed during power outages. In hot weather, the resulting elevation of shelter or enclosure temperatures could cause the electronic equipment to fail, despite the availability of back-up power, and could reduce the operating capacity of the batteries themselves.

A traditional and generally accepted method of providing back-up power to charge batteries and deliver ac power to the HVAC equipment uses a fossil fuel-powered generator. Either a generator has to be placed at each site or portable generators have to be deployed to affected sites during a power failure. Both options have cost, efficiency and reliability issues. Equipping every site with a generator is expensive. Deploying generators from a warehouse requires swift pickup, transportation and delivery to put them on site before the batteries are depleted. That can be a logistical nightmare if roads are clogged with traffic or impassable because of a disaster.

Capital costs are high for the generator and enclosure, a transfer switch and an inverter to convert to ac power for the air conditioner or venting system. Ongoing operational expenses also are high and difficult to control:

- The generator must be exercised on a regular basis.
- Diesel fuel is increasingly more expensive.
- Fuel consumption must be monitored to ensure the correct fuel levels are maintained to provide the programmed back-up time.
- The generators must be serviced on a regular basis.
- Inverters are inefficient, so when they are used, the generator has to be oversized to compensate for power-conversion losses.

Properly designed dc-powered air conditioning and venting provides efficient, practical and economical back-up cooling. High-efficiency, technically advanced, dc air conditioners maximize cooling and minimize battery power consumption. Depending on the size of the shelter, the ambient temperature and the heat load generated by the electronic equipment, only a small number of additional batteries may be required to run the air conditioner or venting system (or both) for six to eight hours or more. A dc unit can be substituted for a standard unit for reliable and predictable cooling during a power failure or brownout.

When two or more air conditioners are used for capacity and redundancy, substituting a dc-powered unit for one of them provides redundancy during normal operations and back-up cooling in the event of a power failure or brownout.

The capital costs of purchasing a generator, transfer switch and inverter, and the ongoing operational fuel and maintenance expenses can be eliminated when dc-powered cooling equipment is used. Where a generator is necessary to power other equipment, using dc air conditioning could allow reducing the size of the generator with a corresponding cost and expense reductions.

Primary power

Interest in renewable energy and alternative fuel sources such as solar power, fuel cells and flow battery electricity storage technologies is growing. One concern about these options is the need to convert dc power output to ac power just to operate the traditional air conditioning or venting equipment (or both), and the efficiencies and costs of that conversion. Where alternative energy sources are used, dc-powered air conditioning and venting products offer an ideal method for cooling telecommunications equipment.

Dc air conditioning or venting equipment makes it unnecessary to oversize the power supply to compensate for the power conversion inefficiencies and high in-rush currents normally experienced with ac equipment. This results in lower capital costs and a more economical and efficient operation.

Additional cooling solutions

An efficient approach to further reduce the power consumption for cooling in both primary power or back-up power applications is to operate an ultra-low-power dc venting system as an economizer in conjunction with a dc air conditioner. This allows better site power management in varying ambient conditions.

The same approach can be used with ac-powered air conditioners for some degree of venting and cooling during a power failure or brownout where no back-up is provided.

Other typical applications for a dc venting system include venting and cooling in more temperate climates where only minimal cooling is required or at sites where air conditioning is impractical.

Features	Advantages	Benefits
Operates on 24 V or 48 V battery; specific voltages can be ordered	Eliminates need for genset Not dependent on ac power supply Can eliminate conventional air conditioning	Reduces capital costs Maintains cooling during power interruption or brownouts
Locatable at source of excessive heat	Supplements primary air conditioning and provides equipment-specific spot-cooling temperature control	Reduces risk of equipment failure and over-temperature shutdown Reduces downtime
Low compressor speed with multiple, long-life fans	Quiet operation; ±55 dB (even quieter systems can be specified)	Eliminates noise complaints in urban and suburban areas
High-output, energy-efficient operation	Lower power consumption than conventional air conditioning	Reduces energy cost
Top-mounting capability	Allows integration of chassis into cabinet Reduces site space requirement	Increases equipment security; reduces risk of damage from vandalism
Capability to use renewable power and alternative energy	Provides cooling where no ac power supply is available Can eliminate the need for a genset	Reduces maintenance cost Lowers capital cost

Table 1. Dc-powered cooling equipment used at telecom sites offers some advantages compared to traditional ac-powered cooling equipment that may require back-up power supplied by a fossil fuel-powered generator.

Where alternative energy sources are used, dc-powered air conditioning and venting products offer an ideal method for cooling telecommunications equipment

Although most telecommunications providers and public communication services are concerned about cooling the equipment, sometimes less attention is paid to cooling the site batteries. Radio equipment will operate in temperatures up to 140 degrees F, yet 72 degrees F is the optimal temperature to ensure batteries meet operational specifications. Air conditioning is usually sized based on the heat load generated by the equipment and the size of the enclosure, but the operating requirements for the batteries often are not taken into consideration. Using a dc-powered air conditioner to spot-cool the batteries fulfills two important functions:

- Focused cooling on the batteries preserves operational integrity.
- Back-up cooling is provided during a power failure or brownout. agl

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