HUIJUE GROUP

AC-Powered vs DC-Powered Cabinet Air Conditioners for Telecom Sites

Compare AC-powered and DC-powered cabinet air conditioners by supply path, outage operation, battery impact, protection, controls and commissioning.

PRODUCT KNOWLEDGE

AC-Powered vs DC-Powered Cabinet Air Conditioners for Telecom Sites

Compare the complete supply path—not just the voltage label—to decide how cabinet cooling should behave during normal service, an outage and power restoration.

Updated September 10, 2026 Cooling power-path comparison Approx. 11 minute read

Contents

Which power supply is better for a telecom cabinet air conditioner?

The better supply is the one that keeps the required thermal function available through the site's defined power states without consuming unacceptable backup energy or creating an uncoordinated electrical branch. A **DC cabinet air conditioner** is not automatically more reliable, and an AC-powered unit is not automatically excluded from backup service.

Imagine two air conditioners with the same sensible cooling capacity at the same indoor and outdoor rating point. Both control cabinet temperature while the grid is healthy. When the grid fails, one loses its nonessential AC feeder immediately; the other remains on the battery bus and shortens the time available to the radio load. The useful comparison begins at that transition—not at the AC or DC label on the nameplate.

This article assumes refrigeration has already been selected as a thermally suitable method. If the project still needs to decide between passive transfer, ventilation, heat exchange and refrigeration, start with the telecom cabinet cooling guide . If the unresolved question is whether refrigeration is necessary at all, use the air-conditioning necessity assessment .

Draw three power states before selecting the unit

A single-line diagram should show where cooling receives power and what changes when each upstream source changes state. Record these three states before comparing catalogues:

1. **Normal service.** Identify the active source, every conversion stage, the branch protective device, available voltage at the unit terminals and the normal control mode.
2. **Source outage.** State whether cooling stops, transfers to essential AC, remains on the telecom DC bus, runs at reduced duty, or is shed at a defined battery threshold.
3. **Restoration.** Define transfer time, voltage recovery, compressor restart delay, anti-short-cycle logic, alarm reset and the effect of simultaneous load pickup on the power system.

Use verbs, not source names

For each state, write what the unit does: runs continuously, pauses, transfers, limits capacity, sheds or restarts. “AC unit” and “DC unit” do not describe those behaviours.

The state map also exposes hidden architecture. A DC unit can be supplied from a rectifier-only branch that disappears with AC input, while an AC unit can sit on an inverter, UPS, generator-backed panel or other essential bus. Ask for the drawing and operating sequence together.

Does a DC cabinet air conditioner always stay online during an outage?

No. A DC-powered air conditioner stays online only when its connection point remains energized, its terminal voltage stays inside the released input range and the control system has not shed the branch. True **battery backed cooling** therefore depends on distribution design, not merely on choosing a DC model.

Check whether the cooling branch is upstream or downstream of load-disconnect contactors and which priority group owns it. During discharge, battery voltage, conductor drop and transient bus sag may move the unit below its undervoltage threshold before the calculated battery energy is exhausted. Repeated stop-start attempts around that threshold can be more disruptive than a controlled shutdown.

Cooling also becomes part of the autonomy budget. That can be justified when temperature would otherwise force radio derating, shorten battery life or cause a critical equipment trip. It can be wasteful when the cabinet’s thermal mass and outage profile allow a safe pause. Model temperature and energy together rather than reserving a fixed percentage without evidence.

At minimum, obtain the unit’s input window, maximum current at low voltage, starting behaviour, undervoltage and overvoltage actions, restart hysteresis, alarm outputs and acceptable DC ripple. Match those values to the actual bus under normal rectifier operation, battery discharge, recharge and generator recovery.

Can an AC-powered cabinet air conditioner receive backup power?

Yes. **AC cabinet cooling** can continue through an outage when an essential AC panel, UPS, inverter or generator path is designed to support it. The engineering question is whether that path can sustain both running demand and the transition behaviour of the offered unit.

For an inverter-backed path, check continuous apparent and real power, waveform requirements, conversion efficiency, idle consumption, overload duration and the cooling unit’s start characteristic. For a generator-backed path, add start delay, transfer interruption, voltage and frequency recovery, and the possibility that cooling restarts with other site loads.

Compressor technology matters. Do not apply a generic motor inrush multiplier to every unit, and do not assume an inverter-driven compressor has no transient demand. Request the manufacturer’s declared maximum current, start trace or compatible-source requirement for the exact model and operating condition.

If the AC source is intentionally interrupted during short outages, define the maximum permitted off-time and the thermal trigger for an early start. A cabinet temperature trend is more defensible than a fixed timer because solar gain, radio traffic, ambient temperature and stored heat vary by site.

Which option is more energy-efficient at the site boundary?

Neither option is inherently more efficient. Compare units at the same sensible cooling duty and rating condition, then include every active conversion stage and its standby consumption. The **cooling power supply** label alone cannot establish site energy.

Site input power = unit input power ÷ active path efficiency + path standby power

An AC unit supplied directly from a stable AC feeder may avoid an extra conversion stage. The same unit backed from a battery through an inverter includes inverter loss and standby demand. A DC unit operating while AC is healthy may receive energy through the site’s rectifiers; during battery discharge, its path changes again. Cable and distribution losses apply to both architectures.

Build an annual state ledger rather than comparing one efficiency value. For each climate and power state, record cooling load, unit input, path efficiency, standby demand and operating hours. Keep unit performance data tied to the same indoor temperature, outdoor temperature, voltage and control mode; otherwise the result is not a normalized comparison.

Do not use a universal savings percentage

Any claimed energy difference depends on the specific air conditioners, load profile, ambient bins, conversion equipment, controls and outage hours. Require the assumptions and calculation file with the bid.

Match interface, cable and protection evidence

The AC branch should be checked against the project’s nominal voltage and frequency, expected variation, interruptions, surges, maximum current and starting behaviour. ETSI EN 300 132-1 is a useful reference for the AC supply interface to ICT equipment, but it does not replace the unit manual, destination electrical rules or project safety design.

For a nominal −48 V telecom interface, ETSI EN 300 132-2 covers relevant DC interface characteristics such as voltage behaviour, current demand and disturbances. Apply it only where that interface is actually specified. A **telecom DC cooling** branch still requires the offered unit’s exact voltage window, polarity, cable-drop limit and protection data.

Design item	AC-powered unit	DC-powered unit	Evidence to retain
Source definition	Voltage, frequency, phases, neutral and backup path	Nominal bus, polarity, earthing arrangement and priority group	Approved single-line diagram
Worst terminal condition	Low/high voltage,	Battery discharge	Min/max terminal-

Design item	AC-powered unit	DC-powered unit	Evidence to retain
	frequency excursion and transfer interruption	voltage, recharge voltage, ripple and cable drop	voltage study
Current basis	Running current, apparent power and declared start demand	Maximum current near the minimum accepted voltage and start demand	Manufacturer curves or test declaration
Protection	AC-rated device, conductor protection and selectivity	DC-rated device with correct voltage, polarity behaviour and interruption capability	Coordination schedule and device datasheets
Isolation and service	Accessible local isolation and safe verification procedure	DC isolation suitable for the available fault energy and architecture	Method statement and labels

Do not interchange AC and DC breaker ratings. Confirm prospective fault current, conductor ampacity, voltage drop, terminal temperature, enclosure entry, bonding and isolation with qualified engineering review. High-energy battery systems require project-specific safe-working procedures.

How should startup and source transfer be tested?

Test the exact installed power path while recording source voltage, branch current, cabinet temperature, unit state and alarms on a common timeline. The acceptance result should prove what happens before, during and after a transition—not merely that the unit can run from a bench supply.

Test event	Observe	Acceptance question
Cold or commanded start	Peak current, bus sag, protective-device response and control boot	Does the branch start without disturbing critical telecom loads?
Loss of normal source	Transfer gap, cooling interruption, alarms and temperature rise	Does behaviour match the defined outage state?
Low-voltage approach	Capacity, current, undervoltage action, hysteresis and load shedding	Is shutdown controlled before unstable cycling or bus collapse?
Source restoration	Voltage recovery, restart delay, simultaneous load pickup and alarm reset	Does cooling resume without repeated trips?
Repeated short interruptions	Anti-short-cycle logic, contactor action and retained settings	Does the unit protect itself while preserving cabinet limits?
Cooling fault	High-temperature alarm, run/fail status and remote escalation	Can operations distinguish power availability from delivered cooling?

A run contact alone is insufficient evidence of cooling. Correlate it with cabinet or equipment-inlet temperature and, where the design warrants it, compressor, fan, pressure or other diagnostic signals. Define alarm delay and escalation so normal restart logic does not generate a nuisance dispatch.

Return a source-selection record with every bid

The bid should make the selection reproducible. Ask each supplier to return the same evidence set:

- the three-state power-path diagram and operating narrative;
- thermal capacity and electrical input at agreed indoor and outdoor rating points;
- accepted voltage and frequency range, maximum current and start characteristics;
- branch protection, isolation, cable sizing and voltage-drop basis;
- normal, outage and recovery energy assumptions;
- load priority, shedding threshold and restart sequence;
- remote alarm mapping and the response to loss of communications;
- commissioning tests, pass criteria and recorded traces;
- maintenance tasks, replacement parts and required technician capability.

Choose AC when the defined essential AC path, service capability and transition behaviour fit the site. Choose DC when the battery-supported bus, terminal-voltage envelope and autonomy tradeoff fit it better. If a dual-input product is offered, require source priority, transfer behaviour and fault isolation to be tested rather than inferred.

Selection boundary

This comparison does not select a Huijue model or approve a project configuration. Final capacity, input range, protection, alarms, environmental rating and source architecture must be confirmed against the released bill of materials and destination requirements.

Review the cooling power path before equipment selection

Send the cabinet heat load, site single-line diagram, AC and DC source limits, outage sequence, autonomy target and monitoring requirements. Huijue can help turn them into a comparable cooling-source specification for engineering review.

Submit the site power inputs

Related engineering resources

Telecom Cabinet Cooling Guide
Fan Cooling vs Cabinet Air Conditioning
Telecom Rectifier System Guide
Lithium Batteries for Telecom Sites

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