



## Keeping the Lines of Communication Open

Capstone Onsite Power to Ensures Uninterrupted Telecommunications

### THE ISSUE:

Protect data network and phone equipment from grid outages using an onsite power solution that delivers low maintenance and minimal environmental impact in a compact package with little noise and no vibration.

### THE SOLUTION:

The Capstone MicroTurbine™ system keeps telecom and data devices running around-the-clock with significant advantages over conventional technologies.



Overhead: Seen from above, the Capstone MicroTurbine demonstrates its small footprint.

### SOLUTION SUCCESSES:

- Ensures non-stop data network/telecom operation via 24x7 onsite power generation
- Much smaller footprint and sound signature than battery/genset installations
- Minimal scheduled maintenance compared to battery/genset combinations
- No hazardous liquids or materials, unlike battery/genset installation
- No special emissions permitting thanks to <9 ppm NOx emissions fueled by natural gas
- Low forecasted O&M costs due to air-cooled/air-lubricated design that has just one moving part

### An Administrative Nucleus

Mandating an alternate source of power support for its data/telecom system, Boeing consulted with the Houston office of Koenig and Associates ([www.koenigassociates.com](http://www.koenigassociates.com)), representatives for MGE UPS Systems ([www.mgeups.com](http://www.mgeups.com)). MGE UPS Systems specializes in power quality and reliability, offering nationwide warranty service and start-up capabilities to its customers.

Boeing required 20 kW power for six hours duration. UPS batteries and genset engines were the conventional choice, but not the best fit with the company's requirements. Genset noise, emissions and vibration would be difficult to mitigate.

### A New Kind of Jet: The Capstone MicroTurbine

Opting for a different power solution, Boeing chose the Capstone MicroTurbine. Based on scaled-down jet technology, the Capstone MicroTurbine's one moving part is air-cooled and air-lubricated, eliminating the need for liquid lubricants, antifreeze, other hazardous fluids, or even water. The Capstone solution inherently results in little scheduled maintenance. It is designed to run 8,000 hours (nearly one year nonstop) between recommended minor inspections and cleaning/replacement of filters. Adding to its ease of operation and end-user transparency, the Capstone MicroTurbine features a compact footprint, relatively low noise and no vibration, which greatly expand siting options.



Doorway: The Capstone C30 MicroTurbine was placed in an existing structure at the Boeing site, making deployment simple.

Koenig and Associates/MGE UPS Systems installed a Capstone C30 in a pre-existing concrete enclosure near the building's loading dock, demonstrating Capstone's ability to integrate easily with available equipment and layouts. MGE's service personal started up the system and placed it on line. The C30 runs on natural gas and sends electric power 24x7 to the data network and telecom equipment consisting of nine switches, two routers and approximately 1,000 phones. The data/telecom system utilizes dual power inputs: one from the microturbine and one from the grid. In the event of a grid power outage, the C30 ensures uninterrupted service. If the microturbine goes offline, the utility grid is the backup source. Boeing required no special emissions or hazardous materials permitting thanks to Capstone's ultra-low emissions and air-cooled/air-bearing design.

# Advantages of Capstone MicroTurbines in Power Quality/Reliability Applications

## Key Benefits:

### Return on Investment

- The Capstone MicroTurbine is designed for continuous operation. This, plus an emissions profile far below any permitting restrictions, means runtime is unlimited.
- In many regions, Capstone MicroTurbines generate power at a cost lower than that of utility rates.
- Enhancing demand reduction payback is the opportunity for cogeneration (using the exhaust heat for heating, drying or heat-driven absorption chilling).

### Reduction of Energy Storage (Batteries)

- Batteries take up valuable floor space, require energy-intensive temperature regulation, contain environmentally hazardous materials, and are costly to maintain and replace.
- A Capstone MicroTurbine UPS reduces storage or rectifier battery capacity to 5 minutes, with the grid as the last backup source.

### Reduction of Operating and Maintenance Costs

- Reciprocating engines require hazardous material permits for the storage and disposal of liquid coolants and lubricants, as well as change out activities.
- Air-cooled, air-lubricated Capstone MicroTurbines use no hazardous materials.
- Capstone MicroTurbines have very minor recommended maintenance intervals every 8,000 hours and recommended overhaul at 40,000 hours.

### Siting Flexibility

- Compared to other generators, Capstone MicroTurbines are lighter, have a smaller footprint, produce less noise and are vibration-free.



Capstone C30

## Typical Layout



Mode of Operation vs. Interruption	External Equipment	Prime to Backup Delay	Backup to Prime Delay
<b>MicroTurbine as Prime* or Standby, plus UPS</b> MT can operate in grid-connected mode as prime, peaking or standby; grid failure initiates MT shutdown/restart, batteries ride through event.	Battery UPS	None	None
<b>MT Grid-Connected and Stand-Alone*</b> MT runs grid connected, shuts down and restarts in standalone mode upon grid failure.	DMC**	2-4 min	<100 msec
<b>MT Stand-Alone Prime, Grid as Backup*</b> MT provides prime power, with ATS switching to utility only if MT goes offline.	ATS	<100 msec	< 100 msec
<b>Grid Prime, MT Standby</b> MT runs only when utility fails, in standalone mode	DMC** or ATS	2-4 min	< 100 msec
<b>Grid Prime, MT Idling Stand-Alone</b> MT idles in isolated stand-alone mode (load state), providing power to the load only during grid failure	ATS	< 100 msec	< 100 msec

\*Cogeneration (exhaust utilization for heating, drying, absorption chilling) is possible with continuous/extended operation.  
\*\*Capstone autoswitching Dual-Mode Controller allows better load matching than an ATS, as MT power in excess of the critical load can flow to non-critical loads upstream of the DMC. ATS does not allow grid-connect operation, or the utilization of excess MT power. However, ATS transfer times are faster, and a utility interconnection agreement may not be required.



- The microturbine generator for power on or beyond the grid:
- Ultra-Low Emissions
  - Designed for Ultra-Low Maintenance
  - Fuel-Flexible
  - Air-Cooled
  - One Moving Part
  - No Lubricants or Coolants

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