

## At a glance

### Location

Región de la Araucanía, Chile

### Commissioned

May 2013

### Fuel

Liquefied Petroleum Gas (LPG).

### Technologies

- Four 65kW Capstone MicroTurbines® configured in an ICHP application.
- Capstone Logic Controller (CLC).

### Results

- The Capstone microturbine array supports 100% of power demand.
- At full load, the system produces about 1,752 Gigawatt Hours (GWh) of electricity and 3,504GWh of thermal energy annually.
- Array produces 200kW of electricity and 400kW of thermal energy.
- Energy efficiency of the system ranges from 70-80%.
- The C65's provide ultra-low noise emissions (<65 dB).
- Installation of the Capstone microturbines is equivalent to removing 350 cars from the road or planting 365 acres of forest.

## Corralco Mountain & Ski Resort Hotel

In southern Chile, on the slopes of Lonquimay Volcano and within a breathtaking national reserve is the Corralco Mountain & Ski Resort Hotel. In this extraordinary intersection that merges rugged mountains and centuries old forests, visitors to the 60-room, 5,525-square-meter (59,470-square-foot) luxury hotel are surrounded by one of the most diverse ecosystems in the world.

Isolated from the utility grid and over 120 kilometers (75 miles) from the nearest city, project developers faced a unique set of challenges when they were exploring how to power the remote hotel.

Situated in the abundant Malalcahuenco Nalcas Natural Reserve filled with wildlife and vegetation, including pumas, condors, foxes and the country's endangered native "Monkey Puzzle" (Araucaria) tree, it was critical to build an environmentally friendly venue that fostered long-term sustainability.

With the nearest utility power supply 10 kilometers (6 miles) from the site, installing power lines for grid connection would be economically and geographically challenging, and disrupt the Reserve's treasured ecosystem.

After conducting endless hours of research, the project team found its clean-and-green power source in four highly efficient, quiet, and low-emission Capstone C65 microturbines installed in an integrated combined heat and power (CHP) application. The microturbines provided the hotel a reliable prime power source that would ensure the site's rich flora and fauna could be cherished by future generations.





The cogeneration system supports 100 percent of power demand for this luxury hotel and is capable of delivering 1,752GWh of electricity and 3,504GWh of thermal energy per year at full load.

"We wanted a simple, clean, and economical onsite power source," explained Mauricio Meyer, CEO of Corralco Mountain & Ski Resort Hotel. "The Capstone microturbines offered the clean energy and quiet solution our guests can appreciate."

Commissioned in 2013, the microturbines reliably generate all electricity the hotel requires. They operate on Liquefied Petroleum Gas (LPG), and at an elevation of 1,500 meters (4,921 feet) above sea level, the array produces 200kW of electricity and 400kW of thermal energy. The temperature and flow of the exhaust gases are recovered to provide heating and sanitary hot water, which meets all the hotel's thermal needs.

"We estimate the overall operating efficiency of the equipment at 80 percent," said Rodolfo Clementi, Abastible S.A.'s Chief of Power Generation and Cogeneration. Located in Santiago, Chile, Abastible – Capstone's certified distributor in Chile – was founded in 1956 to address the country's growing demand for clean energy products.

The hotel owners were, and remain, deeply committed to implementing all possible measures to protect and preserve the environment. Installing an onsite power system that reduces the resort's carbon footprint was key to meeting the hotel's environmentally friendly mission.

Capstone's patented air bearing technology produces ultra-low emissions, including extremely low NOx emissions (<9 ppm). Compared to traditional gensets, using Capstone microturbines at the site is equivalent to planting 365 acres of forest, or removing 350 U.S. passenger vehicles from the road.

Under full load, microturbines are capable of delivering 1,752GWh of electricity and 3,504GWh of thermal energy per year. "This is an efficient technology and provides an

energy source with a lower level of particle emissions and greenhouse gases," said Clementi. Energy efficiency of the system ranges from 70 percent to 80 percent.

Following 4,000 of hours of operation at the hotel, Meyer cited "stability, low level of acoustic contamination, low cost of maintenance, and an intelligent system of consumption and autonomy" as features that have assured hotel ownership their decision to install Capstone microturbines was best for the region and company.

With guest experience a priority for owners, the microturbines' low noise emissions (<65 dB) ensure the boutique hotel and luxury resort maintains its tranquil ambience. Keeping the long-term impact on the environment top-of-mind, the hotel also incorporated LED lighting that reduces light consumption by about 50 percent, and a recycling system that reuses organic waste.

"The heating, hot water and lighting are generated by clean sources," Meyer said. "Our guests have noticed there is not smoke coming from a chimney, no odor or noise. The hotel is in a natural reserve, so these items are much appreciated," he added.

Corralco's system includes integrated heat exchangers installed on each microturbine that capture waste heat energy naturally produced when the microturbines run. The heat exchanger's compact size and low noise emissions make them an ideal fit for the project.

In addition, the power system includes a Capstone Logic Controller which provides basic microturbine control functionality using a programmable logic controller based system. The hotel's CLC can operate in stand alone or dual mode. In a CLC-DM (Dual Mode) system, no single microturbine functions as the system master, providing a type of redundancy.

Meyers is pleased with the microturbines' performance. "The experience has been extraordinary," he said. "It is exceeding our expectations."

"I knew about other generator systems such as geothermal," Meyers added. "While I had my apprehensions, I can attest to that after 8 months of operation, the microturbine system has worked flawlessly, safely, and efficiently. All this is supported by a clean generation system, which is an ideal combination. And in relation to the global trend, it has definitely been a success."

Today, under the power of the Capstone microturbine array, the clean-and-green Corralco Mountain & Ski Resort Hotel helps ensure that guests will continue to cherish the spectacular views and renowned wildlife that makes the area's rugged mountains and lush forests one of Chile's most revered natural treasures. ■