



CHP  
TECHNICAL ASSISTANCE  
PARTNERSHIPS

# Westin Princeville Ocean Resort Villas

## 1-MW CHP System



### Quick Facts

**LOCATION:** Westin Princeville, Kauai, Hawaii  
**MARKET SECTOR:** Hospitality/Hotel  
**FACILITY SIZE:** 18.5 acres, 8 buildings  
**FACILITY PEAK LOAD:** 700 kW  
**EQUIPMENT:** Five 200-kW Capstone C200 microturbines and two absorption chillers  
**FUEL:** Propane  
**USE OF THERMAL ENERGY:** Cooling and pool heating  
**CHP TOTAL EFFICIENCY:** 70%  
**ENVIRONMENTAL BENEFITS:** Carbon reduction from displacing pool heating energy  
**TOTAL PROJECT COST:** \$5.2M  
**ANNUAL ENERGY SAVINGS:** \$440,000  
**PAYBACK:** 11.9 yrs  
**CHP IN OPERATION SINCE:** 2014

### Site Description

Located on the island of Kauai, the Westin Princeville Ocean Resort Villas is one of the largest resorts on the island and thus one of the largest energy consumers. Owned by Starwood Hotels and Resorts, it includes 346 one- and two-bedroom villas, four revitalizing pools, three whirlpools, a two-story clubhouse, a restaurant, and a general store. The Westin Princeville Ocean Resort Villas has embraced sustainable practices since its opening in 2008 and has motivations to further reduce its carbon footprint in the future.

### Reasons for CHP

Due to its geographic isolation and use of imported diesel as its primary source of electric generation, the island of Kauai has inevitably incurred high costs for energy. Aside from the corporate sustainability and global citizenship goals of Starwood Hotels and Resorts, the Westin Princeville Ocean Resort Villas pursued CHP to decrease electrical demand from the grid and ultimately costs. The main reasons the Westin Princeville Ocean Resort Villas implemented CHP are to:

- Reduce energy expenses
- Decrease reliance on grid and increase system resiliency
- Decrease carbon footprint and advance corporate sustainability
- Promote the well-being of Kauai's local contractors and vendors by utilizing their talent for the implementation of this important project.

*"We recognize that the vitality of the resort is directly linked to the vitality of the community where it operates...In addition to doing the right thing for the environment, the Westin Princeville Ocean Resort Villas is proud of the economic benefits that our project provided to Kauai's local contractors and vendors."*

*– Denise Wardlow, General Manager,  
Westin Princeville Ocean Resort Villas*

## CHP Equipment and Configuration

This system includes five 200-kW Capstone C200 microturbines, running on propane, with the exhaust pumped through a large heat exchanger that is tied to a closed loop hot water recirculation system to heat the four pools and three whirlpools. The remaining waste heat is channeled through two absorption chillers for the purpose of cooling the two-story clubhouse. The system can provide reliable power and thermal energy to keep critical facilities running during grid outages.

*“(Because), we are able to utilize the heat energy that would otherwise be discharged out of a conventional system, our overall efficiency is approximately 70 percent versus a typical utility maximum efficiency of 35 percent”*

*– Brian Harrier, Previous Dir. of Engineering, Westin Princeville*

### The Westin Princeville C1000 Capstone Microturbine System



Courtesy of Hawaii Business Magazine issued April 2015 “More Efficient Power” By Chris Oliver

## System Operation During Tropical Storms

Based on the potentially devastating tropical storms that can hit Kauai, it is important for hotels like the Westin Princeville to be able to continue their services to their residents. The severe and sudden rains can cause landslides, as well as flash flooding and in turn, cause power outages to the island.

“During our storms and several overnight power outages, our entire resort has been able to continue running as normal from the five micro-turbines. Because we also have an HRM (Heat Recovery Module) installed with the system, we are able to provide full temperature hot water to all of the resort, including all pools and Jacuzzis. It is great to have 100% “free” heated water as the HRM captures the exhaust heat from the micro-turbines that would otherwise just be exhausted into the environment.” – *Larry Harper, Director of Engineering, Westin Princeville*

## Lessons to Share

- Accurate predictions for thermal and electric demands are difficult to make for the hospitality industry but are critical for achieving the maximum benefits of a CHP system.
- The challenges of CHP installations in urban environments can be overcome with proper planning & coordination.
- On April 14-15, 2018, a powerful tropical storm dropped 28 inches of rainfall during a 24-hour period on the north shore of Kauai causing torrential flooding, which inundated farms, destroyed homes and disrupted many local businesses. The Westin Princeville was able to remain open while others took weeks to reopen.
- CHP systems can be designed to operate independently from the electric grid, providing reliable power and thermal energy to keep critical facilities running during grid outages. CHP systems increase energy security by producing energy at the point of use and are generally 40% to 60% more efficient than non-CHP energy.
- Successful application of CHP in critical facilities depends on engaging the support of decision-makers who build, manage, and operate these facilities, as well as overcoming regulatory barriers. The Westin prioritized coordination between site energy managers and state utility regulators to help reduce barriers to CHP so that its system could be safely installed to provide the Westin Princeville Ocean Resort Villas energy savings and resiliency.

## For More Information

**U.S. DOE WESTERN CHP TECHNICAL ASSISTANCE PARTNERSHIP (CHP TAP)**

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**More CHP project profiles:**  
[www.wCHPTAP.org](http://www.wCHPTAP.org)

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