



CHP  
TECHNICAL ASSISTANCE  
PARTNERSHIPS

# Marine Corps Recruit Depot Parris Island

## 3.5-MW CHP + Microgrid



Platoon 4001 of the 4<sup>th</sup> Recruit Training Battalion, MCRD Parris Island.  
Every year about 17,000 new recruits step foot on the 8,000-acre depot.

*Photo courtesy of MCRD Parris Island*

### Quick Facts

- LOCATION:** Parris Island, SC
- MARKET SECTOR:** Military installation
- FACILITY SIZE:** 3.1 million square feet
- GENERATING CAPACITY:** 3.5 megawatts (MW)  
CHP plus 5.5 MW solar PV
- EQUIPMENT:** 3.5 MW gas turbine, 5.5 MWac,  
solar PV, 8MWh lithium-ion battery
- FUEL:** Natural gas / solar PV
- USE OF THERMAL ENERGY:** Space and domestic  
water heating
- ENVIRONMENTAL BENEFITS:**  
38,000 metric tons CO<sub>2</sub> reduction annually
- TOTAL CONSTRUCTION COST:** \$91 million
- ANNUAL ENERGY SAVINGS:** \$6.9 million
- CHP IN OPERATION SINCE:** 2019

## Project Overview

Secure and resilient energy is critical to the mission of United States Marine Corps Recruit Depot (MCRD) Parris Island, which is summed up by the Depot's mission statement, "We make Marines." To increase the depot's energy resilience, MCRD installed a microgrid that combines several distributed generation sources in a hybrid approach. The microgrid has a 3.5 MW combined heat and power (CHP) system, a 5.5 MW of solar photovoltaic (PV) array, and a 4 MW battery-based energy storage system, together with an integrated control system capable of islanding and fast load shedding. This project, as part of a \$91 million Energy Services Performance Contract (ESPC) with Ameresco, fulfills recent Department of Defense and Department of the Navy policies that require resilient energy systems for critical missions.

Located on the coast, MCRD Parris Island is subject to extreme storms, and the microgrid procurement included an extensive overhaul of the depot's infrastructure to make it capable of withstanding storms, flooding and seismic events, as well as cyber-attacks. With the 13 MW microgrid, electric consumption from the utility grid will be reduced by an estimated 79%, with significant cost savings and an estimated annual greenhouse gas reduction of nearly 38,000 metric tons of CO<sub>2</sub>.

MCRD Parris Island won the Secretary of the Navy 2021 Environmental Award, recognizing efforts that "demonstrated that early and deliberate planning could yield a benefit cost ratio of 5.21, providing \$675 million of net infrastructure, training and human health benefits, thus maximizing the operational budget and securing the depot's mission."

## Reasons for CHP

MCRD had aging infrastructure, including electrical distribution and underground district energy piping in need of replacement and modernization. The depot also sought to implement assets that would ensure resilience and security, while allowing for flexibility to support the overall mission. Reducing the lifecycle operating costs while managing future electricity price increases and natural gas commodity price volatility were also prime objectives of the project.

Ameresco replaced the existing end-of-life steam plant with a new, automated natural gas-fueled CHP system capable of providing 3.5 MW of power and all the steam required for the depot to heat buildings and provide domestic hot water. The performance contract also included comprehensive energy upgrades to many buildings and their systems.

MCRD Parris Island's microgrid installation is a hybrid, or flexible, CHP system. In such a microgrid, a CHP system provides baseload electric and thermal energy, while facilitating the addition of other distributed energy resources so peak energy needs can be met in an optimal way. These resources can include solar PV, wind energy, energy storage, demand management, central controls, and electric vehicle charging opportunities for a diversified site energy solution.

## CHP Equipment, Configuration and Operation

The CHP system serves as the primary energy source for a microgrid that integrates these distributed resources.

- 3.5 MW natural gas-fired reciprocating engine CHP system with 60,000 lb/hr steam
- 5.5 MWac (6.8 MWdc) of onsite solar PV
- 4 MW lithium-ion battery energy storage
- 3.6 MW backup diesel generators
- Two 30,000 lb/hour dual fuel backup boilers

While the hybrid CHP microgrid generates all the necessary steam and most of the electricity under normal conditions, its primary purpose is to provide resilient and secure energy in the event of a utility grid failure. If utility power goes down, the microgrid's intelligent controller automatically disconnects or "islands" from the utility grid, utilizing the CHP system and other resources with fast load shedding to power the depot.



MCRD's new central plant with microgrid and island mode capability providing 3.5 MW of electric and the full steam load required by MCRD Parris Island. Photo courtesy of Business Wire

This project, according to Daniel T. Magro, Naval Facilities Engineering and Expeditionary Warfare Center ESPC Program lead, "Is probably the most comprehensive [ESPC] ever entered into by the Navy, involving 121 buildings (3.1 million square feet total) and 20 energy conservation measures. This will result in MCRD Parris Island reducing its energy consumption by 384,962 million BTUs (79% compared to purchasing electricity from the utility) and water consumption by 74.6 million gallons (27%) annually".

*"With this new plant we have independence. If anything were to happen, like a hurricane or a flood, we can still continue to operate and, more importantly, make Marines."*

-- Brig. Gen. James F. Glynn, Commanding General, MCRD Parris Island

## Lessons Learned

Through the ESPC, Ameresco maintains the plant while the depot handles day-to-day operations. It is extremely important to establish clear Standard Operating Procedures (SOPs) from the beginning to understand the system interdependencies and controls, especially when more than one entity has control of different parts of the system. Cybersecurity is also increasingly important and should be considered and implemented at the start of the project.

The installation tests the islanding feature of the system regularly to maintain operability and proactively identify issues.

## For More Information

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