COMBINED HEAT AND POWER ALLIANCE

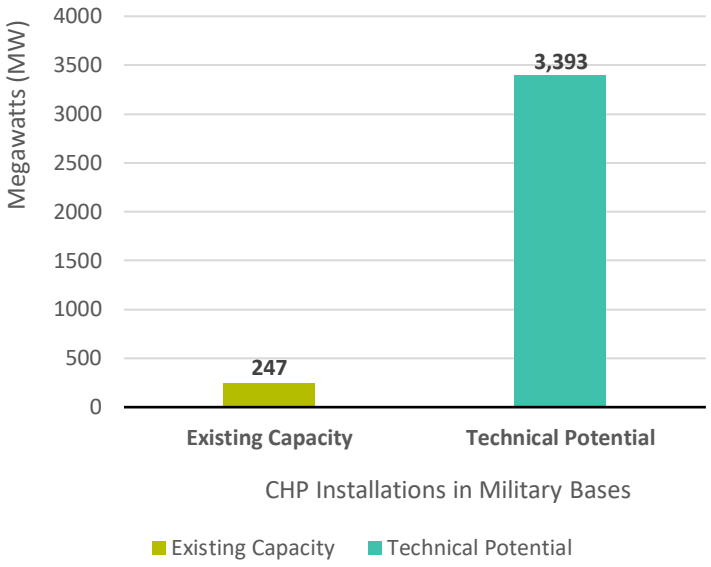
Combined Heat and Power (CHP) Potential in Military Bases

The U.S. Department of Defense employs over 2.5 million Americans at 4,150 domestic sites.[1] Military bases require energy for a variety of functions at numerous facilities, including hospitals, data centers, and barracks. In 2019 alone, the U.S. military consumed 84 million barrels of oil at a cost of $11 billion.[2] Combined heat and power (CHP) generation systems can significantly lower energy costs for military sites by continuously supplying both electricity and heat. These systems are resilient in the face of unexpected grid outages, capable of keeping the nation's defense network active.

Direct CHP Benefits for Military Bases:

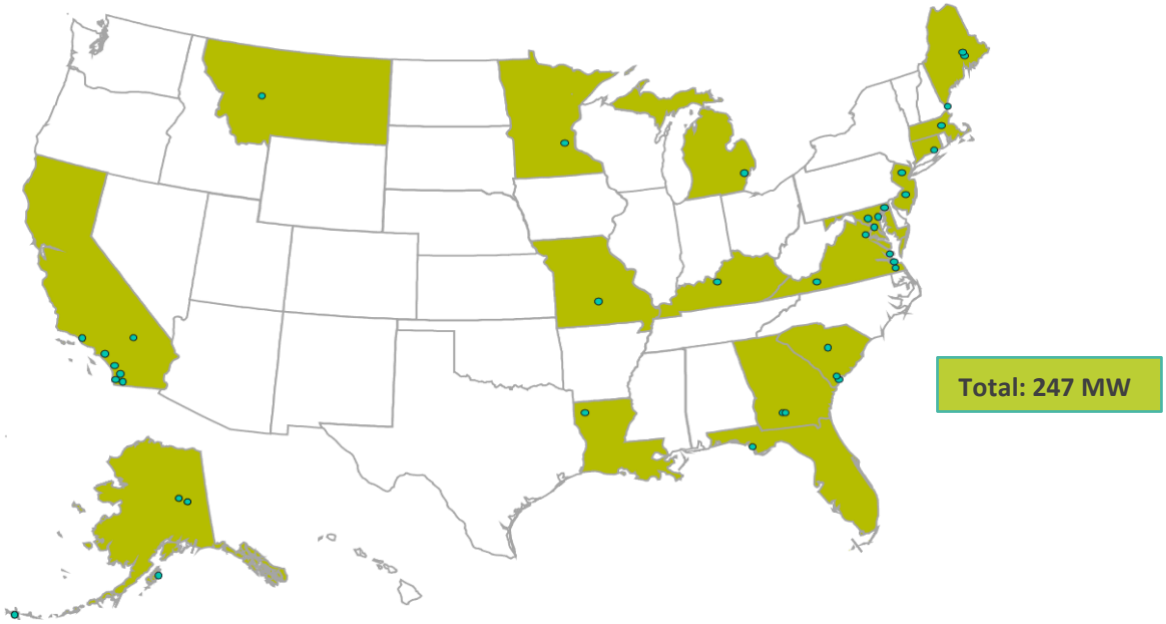
- Increased energy reliability
- Microgrid capability
- Storm resilience & emergency preparedness
- Prevention of military service time loss
- Reduced energy costs
- Increased energy efficiency
- Protection to critical missions
- Reduced greenhouse gas emissions

Figure 1: CHP Capacity at US Military Bases Compared to Technical Potential [3,4]



An electric grid failure due to weather, malfunction, or an emergency puts considerable strain on military bases. A loss of power is not only costly, but it also threatens national security. CHP systems allow a military facility to operate in "island mode," separating itself from the electric grid and continuing to run even during large-scale power outages. This uninterrupted supply of energy prevents the loss of personnel service time and protects our nation's defense sytem. CHP units can also be installed as part of a microgrid that can separate itself from the utility grid, providing electricity to several buildings or facilities. Microgrids also eliminate the need for expensive back-up systems, which military bases must otherwise use in the case of grid failure. A loss of power is not only costly, but it also threatens national security. In an effort to reduce risk to critical missions, the Army requires that all of its facilities have 14 days of back-up power.[3] In the U.S., 39 military bases have installed CHP systems, providing 247 MW of capacity.[4] However, the U.S. Department of Energy estimates that 3,393 MW of potential remains in the military sector alone.[5]

Fig. 2: CHP Military Base Installations in the U.S.[3]



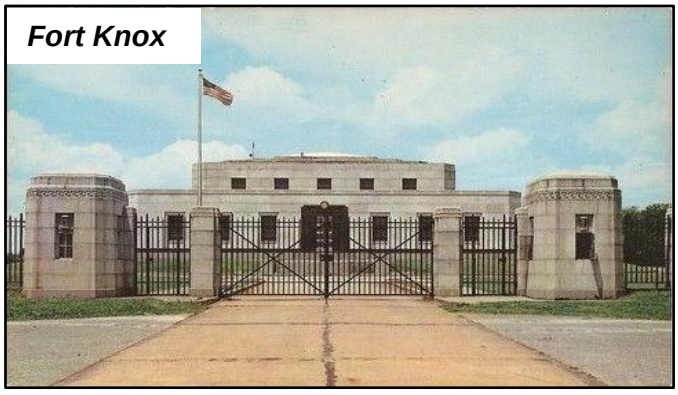
Case Study: Why Military Bases Need Dependable Power

Military bases in the United States support a variety of crucial operations, such as hospitals, housing, and grocery stores. After a fire cut off power to the Travis Air Force Base in 2019, several of their services were suspended indefinitely. For 16 hours, the base was forced to significantly limit operations and restrict personnel until the local utility restored power. The increasing frequency and strength of natural disasters increase the risk of dangerous and costly disruptions to military bases solely reliant on the electric grid. According to a Department of Defense report on energy management, in 2018 military installations reported 562 utility outages lasting 8 hours or longer. The combined length of these outages exceeded 1,695 days and cost the Department about $23 million.[6] These significant power and financial losses underscore the imporatance of reliable and efficient energy systems on military bases, which CHP systems can provide. The Travis Air Force Base took the lessons learned from the recent outage and fortified its power system. Many bases across the country are following a similar path.[7]

A fire near the Travis Air Force Base in California caused a power outage that lasted 16 hours.

CHP Success Stories

Fort Knox



Fort Knox (Fort Knox, KY): During a severe ice storm in 2009, Fort Knox lost its utility service connection, leaving several buildings on the campus without power for 10 days. To increase resiliency and avoid future disruptions, in 2014 the post installed an 8 MW CHP system for its critical infrastructure. The system operates at 81% efficiency, has saved $5 million annually, and will reach its simple payback in 2021. In addition to these benefits, emissions of NOx and CO pollutants have been reduced by 90%.[9]

Marine Corps Air Ground Combat Center (Twentynine Palms, CA): The Marine Corps Air Ground Combat Center utilizes a 16.4 MW CHP system that helps supply energy to 3,000 buildings totaling around 10 million square feet. The Base's decision to install a CHP system aligned with the Navy's push towards maximizing energy efficiency, clean energy generation, and cost savings. Since installation, the campus accrues $8 million in savings annually, at a CHP total efficiency of 75%. With over 10,000 personnel utilizing 119 million kWh a year, CHP helps to efficiently meet this significant energy demand.[8]

Marine Corps Air Ground Combat Center

[1]U.S. DOD. "Base Structure Report" 2018. https://www.acq.osd.mil/eie/Downloads/BSI/Base%20Structure%20Report%20FY18.pdf
[2]U.S. DOD. "Operational Energy Annual Report. 2019. https://www.acq.osd.mil/eie/Downloads/OE/FY19%20OE%20Annual%20Report.pdf
[3]U.S. Army. "Army Pursuing 14-Day Energy, Water Independence for Installations." 2017. https://www.army.mil/article/184993/army_pursuing_14_day_energy_water_independence_for_installations
[4]U.S. DOE. "Combined Heat and Power Installation Database." Installations as of December 31, 2020. https://energy.gov/chp-installs
[5] U.S. DOE. "Combined Heat and Power (CHP) Technical Potential in the United States." March 2016. https://www.energy.gov/sites/prod/files/2016/04/f30/CHP Technical Potential Study 3-31-2016 Final.pdf
[6]U.S. DOD. Annual Energy Management and Resilience Report. 2018. https://www.acq.osd.mil/eie/Downloads/IE/FY%202018%20AEMR.pdf
[7]Air Force Magazine. "USAF Learns Lessons from Travis Power Outage". 2019. https://www.airforcemag.com/usaf-learns-lessons-from-travis-power-outage/
[8]U.S. DOE. "Marine Corps Air Ground Combat Center". 2020. https://chptap.lbl.gov/profile/338/MCAGCC-Project_Profile.pdf
[9]U.S. DOE. "Fort Knox". February 2016. https://chptap.lbl.gov/profile/81/fort-knox-Project_Profile.pdf

For more information, please visit the Alliance: https://chpalliance.org/join