



**MIDWEST  
CHP  
APPLICATION  
CENTER**

In Partnership with  
the US DOE

combined heat & power in government facilities

# Naval Station Great Lakes

## 14.0 MW CHP Application

### Project Profile

#### Quick Facts

**Location:**

Great Lakes, Illinois

**Campus Size:**

- ▶ 278 buildings
- ▶ 10.9 million SF of occupied space

**Maximum Electric Demand:**

32 Megawatts

**Maximum Steam Demand:**

300 kpph

**CHP Electric Capacity:**

14.0 Megawatts

**CHP Thermal Capacity:**

100,000 lb/hr of 350 psi steam

**Prime Movers:**

- ▶ (2) 5.5 MW Solar Taurus 60 dual fueled combustion turbines (inst. 2005)
- ▶ (2) 1.50 MW back pressure steam turbines (inst. 1993)

**Fuel Type:**

Natural Gas and No. 2 Fuel Oil

**Installation Costs:**

\$34,110,909\*

**Annual Savings:**

\$3.5 million\*

**Began Operation:**

Summer 2005

*\* Economics exclude 1993 installation of back pressure steam turbines.*

#### Project Overview

Located 35 miles north of Chicago along the shores of Lake Michigan, the Naval Station Great Lakes (NSGL) operates a combined heat and power (CHP) system that supplies up to 14.0 megawatts of electricity and over 100,000 lb/hr of high pressure steam to the naval training base. At the core of the CHP system are two 5.5 MW Solar Taurus 60 dual-fueled turbine generators with heat recovery steam generators and two backpressure steam turbines totaling 3.0 MW.



**Building 1 of Naval Station Great Lakes**  
(photo courtesy of [www.nsgreatlakes.navy.mil](http://www.nsgreatlakes.navy.mil))

#### Background

By 2002, NSGL was facing a realistic and undesired situation. The NSGL facilities were aging and inefficient, the Energy Policy Act (EPACT) mandated reduction in energy consumption in all federal facilities, NSGL was confronted with expanded responsibilities and shrinking budgets, and the NSGL was now the only U.S. Navy recruit training center in the country.

Ameresco Federal Solutions, an independent energy solutions company based out of Knoxville, Tennessee, along with the Naval Facilities Engineering Command, developed a long term plan to upgrade and modernize the NSGL facilities utilizing third party financing. A three-step plan was developed and implemented to repair / refurbish / upgrade buildings, upgrade the distribution systems, and improve the existing central plant with CHP.

The major challenges to implementing the plant upgrades via a CHP system included:

- ▶ Upgrading the central plant without disrupting on-going operations
- ▶ Operating the naval base independent of the utility grid
- ▶ Complying with new federal regulations without adequate appropriations

These challenges were successfully met as the upgraded combined heat and power system began operation during the summer of 2005.

## Major Items in CHP Upgrade

When the Great Lakes Naval Station central plant entered into renovation, the staff retained the existing backpressure steam turbines for future operation. The major items added to the plant directly related to CHP included:

- ▶ (2) 5.5 MW Solar Taurus 60 dual fueled turbine generators with heat recovery steam generators (HRSGs)
- ▶ Ammonia Selective Catalyst System
- ▶ (2) 2.0 MW Caterpillar 3516 diesel back-up generators
- ▶ Associated switchgear and controls
- ▶ Boilers conversion from No. 6 to No. 2 fuel oil
- ▶ 15 year warranty contract including six factory rebuilds



**5.5 MW Solar Taurus 60 Turbine Generator**



**Navy Personnel viewing the Operating Display**

## CHP Costs and Benefits

The upgraded combined heat and power project investment totaled \$34 million with projected annual savings of \$3.5 million and a simple payback of approximately 9.6 years. The CHP system offers NSGL fuel flexibility (natural gas and No. 2 fuel oil), significant emission reductions from the previous No. 6 fuel oil operated boilers, and the system is able to operate independent of the utility.

## Energy Program Results

The central plant upgrade including the CHP system was part of a three-step plan totaling over \$100 million in Energy Savings Projects incorporating 9 Phases of Energy Projects involving 160+ buildings. The projects included key infrastructure upgrades, improved working and training environment, increased reliability and flexibility, annual savings over \$12 million annually. The NSGL is the largest Utility Energy Savings Contract (UESC) program in the federal government.

## Utility Energy Savings Contract (UESC)

UESC management programs are public utility-sponsored programs that encourage energy efficiency improvements by offering rebates and other subsidies to their customers for energy efficient technologies. The projects are funded by the utility and the project is paid back through the project's energy savings.



**Ammonia Selective Catalyst System**

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\$3.5 million  
annual savings

9.6 year simple  
payback

fuel  
flexibility

grid  
independent

emissions  
reduction

