



# Temple University

## 16 MW On-Site Generation Application

### Project Profile

#### Quick Facts

**Location:**

Philadelphia, PA

**Campus Size:**

Temple's main campus is home to over 10,000 students, 63 buildings, and covers 105 acres

**Campus Loads:**

?? MWh annually

?? MW peak load

**Prime Movers:**

Ten low-pressure, natural gas fired Caterpillar tandem generators sets, each rated at 1.6 MW

**Annual Energy Savings:**

\$1.5 MM net since 1993, cutting Temple's electricity costs in half

**Installed System Cost:**

\$16 MM

**Began Operation:**

May 1993

#### Reasons for Installing CHP

Temple's 1993 installation of on-site generation offered a variety of benefits to the university. It functioned as an emergency source of power when necessary, reduced dependence on the grid, and saved the university tens of millions of dollars in electricity costs.



#### Project Overview

Temple University was founded in 1884 by Dr. Russell Conwell and in 1907 became fully accredited. Temple is the 6th largest provider of professional education in the United States and is known for its law, education, and business departments. Its main campus is located along Broad Street a mile and a half north of Center City, Philadelphia.

On-site generation became an attractive option for its offering of reduced energy costs and relative independence from the grid. Temple also considered a combined heat and power system (which would provide heat in addition to electricity) but ultimately decided against it because of the higher initial cost of such a system. In 1993, they installed ten 1.6 MW generator sets at a total cost of \$16 million. This cost is higher than usual because the installation location required a separate building be constructed for the generators.

Since the project was completed, Temple has seen a marked decrease in their electricity bills. Over a seven year period, the university experienced a savings of \$23 million, or over \$3 million annually. Factoring in the costs associated with fuel, maintenance and financing the project, their annual net savings were still over \$1.5 million.

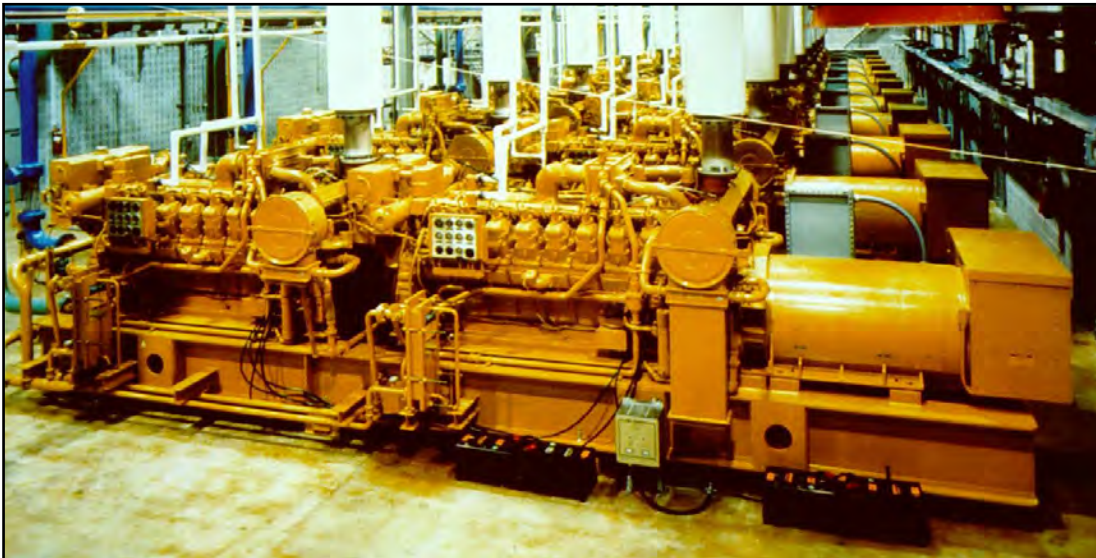
## Installation Specifics:

### Generator information:

- Ten low pressure, natural gas-fired Caterpillar tandem generator sets were installed.
- Each is rated at 1600 kW (2250 bhp) for a total generating capacity of 16 MW.
- NOx emissions for these units are 2.00 g/bhp-hr.

### Operation:

- The generators are controlled by a unit built by Enercon Engineering. It was chosen because Enercon has a history of working with Caterpillar generators.
- Fuel and maintenance costs (including upgrades) comprise just 9% of the gross savings for the installation.
- At the current fuel price of \$8 MMBtu and at 100% load, this facility can produce electricity at around eight cents per kilowatt-hour.



*The generator facility, housed in the building specially constructed for this purpose*

### Economics:

- The total cost of the installation was approximately \$16 million:
  - 35% of this was for the generator sets, 20% for electrical costs, 18% for the building, 14% for HVAC, and the remaining 13% for various other costs.
- This facility offers the university a gross savings of \$3.1 million dollars annually:
  - 9% of this goes to maintenance and fuel costs, and 43% goes to financing the original costs. This means a net savings of \$1.5 million annually.

### Additional Facts:

- Temple originally kept two units as spares. As they became more comfortable with operation, they began using all ten units.
- At \$1000/kW, the installation costs are rather high. Temple estimates that without the necessity of constructing a building, this could have been reduced to \$500/kW.

### U.S. DOE Mid-Atlantic Clean Energy Application Center

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Quotes need to go here, or they could be filled in from the presentation if necessary