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Realizing the Hidden Benefits of Cogeneration

» BY BARRY J. SANDERS

Searching for an Energy Solution

As utility costs increased at North Hill, a 59-acre independent living community in Needham, Massachusetts, Harry Goodale, Director of Plant Services, worked continuously to reduce energy costs by analyzing North Hill's efficiency mix throughout the 500,000 square foot campus. His research and analysis indicated that locating a cogeneration system in the building containing the skilled nursing facility, commercial laundry and main kitchen – the building which generates the highest demand for electricity and hot water – would have the greatest impact on the bottom line. However, North Hill did not want to use its capital to purchase and maintain a cogeneration system.

What is Cogeneration?

Cogeneration, also called combined heat and power or CHP, is the simultaneous production of two types of energy – heat and electricity – from one fuel source. The ability to create two energy outputs from one input makes cogeneration very efficient – almost 90 percent efficient. Therefore implementing such a system to offset energy produced from the grid (33 percent efficient) and onsite boilers (65 percent efficient) can result in significant cost savings and reduction in carbon production. The cogeneration system at North Hill could reduce carbon dioxide emissions by 225 tons per year, the equivalent of 37 cars off the road or 47 acres of new forest.

Efficiency is the Key to Savings

To achieve greatest efficiency and subsequent cost savings, a cogeneration system must be appropriately sized to the energy demands of the building. Specifically, the size of a system should be determined by the thermal load required during the period of least demand. Otherwise, the excess heat produced when generating electricity is not used; it becomes wasted energy, which is equivalent to throwing money away. Utilizing all the heat produced by a continuously operating cogeneration system is the key to optimum performance and efficiency, which leads to the greatest possible savings. The biggest mistake clients make when selecting cogeneration systems is over sizing the system.



THE CHP SYSTEM AT NORTH HILL PROVIDES ELECTRICITY, SPACE HEAT AND DOMESTIC HOT WATER.

Considering Cogeneration at North Hill

Goodale had been aware of cogeneration and its economic and environmental benefits for many years, but never implemented a system because of the considerable issues: equipment purchase price, installation costs, annual operation and maintenance costs plus a poor return on investment.

"But when I heard about the On-Site Utility, I thought 'this is a great deal,'" said Goodale. "North Hill could get a cogeneration system without the purchase price and no equipment responsibilities, so if it breaks, no worries, because American DG Energy takes care of everything."

The On-Site Utility – a "Homerun" for Cogeneration

After analyzing past energy consumption and performing a comprehensive site evaluation, American DG Energy installed a 75 kW cogeneration system in the building at North Hill with the greatest demand for heat and hot water as well as integrated the system with existing building energy equipment. Since the cogeneration system was installed as an On-Site Utility, North Hill bears no capital costs, no installation costs, no operating costs and no equipment responsibility for the system. North Hill even receives a discount on the energy produced by the system and North Hill's boilers operate significantly fewer hours producing additional savings.

According to Goodale, "With no capital investment and all the maintenance provided by American DG Energy, it's a homerun any way you look at it."



NORTH HILL IS A 59-ACRE INDEPENDENT LIVING COMMUNITY LOCATED IN NEEDHAM, MASSACHUSETTS.

Benefits of Cogeneration

Because American DG Energy monitors and operates the cogeneration system to maintain peak efficiency and optimum performance, North Hill began saving on its energy costs as soon as the system began operating in August of 2010. But they also benefitted in ways they had not anticipated.

For the first three months of operation, the cogeneration system provided all heat and hot water for the building. The boilers and hot water heaters did not run at all during that time. "With the cogeneration system running, not once from August to October, did I hear our boilers or water heaters kick on," stated Goodale. "And now, even on very cold days, only one or two boilers run, whereas before, all five would be going."

Once installed, the cogeneration system took over as the base load of heat and power. The building remains connected to the grid and existing boilers and hot water heaters, but the building only draws on those systems when the cogeneration system is at full capacity yet the building needs more electricity or heat. As a result, there is less demand placed on both the grid and the building's existing energy equipment throughout the year. The reduced demand results in decreased operating costs for existing systems, with savings going directly to the bottom line. Plus, the useful life of that equipment is extended due to the reduction in annual run-hours. In the case of North Hill, these benefits, in addition to energy cost savings, were realized immediately because the cogeneration system began operating during the summer, when boilers are least efficient.

The cogeneration system also has environmental benefits due to its high efficiency and the residents at North Hill are actively involved in greening the community, but ultimately, it was the financial benefits that motivated the community to select an On-Site Utility.

"Because we're not paying for equipment and maintenance, it was an easy choice to make," stated Goodale. "We realize there are both environmental and economic reasons for choosing cogeneration, but, in the end, it all comes down to the money."

The Project

Project name: North Hill Cogeneration System

Location: Needham, Massachusetts

Equipment: Tecogen CM-75 cogeneration unit

System start date: August 3, 2010

Project Highlights

- * Installed a 75 kW natural gas engine-driven cogeneration unit
- * Utilized cogeneration unit thermal output to generate space heat and domestic hot water
- * Modified piping and controls for the heating and domestic hot water architecture
- * Eliminated use of hot water heaters and boilers during the non-heating season
- * Installed additional metering to ensure 24/7 continuous monitoring and control of system operation
- * Reduced annual operating expenditures of boiler system and hot water heaters
- * Reduced carbon emissions by 225 tons of carbon dioxide annually
- * System design, installation, operation, maintenance and optimization managed by American DG Energy at no cost to North Hill

Benefits for North Hill

- * Reduced energy costs
- * No capital outlay for equipment
- * Lower operating costs
- * No equipment responsibility
- * Reduced carbon emissions
- * Extended lifespan of existing energy equipment

For more information about cogeneration and American DG Energy's On-Site Utility, visit www.americandg.com.

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