The race to be "green" is on, and facilities are looking for ways like LEED (Leadership in Energy and Environmental Design) certification to make headway toward a more sustainable, energy efficient future. LEED has become the nationally accepted benchmark for the design, construction, and operation of high performance green buildings. The demand for green building systems is driven by a marketplace that is looking for the energy-saving, water-conserving, and materials performance benefits associated with these designs. There are many elements that need to come together for a LEED certified building, with the HVAC system understandably a significant component.

Natural gas technologies are helping building owners to achieve the LEED rating, and two case studies are presented here for reference. The first project involves the recently completed Northland Pines High School in upstate Wisconsin, which is significant because it is the first LEED Gold certified school in the nation. LEED Gold is the second highest rating, and recognizes extraordinary achievement in energy efficiency and environmental sensitivity. Schools are highly visible facilities, not only because of the educational aspects that can be passed on to younger generations, but also because of the importance of their indoor environments, particularly with regard to air quality, HVAC and lighting. There can be no compromises when it comes to our children.

Much thought went into the development of an efficient HVAC system, featuring eight natural gas Patterson Kelly non-condensing boilers feeding a primary-secondary loop system designed for optimal heat recovery. The pumps serving the secondary loop use variable frequency drives to allow the pump load to match the building's load. Depending on the call for heat, and you can imagine that northern Wisconsin can be quite cold in the winter, the system responds by supplying the needed thermal energy to meet peak loads and less than peak loads equally well.

While many facilities have pumps sized for the total connected load, the variable frequency drive pumps were sized to match the anticipated peak load only. Using gas-fired boilers with an optimally designed primary-secondary loop system helped to keep the installation costs very reasonable for a LEED certified building, resulting in total design and construction costs at $115/ft²($29 million for the 250,000 ft² school).

Sometimes the focus on green building can lead to higher first costs and longer payback periods. This was not the case here. Northland Pines came in more than 20% below the national median cost of $150/ft² for high schools built in 2006, according to School Planning and Management magazine's “2006 Construction Report.” Designing responsive systems using conventional
technologies that minimize waste makes both the building owner and contractor happy. Northland Pines’ projected energy savings is approximately 40% compared to the ASHRAE 90.1-2004 baseline building.

The first LEED-certified building in Minnesota happens to be a 75,000-sq.-ft. public elementary school with natural gas used for heating, hot water and kitchen equipment. The Energy Solutions Center highlighted the Westwood Elementary School in Zimmerman, MN when it became one of only four schools in the nation to earn that certification from the U.S. Green Building Council.

A pair of A.O. Smith Cyclone XHE® domestic gas water heaters rated at 94% thermal efficiency provide hot water throughout the school including the kitchen, where two natural gas-fired booster heaters are employed to provide dishwashing water. High-efficiency cooking equipment in the kitchen also operates on natural gas.

LEED provides a complete framework for assessing building performance and meeting sustainability goals. The Rating System Document offers insight into the categories of credit that can lead to a Green Building Certification. Building projects that are certified as meeting LEED performance standards in our region are found in the LEED project list.

In addition to the GBC's LEED program, there is the Green Building Initiative, which licensed the Canadian government's The Green Globes™ system, modified it, and introduced it to the U.S. in 2004. In the U.K., they use a similar evaluation method called BREEAM (BRE Environmental Assessment Method) to promote green building initiatives.

**LEED and Natural Gas**

Energy efficient natural gas systems and equipment can contribute significantly to obtaining a LEED certification rating. Many applications fueled by natural gas are part of LEED certification.

*High efficiency boilers.* Natural gas powered boilers that have energy saving features such as pulse combustion, high turn down burners, economizers, vent dampers, and reset controls can contribute to energy efficiency.

*High efficiency furnaces.* Gas furnaces can be made more energy efficient with features such as a secondary heat exchangers, sealed combustion, and electronic ignition.

*High efficiency water heating.* For storage water heaters, energy efficiency improvements include more efficient burners, better flue design, and lower input pilots. Heat traps on the water pipes and insulation blankets on the tank and water pipes can also save energy. Gas-fired demand water heaters can save energy at hand washing stations and other areas of low hot water demand. Gas booster heaters can save energy on dishwashing in food service operations. Other energy-saving water heating installations include low flow showerheads and sink aerators, as well as horizontal axis clothes washers.
Heat recovery systems. Reclaiming exhaust air from building systems can help to lower energy use and operating costs for heating and cooling systems. Better ventilation and improved indoor air quality are additional benefits.

High efficiency gas cooking equipment. Utilizing high efficiency gas cooking equipment can save tremendous amounts of energy for foodservice operations over standard efficiency gas or electric cooking equipment.

Desiccant dehumidification systems. Desiccant HVAC systems remove moisture from the air and reduce cooling load. They provide cleaner humidity control, reduce cooling costs through inclusion of an off-peak energy source, and operate more efficiently than systems that require lower supply temperatures.

There are a number of other LEED certified schools coming online in the next few years that include new and retrofit designs, and many of these with natural gas. Once building owners and operators realized that costly, exotic technologies with complicated operating systems were not required to obtain the LEED rating, intelligent building designs using conventional heating systems that minimized wasteful energy practices evolved. The end result is a winning situation for the building owner, contractor, environment, and especially our future generations of young people.