

Energy Management for Green and Budget Conscious School Systems

How Wireless Energy Efficiency Can Help Schools Conserve Energy and Save Budgets

With budgetary challenges and rising energy costs, school administrators and facility managers must pare down all wasteful expenses to keep their focus on educating students. In addition, schools and public buildings are frequently targeted to promote and demonstrate green strategies. Thus, maintaining a cost-effective energy policy to reduce energy waste across the district has become a leading way to curb spiraling energy budgets and reduce carbon emissions.

“What can we do now – rather than wait for renovating or building new facilities – to save substantial energy?”

Opportunity

ENERGY is one of the few expenses that can be reduced without affecting classroom instruction... through intelligent conservation. It is time to look at the large opportunity and reduce energy consumption across the portfolio of schools and other public building

We Are Wasting Energy and Time – What Can Be Done?

Regardless of the school district size, the problem is the same: energy expenses typically account for 2-3% of the total public education budget. Yet energy costs are increasing uncontrollably – up 50 to 80% since 2000. There are various approaches to reduce energy consumption and carbon emissions, but few have a significant short-term effect; many require 5 to 15 years to achieve payback. An intelligent energy conservation program is the key to both short- and long-term sustainability.

It's time to look at the opportunity communities have to reduce energy consumption in schools and other public buildings. School districts need a combination of approaches to balance and align short- and long-term objectives with their education and community missions.

Communities need a strategy for energy management that encompasses schools and other buildings. A broad-based energy conservation program becomes more effective as the visibility and control of energy consumption increase. Millennial Net's wireless Energy Efficiency Solutions are designed to leverage existing infrastructure to rapidly and cost-effectively retrofit buildings. The Millennial Net System produces savings of up to 30% and has a typical payback period of less than 2 years.

Monthly Energy Bills Are Out of Control – How Can We Curb Them?

Most school districts have no idea how much energy they consume or what to do about it.

The cost of energy necessary for schools to maintain a comfortable learning environment averages to an annual rate of \$2 to \$3 per square foot – that's \$250 to \$350 per pupil! Rising costs squeeze school budgets for operation and maintenance. While new schools are built to high-performance school standards, which aim to significantly beat these statistics, the majority of existing schools operate with energy consumption that is “out of control.”

Measures to reduce consumption in existing schools tend to focus on expensive and disruptive capital improvements (i.e. more efficient equipment, light fixtures, windows, insulation, or roofing). These measures may indeed save energy, but they do so passively and lack the ability to gauge whether they were cost-justified. Such measures tend to be building-centric, though some offer a web-based view of each building's system.

To significantly curb energy costs, school districts should adopt an on-going energy efficiency program that actively sets policies and ensures compliance.

How Can Energy Efficiency Be Addressed at the District Level?

Conserving energy in *one* school building is only the tip of the conservation iceberg. The majority of energy cost – and therefore the greatest opportunity for conservation – results from all the buildings that make up a school district. The effort to reduce consumption requires a broader view of and approach for energy use. Energy policy and compliance need to be encouraged on all levels within a district – schools, classrooms, and equipment.



Tim Burns, Cherokee Schools District Superintendent in Kansas:

“Our school district consists of three K-8 schools and a high school. We recognized the need to reduce energy consumption, so we installed the system to establish and automate our energy policy across all buildings. The system primarily consists of a wireless network of intelligent thermostats (Wi-Stat). The wireless network provides two-way communication between the Wi-Stats. This enables remote monitoring and control throughout each building. The internet is used to link all buildings to Millennial Net's web-based software application (Wi-EMS). The system was installed by Chevron Energy Solutions and local contractors, with technical support from Millennial Net.”

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A conservation program can be enabled at the district level through an intelligent energy management system that provides sensing and control capabilities from the meter to the classroom. This approach is markedly different from that of most energy management solutions available today, which focus on HVAC equipment operation or lighting rather than on consistent energy policies and compliance, despite the fact that the latter method offers broader savings.

Intelligent Energy Management – What is It, Exactly?

Intelligent energy management actively measures and controls energy consumption. It helps school districts by providing:

- ✓ Visible patterns of energy consumption
- ✓ Implementation of consistent energy policies
- ✓ Policy compliance
- ✓ Performance measuring for continuous improvement

The operation of HVAC and lighting represent most of the energy consumption in school buildings. While policies may be developed to manually reduce wasteful consumption, generally, schools have difficulties consistently complying. Lights tend to be turned off, but controlling HVAC energy waste is more challenging. Given that most schools are occupied only 40% of the time, continuously running the HVAC system is a huge waste of energy.

Solution: Wireless Energy Efficiency Technology from Millennial Net

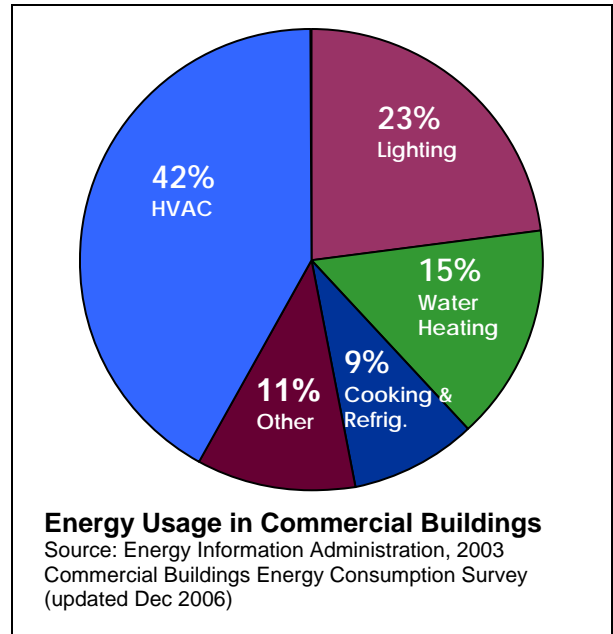
Wasted energy is one of the few expenses that can be decreased without affecting classroom instruction.

Aligning energy consumption with need requires a greater sense of what is going on at the building level. Energy demand, recorded at point-of-use (classrooms, offices, etc.), supply (HVAC equipment), and source meters (gas, electric, water) can provide valuable insight as to how buildings can better consume energy.

Millennial Net provides an energy solution that helps balance budget constraints and operational priorities. The solution is designed for rapid and affordable deployment across multiple buildings. It uses wireless devices and the internet to reduce installation costs and provide greater coverage of sensors and control points. Energy savings are achieved by improved compliance and energy policy enforcement.

Millennial Net's MeshScape[®] Energy Management System is an integrated framework for comprehensive remote monitoring and control of key energy sources, on both the supply and demand sides of energy use. The framework combines recent advances in technology such as wireless sensor networks, the internet, and hosted software applications.

The hosted remote monitoring and control application is available immediately and covers multiple sites via a secure website that can be accessed anywhere. This remotely managed solution quickly generates savings and minimizes the costs of ownership,



School districts need a flexible and effective way to consistently provide comfortable classrooms and reduce energy consumption. Energy profiles measured and recorded over time allow users to better understand consumption patterns and improve energy conservation.

upkeep, and operation. The remote access capability of the system provides greater system-wide visibility, helping your operations personnel manage buildings and equipment and allowing administrators better manage energy policies and costs.

Millennial Net's wireless sensor network devices are ideally suited for retrofitting existing buildings. They work with legacy HVAC systems, fixtures, and appliances, making it unnecessary to upgrade HVAC equipment to save energy. Wireless networking avoids the time and disruption of a hard-wired installation, so there is no need to wait for a long vacation or building shutdown to upgrade to a more efficient system.





“Each Wi-Stat monitors and controls classroom temperatures and regulates the operation of heating ventilation and air conditioning (HVAC) equipment. Our classrooms are generally occupied only 40% of the time. The system reduces energy waste by automatically switching the thermostats to a mode minimizing energy consumption during unoccupied periods.

Like most schools, our buildings serve many purposes after school. It was important to us to centrally manage the occupied schedule of each thermostat. The Millennial Net system enables

The patented MeshScape wireless network is ideal for school buildings. This industrial-class wireless networking technology is a proven robust and scalable foundation for energy conservation. Its highly responsive self-forming and self-healing network allows wireless sensors to be installed easily and put into service with minimal cost and disruption to existing facilities.

Q. How does it Work?

A network of intelligent wireless devices in each school collect and move data bi-directionally in real-time. The devices form the network autonomously as they discover one another and establish bidirectional communication paths through single- and multi-hop routes, requiring no administrative overhead or IT management. The intelligent devices (e.g. wireless thermostats, sensors, and actuators) communicate with a central unit at each school. This unit manages communication to and from internet-based applications and maintains a buffer between the two to ensure data integrity in the event of internet disruptions.

The primary intelligent devices for HVAC management are wireless thermostats, which connect directly to the existing HVAC system and replace older controls. They can operate with or without the wireless network to ensure a comfortable learning environment. Other wireless devices may be added to the network as required to gather environmental and energy consumption data for energy management and analysis.

Use of the wireless MeshScape technology within the energy management system provides users with high-value information at a low cost. The system creates a robust flow of energy data for compliance monitoring, analysis, optimization, and reporting without removing your existing HVAC system.

Q. How will it Fit With Our IT Infrastructure?

Installing Millennial Net’s Wireless Energy Management System has essentially no impact on IT infrastructure or management. The MeshScape wireless network can coexist yet is independent of the school’s Wi-Fi network. The web-based energy management application is a “hosted application” that Millennial Net manages via the internet. There are several secure options commonly accepted by IT security managers for linking the school’s wireless sensor network to the hosted application.

The web-based energy management system provides users with secure access to monitor and control the intelligent devices according to privileges granted by administrators. For example, HVAC management provides a means to monitor and control thermostats, schedule temperature set-points, and access energy management charts, tables and reports.

Q. How Are Energy Policies Implemented and Managed?

Authorized staff responsible for implementing energy policies is able to input and modify temperature set-point ranges for each thermostat based on detailed room occupancy schedules – normal occupancy, special events, and vacation periods. Other policy settings governing various operating modes can permit and constrain local manipulation of energy consumption to increase compliance.

Historical and statistical reports, graphs, and trending charts are provided for administrators to see overall system performance. Comparisons of day-to-day, zone-to-zone, building-to-building and time-to-time energy consumption reveal patterns of use and anomalies. These can highlight opportunities for changes in policy, behavior, and investments in infrastructure. This is also great for energy audits!

Q. Will Students and Teachers Be Uncomfortable?

No – teachers control the temperature for their classrooms and administrators can establish general temperature guidelines.

The key to the success of our system lies in its ability to maintain a healthy classroom environment for teachers and students while enabling special schedule changes “on the fly.” If someone arrives early or stays late, it is simple to override the scheduled set point for a set period of time.

Q. What Energy Savings Could We Anticipate?

While energy prices and energy consumption profiles vary across regions and buildings, Millennial Net’s Wireless Energy Management System can typically achieve savings of 10-30%. An energy efficiency opportunity assessment should be conducted to develop a savings estimate for a specific building or portfolio. Typically, energy accounts for 2% to 3% of an annual school budget; HVAC alone can account for 40% to 60% of that expense. Yet, schools are only occupied 40% of the time. Unless they were built or renovated recently, most school buildings have energy management systems that cannot adequately set and enforce energy policies for an energy conservation program.

The Millennial Net Wireless Energy Management System can result in annual savings of \$15,000 to \$30,000 per school, depending on the number of classrooms. Average payback is realized within two years.



Getting Started

Take Action

Various groups are typically involved when deciding what energy management solution is best, including school administrators, facility managers, local and state officials, teachers, and parent groups. Millennial Net will work with you to determine the right approach for your school. A low-cost demonstration is available for your school so stakeholders can see the system in action before committing to a full implementation.

Energy Opportunity Assessment

An assessment should initially include a review of facility and energy consumption records and plans. A temporary installation of monitoring devices may be used to characterize operations and behavior, indoor and outdoor temperatures, etc. This information would then be combined with intended policies to estimate potential savings. The Millennial Net wireless energy management solution is affordable and adaptable. It can be deployed rapidly to gain immediate benefits and can be incorporated into infrastructure changes and renovations to improve energy efficiency over time.

Installation in Existing Sites

The wireless energy management solution can be implemented with your existing systems. Millennial Net personnel will work with your facilities management team to review the school's HVAC system and determine the number of zones and types of control needed.

Installation is simple and can be performed by a technician following our provided installation guides and/or by Millennial Net. Once the system is installed, Millennial Net will remotely validate its activity. Afterwards, facility staff can login to the web-based energy management system to begin viewing the system themselves. User training and support is provided to initialize settings and schedules that comprise your energy policies. When all settings and schedules have been created, the system is ready to go live. After the system is successfully installed, Millennial Net continues to offer support by providing ongoing remote energy management services.



"We found working with Millennial Net to be a positive experience. Their knowledge, equipment, and technical support are excellent."

"During the 2007 summer vacation, a number of equipment and building improvements were made, primarily to reduce energy costs. The Millennial Net thermostats were installed as a simple replacement to existing thermostats and most were installed at the beginning of school year, after school hours."

"There were no issues that Millennial Net and the installation team could not address and resolve completely. Our teachers found the new thermostats intuitive and simple to operate."

"The networked system has been operating since the fall of 2007 and Wi-EMS was introduced in October. We are extremely pleased with the overall results. We would recommend them to any school or district with similar energy management concerns."

Conclusions and Recommendations

There are many individuals and groups involved in the management of school systems and facilities. Parental groups, teachers, and administrators all want to educate students in the best possible environment. Yet, all are concerned about the environment and the impact of energy consumption on the eco-system.

For a school district to effectively meet its educational mission with efficient use of energy resources, it needs an affordable and easy-to-deploy means to establish a consistent energy policy and measure and analyze its impact. Millennial Net provides a solution to achieve this objective that delivers greater visibility from the source to the point-of-use. The wireless devices leverage existing infrastructure and are compatible with existing building equipment and controls (systems geared for equipment operators and maintenance). Coupled with the internet and web-based application, the Millennial Net solution provides the district with the view and management tools it needs to curb energy waste and expense.

It is in our best interest to be responsible partners and tackle what can be a complicated decision-making process. Working together, we can make progress that will benefit all – particularly the educators and children – in a way that uses school funding most appropriately.

Together with the involved groups, we want to help schools move ahead to begin managing energy more responsibly. Ask for our energy management presentation, arrange an energy savings opportunity assessment, consider the options, and decide.

You can call on Millennial Net as a partner. We will be pleased to speak with you about improving your energy efficiency.

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