



## Telkonet SmartEnergy™

### Energy Management Solutions

#### APPLICATION NOTE

#### Overview

The Electric Power Research Institute reports that energy and energy-related costs in the US alone represent \$800 billion in annual expenditures. Commercial buildings constitute the most electric-intensive sector in the country, with 76% of the energy services provided by electricity. In the US, it is estimated there are 4.7M commercial buildings, which consume 35% of the nations' total electricity.

Energy costs associated with heating, ventilation and air conditioning (HVAC) add up to one of the largest operating expenses for property owners. In most companies, the cost of energy is the largest unmanaged line item operating expense. With electricity rates skyrocketing, being able to control a building's energy usage represents a huge savings opportunity. Many utilities have raised their rates more than 70% over the last two years, and in some cases costs more than doubled. With rising fuel costs, rates are forecast to continue in this direction.

---

**Energy costs associated with heating, ventilation and air conditioning (HVAC) add up to one of the largest operating expenses for property owners.**

---

In office buildings or universities, the energy budget is roughly split in thirds between HVAC, lighting and plug load (anything that is plugged in). However, in the hospitality industry, HVAC typically represents more than 50% of the energy costs.

Studies have shown that 42% of the energy used to heat and cool space is commonly wasted. Sold hotel rooms are unoccupied an average of twelve or more hours per day, with the HVAC system left on most of the time. Energy savings can result from automating the process of dynamic setbacks for the HVAC unit when a room becomes unoccupied. Without energy management, systems will continue to run at the guests' temperature set points until physically changed, even when a room is unoccupied.

#### Components

To manage and monitor the amount of energy used to heat and cool commercial buildings, the following components are needed.

- 1) Packaged terminal air conditioning (PTAC), central air conditioning, or package units. A PTAC is a self-contained air conditioning unit and may incorporate either a heat pump or electrical resistance heating.
- 2) Occupancy sensors, motion detectors, CO2 sensors, air quality sensors and door switches. These are used to determine whether or not a space is occupied.
- 3) Intelligent, programmable thermostats. These interface with occupancy sensors, motion detectors and door switches to monitor a room's temperature. A controller communicates with these devices to adjust the temperature settings and dynamic setbacks, depending on current and future needs for the space.
- 4) Intelligent power meters or sub-meters. These provide a detailed energy profile of buildings, campuses and full enterprises.
- 5) A distribution infrastructure, consisting of a data network, fiber optic, CAT-5 cable or powerline communications (PLC). This is required to create an energy network across a building. By using a connected network of sensors and thermostats, all data can be collected in a central Internet-enabled database to create a working history of all rooms. This enables web-based reporting and bill auditing. A web-enabled energy management and control center is needed to monitor energy, safety, and work orders.

#### Challenges

There are many diverse challenges when implementing an energy management solution. Companies need to be familiar with all the available utility rate structures to be able to lower their utility bills. They may be over-paying for electricity because of incorrect rate class, inefficient building systems or less-than-ideal occupant electricity usage patterns.

Companies also need to understand the various incentive programs offered by utility companies. As an example, US independent system operators



(ISOs) offer programs that pay large commercial customers to voluntarily reduce their energy usage to help them balance the demand for electricity. These ISOs, which are federally regulated regional organizations, are the impartial link between power plants and utility companies that coordinate, control and monitor the operation of the electrical power system of a particular region, such as NE ISO for New England or PJM ISO for Pennsylvania, New Jersey and Maryland.

---

## The cost of energy is the largest unmanaged line item operating expense.

---

Since there are so many facets to energy management, it is not always clear who can help to manage energy costs. The list is long, including the following.

- Utility companies
- Electricians
- Control system manufacturers
- Enterprise energy management companies
- Bill payment companies
- Engineering firms

The challenge is to bring all of the fragmented energy-related information together so that it can be analyzed, monitored and managed to ultimately reduce energy costs.

Energy data needs to be collected on a continual basis to understand the total energy consumption picture. The following data needs to be analyzed to determine how energy is being consumed.

- Utility bills and tariffs
- Utility meter data
- Sub-meter data
- HVAC and heating usage
- Chiller and air handler data
- Temperature and relative humidity data
- Air conditioning and heating profiles across all rooms
- Repair records and maintenance costs for all energy management equipment
- Data from motion detectors, occupancy sensors and door switches
- Occupancy data and door activity data
- Room characteristics

- Recovery time data
- Weather data
- Lighting equipment data

Once this data is collected, another challenge is to correlate all this data and outside factors to the rate of energy consumption. For example, a utility bill is directly related to a hotel's occupancy rate, the outside temperature, humidity, atmospheric conditions, and so on.

Another challenge is to automate the collection of this data, rather than to collect it manually. Relying on the housekeeping staff, maintenance crew or electricians to reset the thermostats in each room is time-consuming, inefficient and not always the most reliable method. Many energy management solutions fail because of arbitrary monitoring methods. Continually monitoring data via the Internet will ensure that data is accurately recorded.

Bringing all this information together into one central database is not a simple task. Data needs to be collected continuously, in real time, from all the energy-related components, and transferred into a centralized, real-time database that can interface with a property management system (PMS). The database needs to be accessible on-site and remotely, with the data organized in an easy-to-use format.

---

## Studies have shown that 42% of the energy used to heat and cool space is commonly wasted.

---

### Summary

In summary, an effective, comprehensive energy management system needs to incorporate the following features.

- Automatically learn and monitor occupancy patterns and room characteristics, eliminating unnecessary heating and cooling of empty rooms.
- Network all energy-related components, including thermostats, occupancy sensors, motion detectors and door switches.
- Transport the data from all the IP-enabled components via the Internet to a centralized database to provide a view of the full enterprise.

- Manage and continually monitor the IP-enabled energy components from a central management server, either on-site or remotely, via web portals or via a user-friendly web-based interface.
- Easily Interface the centralized database with property management systems, reservation systems, weather databases, weather forecasts, such as National Oceanic and Atmospheric Administration (NOAA), utility bills, maintenance and repair reports, and so on, to provide a comprehensive picture of all energy-related data in an enterprise.
- Provide hotel managers, property owners, corporate controllers, HVAC technicians, etc. with access to the energy portal to view all the pertinent information that has been collected and archived, enabling real time monitoring, control and analysis.

With the above features, energy consumption and rates can be analyzed using data generated from the management system. Audits can be conducted to determine causes for peak consumption intervals and recommend approaches to manage and reduce peak utilization.

For properties located in a deregulated power supply market, this analysis can provide details on available lower-cost electricity supply options and can be used as a powerful negotiation tool for electricity supply contracts with competitive utility companies. The analysis can result in the lowest price, lowest risk and most consumer-friendly electricity supply contract terms in the deregulated electricity supply markets.

---

**[www.telkonet.com](http://www.telkonet.com)**

**Telkonet Headquarters**

20374 Seneca Meadows Parkway  
Germantown, Maryland 20876.7004 U.S.A.  
sales@telkonet.com

Phone: 240.912.1800  
Toll-Free in the US: 866.375.6276  
Fax: 240.912.1839