



FACT SHEET

## The Path to Perfect Power: New Technologies Advance Consumer Control

Today, most consumers know little about the costs that show up on their electricity bill except that they are higher during the hottest and coldest months. Few realize that the true price of electricity varies continuously in response to supply and demand, and that most bills are calculated based on an average price. Since they can't see when prices are high and reduce their use accordingly, most residential customers are likely using more electricity than they need to — and thus paying more than they have to.

The good news is that emerging technologies will give consumers power over their electricity use. From Web-based “dashboards” for energy management to in-home systems that store power for emergency use, many of the technologies described below are available for use in residential and commercial spaces today. These technologies will reduce electricity demand, put less stress on the environment and serve as a long-awaited catalyst for transforming the nation's inefficient, unreliable and insecure electricity grid. Key players behind these new products include leading companies in the telecom, networking, software and retail consumer electronics sectors, with more companies entering the race all the time.

### New Technologies for the Home

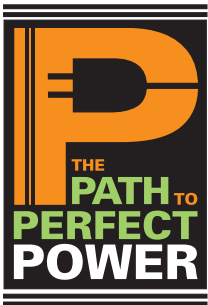
**Online home power management:** Soon consumers will be able to manage their power consumption through software that provides real-time pricing information. Consumers will be able to purchase power when it is least expensive by running appliances and HVAC during those times. What's more, the system will be managed in the background so customers do not have to spend time trying to figure it out. Currently more than 100 companies from the telecom, cable, big-box retail, online content sectors and more are involved in developing demand-response products and services that have applications for at-home power management. Players include Google, Intel, Cisco, Microsoft, Verizon, Zensys, Motorola, General Electric, Intermatic, Samsung, Whirlpool and Leviton. While simple applications can be added to homes that are wireless-enabled today, more robust at-home power management tools and services are emerging and should be in broad use in the next four-to-seven years.



Intermatic's Home Settings system includes modules that plug into appliances and a handheld control that allows customers to turn lights and appliances on and off remotely. The system uses wireless Z-Wave technology from Zensys and is available at Lowe's home improvement stores.

**High-capacity, at-home power storage systems:** Consumers will be able to take advantage of transparent pricing and high-capacity electricity storage to purchase power when it is least expensive, store it, and then use when prices are at their peak or during power interruptions. These systems are available in the retail market now.





**Home power generation systems:** In the next decade, an increasing number of homeowners will be able to generate their own power through various types of clean fossil fuel and renewable energy generation systems. With anticipated regulatory changes, these homeowners could power their homes or create “microgrids” to power their neighborhoods. Power generated but not used or stored could be sold to power companies.

GridPoint is selling battery-based backup power systems that generate and store electricity for use when household demand is high or during an outage. GridPoint offers two versions of its solution — GridPoint Connect, which allows a customer to integrate a renewable power source such as solar and wind, and GridPoint Protect, which offers clean backup power that responds automatically when there’s a shortage or prices are high. Both include an online electricity management system that allows consumers to set up a personal energy profile for maximum energy efficiency.



## New Technologies for the Workplace

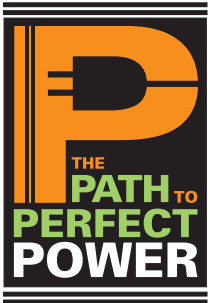
**Demand-response provision:** A number of companies are providing commercial customers with demand-response systems/ real-time pricing data so they can use less power when it’s most expensive or in short supply. Armed with Web-based control systems that are tailored to their particular facility, customers save money while reducing their environmental impact. Some service providers work in partnership with local utilities or retail subsidiaries of the same. Most demand-response activity is taking place in the Northeast, New York state, the mid-Atlantic and California by players that include Comverge, Consumer PowerLine, EnerNOC, Enerwise Global Technologies and Site Controls. This trend will quickly extend to residential customers as technologies for the home make it possible for utilities to offer real-time pricing to customers.

**Smart buildings:** Precise point-of-use data about energy consumption will soon be available via Web portals to tenants, owners or others involved in the power management or maintenance of a commercial building. With this technology, tenants will no longer be subjected to a “one-size-fits-all” approach that charges a flat fee for energy usage based on square footage. Instead, tenants will be able to identify and manage their true energy needs, take appropriate action to manage those needs and then be sub-metered accordingly. Based on these needs, tenants will be able to decide whether to invest in systems that can provide uninterruptible power, power storage or local/ on-site generation. Early adopters of these advances include data/telecom centers, airports, convention centers, large hotels, government buildings and large urban center office buildings. Companies involved in intelligent building technologies include: Alerton Controls, Carrier, Johnson Controls, KMC Controls, Microsoft, Oracle, ProfitKey, Trane, Tridium, Invensys, Staefa Controls, Cisco, Eagle Technology, Cimetrics and IDC.

**Advanced lighting controls:** Lighting in commercial buildings will be controlled by more than just a switch. New controls will involve occupancy and photo sensors, and many controls will be digitally programmable, using the digital addressable lighting interface (DALI). DALI gives each lighting fixture a unique IP address, making it possible to save 30-85 percent compared to conventional fixtures. In addition, business owners and operators will be able to incorporate more

Cisco Systems’ Cisco Connect Real Estate solution is creating connected, intelligent buildings through a Web-based platform that allows intercommunication between multiple proprietary networks to run systems such as HVAC, security and access, energy, lighting, and voice and data.





daylight into their buildings through pipe lighting, solar light tubing, automatic shade controls and photocell daylight dimmers near windows to control interior fixtures. Daylighting could help save 30-60 percent on lighting energy costs. Other energy-saving lighting developments include white LEDs, organic LEDs, smart combined fluorescent-LED applications, multi-photon emitting phosphor lighting and fiber optics. Companies involved in these technologies include Adura Technologies, Leviton, Lutron Electronics, Nextek Power Systems, Osram, Phillips, Sylvania Lighting and Westinghouse Lighting.

Among the innovative HVAC controls developed and patented by the Hartman Company is Uniterm, a computer-controlled system that, through a series of networked modules, allows building occupants to individually control their heating/cooling and lighting systems for maximum efficiency.



**Savvy heating and air conditioning controls:** New technology will automatically adjust building ventilation rates in real time based on occupancy and air quality. Sensors measure the carbon dioxide levels in the air to establish how many people are in the space, then adjust the air conditioner's economizer so that the air flow matches the per person ventilation requirements as established by code. The result is better air quality, lower energy consumption and reduced peak demand.

**New practices related for uninterrupted power supplies:** By connecting power supply sources to computer networks, building owners and operators will be able to supervise and manage more than one site through a Web-based interface. Companies involved in developing network software to accommodate this include MGE and Eaton's PowerWare. At the same time, companies such as TDI are developing new types of uninterrupted power supply devices to accommodate much larger electricity demands.

**On-site power generation systems:** Despite several obstacles that may hinder rapid development of commercial electricity generation systems by building owners and operators, solar power systems are becoming more accepted today. A solar power system: is a way to demonstrate a commitment to using renewable energy; can help earn a LEED (green building) rating for a premises; can have aesthetic appeal and be substituted for costly exterior cladding materials; can be financed through a third-party; can be funded through foundations when it is on a public building; and is eligible for tax credits. Companies involved in developing these types of technologies include Ballard Power, Plug Power, Franklin Fuel Cells, Stirling Engine Systems, STM, Capstone, Waukesha Engines, Caterpillar, Cummins, Ingersoll Rand, Siemens Westinghouse and UTC Power.

**Innovative building designs:** In the near future, new commercial buildings will tend to use less electricity because they will be more environmentally friendly than buildings of today. As many as 35-40 percent of new building decision-makers seriously consider some form of environmentally friendly building designs, and 35-40 percent of new buildings may involve "green building" designs by 2015-2020. These buildings will effectively use environmental improvements to reduce costs.

*This wave of technology is a critical step toward achieving Perfect Power — the vision of the Galvin Electricity Initiative. The Perfect Power System will achieve reliability, efficiency and safety through the integration of microgrids, smart technology, distributed generation and customer control in power use.*