



THE MAGAZINE OF THE CONTINENTAL  
AUTOMATED BUILDINGS ASSOCIATION  
SUMMER 2010 VOLUME 7, NUMBER 2

# iHomes & Buildings



## Measurement & Verification for Commercial Buildings

Measurement and verification in commercial buildings is where the rubber meets the road.

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Smart Grid on the Air → 16

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# BRIGHT GREEN BUILDINGS

## Convergence of Green and Intelligent Buildings

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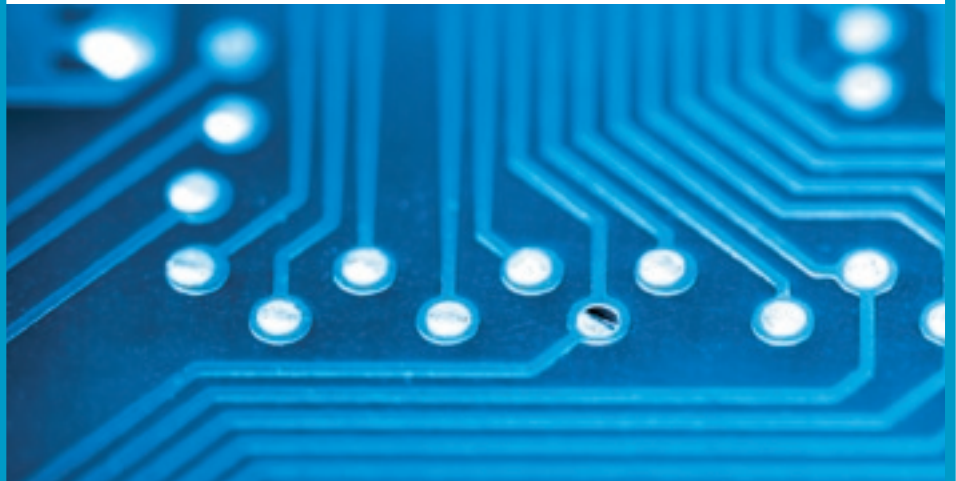
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## CABA President & CEO's Message

Ron Zimmer

Every organization must adapt to changes in the industry, with customers and to technology. The Continental Automated Buildings Association is no different and in my 12 years at CABA, there have been a number of significant changes to the organization. To that point, the CABA Board of Directors at its November 2009 meeting created a Task Force on Memberships and Councils that had a mandate to review what the organization does through its Councils and how to better deliver value, information and services to CABA members.

Twelve highly qualified CABA members that represented a diverse group of industry stakeholders formed the Task Force and CABA Board member Ellis Lindsay from Alcatel-Lucent chaired it. There were a number of meetings and a membership survey that ultimately provided the feedback that allowed the Task Force to formulate a number of recommendations. These were presented to the CABA Board of Directors during a special Board meeting.

It is interesting to note that many of the Councils and activities of CABA are deemed valuable and remain unchanged. However, it was agreed that allowing more CABA members to participate, without requiring a special fee, which was the case with CABA's Connected Home Research Council, should enhance research activities. Therefore it was agreed that all CABA research activities would be consolidated and coordinated under the direction of the CABA Board, CABA Research Director and other staff.

It was further agreed that CABA should continue to collect and provide industry research through the CABA Research Library. Most members aren't aware that as a member benefit, over 300 research documents have been added to the Library. More importantly, CABA will continue to complete at least one residential and one intelligent buildings "landmark research" report annually. Finally, every CABA member will be able to undertake collaborative research and take advantage of CABA's resources at any time. There will be a cost, but it would be based on the actual services requested of CABA.

To accomplish this work, the CABA research subscription/membership dues may have to be adjusted in the next fiscal year. However, with the Task Force recommendations, the CABA Board of Directors have placed CABA on a course that will continue to build its brand and stature as a "knowledge-based industry association".

***Remember — CABA works for you!***

## NEW MEMBERS

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The Continental Automated Buildings Association is a not-for-profit industry association that promotes advanced technologies for the automation of homes and buildings. CABA members benefit from timely, competitive intelligence on the integrated systems industry.

### **Complete Learning Solutions**

Complete Learning Solutions is a leading national provider of technical and workforce training for military, telecommunications, aerospace, and cable industries. Key alliances enable CLS to offer both credit degree programs and non-credit certificate programs. CLS's comprehensive training programs enable companies and individuals to build the skills necessary to compete and succeed.

### **CoR Advisors**

CoR Advisors provides professional consulting services to help commercial real estate owners evaluate and implement "best practices" in intelligent building technologies, energy management, and sustainable business practices.

### **Intel Corporation**

Intel Corporation is a world leader in computing innovation. The company designs and builds the essential technologies that serve as the foundation for the world's computing devices.

### **JLA Strategic Research**

JLA Strategic Research is a value-added research consultancy focused on consumer and business marketing, advertising, product and strategy development.

### **Sensory, Inc.**

Sensory, Inc. is the leader in speech technologies for consumer products. Sensory is a venture capital backed privately held company offering a complete line of IC and software-only solutions for speech recognition, speech synthesis, speaker verification and music synthesis.

### **Vaisala, Inc.**

Vaisala, Inc. is a global leader in environmental and industrial measurement. Building on more than 70 years of experience, Vaisala contributes to a better quality of life by providing a comprehensive range of innovative observation and measurement products and services for meteorology, weather critical operations and controlled environments.

### **Verizon Wireless**

Verizon Wireless is a wireless phone provider that owns and operates the largest mobile telecommunications network in the United States.

**A complete CABA member listing with both product and service information and Web links is available at: [www.caba.org](http://www.caba.org)**

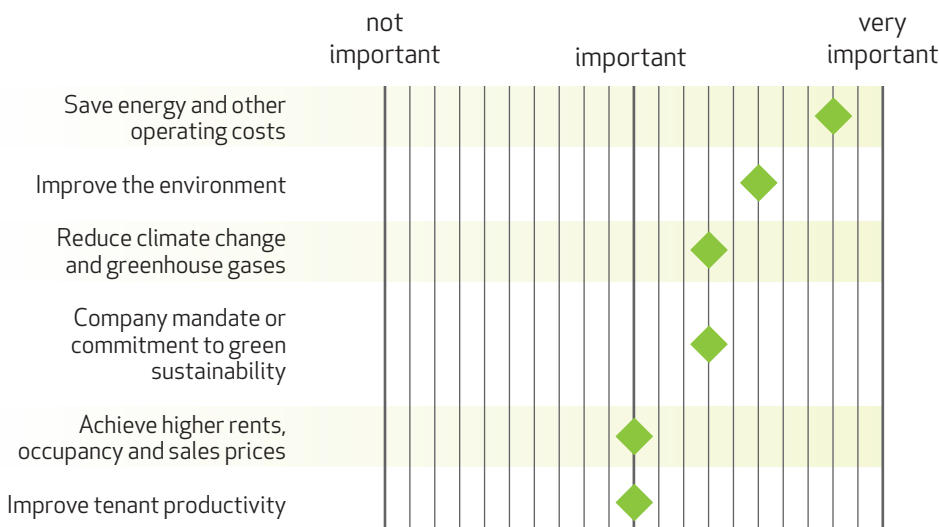
CABA Research Briefs provide a condensed synopsis of specific research papers available in the organization’s research libraries. CABA research libraries provide industry intelligence to the home and large building automation and integrated systems sector.

## Fourth Annual Green Building Survey

This article from experts in the green building marketplace examines the market for green buildings. Ninety-two per cent of 1,600 design and construction professionals surveyed in 2009 supported green and sustainable construction because it saves energy and lowers operating expenses. LEED certification dropped 4.7 per cent in 2009 because of the average four per cent that LEED increases costs. Green leases that promise energy conservation are growing slowly.

### Saving energy and operating costs tops reasons for green building

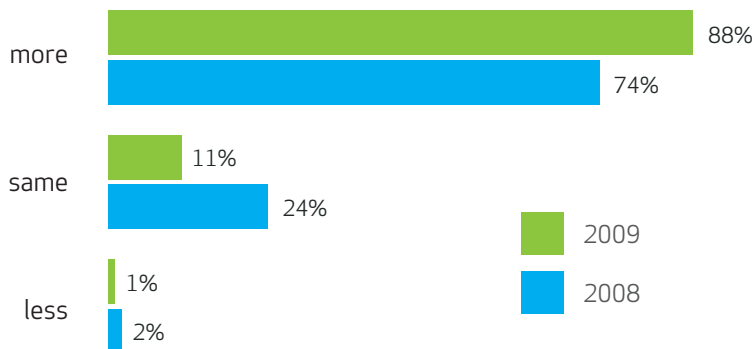
#### How important are these factors to your building green or sustainable projects?



The Green Building Survey asked respondents to choose their most important reasons for building LEED, green or sustainable projects. The top reason cited was to “save energy and other operating costs.”

Perhaps “saving energy and other operating costs” topped the reasons for building green because 97.5% of all respondents believe that energy costs will continue to increase in the future.

#### How likely are you to incorporate energy-saving elements in your future projects?

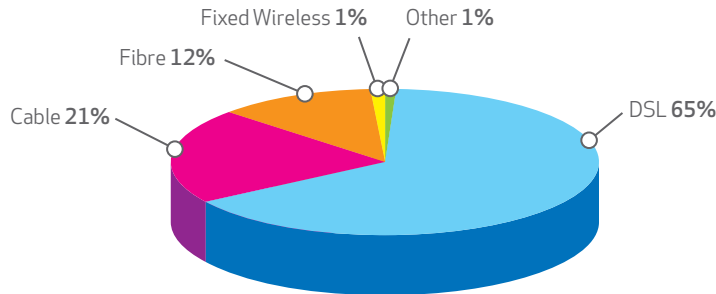


88% of respondents indicated that they are more likely to include energy saving or sustainable elements in their future construction projects – a 14% increase from the previous year.

**Next Generation Broadband Access White Paper**

This article from the Broadband Forum describes the growth of Internet access. By 2025 almost 90 per cent of customers are expected to have access service at 100 Mbps or higher. Applications are expected to include the delivery of HDTV. DSL access has the greatest penetration in China followed by the U.S. VDSL2 has the potential of 100 Mbps. China leads in fiber optics subscribers. Specifications from the Broadband Forum support these deployments.

DSL has been the most popular broadband technology, accounting for two-thirds of all broadband deployments in the U.S.



**Continued Evolution of DSL**

Hundreds of millions of kilometers of copper have been deployed for connecting residential and business customers. Getting the most out of this infrastructure has been of key importance for network providers since the early 1990s.

New DSL deployment is still increasing at an astonishing rate. In 2008, worldwide DSL subscribers grew 16 per cent annually to 266 million lines. Figure 3 shows the sheer magnitude of xDSL subscriber counts and Figure 4 shows that penetration rates can exceed 25 per cent even for large countries like France and Germany.

Figure 3. Top DSL Deployment Markets.

Data Source: PointTopic, 2009

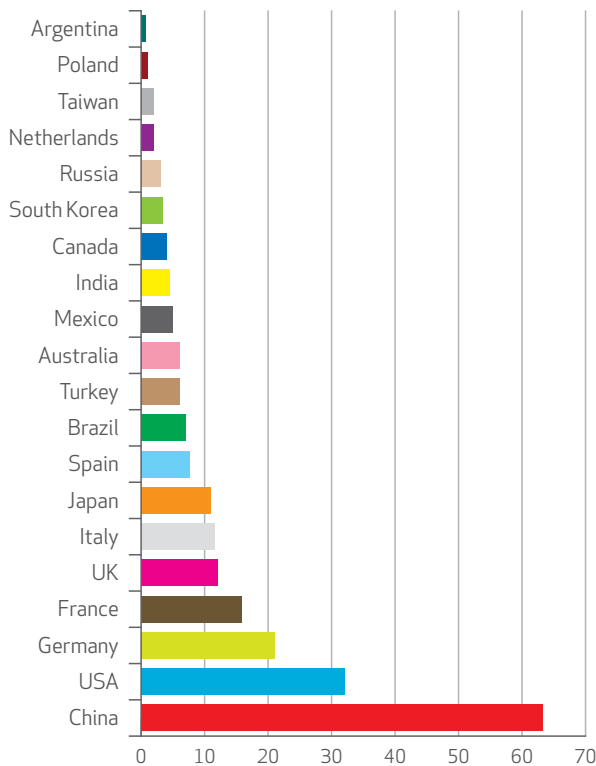
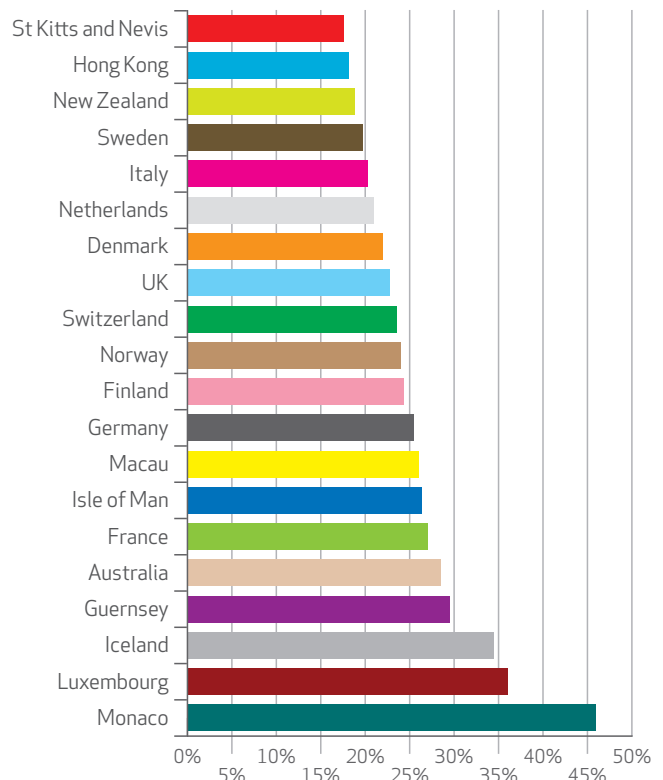


Figure 4. DSL Lines Per 100 Population.

Data Source: PointTopic, 2008





# CABA Continues Comprehensive Connected Home Research Program

By Rawlson O'Neil King

The Continental Automated Buildings Association, through its Connected Home Research Council, has completed a report that develops a better understanding of digital video consumption by examining the habits, practices, and desires of current consumers in regard to TV, computers, and mobile devices.

The study was prepared for CABA by CBS Vision and Comscore and examined viewing decisions; video suggestions and recommendations; new technology purchases; portable devices; future video preferences; and video content purchases.

The study found that in regard to viewing decisions, TV is often the preferred device for watching video with others and that most consumers like the idea of an on-screen tool to help guide their viewing decisions. In addition, the study found that consumers like to receive video recommendations from people they know, and not from critics. The study also found that new technology purchases are collaborative, and that consumers take peer references seriously. In terms of new technology, consumers have become highly interested in the new emerging “video tablet” concept, but are extremely hesitant to pay for video content on portable mobile devices.

“The completion of this study represents another substantial milestone for CABA’s Connected Home Research Council,” stated Ronald J. Zimmer, CABA President & CEO. “This research provided its participants with actionable results that determined the clear potentials and disadvantages of multiple video platforms and identified various strategies that companies can adopt to capitalize on a new emerging wave of Internet-based video services.”

“We are extremely pleased with the results,” added David Dollihite, Vice President of Home Services, Direct Energy and Chair of CABA’s Connected Home Research Council. “The study provided Council members with both a qualitative and quantitative measure of consumer response to new video technologies, which will allow them to make informed decisions about their products and services in the near future.”

The study was funded by: Ball State University, Bell Canada, Hewlett-Packard Company, Microsoft Corporation, Procter & Gamble, Telus Corporation and Whirlpool Corporation.

The report has been released to these funding partners and will be made available for purchase to the rest of the industry after an embargo period. Companies enquiring for details and pricing can contact Ken Gallinger, CABA’s Marketing Director, at [gallinger@caba.org](mailto:gallinger@caba.org) or 613.686.1814 x229.

CABA, through its Connected Home Research Council, has also launched a new study to better understand consumers’ opinions and attitudes about energy management as a managed resource for the home.

The study will assess and quantify the key demand drivers and enablers that determine consumer appeal, interest, applicability and potential adoption of home energy management products and services.

“Providing energy as a managed service broadens the scope of the product and service offerings in the energy space and allows for the redefinition of the customer relationship,” said Dollihite. “This study will help CABA Research Council members determine how consumers will want to manage energy services in the future, while

concurrently assessing where new market and product opportunities will exist.”

The study will undertake an exploration of consumer expectations and technology interoperability and interaction based upon a series of qualitative consumer surveys conducted throughout North America.

An additional goal of the study will be to determine how organizations can construct a more intelligent energy management solution at the consumer level that provides value and potentially impacts every part of the electrical delivery system, from generation, transmission and distribution to consumption.

The true benefits of more intelligent solutions will not be fully realized until all involved across the value chain can fully arm consumers with relevant data and tools to help them make trade-offs and economic decisions based on their use and conservation of power. The study will explore various new revenue model outcomes that will be synthesized and determined by various markers such as socio-economic, psychographic and demographic factors.

Companies participating in CABA’s energy management as a managed resource research project include:

3M Company, Bell Canada, Best Buy, Direct Energy, Freescale Semiconductor, Intel Corporation, Landis+Gyr, Microsoft Corporation, Trane/Ingersoll Rand/Schlage, Tyco Electronics and Whirlpool Corporation.

“CABA is extremely pleased to be engaged in this research area,” stated Zimmer. “It is our intention to execute a cutting-edge consumer study that will identify more unique opportunities in the connected home marketplace through managed energy products and services.”

The research project will be undertaken and supervised by POCO Labs, with surveys undertaken by CBS Vision.

The report will be released to these funding partners and will be made available for purchase to the rest of the industry after an embargo period. For more enquiries concerning both above-mentioned reports, please contact Ken Gallinger, CABA’s Marketing Director, at [gallinger@caba.org](mailto:gallinger@caba.org) or 613.686.1814 x229. **H**

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Rawlson O’Neil King is CABA’s Communications Director.

## INDUSTRY TRENDS

### High-Definition Television

Worldwide shipments of LED backlights for LCD panels measuring 10 inches and larger reached 10.6 million units in Q1 2009, up 63 per cent from the previous quarter and 780 per cent from the same period a year ago, according to a new study from DisplaySearch.

### Fiber-to-the-Home

The number of fiber-to-the-building and fiber-to-the-home connections worldwide reached 29 million by the end of last year, while the number of VDSL connections reached 1.855 million, according to recent figures from French research group IDATE.

### Smart Grid

The U.S. smart grid market will expand 21 per cent to \$17 billion per year by 2014 from today’s market of \$6 billion, according to a report from Specialists in Business Information. The report also forecasts global growth of smart grid technology by 20 per cent to \$171 billion in the same time period. However, the global market for semiconductors and IT still dwarfs the smart grid market.

### 3-D Television

By 2013, there could be as many as 46 million homes worldwide with 3-D capable TV sets, according to GigaOM, who commented that the rate of uptake would be greatly affected by cost considerations. Sony and Panasonic, both of whom have said they will launch 3-D HDTVs in 2010, are likely to lead the way.

# Large Building Automation

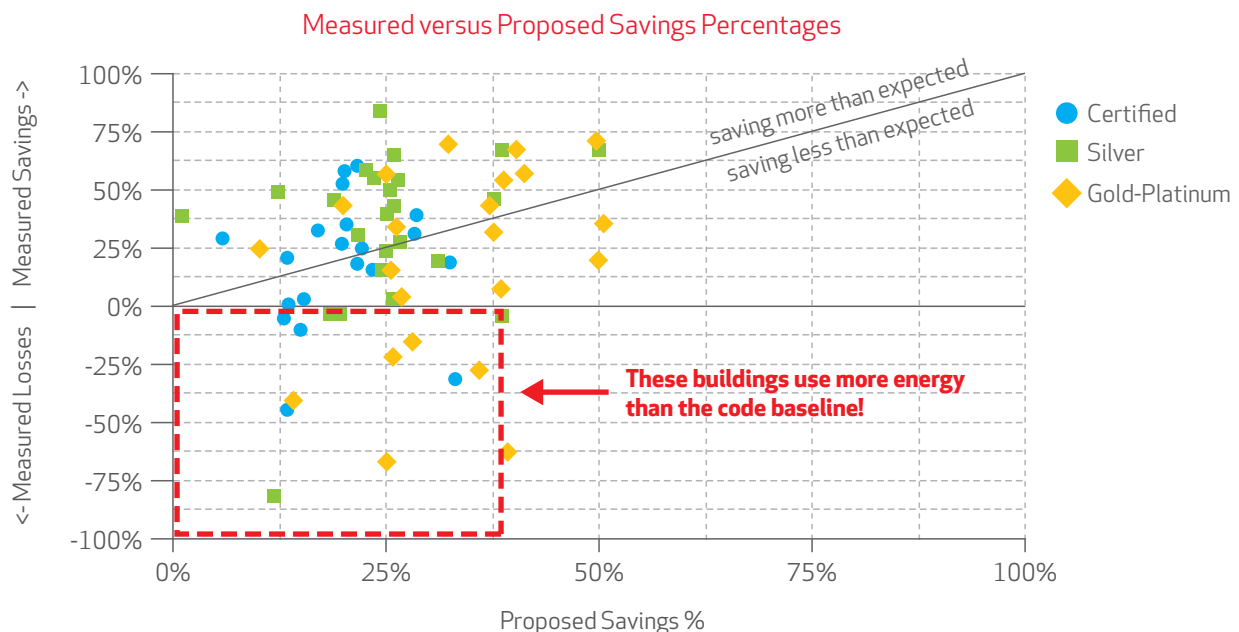


## Measurement & Verification for Commercial Buildings

According to Jim Sinopoli, PE, RCDD, measurement and verification in commercial buildings is where the rubber meets the road.

Measurement and verification (M&V) sounds so simple. After all, how difficult can it be to calculate energy savings by measuring energy usage before and after energy conservation measures (ECM) are implemented? The reality is very different. M&V is a methodical, scientific process which leads to the best available metrics for energy conservation measures and in turn affects financial transactions and other issues related to energy and water use. Some examples of financial effects would be energy performance contracting where the ESCO is paid based on verified energy savings; carbon emission trading where the emissions are the focus of a financial transaction; and even the piloting of a limited ECM, such as a lighting retrofit, where the result of the pilot is used to determine the building owner's return on investment and whether or not the pilot is extended to other spaces or buildings.

As critical as M&V is it is often undervalued and misunderstood. Here's a tidbit to illustrate the point: In 2008, the New Buildings Institute issued a report on the energy performance of LEED-NC certified buildings. Their sample pool was 522 buildings. *Only 121 buildings or 22 per cent of the buildings were able to provide at least one full year of measured post-occupancy energy usage data.* On top of that was the finding that approximately 50 per cent exceeded the design expectations, but fully 50 per cent did not meet design expectations with a portion of the building *performing worse than the ASHRAE baseline.* One of the changes incorporated in LEED Version 3 is the re-weighting of measurement and verification from one point to three points and the requirement to provide a process for corrective action if the M&V plan shows energy savings are not being achieved.



For those not familiar with M&V there can be confusion between commissioning and M&V. While these activities are closely related, they are not the same and are performed by different professionals. Commissioning essentially addresses if the equipment was properly installed and whether the equipment and systems are functionally operating according to the intent of the design. M&V is the process of accurately measuring and verifying energy and water savings. With M&V all the estimates, energy modeling, simulations, design intentions and spreadsheet calculations are gone – what is left is the unadorned reality of the ECM's effect. M&V answers the questions: “Did we get the results we thought we were going to get with the ECM?” and “Is the ECM financially viable?”

What follows is a broad overview of M&V, the methodology for calculating energy savings, elements of an M&V plan, use of metering and M&V costs.

### M&V Overview

The International Performance Measurement and Verification Protocol (IPMVP) govern M&V activities. The Efficiency Valuation Organization (EVO) creates measurement and verification tools including those based on IPMVP. The IPMVP has developed four M&V options to address different situations of energy use and varying techniques to deal with each of the scenarios:

#### Option A – Partially Measured Retrofit Isolation

These are specific ECMs, such as a lighting retrofit for a specific floor or space, where partial measurements may provide adequate accuracy. For example, we may only be interested in the electricity savings of a light retrofit in which case we may periodically measure the power draw of the lighting circuit and calculate energy savings on that one measure. Our ECM “boundary” is just electricity saved. We know however that reducing the power demand of the lighting also reduces the heat generated, therefore decreases the need for cooling which is additional energy savings. We could widen the boundary of the ECM to electricity and cooling reductions by reasonably stipulating the cooling reductions rather than measuring them. With stipulations one has to take into account possible errors and what that may mean for the accuracy of energy savings.

#### Option B – Retrofit Isolation

This option is similar to Option A, but only uses mea-

surements, no stipulations. This option may cost more because more is being measured, but provides more accurate results. Most ECMs would be covered or use Option B. An example would be replacing an older boiler with a new more efficient boiler where the boundary of the ECM and the measurements are exclusively focused on the boiler's fuel systems.

#### Option C – Whole Building

In this option ECMs are addressed collectively, not individually or in isolation. This option works best when the projected savings is significant or when ECMs interact or affect other ECMs. For example, a set of ECMs for one building encompassing a lighting retrofit, HVAC upgrades, plug load control, building envelope and a public awareness initiative. The boundary for the ECMs would be the main electrical and natural gas consumption. The time period to measure energy savings for Option C is typically in years as opposed to months, therefore adjustment to energy calculations such as weather and occupancy become significant.

#### Option D – Calibrated Simulation

This option is similar to Option C in that it addresses the whole building; however it deals with buildings with no baseline data. Software simulation models are used to predict energy usage for the base year, the post-retrofit condition or both. An example would be deployment of ECMs in a building that is part of a larger campus that does not have an individual building meter.

### Energy Savings Calculations and Adjustments

Energy savings are essentially base year energy use, minus post-retrofit energy use, with adjustments. Base year and post-retrofit energy use is supposed by hard data from calibrated meters and sensors. It is the adjustments that normalize the base year and post-retrofit energy use into the same set of conditions.

Adjustments are typically used to restate the base year energy use. Some adjustments are anticipated, such as weather and occupancy, while others are unforeseen such as a change in equipment operations. Other factors that could affect energy use include occupant acceptance of the ECM, equipment deterioration, the design and implementation of the ECM, user demand for services, schedules, etc. The goal of this exercise is to obtain reliable and accurate data on the energy savings. Unknown variables and variances or “noise levels” of the data result

in less accurate, less reliable data, so to a large extent, the effort in calculating savings is focused on reducing and addressing uncertainty. In addition, the M&V approach has to balance the cost with the uncertainty; for instance, would you spend \$20,000 to improve the accuracy of the overall cost savings by \$10,000? Probably not.

### Metering, Sensor and the BAS

Metering is obviously a key component to measurement of energy usage. Building meters should be calibrated and should replicate the method of the meter being provided by the local utility. The “energy/pulse” meters common in buildings should be calibrated with the utility’s revenue grade meter, as well as calibration standards and procedures developed by the National Institute of Standards and Technology. Some meters are self-calibrating. If, for example, the utility meter is calculating peak demand with a 10 minute sliding window, the building equipment should do the same. BTU meters and sensors for temperature, humidity, flow, pressure, light levels and equipment runtime may also need to obtain data on the conditions of the ECM and make adjustments to the energy savings.

Eventually all the meters and sensors are tied together in a building automation system that will collect the data using an embedded or third-party energy management software application to analyze and provide reports on the energy consumption and costs.

### M&V Costs

Studies by the U.S. Department of Energy suggest that the average cost of M&V services is in the range of three to five per cent of total costs. IPMVP shows the cost to determine the energy savings is typically less than 10 per cent of the total energy savings. Cost will vary by the option used. A study by NAESCO and the U.S. Environmental Protection Agency found the cost for Options B and D to be around three to 10 per cent, Option A to be one to five per cent and Option C to be one to three per cent, depending if meters were already installed. Cost will vary based on the amount of equipment, the value of energy savings, the interaction between energy consuming systems, the level of uncertainty, the availability of an energy management system, etc.

### The M&V Plan

A M&V plan will vary depending on not only the option selected but the purpose and the level of accuracy required.

An M&V plan to be used as part of a contract between a building owner and an ESCO will be different than a plan developed by the facilities department to test a lighting retrofit ECM. Major elements of the plan should contain:

- A description of the ECM(s) and the anticipated effect
- The boundaries of the ECM
- Base year conditions and energy data
- Proposed changes to the base year
- The duration of the post-retrofit period
- The set of conditions that adjustments will be applied to
- The commissioning procedures for the ECM
- The IPMVP option that will be used
- The analysis procedures and assumptions that will be used
- The specifics of the meters that are to be used (calibration, commissioning, time periods, etc.)
- The quantification of the expected accuracy of the measurement, noting factors that cannot be quantified
- How results will be reported and documented
- Dependencies of third-parties
- The budget and resources required for the total M&V process

The astounding fact that only 22 per cent of a sample of LEED certified buildings have one-year of post-occupancy energy data, tells a lot about the changes needed in building operations. We need to focus on results and M&V is the means to that end. M&V and energy reporting must be ingrained in the design and operation of buildings. **H**

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James M. Sinopoli, PE, RCDD is Principal of Smart Buildings LLC. He recently authored a book titled *Smart Buildings*.



## Delivering the Smart Grid to the Home

Bill Rose describes how the smart grid might affect homeowners in terms of their utility bills.

I was prompted to write this article after attending a conference on the role of consumer electronics in Smart Grid initiatives. At the conference several government and utility representatives urged the consumer electronics (CE) industry and consumer industry in general to take the lead in promoting energy savings devices. This was not just about energy efficiency but smarter devices with features that will allow CE devices, appliances, and HVAC, lighting and security systems to communicate with each other and with smart meters and utilities. Smart products will let consumers see how much electricity each connected device is using, how much it is costing them, resulting in a change in behavior and a reduction in energy usage. Everyone wins – our bills go down; utilities get a flatter demand curve cutting their costs; and the consumer industry makes money selling these products.

In this world view, a new generation of products would use home networks called Home Area Networks or HANs such as Wi-Fi, Ethernet, ZigBee, Z-Wave, and others to share data and provide us with up to the minute energy usage and cost data, while providing us with the tools to turn them on and off remotely and program them for more efficient operation.

Even better for the utilities, with this new information and control capability we will shift our use of electricity from periods of high demand to a time when the demand is lower. Of course this begs the question, what is the incentive for a business such as a utility to sell less of something to their customers? The answer is the demand curve I mentioned earlier.

Here's how it works: Utilities have several different classes of power plants. The primary generators are relatively inexpensive to operate but very expensive to build

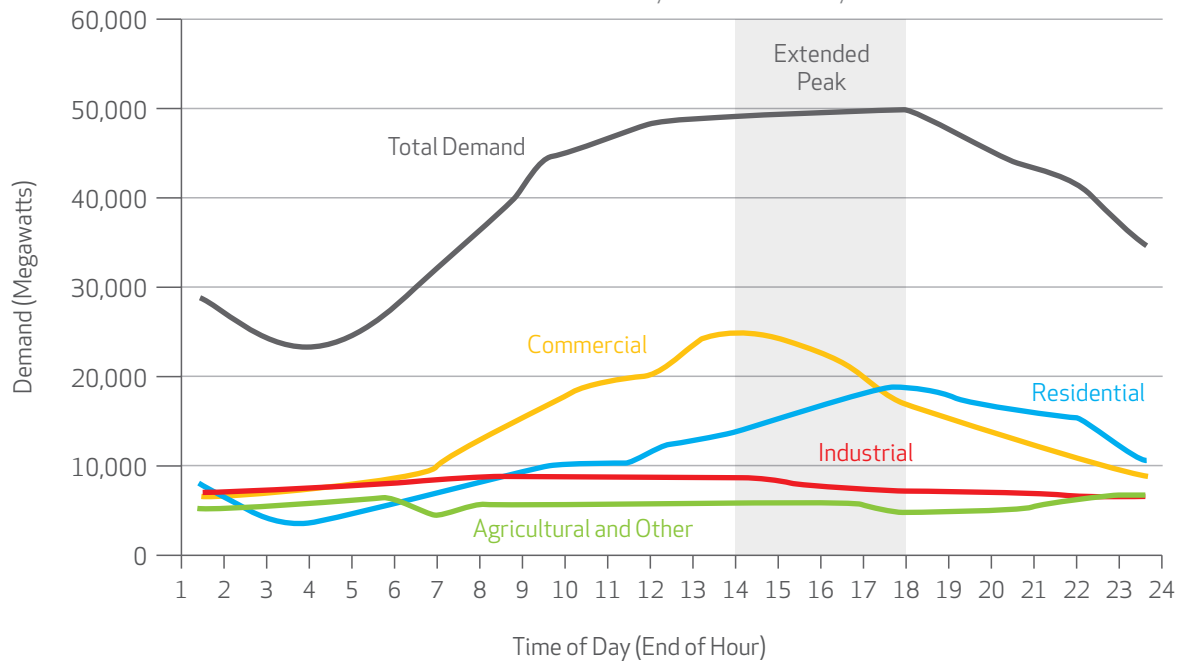
and difficult to turn on and off so they are left running all of the time. These include coal, hydroelectric and nuclear plants. Utilities only build enough of them to meet the baseline demand for electricity. When the demand exceeds its output, other generators, typically natural gas and oil can be brought on line. These plants are less expensive to build but are also less efficient and more costly to operate. The third choice is to buy energy on the open market through a combination of long (cheap) and short (expensive) term contracts. Of course there is also wind and solar. These are a little more problematic though since, while inexpensive to operate they are not always available when you need them thanks to clouds, sunset, and calm days.

Figure 1 shows the total California demand curve for a hot day in 1999. Flattening the demand curve means utilities can plan better. They don't have to use the less efficient generators as much and they can commit to longer term contracts to smooth out the inevitable, but lower, peaks in demand. The savings to a utility can be significant. The peak energy costs to a utility on the spot (short term) market can go up to \$4/kWH. The average cost to consumers for electricity in the U.S. is \$0.1065/kWH. Do the math. If it costs them \$4 and they sell it to us for \$0.1065 they would rather not sell us that electricity.

So far it all makes sense. The problem is that there is little incentive for consumers to do this except for some fairly modest savings from using less electricity. The savings could be far greater if utilities were to charge us based on what it costs them. This is called time-of-use (TOU) billing. If the utility offered everyone TOU billing, people would be more likely to invest in smarter products and alter their behavior. Where offered, peak electricity

Figure 1: Demand Curve

Source: Lawrence Berkeley National Laboratory



rates can be as much as three times higher than off-peak. However, without a variable rate the savings goes to the utility not to you, unless of course you trust that all of your neighbors will also do their clothes washing at night and your electric company will pass their savings on to you.

Another solution being discussed by the utilities is called demand response. Here the utility sells you electricity at a reduced cost if you agree to let them turn off your air conditioning, electric heat, or pool heater for a period of time. But once again how much will you really save? A five per cent reduction is on average \$5 a month but you don't get to choose if or when it will occur. If you happen to have 30 people over on a hot day – you get the point. And, of course, someone has to pay for the equipment. These programs work well for commercial and industrial customers, but not for homes. Comfort trumps a few dollars, at least in the United States.

The obvious solution, which most of us in the room pointed out, is to make variable rate billing available to everyone as an opt-in choice. With time, manufacturers will see a market and offer the necessary products; we consumers will buy them since they will save us some real money; and we will change our behavior to maximize the savings.

Unfortunately according to the experts in the room, there are a few problems with this:

- Moving to variable billing is politically unpopular since initially most people would see their bills go up not down. This is because current home appliances and HVAC systems are not smart and therefore require the consumer to manually control them.
- There are over 3,200 utilities in the U.S. including investor-owned and publicly owned utilities, cooperatives, and federal utilities with numerous federal, state and local regulators. Getting agreement will take time – a lot of time.
- Moving to TOU billing costs money. Utilities will have to replace their meters with more expensive smart meters; put some sort of communications link to the meter in place; change their billing systems; deal with customer service calls from irate consumers (higher bills equal more complaints); the list goes on. And without the availability of inexpensive networked appliances and home systems there will be little change to the demand curves, at least in the beginning.

The unspoken message was that, rather than face the difficult task of coordinating the effort, it is simpler to ask the consumer industries to take the lead. Then once the products are in the market and the consumer has been educated by industry, it will be easier to get utilities and regulators to move toward TOU billing. Of course, such

→ *continued on page 18*

## NETWORKING AND OUTREACH

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CABA's mandate includes providing its members with networking and outreach opportunities through participation at numerous industry events.



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Ron Zimmer, CABA President & CEO, signed a cooperation agreement at the Smart House/Intelligent Building Conference in April 2010 in Rakvere, Estonia.

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Ron Zimmer, CABA President & CEO, with attendees at the Smart House/Intelligent Building Conference in April 2010 in Rakvere, Estonia.



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Martin Cullum, GM Technology Development – Video Network at Bell Canada and CABA Chairman of the Board addressed CABA's Digital Home Ecosystem Forum on May 5, 2010. Microsoft Corporation hosted this Connected Home Research Council event.




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A panel discussion at CABA's Digital Home Ecosystem Forum on May 5, 2010.



## Smart Grid on the Air

By Ken Wacks

Dr. Kenneth Wacks was interviewed about electricity smart grids on the syndicated radio program *Into Tomorrow*. This article is a transcript of the interview with some added illustrations.



*Into Tomorrow* is a weekly three-hour program that discusses technology issues and has been reporting on home automation for about 15 years. The host, Dave Graveline, sets up a mobile studio at most of the trade shows serving the home systems industry, such as the Consumer Electronics Show and Electronic House Expo (EHX). This interview was conducted at EHX on March 26, 2010 in Orlando, Florida as an informal dialogue with no rehearsal.

The entire three-hour show was broadcast on April 2, 2010 and is available as an MP3-format podcast or a stream at [www.intotomorrow.com](http://www.intotomorrow.com). An excerpt of the show containing this interview is posted at [www.kenwacks.com](http://www.kenwacks.com).

### Into Tomorrow interview

**Dave:** Our road trip continues this week as we broadcast from the Electronic House Expo in Orlando. Hi, it's Dave Graveline. We're helping you break it all out when it comes to home tech.

You've heard us talking about smart grids, but do you know what they are exactly? Well our next guest is here to tell us about that. He is a GridWise Architecture Council member, Ken Wacks. Ken, welcome into tomorrow.

**Ken:** Thank you very much, Dave. It's a pleasure to be here.

**Dave:** We thought it would be cool to get your perspective on a lot of discussion that we've even seen and heard about here around EHX involving smart grid. So, first of all, how do you describe what a smart grid is and then let's get into how it may be helping us into tomorrow.

**Ken:** Well, to understand the smart grid is to understand the electric system we've had in place for more than a century [Figure 1].



Figure 1 – The Traditional Electric Grid

**Dave:** Yeah, long time, the old technology of many cases?

**Ken:** Right. The good news is the lights are still on, so we do not have a crisis yet. But a number of the soothsayers in our industry look ahead and say as the economy improves, we may have electricity shortages. But more importantly, there are new technologies coming along for

**Ken:** The key benefit of a smart grid is overlaying information technology (IT) on the existing power network [Figure 2]. So, what we can view as smart grid is a blending of the Old World low-tech with high-tech. We see there are benefits there, but there are really difficult challenges because of the mindset of the low-tech engineers and the high-tech engineers; they live in different worlds.

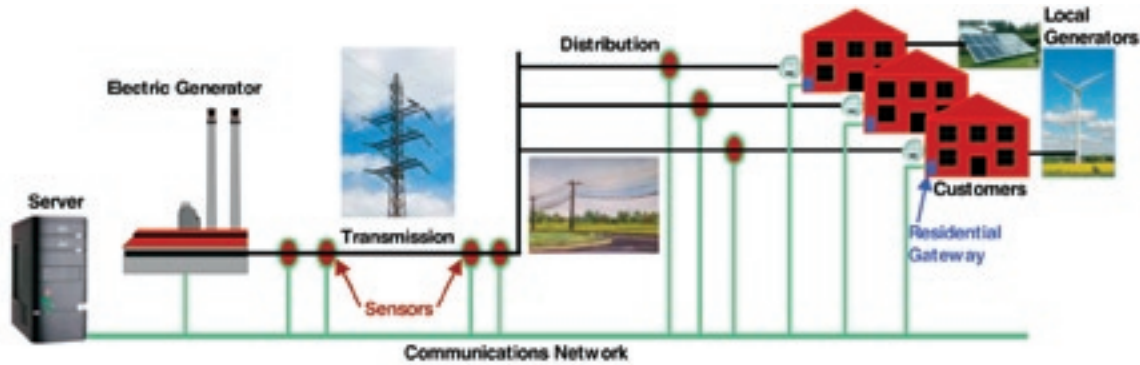


Figure 2 - The Electric Smart Grid

other sources of electricity, like photovoltaics, and windmills, and biofuels, that mean we're going to have a lot of people generating electricity. And instead of having a few generators and a lot of customers, we may have thousands of generators including you and me.

**Dave:** I would hope because if nothing else I would love to send less money to the power company than I've been paying, as you've said, for a century. I feel like I personally have been paying for a century as it is. And, when we talk about technology in place, a lot of it is, I'm sure, very old technology. So, don't we have to also upgrade these grids?

**Ken:** Well, you know the power system for all its strengths has really been running open loop. What I mean by that, is if your lights go out the electric company doesn't know it unless it affects the whole community.

**Dave:** And you have to call or have people call to react.

**Ken:** They track the calls and if they see a whole bunch from one neighborhood, they say, "Well, we might really have a problem, let's roll a truck."

**Dave:** But part of the smart grid will be that if something goes down, even if it's one house on a block, they would be advised.

**Dave:** Ken, does it have anything to do also with delivering Internet using the electricity grid?

**Ken:** There have been plans called Broadband over Powerline to deliver Internet, and about 10 to 15 years ago there was talk that maybe the electric companies would become ISPs, Internet Service Providers.

**Dave:** Because it's the only service that is going to every house.

**Ken:** The issue is this low-tech versus high-tech. It's not that BPL, Broadband over Powerline, couldn't be made to work, it's that electric companies are in no way or shape prepared to run the business.

**Dave:** Yeah, there you go. I mean you were talking about having to get not only the Internet to each of their main stations and substations, but then problems, I'm sure, with interference, let alone with everything else.

**Ken:** Well, let's talk about business. How good are public utilities at cutting deals with Hollywood to bring us the movies we want.

**Dave:** Good point. Cable companies have enough trouble. Now we need all those little power companies trying to do it, right? So I guess we are not going to see that, not very likely.

**Ken:** In fact, all the companies that touted their strengths in BPL are downplaying that. They are using the BPL technology to monitor the grid. As I told you, the grid runs open loop, but now there is a big push for what's called "wide area situational awareness" where the grid will be more heavily instrumented so that the electric company will know if there is a break in a distribution line somewhere.

**Dave:** I mentioned earlier about all of us perhaps helping to generate power and, in some cases at least, maybe getting it on the grid and sharing our excess power. How will that work, and how does that work in smart grid technology?

**Ken:** Well, the fundamental problem is the people who operate the smart grid, the "independent system operators" as they are called, are used to having power flow from a few generators to a lot of customers. Now we are talking about two-way power. They need a lot of IT to manage this.

How will it work? Well, there are some limited trials in place where people may have photocells on their roof. They use it, and then any of the excess gets sent off to the utility. Now, depending on the state you are in, you may be able to spin your meter backwards and actually get paid retail rates for the excess power you generated.

**Dave:** Well wouldn't that be nice. And I guess in a perfect world, we can hope for that and for more and more folks doing that. I know we hear from listeners occasionally around the country that are saying they got either wind power or some other kind of thing where they're actually spinning the meter backwards.

You are going to learn more at [www.gridwiseac.org](http://www.gridwiseac.org) and of course Ken's own site where he certainly writes a lot about this, and you can keep tabs on what's going on: [www.kenwacks.com](http://www.kenwacks.com) and [www.gridwiseac.org](http://www.gridwiseac.org). Thanks for joining us Ken here at EHX.

**Ken:** A pleasure, Dave. **H**

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Dr. Kenneth Wacks has been a pioneer in establishing the home systems industry. He advises manufacturers and utilities worldwide on business opportunities, network alternatives, and product development in home and building systems. In 2008, the United States Department of Energy appointed him to the GridWise Architecture Council. For further information, please contact Dr. Wacks at 781.662.6211; [kenn@alum.mit.edu](mailto:kenn@alum.mit.edu); [www.kenwacks.com](http://www.kenwacks.com).

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## HOME SYSTEMS - CONTINUED FROM PAGE 13

an undertaking shows a lack of understanding as to how the CE and appliance industries and retailers operate, and need for utility intervention.

So what's the solution? First, there must be more utilities offering "opt-in" variable pricing. Few consumers will opt-in in the beginning since there are few products that can take advantage of it. However, if the real cost difference between peak and off-peak pricing is gradually phased in over time, or different levels of TOU are offered, consumers would have some time to adapt their behavior accordingly, and replace their old devices and systems with the smart models. As it becomes more prevalent the market for these products will grow and with it the number of products that can take advantage of it. Gradually utilities can increase the peak/off-peak pricing differential to a level more reflective of their costs or consumers opt for the higher differential contracts. And if

the government really wants to get this moving they will offer incentives in the form of tax incentives to utilities that offer the programs and to consumers who sign up for them. No need to subsidize the products. Consumers will buy them if it makes dollars and sense. **H**

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William Rose is Principal of WJR Consulting Inc.



## How Ultra Low Power Wireless Networks and ZigBee RF4CE Will Make Homes Smart

By Cees Links

### Why are our homes dumb?

For many years – decades even, we have been waiting for the automated “smart” house – a house that is as technically advanced as our automobiles. For decades, we have been able to remotely lock and unlock our car doors, raise and lower our car windows, adjust temperatures for different parts of the car seating areas, and even clean the back and front windows.

### Why can't we do that with our houses?

Why are most homes still living in the tech dark ages? Gurus and tech-evangelists have long been promising the smart home – the automated home with devices that talk to each other, with appliances and central home systems that can be controlled from a home dashboard or over the

Internet. Except for a few hobbyists and early innovators, most homes today are still stupid.

However, with the arrival of the new third home wireless network, this is beginning to change. Most homes already have two wireless networks – the cordless phone network for communication and the data network – usually Wi-Fi. Both are very effective for high bandwidth, power-gulping applications like watching Internet videos and talking on the phone.

However, for many less data intensive communications, the new ultra low-power networks – based on the 802.15.4 standard and new ZigBee standards (including ZigBee RF4CE and ZigBee Green Power) promise to not only make our homes smart, but to do it in a way that is both green and maintenance free.



This year, large consumer electronic manufacturers, cable set-top-box makers and service providers will start rolling out systems for our homes that will finally make our homes as smart as our cars. This revolution is going to start small, starting with the remote control we use to control our TV and set-top-box. However, in the coming years we will see new capabilities added to that remote.

Based on using a RF powered remote control, it will become possible to monitor and control all the home's systems from a single central dashboard – your remote control. By using radio frequency (RF) instead of the old fashioned infrared (IR), this central mobile dashboard can be used in any room to control systems based in other parts of the home. RF transits through walls, through doors, and through furniture. Because RF supports interactivity, not only can the homeowner control other systems, but she or he can monitor the systems as well by using the display on the remote.

While sitting in the home office, the homeowner can monitor and control the temperature in different rooms, set up recording on the DVR in the living room, turn off the lights in the kids' rooms after they go out and play. She can even capture a digital image from the front door camera to see who is ringing the doorbell.

And if the kids do grab the remote and somehow lose it, she can go to one of the controlled appliances – like the flat screen TV, and press the “Find Me” button. The remote control will start beeping, playing a song, whatever it takes to make it easy to find again.

Yes, these technologies can be cobbled together now, but they are expensive and need technical expertise to make them all play well together. Because of the new ZigBee/RF4CE standard, vendors are creating systems and devices that will be less expensive and will be able to interact with each other. In addition, the new ultra low-power capabilities make these devices maintenance free and green by greatly reducing the amount of batteries needed to operate the various sensors around the home, as well as in the remote itself.

Batteries are one of the more hidden polluters of the planet. Even though they are small, each contains heavy metals and toxic chemicals. In addition, there is a heavy carbon footprint involved in the mining and refining of the raw materials, as well as in the actual manufacture and distribution of batteries, as well as in the final recycling and disposal of batteries.

By using new ultra low-power wireless technology, consumer electronics manufacturers are now starting to

rolling out remote controls that use a lot less power and never need to have the batteries changed or charged.

For example: with a typical remote control, one has to change the batteries at least once a year. Open it up, pull out the old ones and put in new AA batteries. If it is an old remote, you probably need to replace the duct tape or rubber bands holding it together.

If you have battery powered sensors in your home for security and temperature control, you already know the repeated irritation for tracking down the beeping and having to change batteries (and why do these battery powered sensors always run out of power in the middle of the night?).

By reducing the power draw and enabling the battery to last for the product's lifetime (10 years or more), it is possible to reduce the overall number of batteries needed by 90 per cent. This means billions fewer batteries need to be made – billions fewer batteries tossed into landfills.

By not requiring the user to open up devices to replace and or recharge batteries, these devices also become essentially maintenance free, which enables the makers to design remote controls and sensors that do not require battery compartments and lids. No more duct tape and rubber bands.

By using these new ZigBee RF4CE networks, we are improving our overall ecology as well as making our lives a lot more convenient. No more having to point and shoot with remote controls to change the channel, to set up recording on our DVRs. No need to hike downstairs to adjust the thermostat or to turn off lights after everyone has left the room. Because this new technology is based on a standard – ZigBee RF4CE – companies and manufacturers worldwide can build cost effectively design solutions that will interact and talk to each other.

The new third wireless network is coming this year – bringing with it the long awaited promise of the smart home – a home that is as automated and easy to use as the car that is parked in the home's garage. Parents often tell their children that watching too much TV can make them stupid. That may be. However, because of ZigBee/RF4CE and the third home wireless network, your TV set's remote control will at least make your house a lot smarter. **H**

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Cees Links is CEO of GreenPeak Technologies.

# UPCOMING EVENTS

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## **Security Canada West**

June 16, 2010  
Richmond, BC  
[www.securitycanadaexpo.com/en/attendees/west](http://www.securitycanadaexpo.com/en/attendees/west)

## **BuildingsNY**

June 16-17, 2010  
New York, NY  
[www.buildingsny.com](http://www.buildingsny.com)

## **Smart Energy International**

September 7-9, 2010  
San Jose, CA  
[www.spintelligent-events.com/sei2010/en](http://www.spintelligent-events.com/sei2010/en)

## **2010 FTTH Conference & Expo**

September 12-16, 2010  
Las Vegas, NV  
[www.ftthconference.com](http://www.ftthconference.com)

## **Security Canada Atlantic**

September 16, 2010  
Moncton, NB  
[www.securitycanadaexpo.com/en/attendees/east](http://www.securitycanadaexpo.com/en/attendees/east)

## **CEDIA EXPO 2010**

September 22-26, 2010  
Atlanta, GA  
[www.cedia.net/expo](http://www.cedia.net/expo)

## **GridWeek 2010**

October 18-21, 2010  
Washington, DC  
[www.gridweek.com/2010](http://www.gridweek.com/2010)

## **Security Canada Central**

October 20-21, 2010  
Toronto, ON  
[www.securitycanadaexpo.com/en/attendees/central](http://www.securitycanadaexpo.com/en/attendees/central)

## **AHR Mexico**

October 26-28, 2010  
Mexico City  
[www.ahrexpomexico.com](http://www.ahrexpomexico.com)

## **ISC East**

November 3-4, 2010  
New York, NY  
[www.isceast.com](http://www.isceast.com)

## **Net-atHome**

November 17-19, 2010  
Nice, France  
[www.ict-sustainablehomes.org](http://www.ict-sustainablehomes.org)

## **2010 Real Property National Workshop**

November 23-25, 2010  
Toronto, ON  
[www.rpic-ibic.ca/en/events/2010rpic\\_workshop](http://www.rpic-ibic.ca/en/events/2010rpic_workshop)

## **HI-TECH BUILDING**

December 7-9, 2010  
Moscow, Russia  
[www.isrussia.ru/en/isrussia](http://www.isrussia.ru/en/isrussia)

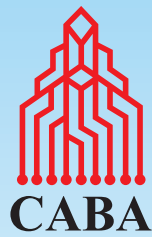
## **Integrated Systems Russia**

December 7-9, 2010  
Moscow, Russia  
[www.isrussia.ru/en/isrussia](http://www.isrussia.ru/en/isrussia)

## **Smart Energy Summit**

January 24-26, 2011  
Austin, TX  
[www.smartenergysummit2011.com](http://www.smartenergysummit2011.com)

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Go to: [www.caba.org/events](http://www.caba.org/events)



# Intelligent and Integrated Buildings Technologies

Market Size in North America 2010



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Research Report Now Available  
More information available at [www.caba.org/market-size-2010](http://www.caba.org/market-size-2010)

Research conducted by: 