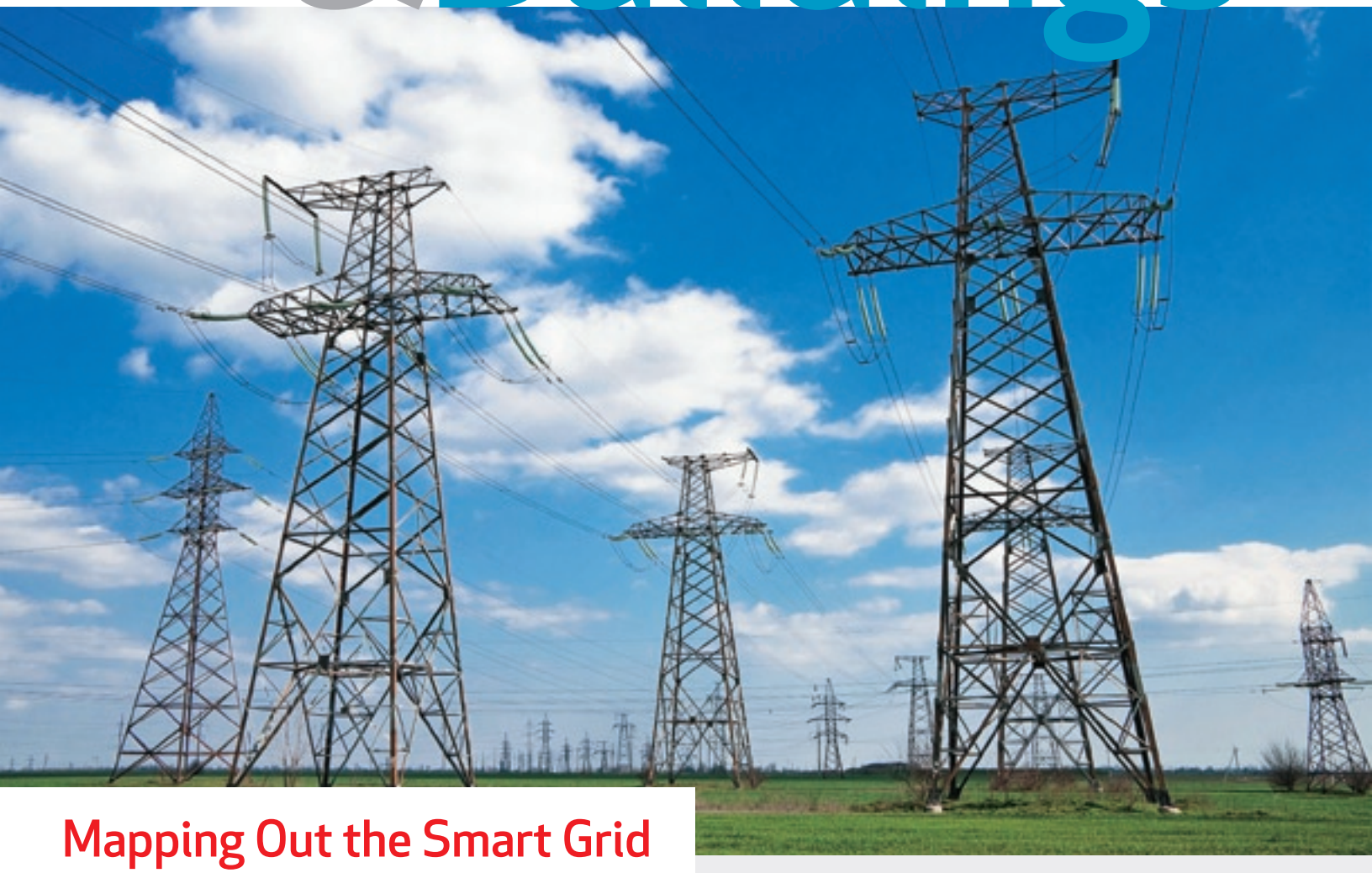
THE MAGAZINE OF THE CONTINENTAL AUTOMATED BUILDINGS ASSOCIATION
CABA
SUMMER 2009 VOLUME 6, NUMBER 2

iHomes & Buildings



Mapping Out the Smart Grid

According to Robert H. Lane, the smart grid will open doors for new control by common folk, in this case over energy management, now the domain of remote utilities and grid operators.

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CABA's Connected Home
Research Council

Your research arm for the Connected Home

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FEATURES

COLUMNS

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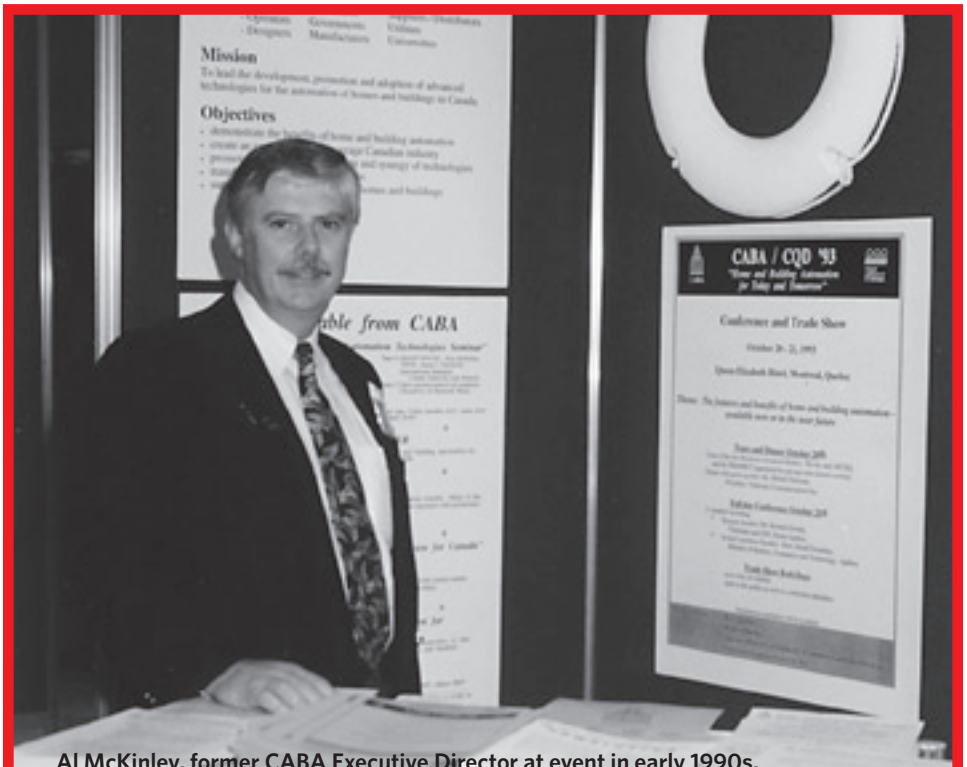


Al McKinley, former CABA Executive Director at event in early 1990s.

CABA Celebrates 20 Years

CABA's 20th anniversary is an opportune time to reflect on how joint efforts have strengthened our industry.

"CABA was created by visionaries. The organization has come a long way from its early years, and so, of course, has the industry. The progress that has been made is the sum of a tremendous numbers of ideas and hard work enacted by the CABA membership, its staff, and the industry at large." — **Al McKinley, former CABA Executive Director**

"Heartiest congratulations to CABA members and staff on your remarkable milestone. Challenging times require dedicated staff and committed members – and indeed that has been the secret to CABA's twenty years of success. It's a real pleasure for me to salute CABA, and to recognize its outstanding achievements."
— **Jack Fraser, former CABA President**

"CABA is an excellent association to further industry thought and insights. The broad and diverse CABA membership also provides expanded opportunities for networking and collaboration." — **Martin Cullum, CABA Chairman of the Board**

"CABA is an excellent organization. Its mantra is to be the definitive information source for home and building automation and it achieves this objective by providing the industry with outstanding research and practical steps to drive the development of high performance home and buildings." — **Brad Haeberle, Vice President, Siemens**

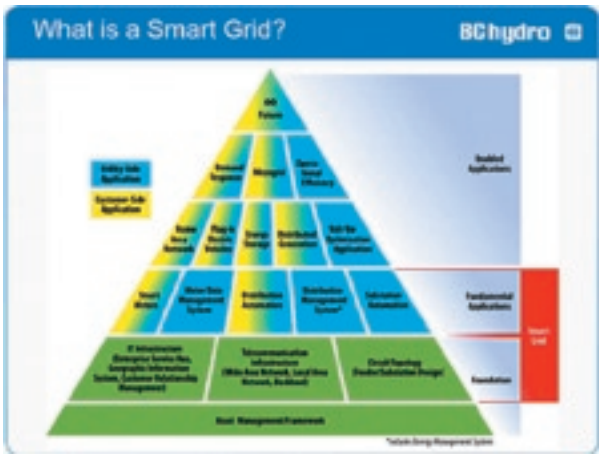
"In 1994, when I joined CABA, I felt the initiative of a few major manufacturers and utility companies was an opportunity to keep abreast of trends that had the potential to affect technological development within our industry. My intention at that time was to participate for only a few years. Now 14 years later, I am still involved at the highest levels, and it goes without saying that CABA is the best method to network, monitor technological and industrial developments and most importantly, develop opportunities to grow your business." — **Leo DelZotto, President, Tridel Corporation**

CABA President & CEO's Message

Ron Zimmer

In the 12 years that I have been involved with CABA, there have always been identifiable market drivers for the integrated systems in homes and buildings. However, the "stars" may have finally aligned to illuminate the "perfect storm" that will finally see major proliferation of connected homes and intelligent buildings.

The movement to green and sustainable buildings, coupled by a need to conserve energy, has brought renewed interest concerning integrated systems. Major efforts to curb energy use throughout North America have support at the highest political levels to create a "smart grid". For this effort to succeed, they first need to solve the biggest issue this industry has always faced: a lack of interoperability between protocols and standards, as illustrated.



Source: BC Hydro

My recent presentations at a smart grid event in Vancouver and at a GSA high performance building event in Albuquerque both reinforced these opportunities. Although there may be disagreement on a smart grid definition, there appears to be universal agreement that the utilities should be able to seamlessly connect and control devices in buildings.

To illustrate the activity that is taking place, the US Department of Energy and the US Department of Commerce are in the process of developing a smart grid roadmap. They have funded the National Institute for Science and Technology (NIST) to complete this task this year. The Electric Power Research Institute (EPRI) has been sub-contracted to bring forward the "standards" for the smart grid. Several meetings have already been held and attendance had to be limited to 500 people.

The CABA Board of Directors discussed this issue at their meeting hosted by Trane and there will be forthcoming action taken by CABA on this opportunity. Both Dr. Ken Wacks and Robert H. Lane have provided further insights, with articles in this publication, on the challenges and opportunities surrounding the smart grid. CABA encourages all stakeholders to take an active role in the discussions as the future for digital homes and high performance buildings will change significantly in the near future. Will your organization be a winner or loser?

NEW MEMBERS

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.
Here is a sampling of our latest members.

Ball State University
The Center for Media Design at Ball State University is a research and development facility focused on the creation, testing, and practical application of digital technologies for business, classroom, home and community.

The Duchossois Group
The Duchossois Group is a privately held, family-owned investment and operating company with holdings in the consumer products, technology and service sectors, including AMX Corporation and the Chamberlain Group.

Energy Eye
Energy Eye provides simple and economical energy reduction solutions to hoteliers through high-efficiency HVAC and packaged terminal air conditioner management. The firm is dedicated to manufacturing high-quality wireless energy management products and providing the best possible energy saving solutions for the global marketplace.

GainSpan
GainSpan is a leading provider of low power Wi-Fi semiconductor and software solutions that offers up to 10 years of battery life to sensors and embedded applications. GainSpan and its ecosystem partners allow for the reduction of energy bills and carbon footprints by leveraging existing Wi-Fi infrastructure and enabling battery powered or energy harvesting based sensors applications.

U.S. General Services Administration
The U.S. General Services Administration provides workplaces by constructing, managing, and preserving government buildings and by leasing and managing commercial real estate. GSA's acquisition solutions offer private sector professional services, equipment, supplies, telecommunications, and information technology to government organizations and the military.

HomeGrid Forum
HomeGrid Forum is a global, non-profit trade group promoting the International Telecommunication Union's G.hn standardization efforts for next-generation home networking. HomeGrid promotes adoption of G.hn through technical and marketing efforts, addresses certification and interoperability of G.hn-compliant products, and cooperates with complementary industry alliances.

Universal Powerline Association
The Universal Powerline Association is an international not-for-profit trade association working to promote global standards and regulations in the fast developing powerline communication market.

A complete CABA member listing with product/service information and Web links is available at www.caba.org.

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

Geared for Change: Energy Efficiency in Canada's Commercial Building Sector

This paper, jointly authored by the National Round Table on the Environment and the Economy (NRTEE) and Sustainable Development Technology Canada (SDTC), examines reducing the carbon footprint of commercial buildings in Canada. The focus of the research is on highly efficient clustered buildings and heavily utilizes statistics that analyze building energy consumption and intensity rates. The full version of this research was published as a CABA Information Series and is available in CABA's Research Library at www.caba.org.

FIGURE 5

Commercial Building Energy Consumption by End Use[21]

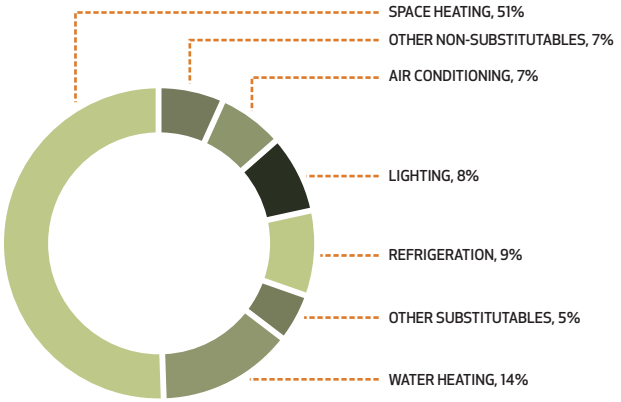


FIGURE 6

Commercial Building Energy Consumption by Fuel Type[22]

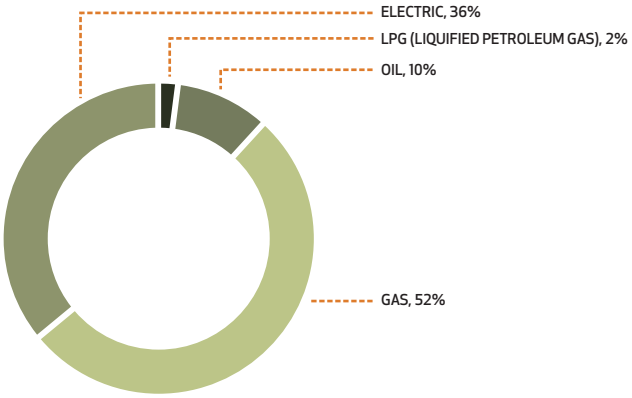
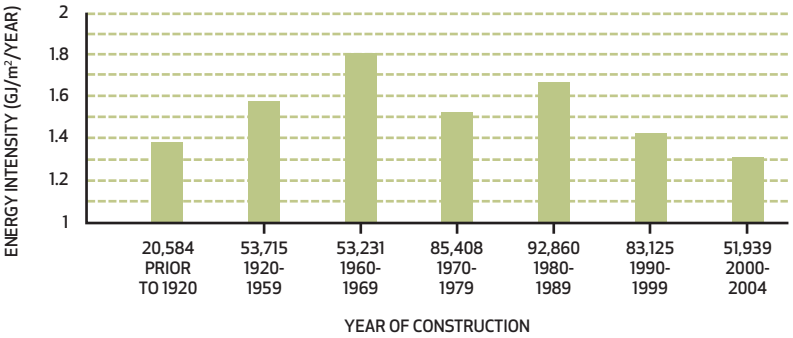


FIGURE 7

Energy Intesnsity (GJ/m2/year) by Building Age[24]



Note that the number directly under each column denotes the number of buildings of each age group that currently exist in Canada.

Game Consoles and the Emerging Over-the-Top Video Opportunity

This report from The Diffusion Group examines how incumbent Pay TV providers can compete with video delivery via broadband Internet. The full version of this research was published as a CABA Information Series and is available in CABA's Research Library at www.caba.org.

End-to-end primary OTT video solutions - A solution whose primary purpose is to supplement or replace existing Pay TV services via a proprietary TV-only set-top box and a specific (non-open or walled-garden) collection of live or on-demand video channels.

First-generation examples include Akimbo and Moviebeam, both of which required consumers to spend hundreds upfront for a proprietary set-top box to deliver a closed offering. Both failed miserably, being far ahead of consumer behavior and market viability trends - not to mention having lousy business models.

Current generation examples include:

1. Movies-on-demand services such as Vudu and Apple TV, which require a dedicated proprietary set-top box and a pay-per-download rental or ownership purchase model, though neither offer a subscription-based model.
2. Broadband TV services such as SkyAngel and Kylin.tv both of which require a dedicated (single-function) proprietary set-top box.
3. Hybrid broadband and broadcast services such as BT Vision and Sezmi which supplement over-the-air TV broadcasts with broadband delivered content. BT uses its DSL network plus a DVB-T tuner for Freeview over-the-air broadcast content.
4. Movies-on-demand services such as those offered by both Netflix and Blockbuster. These services are starting to use broadband to expand their catalog of library titles and improve customer service through instant delivery over broadband.
5. Consumer electronics from vendors such as Sony and Panasonic are building media portals which are increasingly incorporating direct broadband connectivity in order to deliver content directly to consumers. In theory, such direct connectivity eliminates the need for a secondary hardware platform - at least for the services which Sony and Panasonic decide to provide. This theme suggests that video control points may shift from Pay TV operators to retail hardware vendors, thus giving them a gateway through which third-party application developers can reach consumers (and from which the hardware vendor takes a slice of revenue, à la Apple's iPhone widget gallery).

Generally, end-to-end primary solutions involve single-purpose hardware and software - they are built with only one purpose: to bypass incumbent Pay TV providers and deliver a walled garden of video-related services directly to the living room TV.

End-to-end secondary OTT video solutions - A solution whose primary purpose is something other than video transport but whose hardware and software combination also enables a TV-based online video experience.

First-generation examples include TiVo, a platform whose primary purpose was digitally recording live TV for on-demand playback and has now incorporated online video into its offering.

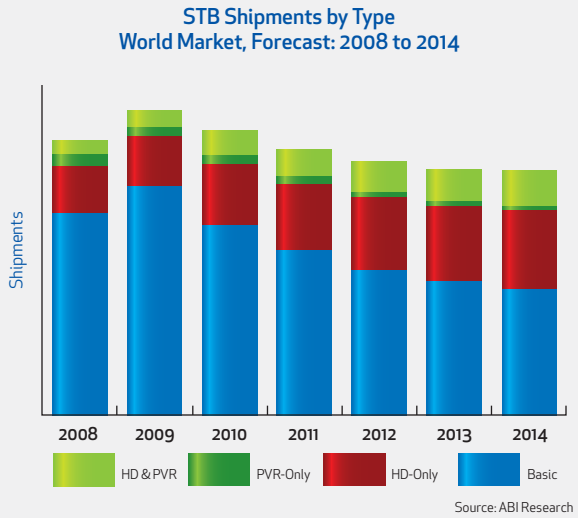
Current-generation examples include next-generation gaming consoles such the Xbox 380 or PS3. When combined with their Web-based online media portals, these platforms can deliver a robust video experience via download-for-purchase or (in the case of Xbox LIVE) streaming via Netflix, all over a broadband connection.

Bridge devices - Solutions intended to connect PCs to TVs such as Microsoft's Media Center Extender, Sling Catcher/Projector or ZeeVee in order to share all sorts of PC- or Internet-based information and media, including video.

INDUSTRY TRENDS

Interactive Television

According to ABI Research, shipments of set-top boxes are expected to peak this year, at least in mature markets, and then commence a gradual decline. However the rolling series of analog TV shutoffs in countries around the world, combined with the strong uptake of high-definition TV sets, mean that HD set-top boxes will form a growing fraction of the total market. High-definition set-top boxes are expected to account for about 30 per cent of all set-top box shipments as soon as 2010.



Smart Grid

The U.S. smart grid market will expand 21 per cent to $17 billion per year by 2014 from today's market size 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.

Home Networking

A recent consumer survey conducted by ABI Research has found that while most owners of home networks find their equipment works reasonably well, 30 per cent of survey respondents find setting up home networks difficult.

Information Technology

Nearly half of businesses reduced their IT budgets in the first quarter of 2009, according to Gartner. In a survey of 900 chief information officers, 42 per cent said the cash allocated to the IT department had been reduced from the previous quarter's amount. Spending will be near the levels in 2007. IT budgets will decline a total of 4.7 per cent this year, according to the research. The largest budgetary decline was in professional services, telecommunications and technology, with a 10 per cent drop. Manufacturing IT expenditure is set to fall at eight per cent, and utilities and financial services four per cent.

Home Automation

According to a new technical market research report from Electronics.ca, the U.S. market for home automation and security technologies generated $2.3 billion in 2008 and an estimated $2.5 billion in 2009. This will increase to $8.1 billion in 2014, for a compound annual growth rate (CAGR) of 26.5 per cent. ABI Research reports that home automation shipments would approach 2.8 million by 2011.

Green Buildings

The American Recovery and Reinvestment Act of 2009 authorized the General Services Administration's Public Building Service to invest $5.55 billion in federal public building projects. This includes $4.5 billion to transform federal facilities into exemplary high-performance green buildings.

Consumer Electronics

Consumer demand for digital media and online content will push worldwide annual sales of connected consumer electronics to more than 100 million units by 2013, according to Parks Associates.

Mapping Out the Smart Grid

By Robert H. Lane

The smart grid opens doors for new control by common folk, in this case over energy management, now the domain of remote utilities and grid operators. The grid will speak to us and we will speak back through our actions. Collectively, we will determine what kind of energy is used and when. In one sense, we will become energy policymakers through our purchasing choices. Making information retrieval user friendly and scalable in real time will be crucial to the success of the smart grid.

Energy conservationists have always said the cheapest form of new energy is harnessing the energy that is now wasted. Unfortunately, the electrical grid wastes energy to the extreme. One can argue the current North American grid was a significant technological achievement of the twentieth century. However, despite its size, the grid is actually quite dumb. Power usually flows one way, and utility managers receive little or no information about how well it's being used or whether the amount of energy flowing to a particular region or city is too much or too little.

Parts of the system are under built, while other components cannot function efficiently due to outdated regulatory restraints, fractured connectivity to other parts of the network and in many cases failure to maintain system controls at the level of current technology, especially as it pertains to the Internet. Yes, funds were spent on computer technology in the back office, but rarely in the field. One recent study found that transmission congestion cumulatively costs consumers on the Eastern seaboard $16.5 billion per year in higher energy prices.

The term 'smart grid' is somewhat fluid, encompassing a mixed bag of technologies from smart meters in houses and businesses to area networks and how we can link renewable energy sources to those currently providing the majority of electrical power. Perhaps the vision we seek is analogous to the communication grid.

According to Adam Stein, co-founder of TerraPass: "The smart grid should be a self-healing, automated grid that can manage complex flows of electrons, from the hundreds – potentially thousands of large and small sources of power to millions of homes, businesses, industrial customers and potentially, electric cars that require that energy."

Yes, the new electrical grid will have to have many if not all the technical control features that we know are included in our worldwide communication network. But it will also need to encapsulate other specific characteristics:

1. The Electrical Grid must be more reliable – A reliable grid provides power dependably when and where its users need it and of the quality they value. It provides ample warning of growing problems and withstands most disturbances without failing. It takes corrective action before most users are affected. It knows when a transformer failure might occur and can dispatch solutions or manpower to correct it.

2. The Grid must be more secure – A secure grid withstands physical and cyber attacks without suffering massive blackouts or exorbitant recovery costs. It is also less vulnerable to natural disasters and recovers more quickly.

→ *continued on page 19*

CABA Undertakes Video Consumption Study

By Alex Detre

The Continental Automated Buildings Association, through its Connected Home Research Council, is launching a consumer market study that examines alternative delivery methods for video entertainment into the home.

CABA's "Video Consumption" research project will study the emergence and potential of over-the-top video services. These Internet protocol-based services ride on top of other channels primarily used for broadcast, such as coaxial or fiber optic cable.

In the past two years, popular television programming has been made available at no charge on the Internet using over-the-top video. The new technology holds the promise of not just replicating commercial television, but possibly offering new viewing experiences on TV, on personal computers and mobile devices.

CABA's research will explore the state of over-the-top video, possible new applications, technical challenges, business impediments and display modalities.

"Advanced by increasing broadband penetration and rising connection speeds, over-the-top video services have propagated in the past couple of years as a large number of organizations aim to reach their audience online," stated David Dollihite, Vice President of Home Services, Direct Energy and Chair of CABA's Connected Home Research Council. "This study, conducted by CABA Research Council members will examine the clear potentials and disadvantages of the technology and determine the various strategies that companies can adopt to capitalize on a new emerging wave of Internet-based video services."

The first phase of the study will define possible user experiences afforded by over-the-top video services. The second phase of the project will create simulations of possible over-the-top video experiences and will conduct focus groups to determine and assess consumer interest.

CABA's Connected Home
Research Council

Ball State University, Bell Canada, Cisco Systems, Hewlett-Packard Company, Microsoft Corporation, Procter & Gamble, Telus Corporation, and Whirlpool Corporation are participating in this project.

"Clearly the increasing use of online video demonstrates that IP-based video has become a mass platform for distributing video content to a wide cross section of Americans," stated Cheri Marine, Research Product Planner at Microsoft Corporation. "This study will determine the range of new, exciting opportunities that will be available to both consumers and businesses catering to this platform."

"Realizing that Internet-based technologies will drastically change the broadcast industry in years to come, CABA is excited to partner with key platform providers to investigate the market potential of emerging over-the-top video services," said Ronald J. Zimmer, CABA President & CEO. "CABA views research into disruptive technologies as essential to its mandate and is contented that a collaborative investigation into over-the-top video services is being conducted by its membership."

CBS and ComScore, Inc. will conduct the study on behalf of CABA.

Alex Detre is CABA's Research Director.

Diving into Building Water Management

Jim Sinopoli, PE, RCDD, notes that monitoring and managing water use is really a part of the larger effort of the measurement and verification of a building's performance.

Next to the global financial situation and its effect on construction, most of the public, market focus, and attention regarding buildings is on energy; alternative energy sources, smart power grids, and energy use of HVAC and lighting systems in buildings. Somewhat lost in all that attention is water and specially water use in buildings. Water is a different resource. It may be our most precious resource. Where alternatives exist for energy sources, the alternatives to water are none. If you don't think water is a critical resource, consider that people can survive longer without food and certainly without energy than they can without water; that's not surprising considering that two-thirds of the human body by weight is composed of water.

Water also has a direct connection to energy use. Every gallon or liter of water used may require some pumping or treatment, which uses energy. Reducing potable water uses reduces energy consumption.

Except for a few specialized building types (industrial processes with heavy water use, laboratories, etc.), the monitoring and management of water in buildings is generally woeful. How many facility managers can monitor and manage real-time water use in their buildings from a personal computer? The answer is very few. This may be related to water having a lower profile than energy, but a large part is due to the dearth of innovative monitoring and management products in this sector. Surely some innovators, entrepreneurs and venture capitalists will eventually see the tremendous market potential for such water systems.

Overview

Water management is recognized in green building programs throughout the world. Water efficiency is one of the five main categories for the US Green Building Council's LEED certification. LEED credits related to water use include water efficient landscaping, water use reduction and innovative wastewater techniques. A major thrust of water efficiency is the reduction or elimination of the use of potable water. Techniques such as rainwater capture, advanced wastewater treatment, greywater "harvesting", and water-conserving plumbing fixtures are all tools that can be used to reduce the use of potable water.

From a smart building perspective however, the interest is how we manage and monitor the water use in buildings. More specifically, the interest is in the systems that will allow us to collect data on water use and provide actionable information to a facility or property manager. Monitoring and managing water use is really a part of the larger effort of the measurement and verification of a building's performance. Management of a building's water use can no longer be receiving a water bill at the end of the month from the water utility and comparing the bill to the previous month's bill. It is a water management system that monitors and manages water use that will change the process from simply supplying water to managing the demand for water.

Water use in commercial buildings obviously varies by building type, the type of plumbing fixtures, restrooms, landscaping needs, the use of hydronic cooling systems, kitchens, cafeterias, etc. USGBC offers some guidance on how to estimate a building's water use. In new construction, water use is determined by estimated building occupancy, for existing buildings it's past water use records. The baseline water use is calculated using building occupancy, a reduction of fixtures and fitting, and fixtures and fittings meeting or exceeding national or international plumbing codes and standards.

Control Systems

Think of a building as having two main water systems. One is the plumbing system within the building and the other is the irrigation system for the building's landscape. Ironically, the monitoring and management capabilities of irrigation systems seem far beyond such systems for interior plumbing. The technology for irrigation has been honed from facilities such as golf courses and parks.

Reducing the use of potable water for landscaping can be done with using recycled wastewater, captured rainwater and carefully selecting plants and trees. Effective and efficient watering is left to the irrigation control systems.

Typically these are systems that have a preset schedule and sensors that can adjust the watering schedule as needed. These sensors may be moisture sensors, flow sensors, rain shut-offs and "evapotranspiration" controllers (devices that measure the evaporation of water into the air and the loss of water by the plants, used in precisely calculating the specific water need of the plants). The result is watering the right areas with the right amount of water and avoiding over or under watering and runoff.

The irrigation systems usually have a central controller connected to a system administration terminal. These central controllers have evolved from motorized valves, to electromechanical clocks to microprocessor-based controllers. The connections between the controller and the devices are typically two-wire proprietary connections. The system administration systems will use maps of the landscaped areas (either from a GPS or the landscape architect's CAD drawings) and identify the locations of sprinklers and sensors. Some irrigation systems are fairly sophisticated, with the system controller able to download current weather predictions and adjust the system as needed. Products are also available for those organizations with a portfolio of real estate, allowing a central operation center to monitor each building's system and aggregate data for enterprise water use.

Plumbing Systems

Monitoring and management systems in buildings have several advantages:

- Water leaks and running fixtures can be quickly detected, reducing maintenance, saving water and reducing the owner's liabilities.
- Maintenance is improved due to the capability to more accurately identify the location of problems. For example, there is value in a facility manager that detects which hotel room or which restroom in a commercial building has a toilet running.
- Systems can provide information on when the fixtures are being used, flow rates, restroom traffic patterns, what fixtures are being used and how water use changes with the season. From that, the facility manager can gather usage trends, do planning and budgeting, and establish a preventative maintenance program.

Networked water monitoring and management systems consist of water meters, sensor-operator water fixtures such as faucets, urinals, water closets, occupancy sensors, automated ball valves and water valves. Some of these devices can be monitored and managed and others can only be monitored. These types of management systems are also applicable to greywater, wastewater and recycled rainwater systems. For example a greywater system will need to monitor: ultraviolet lamps used to disinfect greywater; filters; system pressure; UV lamp life and failure; and pumps, etc.

As an example, the Sloan Valve Company, one of the few companies to manufacturer water management systems, has also used people counters in restrooms to determine traffic patterns and predict water usage patterns. At a major retail establishment they were able to use data on current water use and specific use of restrooms to correctly estimate water use and use of restrooms, including spikes and dips in usage around major holidays. The actual data, which was submitted as part of a LEED application, demonstrated an initial design underestimation of use.

Generally the area of water monitoring and management has been primarily developed around water utilities, landscaping applications and special water-intense processes and uses. The in-building systems mainly consist of metering and code-compliant restroom fixtures, and the industry has been lagging in developing advanced hardware and software for in-building water management systems. It's a huge market opportunity for someone or some company to seize.

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


Smart Home Technology: Allowing Seniors to Age in Place

Lacey Jezioro and Wendy Lamirand assert that baby boomers want to age in place at home as long as possible and are actively seeking the technological ways and means to do so.

Connected smart homes are here and are not just for the younger consumer. This is a trans-generational movement. Aging baby boomers are beginning to embrace the concept of smart home technology and what it can do for them. The baby boomers are among the healthiest, wealthiest and best educated older adults than previous generations, along with being more tech-savvy. Smart homes can be a luxurious convenience for the average consumer, but for seniors or people with disabilities, it can help them live independently. A connected home can be the difference between seniors having to move to some type of assisted living facility or being able to remain in the comforts of their own home for a much lower cost.

Baby boomers are making decisions earlier than past generations about where to spend their retirement years and many are choosing to remain in their own homes. An AARP survey showed that 83 per cent of Americans, currently over the age of 45, say they would like to remain in their current residence for as long as possible and this concept is known as 'aging in place'. Aging in place can be a better alternative than moving into nursing homes, which are not only costly, but lack the psychosocial value of familiar surroundings and remaining in the community. As baby boomers seek to age in place, they are searching for products that will allow them to stay in their homes at the highest level of independence, even as their circumstances change.

The boomer impact is beginning to affect the home building and consumer product markets. According to a study of consumers 50 and older, 65 per cent plan to remodel or improve their homes. AARP has partnered with the National Association of Home Builders (NAHB) and the American Occupational Therapy Association (AOTA) to increase awareness and create initiatives for aging in place. Together these organizations created a designation to allow builders and professionals to become certified aging in place specialists (CAPS) by instructing them on how to modify homes for seniors. Traditional home modifications have included architectural modifications like adding ramps and widening doorways. Occupational therapists are recommending adaptations to specific areas of the home, such as the bathroom, which can include the installation of grab bars and changes to the shower for safety. Connecting numerous technology devices throughout the home is also becoming a more prevalent adaptation for the elderly aging in place. Home modifications and assistive technology allow seniors to continue to perform everyday tasks easier and more independently.

Baby boomers are now looking at smart home technology along with traditional home modifications. A smart home is a residence that uses a central computer program to integrate its various home automation systems, allowing for remote or automatic control of home devices and appliances such as security, health monitoring, and the home environment. The smart home of the future will have hidden computers and sensors throughout the house. When you enter a room the lights will gradually come on, increasing in intensity as your eyes adjust, and then dim off as you exit the room. There will

Figure 1 – Control Module: This controller lets you command up to 16 different compatible receivers, including lamp and appliance modules.

Figure 2 – Appliance Module: The application modules allows for remote control of household electronic devices. By plugging the appliance into this module, it can be turned on or off from a controller anywhere in the house.

Figure 3 – Transceiver module: This module receives radio frequency commands from remote controls to operate lamps or appliances plugged into it.

be various health monitoring devices throughout the home, especially in the bathroom. Vital signs such as heart rate, blood pressure and glucose monitoring will be accomplished through sensors in your clothing or in your bathroom without you even knowing that it is being done. Doctors will be able to treat you remotely from their office. You will be able to remotely control and monitor home appliances as you move throughout your home and property. Smart home technologies will also focus on making kitchens and pantries more efficient and usable for all.

Although assistive devices and smart home technologies may have a higher initial investment, experts believe that the benefits of this type of technology far outweigh its cost. Effectiveness of assistive technology and environmental interventions was evaluated in an 18-month study done by the Rehabilitation Engineering Research Center (RERC) on Aging at the University at Buffalo. Control group participants received standard care, while the treatment group received assistive devices and modifications. This study showed that the treatment group spent more on assistive technology devices: initially $2,620, versus $443 for the control group. However, the treatment group had significantly less expenditures for ongoing healthcare than the control group; overall total costs of $14,173 for the treatment group versus $31,610 for the control group.

More recently, University at Buffalo researchers have studied the cost effectiveness, usage and impact of smart home technologies with the elderly population. Here the treatment group was provided with a computer and a $400 X10-based smart home package. These packages included a remote control and modules for lamps and appliances, key chain remote, two-way transceiver module and computer interface that operates and controls the on/off timings of lamps or appliances, and ActiveHome software. Standalone products included door and window sensors, a motion sensor, a power flash that acts as an interface between the security system and an alarm (chime) and a wall switch for manual control of lighting, connected to a motion detector. The data revealed that participants in the study who received the smart home technology maintained their physical and cognitive status, in contrast to non-users that showed a significant decline. Researchers found that 80 per cent of the smart home technology users remained living in their homes at the end of the two-year study period versus 66 per cent of the control group.

The studies mentioned demonstrate the cost effectiveness of using smart home and assistive technology, which help seniors to age in place while maintaining their quality of life. Given the aging population, their desire to age in place, and cost effectiveness, there is a need for continued research and development of new smart technology products.

For more information about research at the University at Buffalo, The State University of New York, please refer to the Center on Knowledge Translation for Technology Transfer and the RERC on Universal Design in the Built Environment Web sites:
http://kt4tt.buffalo.edu
http://www.ap.buffalo.edu/idea/RERC/rercud.asp.

Lacey Jezioro and Wendy Lamirand are graduate research assistants at the University at Buffalo Center on Knowledge Translation for Technology Transfer and the Rehabilitation Engineering Research Center on Universal Design in the Built Environment.

A Cornucopia of Home Networking Protocols

By Ken Wacks

President Barack Obama has made energy a key policy initiative. The U.S. Congress appropriated $11 billion in the Recovery and Reinvestment Act for energy projects with $4.5 billion allocated to "smart grid" development. The goal of the smart grid is to apply information technology to improve the reliability of electricity and to accommodate local generation, such as solar-voltaic and wind power.

In 2005 and again in 2007 Congress mandated that utilities deploy demand response techniques for adjusting demand to match available electricity supply. Effective demand response involves major energy consuming appliances in the home. Utilities have stared to investigate how to communicate with home appliances via home networks. They are just becoming aware of the variety of communications protocols used for home automation.

Betsy Loeff of *Utilimetrics News*, recently interviewed me about standards for home area networks. Utilimetrics is a trade association of utilities and equipment suppliers focusing on the metering of electricity, gas, and water, plus related customer services such as demand response. Janice Greenberg, the Utilimetrics Membership Services Director, has generously given CABA permission to reprint this article. I enhanced the article with information about a variety of home networking protocols.

Way to Go? HAN Protocols Up For Grabs

[Published March 2009 in *Utilimetrics News*]

Some of the biggest corporate names in advanced metering technology (AMI) – Elster, Landis+Gyr, Aclara and Itron – made the pages of *USA Today* last month. The reason? They came out of their corners swinging when the economic stimulus package looked as though it would require utilities to choose Internet-based networking in order to qualify for some of those 4.5 billion smart-grid dollars provided by the recovery bill.

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In fact, Utilimetrics helped lead the fight. CEO Joel Hoiland quickly contacted Congressional leaders to clarify the downside of dictating technology options in the bill. In a letter to Ed Markey, chairman of the House Subcommittee on Energy and Environment, Hoiland explained that each utility charts its own road map toward the smart grid, and "requiring technology specifics in the 'stimulus package' preempts service providers, regulators and consumers from designing" the best solution to suit their needs.

Not surprisingly, industry outcry prompted legislators to water down the stimulus bill's language. Now the package calls for utilities to use "Internet-based or other open protocols and standards if available and appropriate" in their AMI deployments. But, uncertainty remains surrounding AMI communications protocols, especially those related to the HANs that utilities hope consumers will eventually embrace.

Gotta HAN It To You

HANs are short-range communications networks that

connect appliances and other devices within a home. By combining HANs with AMI, the networks would empower consumers to track their energy usage through in-home display units, program smart thermostats to respond to price signals or peak alerts from the electric utility, and monitor loads remotely. The utility, meanwhile, gains a pathway for direct load control.

Given these applications, HANs have become integral parts of utility AMI plans. You can find a good summary of the reasons why in Google's recent comments to the California Public Utilities Commission on smart grid policy. Submitted by Bill Coughran, senior vice president of Engineering for Google, Inc., and Dan Reicher, director of climate change and energy initiatives for Google.org, the commentary covers a number of the drivers for HAN plans in smart grid deployments. Among these drivers are the energy conservation effects of consumer education. As the Google team points out, studies have seen consumers cut electricity consumption as much as 15 per cent simply by having access to information that shows electricity consumption in real time.

Combining automation with consumption information ups the conservation payoff. Results from California's 2003/2004 statewide pricing study show that automating demand response - a task that HANs facilitate - reduced demand by as much as 27 per cent on days when critical-peak pricing went into effect.

Such conservation or load shifting delivers cost savings to utilities and consumers alike. In addition, there is an environmental payload. The Googlers told California regulators that, "If just half of U.S. households cut their demand by 10 per cent, the electricity savings avoided would be greater than today's total U.S. wind and solar-power output. The CO_2 emissions avoided would be equal to taking approximately eight million cars off the road."

With benefits like this, it's no small wonder public utilities commissions are looking closely at HAN technology. Texas regulators have mandated that AMI systems be capable of delivering real-time consumption data to consumers and communicating with appliances or other devices within residences. The Lone Star State's policy also says consumers own their energy-use history, and they shouldn't have to pay the utility a fee to see it. Google's Coughran and Reicher asked California regulators to make similar rulings.

Even consumers seem to be ready to jump on board the HAN bandwagon. According to analysts at ABI Research, more than 70 per cent of people who responded to a November 2008 survey expressed an interest in using home automation to "manage consumption of energy" in their homes. Among the 1,010 survey takers, this use of home automation topped uses such as lighting and entertainment equipment control or monitoring family members. Only remote monitoring of the premises for security reasons was more important to the survey respondents, and that nudged out energy management by merely a few percentage points.

The Standard Approach

What kind of technology will consumers be using in their home automation systems and HANs? That's a popular question, says Dr. Kenneth Wacks, a management consultant and member of the GridWise Architecture Council (GWAC). He's working on an answer.

GWAC is a 13-expert panel appointed by the US Department of Energy to provide guidance for the utility industry as it starts to implement smart grids. As part of this work, the council has been asked to help the National Institute of Standards and Technology (NIST) fulfill an obligation to Congress that entails writing a report on the status of standards and specifications related to the smart grid industry. To that end, Wacks was asked to produce a catalog of HAN communications technologies for the report and, so far, he's tallied up about 30 of them [listed in the table below].

"Not all 30 have been used by utilities," he says. "Some are not market winners. This is just a survey of protocols for communications inside a home."

As someone who has sat on a number of standards committees – and run a few, too – Wacks is careful to distinguish between protocols and actual "standards." Protocols can be developed by individual companies or by consortia of companies, such as the ZigBee Alliance, the Z-Wave Alliance, the HomePlug Powerline Alliance and other groups currently vying for the utility industry's nod of favor in HAN technologies.

Standards are specifications "developed under the legal authority of a standards developing organization [SDO]," like the Consumer Electronics Association, Wacks explains. In the U.S., SDOs are accredited by the American National Standards Institute (ANSI). That means the word "standard" is a legal term, referring to specifications created by an SDO that meet ANSI's "essential requirements for openness, balance, consensus and due process." However, this is not the process that

	Home Networking Communications Protocols								
Protocol	Communications Domain					Protocol Type			Note
	Gateway	Network Configur-ation	User Interface	Upper OSI Layers	Lower OSI Layers	Standard	Consortium	Proprietary	
CEBus				X	All media	ANSI			
DS2					PLC-BB		Univ. PL Cons.		PLC broadband
Echonet				X	All media	ISO/IEC	Echonet Cons.		
Ethernet					TP	IEEE/ISO			TP = twisted-pair wires
FireWire					TP	IEEE	1394 Trade Assn.		Streaming data - 1394
HomeGate	X					ISO/IEC			Residential gateway
HomePlug					PLC-BB		HomePlug Alliance		PLC broadband
HomePNA					TP		HPNA Alliance		Telephone lines
IEEE 802.15.4					RF	IEEE			Used by ZigBee
IQRS		X				ISO/IEC	IQRS Group		
Insteon				X	PLC, RF			X	
IPv6LoPAN					RF	IETF			
KNX				X	RF, PLC, TP	ISO/IEC	KNX Association		PLC narrowband
LonTalk					RF, PLC, TP	ISO/IEC	LonMark Interop.		PLC narrowband
MoCA					Coax		MoCA		Ethernet on Coax
Panasonic PLC					PLC-BB		HD-PLC		PLC broadband
Product Interop.	X					ISO/IEC			Links applications
Serial master-slave					TP	EIA-485			Driver/receiver spec.
Serial point-point					TP	EIA-232			Driver/receiver spec.
Univ. Remote Control			X			ISO/IEC			UI tailored to customer
UPB					PLC			X	
UPnP		X				ISO/IEC	UPnP Forum		
WiBeem					RF	ISO/IEC			
WiFi					RF	IEEE	WiFi Alliance		
X-10					PLC			X	PLC narrowband
Yitran					PLC		HomePlug Alliance		PLC narrowband
Z-Wave				X	RF		Z-Wave Alliance		
ZigBee				X	RF		ZigBee Alliance		Uses IEEE 802.15.4
NOTES:	This is a preliminary incomplete list of protocols, arranged alphabetically, without regard to market penetration								
	ANSI = American National Standards Institute								
	ISO = International Organization for Standardization								
	IEC = International Electrotechnical Commission								
	EIA = Electronic Industries Alliance (EIA standards are now managed by the CEA, Consumer Electronics Association)								
	IEEE = Institute of Electrical and Electronic Engineers								
	IETF = Internet Engineering Task Force								

predominates in the development of specifications for HANs and AMI today.

Rather, Wacks notes, the communications specifications being developed and touted in the HAN and AMI space today mostly are being championed by individual companies or a consortia made up of several corporations. "How do we extend utility networks from the utility back office to substations to meters to in-home devices in order to implement demand response? What technologies do we use?" he asks. According to him, the GridWise Architecture Council has "come to the conclusion that we're going to have many technologies. It will be nearly impossible to get the industry to coalesce around one set of specifications."

This could be troublesome. According to the 2008 Demand Response and Advanced Metering Assessment published this past December by the Federal Energy Regulatory Commission (FERC): "General uncertainty over the development and evolution of standards and how they will impact networking technology, especially as regards HAN integration, has some state regulators reluctant to proceed with AMI specifications, because they may discover a year or two later that they chose an inferior or unsupported technology."

As a case in point, the FERC report points to the New York Public Service Commission's decision to not authorize full-scale AMI deployments by Consolidated Edison in 2008. According to unofficial transcripts of a Commission meeting on January 16, 2008, there was concern because, "Many parties express caution that HANs and similar home appliance control systems are quite new, involve several competing designs and currently lack standardization of design or cross-compatibility."

Homeward Bound

More than a year later, the same situation remains: There is no clear winner on HAN or AMI network specifications. According to Wacks and others, that means the focus needs to be on interoperability, "so that we can get messages from end to end, even though the messages may be translated between different communications technologies along the way."

This means, he continues, that there will be a need for gateways, or devices that translate between two different

communications protocols. Where will those gateways reside? Some utilities are pushing for them to be located within the meters themselves, although Wacks doesn't think that's the way to go.

"Meters are designed to be in the field for years, if not decades," he says. "The HAN hardware that's going inside meters will be obsolete in five years." It's a fundamental problem, in his view.

Another problem: HANs may start with connections to smart thermostats provided to consumers by utilities but, ultimately, the networks will link to a variety of consumer electronics. Have utilities included the consumer electronics industry in HAN discussions? Not so much.

"There probably ought to be a lot more dialogue between what we call our 'tech home' community – companies who install or build equipment for home systems – and utilities," says Brian Markwalter, vice president of technology and standards for the Consumer Electronics Association. He recognizes utilities using HAN technology for load shedding have a need to verify that signals get through to the targeted appliances and load has, indeed, been curtailed. "We need to balance that with the rest of the consumers' home systems, where things may be items consumers bought themselves and consider their own."

Markwalter also thinks consumers themselves should be brought into the planning. "Be careful of treating this as something pushed out to consumers," he says.

Finding Your One and Only

Given these issues, how should utility managers plan the HAN part of an AMI deployment? Try before you buy, says Wacks. According to him, "Now is not the time to start mandating what works and what doesn't work. Now is the time for utilities to trial many different solutions."

Wacks also thinks utilities should take the same approach consumer electronics manufacturers take: Put the products out on the market, and let the market pick the winners.

CEA's Markwalter says, "That's a nice success story toward the end, but I'm not sure it will work at first" with HANs. "Home systems tend to be complicated," and he's not sure they're do-it-yourself technologies. Still, he sees merit in Wacks' market-based trials of HAN devices. "If we don't allow that, I don't think we will have succeeded. Volume won't be there. Prices won't be great. It will remain a niche market. That's not successful for anybody."

Until devices do hit the market, utilities planning for AMI with HAN applications have some resources to examine for ideas on specifications that promote interoperability. One is a set of general, high-level requirements created by a group called UtilityAMI. The suggestions are designed to be of value in a variety of deployment situations.

In addition, the Electric Power Research Institute (EPRI) is gearing up to launch a multi-utility study of radio-frequency and powerline communications protocols used for HANs. After a year of utility-based technology trials, EPRI intends to consolidate findings into a report that outlines performance related to transmission range, data throughput and electromagnetic interference between advanced meters and appliances in a variety of residential settings. EPRI scientists also intend to evaluate network security issues. Research begins this spring. A report should be forthcoming in spring of 2010.

Other groups also are investigating HAN and AMI network options. These include the Association of Home Appliance Manufacturers (AHAM) and the National Electrical Manufacturers Association (NEMA). Internationally, the U.S. is leading an ISO/IEC project to write world standards for gateways and product interoperability that apply to home networks. ISO (International Organization for Standardization) and IEC (International Electrotechnical Commission) issue standards that promote trade and commerce. ANSI votes U.S. positions on ISO/IEC standards and appoints delegates to meetings. Ultimately, the product interoperability standard under development will include a system model of an energy management system that can support demand response.

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; www.kenwacks.com.

Say Good Bye to Infrared and Hello to Radio based Remote Controls

By Cees Links

For over 30 years, the home automation and consumer electronics industry has been utilizing infrared (IR) technology for remote controls. But IR is not the optimal solution. Not only does it only offer a limited range, an IR-based remote control unit must be in line-of-sight of the device. This means in order to operate and control a device, the remote control must be aimed at the device. Devices have to be out in the open, not hidden away inside of cabinets or closets. If you want to control a device using IR, it has to be in the same room and within range.

In addition, IR does not support interactivity. This means that if you want to see what effect your IR remote control is having on your device, you need to be close enough to read it from the television or from the device's display.

In contrast, remote controls using radio frequency (RF) provide more flexibility and added features over IR. RF remote controls can provide two-way, high-speed communication and do not require line-of-sight as the signal can transmit through walls and floors. RF-based remote controls are excellent for controlling equipment inside a cabinet or in another room. Even more impressive, an RF remote control can use an interactive display screen built into the remote so you can monitor your home automation and entertainment choices and performance parameters. RF also enables you to use your remote control from anywhere in the house – not just in front of the device you are trying to use. Why do you have to hike downstairs or to the other end of the house to adjust your home's electronic controls?

RF remotes can be used to control a variety of other home applications such as climate control, opening and closing automatic curtains and window shades, as well as the home's security system. Wouldn't it be convenient to have your remote be able to activate your home's security system from anywhere in the house? Or, if there is an alarm, be able to see where the problem is by just looking at the remote control's display screen.

The next generation of home remotes for consumer electronics solves those problems. Leading consumer electronics companies, including Panasonic, Philips, Samsung and Sony have all realized that there are too many different protocols for IR-remote controls and have teamed up with the ZigBee organization to form the ZigBee RF4CE Alliance. The Alliance is in the process of establishing a worldwide standard for RF-remote controls to help create a single protocol for all RF remote controls.

ZigBee RF4CE will be using the 2.4 GHz radio band (next to but channel separated from Bluetooth and Wi-Fi). The protocol is based on the IEEE 802.15.4 standard that has existed since 2003.

These RF remote controls will easily transmit through walls and cabinet doors, and enable "two-way" communications, allowing the home automation server set to provide feedback to the remote control, e.g. location, alarm status, temperature, or other information. This will eliminate the need for the user to have to alternate from looking first at the keypad and then to peer at the server display to confirm that they have indeed selected the correct control. This two-way remote concept capability will also open the door to interactive television with features such as remote control voting and true TV shopping.

By leveraging ultra low-power conservation technologies, RF remote controls also have the promise to be able to run for longer times on smaller batteries. Together

with the standardization where one remote control can be used for multiple boxes, this means that, for a change, the use of batteries can be reduced with the arrival of a new technology. This is good news for our environment and growing of our green economy.

The advantage of an open standard is that it invites other companies to develop their applications on it as well: dimming/switching lighting, opening/closing curtains, and control of heating and air-conditioning. This is something that is theoretically possible with IR remote controls as well, but history has shown that the large variety of infrared protocols has been a major roadblock that RF and the new ZigBee RF4CE standard are now solving.

As with a lot of new technology – once implemented – we will ask ourselves, how did we live our lives before? Pointing at devices to make them work? That is so old fashioned...

The adoption of RF remote controls is going to change how we interact with the world around us, as well as how we take care of our environment. Bye-bye IR. Hello, RF.

Cees Links is CEO of GreenPeak Technologies.

FOCUS – CONTINUED FROM PAGE 8

3. The Grid must be more economic – An economic grid operates under the basic laws of supply and demand, resulting in fair prices and adequate supplies. The advent of more local generation (distributed generation) means that it will be imperative that proper monitoring and controls are put in place. Failure to comply with this will be counterproductive to reliable delivery of power.

4. The Grid must be more efficient – An efficient grid takes advantage of investments that lead to cost control, reduced transmission and distribution electrical losses, more efficient power production and improved asset utilization. Methods to control flow of power to reduce transmission congestion and allow access to low cost generating sources, including all forms of renewable energy, must be available.

Asset management and operation of the grid must be fine-tuned to deliver the desired functionality at a minimum cost. This does not imply that assets will be driven to their limits continuously, but rather that they will be managed to effectively deliver what is needed, when it is needed. Improved load factors and lower system losses are the cornerstone to optimizing assets.

Advanced information technologies will provide a vast amount of data and information that will be integrated with existing enterprise-wide systems, significantly enhancing their ability to optimize operations and maintenance processes.

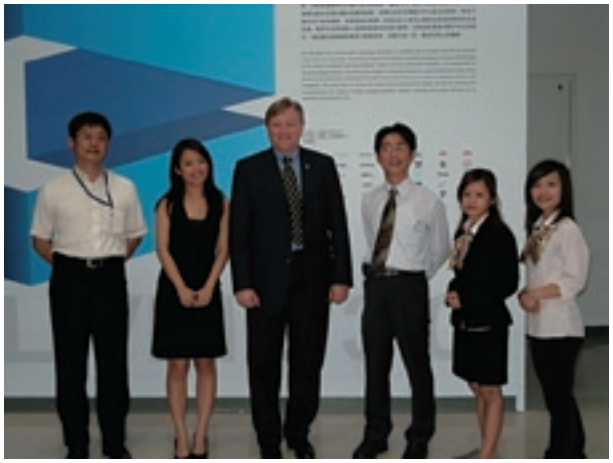
A note of caution – The IT & communication technology supplier world is overflowing with solutions, vaporware and far too many examples of promises made and never delivered on time, but more importantly within budget. The smart grid is not another back office solution or IT platform – it is a real time network that cannot afford to be based upon proprietary vendor solutions. It must be based upon open standards. To date this has not been a hallmark of smart grid planning. Time must be taken to get it right before we build.

5. The Grid must be 'greener' – An ecologically friendly grid reduces environmental impacts through initiatives in generation, transmission, distribution, storage and consumption. Access to sources of renewable energy must be expanded. Where possible, future designs will occupy less land – thus reducing the physical impact on the landscape.

Robert Lane is President of Robert H. Lane & Associates Inc., a noted business consultancy. He can be contacted at 416.239.0880; laneconsul@aol.com.

CABA President and CEO Ronald J. Zimmer gave a presentation at the International Symposium Of Intelligent Application for Future Life in Taipei, Taiwan in May 2009. His presentations focused on new information, research, trends and analysis focused on intelligent, high-performance buildings. The presentations are available on CABA's Web site at www.caba.org.

CABA President & CEO Ronald J. Zimmer learns about new technological developments at Taiwan's Industrial Technology Research Institute.



Zimmer meets with Institute staff, following a tour of its Home Network Technology Center: Living 3.0 space.

Zimmer delivers presentation during a symposium session. More information about Taiwan's Industrial Technology Research Institute is available at: www.itri.org.tw

UPCOMING EVENTS

InfoComm 09 Conference
June 14-19, 2009
Orlando, FL
www.infocommshow.org

3rd CIB International Conference on Smart and Sustainable Built Environments
June 15-19, 2009
Delft, Netherlands
www.sasbe2009.com

BuildingsNY
June 16-17, 2009
New York, NY
www.buildingsny.com

Realcomm Chicago 2009
June 23-24, 2009
Chicago, IL
www.realcomm.com/chicago.htm

Universal Powerline Association's Global Event, Plug into Profit 09
September 1-2, 2009
San Diego, CA
www.upaexpo.com

Connected Home Research Council Family Ecosystem Forum
September 9, 2009
Atlanta, GA
www.caba.org/connectedhome

CEDIA EXPO 2009
September 9-13, 2009
Atlanta, GA
www.cedia.net/expo

Security Canada Atlantic
September 15, 2009
Dartmouth, NS
www.securitycanadaexpo.com/en/exhibitors/atlantic

Security Canada Central
October 21-22, 2009
Toronto, ON
www.securitycanadaexpo.com/en/attendees/central

ISC East: International Security Conference East
October 28-29, 2009
New York, NY
www.isceast.com

Intelligent Buildings and Smart Homes Conference 2009
November 18-20, 2009
National Taiwan University of Science and Technology, Taipei
www.ibash2009.ntust.edu.tw

Ecobuild America and AEC Science and Technology
December 8-10, 2009
Washington, DC
www.aececobuild.com

HI-TECH BUILDING 2009
December 8-10, 2009
Moscow
hthb.ru/en/hthb/

Integrated Systems Russia
December 8-10, 2009
Moscow
www.isrussia.ru/home.php?lang=en

NextGen Home Experience @ 2010 International Consumer Electronics Show
January 7-10, 2010
Las Vegas, NV
www.nextgenhome.com

NextGen Home Experience @ 2010 International Builders' Show
January 19-22, 2010
Las Vegas, NV
www.nextgenhome.com

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