INTEGRATED GREEN AV SYSTEMS BY INFOCOMM INTERNATIONAL

OVERVIEW: WHAT IS GREEN AV?

Over the past several decades, audiovisual (AV) technology has evolved from simple, piecemeal loudspeakers and projectors used as presentation tools into integrated and networkable systems capable of linking organizations and their facilities in new and dynamic ways. The convergence of AV and IT technologies has raised the bar for usability and systems integration, especially in intelligent and green buildings where user comfort, energy efficiency, and asset management are key features.

Brought forth by rising energy prices and an increased awareness of issues related to global warming, the mainstream green movement and the increasing demand for energy efficient products has prompted the AV community to harness existing technology for use in new applications. The term "green AV" was coined in reference to projects where established AV technologies like videoconferencing, environmental controls via touch panel interfaces, digital asset management, and audio/video signal dissemination are designed not only for communications purposes or convenience, but also to conserve energy, reduce carbon emissions, decrease operational costs, and to maximize the operational efficiencies.

Other drivers of green AV include the Restriction of Hazardous Substances (RoHS) Directive, passed by the European Union and enacted on July 1, 2006, that restricts the use of certain hazardous substances in electrical and electronic equipment. Since most AV manufacturers sell their products in international markets, RoHS compliance meant that the levels of lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyl (PBB) and polybrominated diphenyl ether (PBDE) flame retardants were reduced on a global scale.

Advancing network technology and wireless networking systems, as well as advances in room control and smart automation using sensors and timers are other key drivers that are fueling the green AV movement toward sustainable and intelligent building goals.

Green AV benefits broad market segments – government, education, corporate, commercial, industrial, houses of worship, and multi-residential housing, to name a few. These markets share a common goal to increase efficiency in long-term use buildings without compromising performance. According to the U.S. Department of Energy, buildings consume nearly 40% of all energy and 70% of all electricity produced in the United States. The melding of green AV system integration and intelligent building design achieves the common goals of reduced carbon output, user comfort, and increased efficiency while enhancing normal daily operation.

GREEN AV IN AN INTELLIGENT APPLICATION

The combination of green AV and intelligent building design proves a powerful combination for building owners, occupants, and visitors. Studies have shown that students in day-lit rooms consistently score higher than students in windowless classrooms. In addition, studies of workers in green buildings report productivity improvements of up to 16%, reduced absenteeism, and improved work quality. In healthcare facilities, patients recover faster and have fewer complications when recuperating in rooms with outside views, controlled acoustical environments, and fresh air available to them.

A modern intelligent conference room with green AV features may include a networked projector and/or LCD displays, intelligent lighting and window shade systems, a digital audio system, and a high-definition videoconferencing system. Traditionally, an administrative assistant or AV technician would be assigned to prepare the room for the day's meeting by arriving early to turn the thermostat up/down, turn on the lights, warm up the projector, adjust the audio system, and perhaps turn on and connect with the remote videoconferencing site. However, proper design and integration with intelligent building systems takes the potential of intelligent and green AV to a whole new level.

The combination of green AV and intelligent building design can turn a complicated series of events into an experience so simple that everyone becomes a system user. For example, take this same scenario but add in the integrated building management piece. The administrative assistant would send out an invitation to the meeting and the room scheduling software would schedule the meeting to the nearest location that can accommodate that number of invitees or that minimizes participant travel. Based on requested capabilities in the meeting invite, the AV control system would take over the task of turning on the AV components, setting them to the proper operational mode, and adjusting the room temperature to a comfortable level prior to the meeting start time. Ambient light sensors installed in the room would measure the amount of incoming natural light (which is becoming more prevalent in green building), adjust window shades as appropriate for the function, and supplement the natural light with the interior lighting system to achieve the proper environment for a presentation or videoconference. The videoconference bridge can be dialed five minutes prior to the meeting so all attendees have to do is enter the room.

Figure 1 highlights the key differences between green AV and green AV in an intelligent building.

Figure 1: A Comparison of Green AV versus Green AV in Intelligent Buildings

GREEN AV	GREEN AV IN INTELLIGENT BUILDINGS
Motion sensors integrated into the lighting system automatically lights a room when a person enters for a meeting.	Room scheduling software will turn the lights on in a room 10 minutes prior to the scheduled meeting, as well as automatically adjust the room temperature to a comfortable level.
System components go into standby mode or power down when not in use.	A sequential power system integrated with the room scheduling software turns system on/off in proper order and at the proper time.
A building-wide digital signage system enhances communication but also saves paper and reduces the fire hazard created by bulletin boards.	The digital signage does multiple duties as room signage as well as an emergency communication system. If integrated into a control system with motion sensors and timers, the signage can be remotely turned off overnight to save energy or when there are no people near a display. Digital signage can also communicate green and intelligent building information to workers, students, and visitors about the building's energy and water conservation metrics and other green aspects of the facility such as wayfinding to the nearest recycling bins.
Videoconferencing is deployed to reduce an organization's carbon emissions.	Intelligent scheduling software looks across an enterprise's room resources and finds videoconference spaces nearest to each participant to maximize meeting efficiency and further reduce carbon emissions.
The use of a touchpanel control system for audio, video, and lighting.	Additional programming to also ties in HVAC, motorized shades, security system, etc.

SPECIFIC TECHNOLOGIES

Video technology plays a prevalent role in green AV. Advancements that range from highdefinition flat panel displays to videoconferencing systems have all had positive impacts on the environment. In the past few years, high-definition (HD) video has gone from a future, niche technology to broad-based adoption in the consumer marketplace at a lightening pace. Like the consumer market, the commercial marketplace has seen a growing demand for HD video quality in technology applications such as digital signage, conferencing technology, and large venue entertainment systems. The quality advances offered by HD technologies allow viewers to experience a more informative, richer experience.

LCD and plasma displays are more environmentally friendly than cathode ray tube (CRT) televisions. The higher efficiency of these technologies results in a lower heat load, which also means less HVAC and less overall power usage. In addition, some display manufacturers have released flat panel desktop displays that include its carbon footprint as a product specification. Once in use, these displays also

provide the user with an on-screen calculator that educates him or her about how its carbon footprint changes in relation to power consumption as brightness and contrast settings are adjusted.

Video technology has also grown into a suitable alternative to transportation. Technologies like distance learning, telepresence, and videoconferencing systems connect people in similar fashion without the gas consumption to drive to the airport and the jet fuel burned to fly across the country not to mention taxi rides, hotel room energy use, and other travel-related energy costs. These technologies, spread across a national or multi-national corporation, can have a significant impact on a company's resource consumption and carbon footprint. The key to quick adoption and use of these technologies are proper facilities that encourage staff members, students or workers to request their use over traditional travel. In today's global economy, robust use of current conferencing technologies from desktop videoconferencing to telepresence should be a centerpiece of an intelligent organization's intelligent buildings.

AV control technology has also advanced and taken a prominent role in intelligent and green AV systems. Years ago, these control systems acted like a mega universal remote, replicating functions for each AV component's handheld remote. The advent of touchpanel technology has propelled AV control systems into compact, intuitive interfaces that can control AV, lighting, temperature, motorized window shades, as well as process information from and algorithms for occupancy sensors, ambient light sensors, and timers. Today's AV control system can serve as the human interface to the intelligent building.

Window shades also play an important role in creating the proper environment for green AV systems in intelligent buildings. With such an intense emphasis on daylight harvesting and temperature control, the proper selection of window shade materials and controls is essential for optimal operation. In an intelligent building, automated window shades used in conjunction with ambient light sensors and atomic clocks can adjust the correct amount of light for the time of day as well as the time of year.

Rich media capture and dissemination is the result of a combination of AV technologies such as the recording of audio, video, and presentation content. The goal is to offer a full presentation experience in an asynchronous, anytime-anywhere delivery method to enhance an organization's ability to communicate vital information regardless of geography and room size or availability. Rich media systems can reduce the operational headcount associated with training and teaching allowing core content to be stored and played on-demand to employees and students around the world. This type of information delivery allows realtime meetings and class sessions to be more effective since foundational information can be reviewed prior to a follow-up, interactive session.

In LEED 2009, a project can earn up to five "Innovation Points" on a LEED project for exemplary or innovative solutions to improving a building's sustainability. While there is no direct correlation with AV and LEED points, there are ways to address LEED requirements with innovative AV solutions.

Figure 2 illustrates how AV technology can help building owners attain LEED points.

Figure 2: Green AV and LEED Requirements

LEED requirement: Pursue transportation alternatives to reduce carbon emissions.
AV solution: Demonstrate how AV conferencing technologies have reduced an organization's carbon emissions using an alternate compliance path to existing telecommuting credits.
LEED requirement: Daylighting using skylights, atriums, or window walls that lets in an abundance of daylight and offers outside views.
AV solution: Recess the LCD displays in alcoves so that performance and contrast ratio is preserved, or use automated shade control to achieve the best balance between daylight and performance. Choice of shade fabric that will reduce glare but still let in natural light.
LEED requirement: The use of recycled or rapidly renewable resources that were harvested with minimal impact on the environment.
AV solution: Use recycled denim as acoustical dampening material, or use acoustical ceiling tiles made from recycled newspapers.
LEED requirement: Contribute to the energy efficiency of the building.
AV solution: Use AV systems that are designed to power down automatically with power sequencers that will also address phantom power loads, and use of Energy Star-compliant products where possible. Using a mirror mount, install a projector that remains in the ceiling during operation to reduce heat load in the room.
LEED requirement: Improve indoor air quality.
AV solution: Specify AV products such as screens and millwork with low-emitting volatile organic compounds (VOCs).

CURRENT BARRIERS AND OPPORTUNITIES

Historically, AV systems have been regarded for their essential functionality, such as the sound system in a house of worship, or for their wow factor, like a high definition LED display at a new ball park, rather than for their ROI or sustainable features. AV professionals, manufacturers, and buyers are beginning to look at AV technologies through this new sustainability paradigm, but the awakening is just beginning.

Power consumption of AV equipment has not traditionally been a product differentiator. The calculation of the carbon footprints for AV systems was rarely, if ever, requested. Even videoconference systems, the most obvious of green AV technologies, has been sold as more of a time-saving convenience for busy executives and cost-saver for facultyconstrained institutions of higher learning, than for carbon reductions.

Likewise, intelligent buildings have sought a unified user interface that can bridge the disparate technologies to make the whole greater than the sum of its parts. AV technologies can be that bridge bringing vital information to the occupants of intelligent and green buildings.

Education, information sharing, and experimentation are the keys to evolving how building owners view AV technologies. With the growing demand for greater competitiveness in a global economy marketplace and possible "cap and trade" legislation, AV solutions that not only appreciate but take center stage in the intelligent and green building will become ever more mission critical.

THE SOUTHFACE ECO OFFICE – A CASE STUDY

Southface, a 501(c)(3) non-profit organization based in Atlanta, GA, has a mission to promote the tenets of sustainable design by providing education to the construction industry—architects, engineers, contractors, developers and building owners—on LEED certification compliance and green building best practices. Southface's new Eco Office headquarters is a model for using sustainable and intelligent design practices in the design and construction of a commercial office. As such, the entire building is a teaching tool used as Southface's office, but is also open to the public for tours and educational seminars.

Southface's LEED-Platinum facility incorporates sustainability throughout. In droughtstricken Atlanta, water management features include rainwater harvesting, waterless and low-flow fixtures, a composting toilet system and a vegetated roof. Energy conservation is achieved through passive solar orientation, daylight harvesting, a continuous thermal envelope, intelligent lighting, an electromagnetic elevator and photovoltaic-integrated glazing. A rigorous recycling program greatly reduced construction waste to almost nothing.

Intelligent features of the building include motion and ambient light sensors tied to the lighting and interior shade systems and electrochromic tintable glazing and motorized sun control devices that adjust automatically to maximize daylighting and minimize solar heat gain.

HOW INTELLIGENT AND GREEN AV SOLUTIONS PROMOTE SOUTHFACE'S MISSION

AV technologies play a vital role in helping Southface disseminate their message. Given the organization's mission and purpose, AV solutions had to be sympathetic to the green and intelligent goals of the project. The heart of the building is a 1,200-square-foot, "paperless" classroom. This innovative classroom features a state-of-the-art AV system blending traditional presentation capabilities with a full-wall, interactive digital whiteboard system from PolyVision. The PolyVision Thunder™ system empowers real-time brainstorming for LEED charrettes, design reviews, and other interactive training sessions.

To start a session, a presenter begins writing on the digital easel. As virtual flip charts are filled, they are projected across four video projectors. Up to eight separate

How Green AV can Affect LEED Ratings

The truth is that a project can get LEED Platinum certification (the highest level) without a particularly energy-efficient AV system. To date, the U.S. Green Buildings Council does not award direct LEED points for AV technology. That does not mean that AV is not an important element to consider within an intelligent building design. User comfort and convenience are intangible benefits to a properly designed and installed AV system. The AV community has actively worked to have AV technology formally recognized, especially given alternative transportation technology like videoconferencing.

virtual flip chart pages are viewable simultaneously and information can be grabbed from one page and moved to another with the stroke of a pen. A conferencing audio system combined with the Thunder server allow remote participants to not only join the conversation and view the presentation from anywhere in the world, but they to can annotate on slides for all local participants to see. At the end of the meeting an email containing all meeting content is automatically sent to all attendees. Thus, no one has to take notes, copy handouts, or scan/transcribe flip charts.

Other sustainable features of the classroom include PolyVision's e3 environmental ceramic steel marker boards which are Cradle-to-Cradle certified, low-VOC finishes, and low power consumption AV equipment. Intelligent and green features of the classroom include intelligent lighting and shade controls to promote daylight harvesting and minimize the need for any supplemental illumination from the room's lighting system. Auto on/off features of the Thunder system minimize energy consumption and maximize projector lamp life. Sustainable features were contemplated even in the selection of microphones where RevoLabs Solo™ rechargeable microphones were specified not only for their audio quality, but also to eliminate the waste from dead batteries typically associated with traditional wireless lavalier microphones.

AV systems also play a prominent role in promoting the green and intelligent features of the building through interactive digital signage. Lucid Designs Building Dashboard software takes real-time information from the various building systems—HVAC, lighting, temperature sensors, etc.—and allows visitors to view the current power consumption of the building, amount of rainwater stored in rooftop cisterns, and other environmental data through userfriendly interactive touch screens.

In the end, world-class AV hardware and software have been integrated with information from the core building systems to allow Southface to take its educational message out of the textbooks and into a building environment that is a teaching tool in and of itself.