

A man with dark skin and curly hair, wearing blue-rimmed glasses and a blue denim shirt, is looking down at a server rack. The server rack is filled with various components, including cables and lights. The background is dark, and the server rack is illuminated with blue and white lights. A dense, green forest of evergreen trees is overlaid on the bottom half of the image, creating a visual connection between technology and nature.

NETGEAR® AV

Sustainability Report 2023

Changing to Lifecycle Thinking
for Sustainability in AV-over-IP
Network Design

With the technology industry at the forefront of global progress, how is such an energy-intensive field reconciling with the ongoing climate crisis? The need for practical best practices that are relevant and relatable to improve the sustainability of company setups is urgent.

This report was commissioned by NETGEAR.
Written by Alia Dobson
With research done by Richard Jonker



The European Union's standard for sustainable development is: "a life of dignity for all within the planet's limits and reconciling economic efficiency, social inclusion and environmental responsibility", but are there greener alternatives that exist within the Pro AV industry?

This issue can also be thought of not as a problem needing to be fixed but as a gap in the market that businesses need to address. It's high time for the private sector to step up and use its enormous investment power to create industrial change. To meet these goals, we need to achieve sustainable transitions guided by the mission of sustainable design thinking, but this requires cooperation from everyone.

"Identify opportunities to mitigate our impact on the environment and reduce our carbon footprint through improved and sustainable workplace, product designs, manufacturing processes, product life cycle, and end-of-life recycling."

"Sustainability is not something you can buy, not something you can do, you need to live it."

Jürgen Defroyère, Global Director of Process Improvement at Crestron

Productivity and innovation can help

80% of carbon savings can be captured at the design stage

Sustainable alternatives can and should work in conjunction with increased productivity. Efficiency and greener technology can be one and the same. An estimated 7 minutes are lost every Microsoft Teams call just setting up the conference room, the clear next step should be to implement an automated setup. If sustainability is introduced at the core of design thinking steps, then this automation process could easily reduce energy usage by, for example, powering itself off during downtimes. As AVIXA's Sustainability Task Force Expert Anna Bateman reports, "80% of carbon savings can be captured at the design stage". Industry specialists know that the technology is there for such transitions, it is just a question of implementation. For example, bestowed The AVaward this past year as the most sustainable product, the Fohhn Hybrid-1 speaker runs with an auto power save function, supporting another greener alternative by improving the audio quality of hybrid working spaces. Designed for circularity, using locally sourced materials, the product exemplifies sustainable design thinking for a modest price.

Being conscious of ideals like simplicity, scalability and lifecycle in the conception, manufacturing, and installation phases of products is vital. Implementing these values can be done in the virtual world by bringing everything over the network, or with physical working spaces by maximizing productivity and efficiency in a shared infrastructure. Arranging office buildings with smart sensors scanning for utilized spaces can allow for remote management, cutting down on energy consumption and costs. What is essential to remember throughout this transition process is that it is not about being perfect, but everybody trying. But to make that effort, these sustainable best practices in AV should be codified, making them logical choices instead of difficult sacrifices.

The following are changes that can be made by integrators in every sector to align installations and offices with sustainable life cycle thinking and AVoIP design.

Installations: do it right the first time

“Perfect preparation prevents poor performance. Let’s apply this to our green thinking.”

Anna Bateman, Sustainability Task Force Expert at Avixa

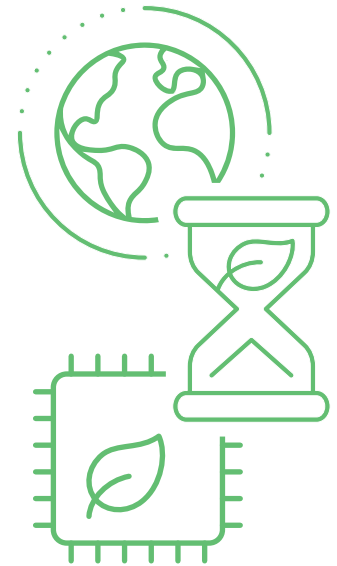
Ensuring an efficient installation is accomplished by achieving predicted outcomes and avoiding a ‘truck roll’, or wasting time, energy and materials. Certain steps can be taken to optimize the success of a project. Integrators should take care to familiarize themselves with the site beforehand, either through in-person site surveys or video footage. Include distributors as well in these efforts by keeping stock and establishing the materials required beforehand. Following standardized practices for an organized installation minimizes costs and maximizes outcomes, in turn reducing waste and meeting sustainability targets.

Technology is not the only answer, but choosing greener products can be.

“Integrators need to consider the life expectancy of each product, to determine the life expectancy of the complete system.”

Anna Bateman, Sustainability Task Force Expert at AVIXA

The choice of materials and products should follow a circular design when it comes to production, integration with systems, maintenance requirements, and end-of-life recycling programs. Question where the materials are being sourced, for environmental and ethical reasons, and what the transportation costs are during pre- and post-production. With the energy prices of today, it should be standard practice to include energy usage, not only the audio/visual quality, like low voltage all-in-one computers that companies like Thinlabs have created, producing the quality of a 300-watt display and computer using only about 70 watts.



Silicon



Choosing the right chip for your product can also be done according to power consumption levels, by choosing an ASIC instead of an FPGA, for example. Running systems over PoE networks enables technology like video cameras to run on the same cabling, making the total system significantly smaller, remotely powering itself, and enabling workflows like automatic recording for broadcast and educational purposes. And when we emphasize the benefits of automating systems, make sure to verify after implementation that no devices are powered on, including separate power supplies and chargers consuming power in commercial buildings. Sustainable design thinking should not only reduce cabling but optimize the kind of cables used. This perspective should also prioritize modular layouts

to avoid obsolescence when upgrading. Moving software to cloud and data center configurations for AV should be preferred over operating locally, as these applications are more energy-efficient in general. Centralized data centers are able to contain and regulate power consumption better than widely distributed data processing devices. Many industry experts agree that the technology required for intelligent video conference equipment exists, it just needs to be prioritized. Invest in alternatives that prolong the tech cycle, and whose impacts are considered as a whole, in a complete system, instead of as individual pieces.



The new and improved Power over Ethernet in AV over IP

The definition of innovation includes three things; incremental value for the customer, ease of use, and adding something new.

AV and Power over Ethernet have been around since the 1990s, and as we know, innovation is iterative, so if the new technologies are not including sustainability, they are not progressing much further than their predecessors. Power over Ethernet, or PoE, provides electric power and data over a single cable.

"Safe, reliable, easily configured and flexible well-established technology."

Mike Lewis, Marketing Director at Silvertel



AVoIPoE design thinking is a way of running IP-based AV systems (AV over IP) entirely over Power Over Ethernet (PoE) with the ability to significantly cut down on energy consumption. As Broadtek's Siya Fakher states, this way of thinking is going to save you money and time during installations. The setup runs on half the voltage versus US AC power, meaning fewer AC outlets are required for clients, and with the ability to run CAT cables and automate all of this over IP. IP is substantially better for scaling operations as it requires less cabling, and is format independent, meaning the core switching only needs to be upgraded not completely replaced. This design could pertain to WiFi as well, for example connecting access points to smart switches with PoE would allow for remote monitoring to control usage.

Further efficiency

Modern Pro AV technology should embrace modern techniques to lower energy consumption through adhering to standards like Energy Efficient Ethernet. Make sure to design with the lowest power consumption in mind by actively comparing the different technologies that are out there. Overall, AVoIP and PoE are necessary for future proofing installations, as it supports cost savings, streamlines day-to-day operations and is energy efficient.



Reducing, reusing & recycling in the office

"Retrofitting [...] to be Future-Fit."

JLL, the World's Leading Commercial Real Estate Company

The most important steps to be taken first are reducing consumption, waste, emissions, etc., then follow with reusing, transforming, and repurposing.

And finally, when the life cycle of a product is expired, we turn to recycling. Such programs exist but are rarely utilized properly. For many technology companies like NETGEAR, implementing their own recycling program could be of value. Taking back previous boxes and switches, even non-brand ones, once obsolete

for the client could then either be donated or broken down into materials for disposal. Crestron has upheld this environmental responsibility through its recycling programs, while also fulfilling a social responsibility by donating used products to schools and hospitals. This commitment can also be accomplished through using secondary organizations, like Techbuyer.

Certification schemes could be utilized for increased credibility, like Barco's ECO label, which rates pieces of technology by sustainability factors. Other ratings for physical buildings serve as inspiration for moving towards a more complete reduction in a company's carbon footprint, such as LEED-certified building schemes, or the EPC building ratings in the UK.

Wyrestorm exemplifies the reduction model, as they have significantly reduced the amount of plastic packaging and unnecessary cabling shipped with every product of theirs, and the little packaging that is included being locally recyclable.

It is up to everyone in the production chain to implement such schemes. The responsibility to take back what is put out there is a responsibility shared amongst manufacturers, resellers, installers and integrators.



Emerging trends in commercial & residential AV – how to deploy these sustainably?

- Centrally powered and controlled, high-resolution, high frame rate, low latency video
- Audio-over-IP based amplifier/speaker systems
- Programmable and remote-controlled LED lights and lighting effects
- All-in-one PC's, AV-over-IP Ethernet switches, video comms appliances
- Outdoor AV; amplifier/speakers, displays, outdoor WiFi
- Digital signage with a variety of displays, players, and controllers
- Smart door locks, access control equipment, UHD PTZ surveillance cameras
- USB-C power supplies to charge laptops, tablets, control panels
- Centrally managed 'smart' heating, air conditioning and ventilation
- Point-to-point radio communication devices to connect buildings

Business model: what does yours stand for?

*"Companies with a clear sense of purpose
have the brightest future."*

Ryan Gellert, CEO of Patagonia

Recent data has shown that **brands with sustainability as a core focus are growing 50% faster and more profitable than their competitors**. As we look at the bigger picture, the next step is to align business models within planetary boundaries and achieve those sustainability targets that everyone is being assigned. Investors are now weighing risks in terms of environmental policies and climate change, calling long-term sustainability risks 'stranded assets'.

Embedding environmentally conscious policies in your business operations has given companies 40% higher return.

Combining these aims with continued education for everyone involved will also allow employees to make better choices for themselves and sustainability.

Remember that everyone within your organization can be treated as stakeholders with the ability to make a difference in risk mitigation. As Jürgen Defroyère from Crestron likes to say, "never waste a good crisis" and the current one requires programs to be implemented for risk mitigation strategies. He believes that we should never underestimate the power of human influence, because "from the employee level to CEO level, everyone can make an impact every day to support these causes".

Barco has since integrated their sustainability policy in their annual report, alongside equality, which "enables their customers to lower their environmental footprint through presenting more green options". They understand that this issue will not be solved by playing a blame game, or individualizing responsibility of the climate crisis on the consumer.

This train of thought also promotes collaboration over competition, which is important for the Pro AV industry to remember. You should be focused on the end-user experience when it comes to designing systems as a whole, not only your individual contribution. Broadtek's new business model exemplifies this, by getting system integrators, consultants, and end users to collaborate you "ultimately need to work together [for an] end-to-end solution at a much higher level to present confidence to customers". How does your company achieve the balance between social and environmental responsibility while also increasing market shares?



Confronting the truth about your carbon emissions

“Hold people accountable and measure the results.”

Patricia Lotich, Writer at The Thriving Small Business

While making these changes is imperative for the future, companies' current carbon footprints need to be assessed before being able to make measurable improvements. Calculating past emissions can be done in many ways, such as employing outside organizations to validate outputs for sustainability targets like Barco and Crestron do. Also, targets can be examined using the 2030 Sustainable Development Goals online company assessment.

There are many problems contributing to high numbers of emissions. One of the biggest problems is the division of the traditional 'workspace' that now includes those who work from home, those only in the office, and hybrid workers who work from both. Suddenly, companies are having to support all three. Maybe the WiFi should be improved in the office building to bring colleagues back together, but addressing such issues should be done with sustainability as a factor. Microsoft provides

an online calculator for establishing your carbon footprint and how much it is being reduced by increasing hybrid work. Best practices like these need to be codified as standards so that other companies take them seriously and follow suit. The Corporate Finance Institute uses the framework of ESG factors, or Environmental, Social, and Governance, to help [“stakeholders”](#) understand how an organization is managing risks and opportunities related to environmental, social, and governance criteria” in a way that expands the idea that sustainability is only an environmental issue. These factors need to be considered in any formal commitments for sustainability, in conjunction with the company's present impact on the environment to incite real change. Everyone has their part to play in this and based on the three ESG pillars, there are many parts to play. Let's be transparent about business operations and decarbonize the core services provided.

Calls to action



Here is a breakdown of actionable items to operate more sustainably.

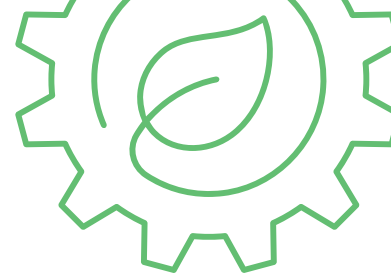
- 1 Ensure a good site survey to optimize predictability and prevent truck rolls, or a waste of time, energy, and resources.
- 2 Power devices completely off when not in use instead of sleep mode.
- 3 Invest in quality equipment for scalability that is multipurpose and works efficiently so it can be controlled remotely and start up quickly.
- 4 Use low voltage displays to save up to 70% of energy.
- 5 Choose responsibly-sourced materials with reusable or recyclable options.
- 6 Install PoE-based AV networks to reduce wiring and promote modular upgrades. Using PoE reduces the number of cables and outlets required, which can help to reduce clutter while improving the appearance of rooms/installations.
- 7 Automate recording for ease in broadcasting and educational contexts.
- 8 Promote cooperation over competition in finding complete manufacturing solutions to aid the end user.
- 9 Provide carbon-reducing options for remote, in-person and hybrid working environments.
- 10 Promote operations in buildings and with manufacturers who have sustainability certification schemes.
- 11 Work in the digital world by bringing everything over the network for the possibility of having remote visibility for operations and management of physical spaces.

What are the advantages of using Power over Ethernet for AV deployments?



- It's one standard: adoption endorsed by the IEEE
- Safe, reliable, easily configured, and flexible
- Well-established technology, far more efficient than power over USB
- The latest version of the PoE standard promotes enhanced energy saving features, like 'Standby'
- Reliable, cost-effective, safe, 'always connected', remote manageable, energy saving
- Allows 2 powered down devices to be powered from one PoE port
- Rapid time-to-market for manufacturers; with modular, plug & play design, and applications support
- Simple implementation → reduced development costs, clean installations = less errors
- Interoperability between "compliant" equipment / vendors
- No specialist skills needed to install.
- Reduction in total cost of ownership; vendor reduction, management, planning, stocking, material handling, etc.
- Increased flexibility: PoE allows you to easily add or move devices without having to worry about finding a nearby power outlet

What are important advantages of PoE specifically for installers/integrators?



- **Reliable:** Keep devices running even in the event of a power outage with redundant power supply (RPS) backup options - important for critical services
- **Centralized control:** Manage power to devices from a centralized switch and power them up as required
- **Cost-effective:** Fewer, separate power adapters are needed and only one low-cost UTP cable run is required rather than two. No need for electricians; could even use existing networking infrastructure
- Inherently safe technology thanks to lower voltage and centralized power supply
- Always connected (and that does not mean always 'on')
- Remote manageable / programmable, including the options to power-cycle a device that is hanging, time-scheduled power-on/off, automations or 'if-this-then-that' logical operations
- Energy saving and sustainable by design, because of reduction of number of power supplies to one highly efficient central power distribution unit: the PoE Ethernet switch
- Simple wiring, less prone to errors
- Extends coverage in complex buildings, overcomes hard-to-wire environments, including old or protected buildings
- Ideal combination with PoE/+ /++ AV-over-IP encoders/decoders

Optimizing PoE for the lowest possible energy consumption - design tips



- The use of PoE injectors (midspan) is not a design best practice, due to adding a device that could become the single point of failure. There are also frequently observed quality issues. Other disadvantages are increased energy consumption as well as the higher total price per port.
- **Preparation:**
 - How many PoE devices do I need to connect to the network?
 - What class of PoE are these PoE devices and where are they located?
 - What total bandwidth (data throughput capability) do I need for each device?
 - Now, do the math - how much total power budget do I need for each PoE switch? The highest energy efficiency is reached by minimizing the number of PoE switches. The calculation needs to assume correct negotiation with regards to the necessary PoE energy budget between the switch and the end point. The correct outcome needs to be verified - which means tested - during/after the installation.
- Where are the PoE devices located? Always use a star-topology instead of a daisy-chain or ring-topology when using multiple switches
- Keep the PoE cables short to minimize energy consumption; use fiber connections from the core switch to the edge PoE switches over larger distances (for example, use fiber if the distance is more than 10m)
- How are you going to interconnect these switches? Copper, fiber, what speed? And what kind of media? Ask your network supplier for help.
- Do the switches need to support multicast for AV over IP? Are you planning for multiple protocols and switches? Ask your network supplier for help.
- Do you need to design a redundant topology with two spine switches and multiple dual-connected leaves? Ask your network supplier for help.

Budgetary considerations



PoE devices (up to 15W) are generally lower in price than PoE+ devices (up to 30W).

It is generally both more economic (price per port) as energy-efficient to opt for a high port-count (for example 48 ports) switch instead of several low port-count switches (for example four 12-port switches), while avoiding unnecessarily high PoE standards at the same time.

This is not just due to the cost of using multiple switches but also because of the elimination of interconnect cabling.

Strike a reasonable balance between the minimal spec switch vs. design for scale. Does the application warrant more switch CPU horsepower? AV over IP? In general, with video-over-IP or multiple switches, or even more than ~10 audio-over-IP end points, the switch fabric needs to support proper IGMP for multicast.



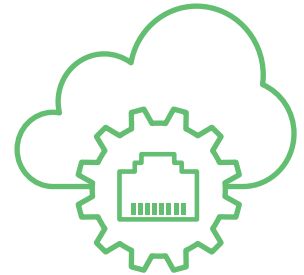
How advanced network & cloud features help to optimize energy consumption



If a network device, like a PoE switch or AV encoder needs to be communicating with an external management system, VPN is not the best nor securest solution anymore. These days, API's are commonly used for this task. An API is a mediator between the users or clients and the resources or web services they want to get. It's also a way for an organization to share resources and information while maintaining security, control, and authentication—determining who gets access to what.

A REST(ful) API is the next, better, version: more status-oriented, secure and communicative. REST stands for Representational State Transfer. It is a way for two computers to talk to each other, like a conversation between two people. It is used to transfer data between different parts of website(s) or application(s). But it does not store sensitive data. For example, when you use your mobile phone to buy something online, the website needs to send the payment information to the payment processor. This is done using a REST API.

If any device in an AV system can communicate with a central communication and management platform, there are now possibilities to intelligently switch equipment on or off.



Example

Think of all the equipment generally being installed in a mid size video conferencing room: cameras, displays, microphones, loudspeakers, Ethernet switches, control panels and so on.

Here are three ways you can limit the energy consumption of these devices:



Time-based

Equipment will be powered on, weekdays at 07:30am and powered off at 07:30pm. This method is not very handy if you want to use the room outside these timeslots. And still, even if the room is not in use, the equipment keeps on using energy.



User-based

The users in the conference room switch the equipment on and off. We have learned over the years that the problem is not so much with switching on, although employees complain about the boot-up time of some devices, but mainly with the fact that people simply forget to switch equipment off.

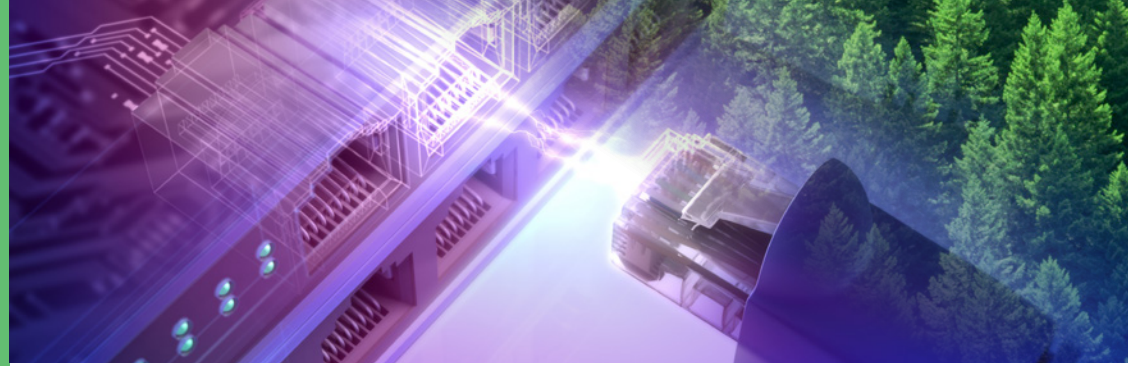


Smart / use-based

A cloud-based management system uses online calendars, a room occupancy sensor and other IoT technology to intelligently switch the equipment on two minutes before the meeting is about to start, and switches everything off as soon as the meeting room is vacated.



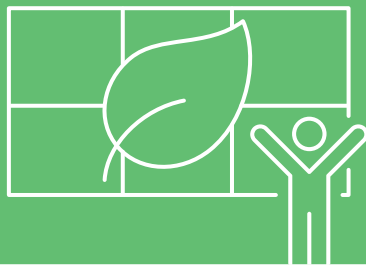
Summary: PoE design thinking from the ground up – How?



- PoE technology allows you to power devices using the same Ethernet cables that are used for data transmission. This eliminates the need for separate power cables, power supplies, and outlets, making installation easier, less complex and more convenient.
- Replace any device with a PoE end point where possible. Using PoE reduces the number of cables and outlets required – even when run from one location in a star topology.
- PoE allows you to easily add or move devices without having to worry about finding a nearby power outlet.
- Design for the future by running extra CAT cables to key rooms allowing you to add a PoE switch and additional end points later, without worrying about cabling.
- PoE devices are often more energy efficient than their non-PoE counterparts, as they can be powered down or placed into a low-power mode when not in use.
- Using PoE can save you money on the cost of installation, as you won't need to hire an electrician to install additional outlets or power cables. Don't forget to include these points in a TCO calculation.

General tips:

How to build a more sustainable + energy efficient AV installation.



- Arrange to turn off equipment when not in use: Make sure to turn off computers, monitors, and other equipment when they are not in use.
- Use remote-controlled on/off switches for any non-PoE equipment.
- Check the power settings on devices to enable low-power modes or automatically turn them off when not in use. Choose energy-efficient equipment, to reduce energy consumption.
- Consider using cloud/virtualization to consolidate CPU's and minimize the number of physical devices in a network.
- Use efficient networking equipment: choose switches and WiFi access points, that are energy efficient and not "over dimensioned".
- Use a network monitoring tool to track energy usage and identify opportunities for improvement.
- Use a remote-managed power strip to control power supplies to multiple devices and turn them off when not in use.
- Use a server room or rack temperature monitor to ensure that it is kept at an optimal temperature.
- Consider using renewable energy sources, such as solar or wind power, to power your network.

Sustainability perspectives from various stakeholders

When navigating a sustainability-in-AV discussion, it helps to see the different perspectives.



AV Manufacturers

May focus on sustainability by using eco-friendly materials in their products, reducing energy consumption, and implementing recycling programs for end-of-life equipment.



Installers


May prioritize sustainability by recommending energy-efficient equipment and proper disposal methods for old equipment.



End-users

May be interested in sustainability by purchasing equipment that is energy-efficient and has a long lifespan, as well as properly disposing of old equipment, left-over materials, and packaging.

In general, the common interest on sustainability, in commercial / residential audio/video equipment, revolves around reducing energy consumption, using eco-friendly materials, and properly disposing of equipment at the end of its lifespan.

The background of the slide is a composite image. The top half shows a view of Earth from space, with the blue and white horizon of the planet against a dark starry sky. The bottom half shows a dense, vibrant green forest, likely a tropical rainforest, with sunlight filtering through the trees.

*"Treat the earth well.
It was not given to you
by your parents, it
was loaned to you
by your children."*

Kenyan proverb

Closing thoughts

As we look towards the future, the next hurdles will be circularity in cloud systems where we harvest heat generated from cooling sustainably constructed data centers operating with net-zero emissions. There are countless inspiring innovations happening around the world made to meet these exact problems, but changes can be made at every step of the technology cycle. It is no longer acceptable to support products and systems from cradle to grave, but from cradle to cradle. The benefits of sustainable lifecycle thinking, and smart spaces are endless: simplicity and efficiency in design, improved end-user experience, financial

savings or rewards, increased employee productivity levels, creativity, ingenuity and retention. Companies proactively reducing their emissions should consider their own interests instead of waiting for institutions like the European Union. While the EU is moving quickly to establish strict thresholds for private businesses to meet sustainability targets, companies proactively reducing their emissions will stay ahead of this curve and possibly consider their own interests. Which steps are most important, or which should take priority is another question, but the final message is clear; we need to do better, and we need to do it now.

*"it all starts from everyone taking
a little bit of responsibility."*

Siya Fakher at Broadtek

Do you want to position your company as a trailblazer today for a more secure tomorrow?

The Challenge: NETGEAR invites its ~200 Pro AV industry partners and thousands of integrators to join our efforts advocating for sustainable design training.



RESOURCES

www.usgbc.org/leed

www.barco.com/en/about-barco/sustainability

www.thegreenvillage.org/en/sustainable-construction-and-renovation

www.fohhn.com/en/responsibility

www.jll.co.uk/en/newsroom/-retrofit-race--needed-to-prevent-office-stock-undermining-regio

www.buildenergy.co.uk/services/breeam/what-is-breeam

www.cedaci.org

www.linkedin.com/pulse/sustainability-its-too-late-make-change-anna-bateman

www.linkedin.com/pulse/basic-sustainable-design-best-practice-anna-bateman

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www.asicnorth.com/blog/asic-vs-fpga-difference/

www.youtube.com/watch?v=yCuheTKZA88

ec.europa.eu/environment/sustainable-development/

www.microsoft.com/en-us/sustainability/emissions-impact-dashboard



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