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White Paper

The Audio Visual (AV) Industry and its effect on the Environment within Higher Education

A white Paper prepared by Roland Dreesden – Managing Director, Reflex Limited

This paper is prepared on the basis that the use of audio visual products as a means of improving the effectiveness of learning in the field of Higher Education are here to stay.

The purpose of this White Paper is to provide the SCHOMS members with a high level overview of what Reflex sees are the issues facing the AV industry and its customers with regards to Carbon Footprint and energy savings. I do not pretend to be a Guru on Global Warming, but more to cover the issue through the eyes of an AV integrator who is part of the total Supply Chain.

In preparing the paper I have examined the following areas:-

- **Current products and technologies already in use.**
- **Manufacturers: What are they doing to reduce power consumption in the equipment that they supply?**
- **AV Integrators: Their role in designing complete room systems to improve power reduction and also in addressing their Corporate Social Responsibility (CSR).**
- **Customers: What can the end user do to address the energy emissions issues at a local site level?**
- **How AV solutions can help reduce the carbon footprint within Higher Education.**

Current Products and Technologies Already in Use

Recent Developments

One of the impacts of the recent and rapid developments in audio visual technology is a range of new products and applications that consume significantly more energy than their predecessors.

Question: How do you listen to the radio at home?

It used to be that you had a stand alone radio with in-built speakers and a small amplifier that was plugged into the mains that produced a few watts. If you look at the options we have today, many people, me included, use Sky to listen to the radio which means that you have the power element of the Digi Box, if you have not got surround sound then you need to have the TV on for the audio, alternatively if you have got surround sound you will need to power up the amplifier and speakers, but you will still need the TV on for a while in order to select your station. So things have moved on, but not always for the better!!!

There is an increasing volume of publicity and concern regarding AV products in the home with plasma TV's attracting particular attention.

Professor Paul Ekins of the UK Energy Research Centre has conducted research into the subject and reports on the impact of replacing cathode ray tube – CRT – televisions with plasma

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TVs. His research has concluded that plasma TVs are on average twice the size of CRTs and consume about four times the energy. A CRT TV typically costs about £25 per year to run and accounts for about 100kg of carbon dioxide (CO₂) emissions, whereas a typical plasma TV costs about £100 per year and accounts for 400kg of CO₂.

This research is attracting lots of interest from the Government too with David Cameron recently calling for a heavy tax to be levied on plasma TVs.

Business/Public Sector Markets

Whilst this research and attention has understandably focussed on the consumer market (because of the vast volumes of products involved through that market) the issue is equally topical within the business/public sectors.

Plasma Screens

The first thing to report is that many manufacturers of plasma screens have recognised that there are 2 different markets and have developed different product specifications to address each one. Whereas the consumer market is primarily cost driven the “Professional” or business product caters for other considerations such as connectivity to other devices and the display of computer as well as video images. It also appears that many of the professional screen manufacturer’s are seeking to address the power issue by methods such as; ensuring that they can minimise the running power as well as the power consumed in Stand-By mode to <1W, or by installing variable setting thermostatic fans so the temperature can be controlled to the relevant environment in which the screen sits to combat the heat that is dissipated by the screen, plus many have Automatic Power-Off Timers which assist when the screens are not being used, although how many people are actually taking advantage of that facility is questionable.

It does appear there is a decision for the customer to make. “Consumer” screens are generally cheaper to purchase, but not necessarily very economic to run whilst “professional “ ones have additional features and can be more energy efficient but are typically more expensive to purchase. For example we compared a wide range of 42” plasma displays and found that their energy efficiency in terms of running costs and CO₂ emissions varied by over 67%.

Plasma 42”	In-use 230 watts Standby 2 watts	216Kg Co2 per year	£79.48 running cost per year
Plasma 42”	In-use 405 watts Standby 0.9 watts	381Kg Co2 per year	£133.43 running cost per year

Between both extremes there were more than 20 other models with differing ratings.

So, at the end of the day the customer has to make the choice with regards to Lowest Price Vs Life Time Running Cost, the other factor that will play an important part is the number of screens being deployed within an organisation.

LCD Screens

Most people are aware that there are other large “flatscreen” display technologies available in the market. The most common of these by far are LCD screens. This technology has been around for well over 20 years and has been used in a myriad of applications from watches to computer screens. However, recent developments in the past 5 years have meant that they are a viable alternative to plasma as a large screen display device.

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There is a raft of arguments for and against each of the technologies (burn-in, contrast ratios, colour fidelity etc). But which is the better technology to use in terms of energy efficiency? Well as I am sure you are not surprised both manufacturers rate their own technology to be better than the others.

Plasma	In-use 277 watts	
LCD	In-use 180 watts	But LCD does have a continuous back light operating

There are then further complications surrounding the fact that plasma only uses energy when required (very little when displaying blacks) whilst LCDs use constant levels of power. Our research didn't find conclusive proof as to which was the most efficient, however a recent Which Report into consumer products concluded that Plasma TV's require more power to achieve the same brightness, therefore making LCD TV's more efficient.

Projectors

Currently the major alternative display technology to the flat screen display device is the video/data projector.

Over the last few years there has most definitely been a migration from projectors to flat panel screens, even though there has been a dramatic price reduction in the SVGA and XGA low end projectors (up to circa 2000 lumens). To be fair, the balance between the cost of the projector and the replacement projector lamp is now really disproportionate. The lamp is a consumable product, but does have a limited life span which is less than a flat panel screen. I also believe that this anomaly may be relatively short lived as the end user feels that they are being taken for a ride, similar to the price relationship of printers and replacement ink cartridges.

The other reason for the migration to flat screens, certainly within the corporate, is that having a ceiling mounted projector in a Board Room environment is not aesthetically pleasing to the room, however, with Lecture Theatres there is not a lot of choice as flat screens are not as large as a projected image. The only other option would be a flat screen "wall" or Rear Projection solution. In terms of energy efficiency the latter would be the best, as the projector can have a lower lumen level as it is in a dark environment and thus will not try to compete with the ambient light as in front projection.

When it comes to projectors there is a wide variation between models in terms of energy consumption and CO2 emissions. Again we were only able to identify research for "Home Cinema" projectors, but believe that the data below adequately illustrates the point.

Below is a table showing how two 'Home Cinema' projectors from different manufacturers compare. There are differences in the specifications, however we have selected them to illustrate the significant variations that can exist between models:

Projector	In-use 180 watts Standby 3 watts	169Kg Co2 per year	£62.20 running cost per year
Projector	In-use 980 watts Standby 7.8 watts	922Kg Co2 per year	£280.38 running cost per year

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Notwithstanding the variations between individual models it is certainly true that in applications that require large screen images the projector is significantly more environmentally friendly than alternatives such as plasma or LCD walls.

Does it get any worse?

So far we have been talking about the heat and energy consumed and dissipated directly from different types of display devices, but that doesn't even take into account the other AV equipment that can exist within a room such as DVD, visualiser, amplifier, control system etc.

We next need to examine the effect that this has on room environment itself?

The heat that is generated has to go somewhere and usually ends up remaining in the room, so the way to battle with the additional heat is to increase the air conditioning, or open windows. The former effectively means you are burning yet more energy to get the room back to a comfortable working level, the later means you are probably also wasting the warmth generated by your heating system which is now going, literally, straight out of the window.

Solving this equation has become a front-of-mind concern for AV designers going forward and we will look at it further when looking at the role of the AV Integrator.

Its is now time to examine the roles of the different members of the supply chain

Manufacturers: What are they doing to reduce power consumption in the equipment that they supply?

More Environmentally Friendly Materials

So what are the manufacturers doing, well many of them or changing the methods and the materials etc in the products that they manufacture.

Some of these improvements are voluntary, for example the EPEAT program.

There are three levels of accreditation that they can apply for which relate to addressing energy efficiencies. The EPEAT (Electronic Products Environment Assessment Tool) Registry on the web site www.epeat.net includes products that have been declared by their manufacturers to be in conformance with the environmental performance standard for electronic products - IEEE 1680- 2006.

EPEAT Registered Products Search Tool				
				Total
Product	BRONZE	SILVER	GOLD	
Desktops	20	98	12	130
Integrated Systems	6	5	0	11
Monitors	19	224	1	244
Notebooks	31	262	8	301

EPEAT™ Performance Tiers

EPEAT evaluates electronic products according to three tiers of environmental performance – Bronze, Silver and Gold. The complete set of performance criteria includes 23 required criteria and 28 optional criteria in 8 categories. To be EPEAT registered, products must meet all the required criteria. Products may then achieve a higher level EPEAT “rating” by meeting additional optional criteria, as follows:

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However, it does not mean that manufacturers who have not applied to EPEAT are not producing more energy efficient equipment.

Other improvements have come about as a result of significant new European legislation designed to improve the environment.

Over the past 2 years manufacturers have had to ensure that all their products complied with the RoHS directive.

- **The RoHS Directive** stands for "the restriction of the use of certain hazardous substances in electrical and electronic equipment". This Directive bans the placing on the EU market of new electrical and electronic equipment containing more than agreed levels of lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyl (PBB) and polybrominated diphenyl ether (PBDE) flame retardants.

We believe that all AV products available on the UK market are now RoHS compliant.

The other major piece of recent legislation is the

- **EC Directive on Waste Electrical and Electronic Equipment (WEEE).** WEEE aims to minimise the impact of electrical and electronic goods on the environment, by increasing re-use and recycling and reducing the amount of WEEE going to landfill. It seeks to achieve this by making producers responsible for financing the collection, treatment, and recovery of waste electrical equipment, and by obliging distributors to allow consumers to return their waste equipment free of charge.

New Technologies and Solutions

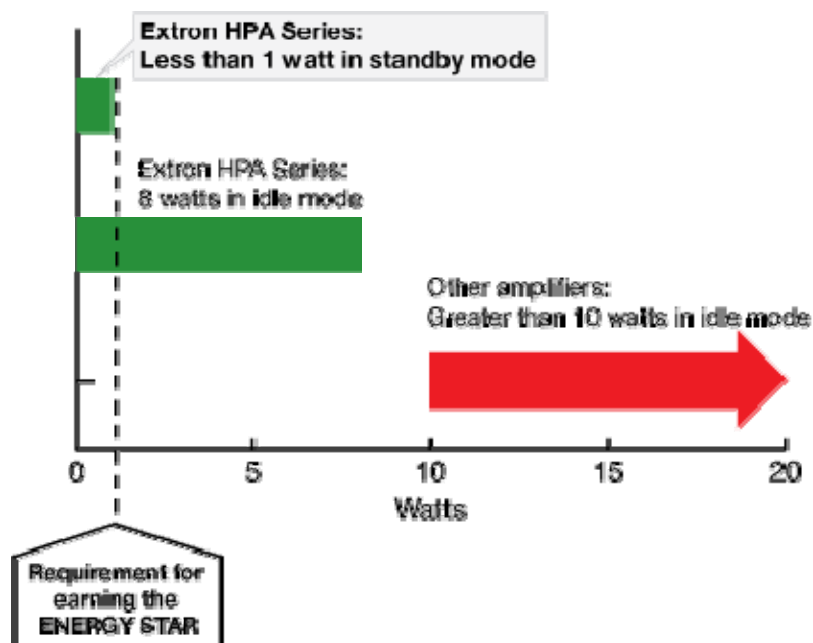
Other ways in which manufacturers can help is by developing new energy efficient products and solutions.

For example the latest developments in flat screen technology centre around 'Organic Light Emitting Diode' (OLED) screens. Unlike conventional LCD's this technology does not require a backlight. Imagine a screen that is thinner, has better picture quality, and even less expensive. Sounds too good to be true? With OLED technology making its way into screens, this is what we can expect. However, large format OLED monitors are still on the horizon, but smaller devices sporting OLED screens are starting to trickle down into the market.

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Other manufacturers are taking current products and examining ways in which they can make them more energy efficient. An excellent example of this is the new range of HPA energy efficient amplifiers developed by Extron. Typical amplifiers draw a lot of power, even when they are not working. Amplifiers in the 50 to 100 watt range can draw as much as 20 watts when not producing sound. Extron HPA Series amplifiers draw only 8 watts in idle mode. Additionally, these ENERGY STAR qualified amplifiers feature a standby mode with less than one watt of power consumption, significantly reducing operating costs. Shown graphically:-



Another major development over recent years has been the integration of AV products onto computer networks.

Having the ability to monitor and control all AV products over networks has to be the way forward. Several manufacturers provide their own specific software or there is the option to integrate their equipment with Control System software. There are a number of benefits of networked products that we will examine in more detail in the final section of this paper.

Finally, manufacturers can be environmentally friendly in their own right. Many are very large, often multinational organisations that have a major impact on the environment. Those that place a high emphasis on Corporate Social Responsibility will have many initiatives, and programmes to conserve energy and strive to be carbon neutral.

AV Integrators: Their role in designing complete room systems to improve power reduction and also in addressing their Corporate Social Responsibility (CSR).

Room Design

Room design has always been an important part of the AV Integrators role. Knowledge of audience viewing angles, screen size, acoustics, voice re-enforcement, ease-of-use etc have long been the core capabilities of the AV designer. But now there is another dimension that

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needs to be considered. Below are just a few examples that both the AV integrator and the end user have to consider:

- What is the most appropriate display device after accounting for image size, aesthetics, purchase price running costs and CO2 emissions?
- Where should the equipment be located to allow for the most effective dissipation of heat?
- Can the ambient light be reduced so a lower Lumen projector can be used, therefore consider using window shading?
- Which models of the chosen display device are most energy efficient?
- If projection is the best display solution which screen surface will get more apparent brightness from the projector.
- Could rear projection be a consideration, again using a lower Lumen projector?
- What equipment in the room should be controlled – should it include non-AV equipment such as lighting, air conditioning, blinds etc?
- How should the control system be programmed to ensure efficient and regular shut-down of equipment?
- Should the room incorporate a remote monitoring capability to enable control by central functions or third parties?
- To what extent should the room be designed for future developments – how do you weigh up the balance between future proofing and scalability against designing a system that is over specified?

The extent to which the AV industry is starting to take on board its responsibilities with regard to the environment is borne out by the fact that the next version of Infocomm International's CTS-D qualification will incorporate a module on energy efficient design.

Other Initiatives

In addition to design there are a myriad of other ways in which the AV Integrator can help with the reduction of carbon emissions both internally and for its customer. Listed below are some examples of what integrators can offer:

- **Providing advice.** As AV Integrators it is our job to understand the impact of the products and solutions we provide on the environment. By imparting this knowledge to our customers we can help them make more informed decisions.
- **Promoting environmentally friendly solutions.** As will be seen from the final section of this White Paper a number of AV solutions (videoconferencing in particular) can have a significantly beneficial effect upon the environment. By making customers aware of these products/solutions we can encourage organisations to adopt the technology.
- **Being green ourselves.** As businesses in their own right, AV Integrators can all do their bit to behave responsibly with regards to the environment. There are a number of accreditation schemes such as BS EN ISO14001: 2004, which provide standards for effective environmental management systems. ISO 14001 enables organisations to; demonstrate how they meet their legal obligations, develop and implement environmental objectives, implement commitment throughout the organisation and support environmental protection and prevention of pollution.
- **Recycling.** Whilst the legal responsibility for the collection and disposal of WEEE lies with the producer, it is, in some instances, much more practical for the goods to be removed and disposed of (through a registered take-back scheme) by the AV Integrator.

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- **Upgrades and trade-in.** It is frequently possible, in the case of upgrading or moving AV facilities, to re-use existing equipment. A responsible AV Integrator will advise their customers where this is appropriate. Some integrators will offer trade-in of equipment against the purchase of new items, and then sell the trade-in equipment to other clients. A good example of this would be projector lamps.
- **Offering remote monitoring and management.** By monitoring equipment on customers site, the AV Integrator is able to rectify some faults remotely, avoiding the need for travel to site, and in other instances diagnose the nature of the fault, so that an engineer can be equipped with the right equipment to rectify in a single visit.
- **Maintaining equipment, filter cleaning etc.** By providing effective maintenance, the AV Integrator can ensure that equipment will operate more efficiently, last longer, use less consumables as well as minimising the disruption for customers
- **Training on 'Good Practice'.** The AV Integrator can provide training for customers to ensure that they run their AV systems most efficiently. This can be user training covering issues such as turning equipment off correctly, operating projectors in "eco" mode, avoiding plasma "burn" etc. If the organisation employs its own technicians then training can be provided covering items such as changing of filters, projector lamp changing, adding new items to control systems etc.
- **Buying from reputable suppliers.** The AV Integrator can make sure that they buy from manufacturers that take their CSR seriously, that produce products that are energy efficient, that comply with all European legislation etc.



Customers: What can the end user do to address the energy emissions issues at a local site level?

The customer is at the end of the supply chain, and is therefore to some extent dependent upon what is provided by manufacturers and integrators. However, there are a number of things that the customer can do to reduce their carbon footprint.

- Look at the full life cost of any solution. A solution that is initially £10,000 cheaper, but costs £5,000 a year more in energy costs is not the best either economically, or environmentally.

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- Investigate and embrace energy saving technologies. The solutions explored in the final section of this paper represent real ways in which organisations can reduce their carbon footprint.
- Work with organisations that share your vision of a greener world. Partner with integrators that have a recognised environmental management system and accreditations and buy the products from manufacturers that are developing energy efficient solutions and are taking their Corporate Social Responsibility seriously.
- Operate the equipment in an energy efficient way internally. Ensure all systems are powered off when not in use, use projectors in “eco” mode when appropriate, clean and maintain equipment regularly, look to re-use or re-cycle equipment where possible.
- Be open minded in terms of working with AV suppliers. To get real benefits out of remote diagnostics and other networking features it is important that customers allow the AV Integrator access to their computer networks.

How AV solutions can help reduce the carbon footprint within Higher Education.

Videoconferencing

There is an argument that videoconferencing is the single most important current technology in terms of potential energy saving. Some of the benefits that universities could obtain by fully adopting videoconferencing technology are listed below:-

- Distance learning. By having a lecture recorded in one location and broadcast to other locations there are a number of benefits. The lecturer only has to give one lecture, students need travel only to the nearest location, remote experts can appear by videoconference during certain parts of the lecture, documents can be downloaded for discussion and audience feedback can be obtained from each location.
- Collaborative work. Lecturers sharing best practice, students collaborating on research projects, consortia meetings etc could all be conducted via videoconference without individual members having to leave their own universities. Dramatic savings occur when some of the participants are overseas. Videoconferencing for this type of work can also enable the inclusion of participants that would by necessity be excluded from face-to-face meetings, for example overseas universities.
- For the administration staff at a University videoconferencing could be used to implement an effective telecommuting policy. Staff will be able to work from home, but still retain face-face contact with colleagues and team members. Additionally, if one department spans several sites or campuses then videoconferencing gives managers the ability to supervise departments remotely, reducing the need to meet in person with each team member.

Taking an example from the corporate sector Lex Vehicle Leasing – part of the RAC group, has been using videoconferencing between its Manchester, Marlow and Stirling offices since the beginning of 2004 and estimates that 2 years later it had saved 800 tonnes of CO2 from being emitted into the atmosphere. In addition the company has reported timesavings of 6,000 hours or 150 man weeks.

In summary videoconferencing can make an enormous contribution to a greener planet. The top 10 benefits to an organisation have been identified as:-

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- 1. Telecommuting.** Videoconferencing can be used to implement an effective telecommuting policy. Staff will be able to work from a home office, but still maintain face-face contact with their team members. The reduction in the amount of time employees spend travelling to work each week is not only good for the environment, but the time added to the day can give workers an improved work/life balance.
- 2. Access to remote experts.** Organisations often require the input of experts for advice and guidance. Videoconferencing can be used instead of travel to access these knowledge resources who are often located at a distance, and as a result experts' costly time is used more effectively.
- 3. Human resource interviewing.** Organisations can use video to streamline the interview process. For example, high definition videoconferencing makes it possible to see extremely fine details such as facial expressions and body language. Consequently an organisation could set up regional interview centres (say at other universities) and complete a nationwide interview process without individuals having to travel.
- 4. Senior management meetings.** It can be challenging for an organisation to arrange a convenient time for senior management meetings. Organisations can arrange for them to meet over video to increase participation and reduce time spent in transit.
- 5. Remote customer/supplier meetings.** An organisation may have clients that request weekly reviews of ongoing projects. These can be carried out over videoconference, and any relevant documentation can be shared.
- 6. Remote management.** The modern working/learning environment is evolving to include numerous locations. Videoconferencing gives managers the freedom to supervise departments remotely, reducing the need to meet in person with each team member.
- 7. Real-time document sharing.** Whether it's next year's draft budget or ideas for a 100 Year Celebration videoconferencing improves efficiency by participants to share and discuss documents in real time.
- 8. Distance Learning.** The availability of lectures, courses, professional development courses on videoconference enables individuals to participate in training and learning from organisations anywhere in the world – without the need to travel.
- 9. Product Research and Development.** Today research and development is often the result of collaboration between remote organisations or departments. Videoconferencing can be used to collaborate on research and development, increasing the speed of decision making.
- 10. Team building.** This use of videoconferencing is hard to quantify, but is no less important. Video makes meetings more personal, and can replace trips between an organisation's locations, that are often required for maintaining a sense of community within a geographically dispersed organisation.

Room Control Systems

Room control systems have a number of benefits. Firstly, and the reason for which they were first designed, they give users a simple to use single interface to operate all of the AV equipment within a room. However, today they are becoming ever more sophisticated and can now be used to assist in making AV facilities more environmentally friendly.

- They can be programmed to turn off equipment when not in use. This can either be by an individual operator on each item of equipment, or for the whole room at once. In fact control systems can also turn mains power on or off ensuring complete shut-down when not in use. Alternatively a system can be programmed to perform shut-downs at pre-determined times or after the equipment has been inactive for a certain period of time. It is also possible to incorporate non-AV devices such as air conditioning, and therefore regulate its operation to the temperature of the room.

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- There are now enterprise wide control systems available in the market. These enable the provision of “Master” control points which allows authorised operators to control the functionality of several rooms from a single interface. This therefore enables one individual to turn equipment on or off across a range of rooms, in different buildings and even on different campuses.
- Another feature of these enterprise wide control systems is that they enable remote diagnostics to be performed. This means for example that an AV technician’s dept might be responsible for 100 rooms across a university. They will be able to monitor the equipment to ensure that it is working, understand and be able to fix/provide technical support for certain faults, or be alerted to certain events such as a blown projector lamp, or the removal of an item of equipment from the network.

The benefits to the organisation of this type of software and diagnostics include:-

- Fewer staff in the AV Technicians Dept as they are able to look after more systems/head.
- Less downtime in lecture theatres/classrooms as certain faults can be fixed remotely.
- Less travelling to individual rooms by technicians because they will know the nature of the fault in advance and therefore can take the right equipment to repair or swap-out the faulty equipment.

It is true to say that Universities are truly starting to embrace the benefits of room control systems and starting to enjoy some of the benefits that they bring – but there is still a long way to go before they are fully implemented across all campuses.

Get maximum use out of your existing investment.

Having made an investment in AV facilities it is important that organisations think laterally to try and maximise the value they get from that equipment.

A good example of this occurred at O2. They have recently invested in a network of digital signage screens located throughout their premises, which are used to provide messages or instructions to staff and visitors. What they realised and have now adopted, was that they could also use those same screens to provide regular and ongoing training to their staff at the same time at any location.

Conclusions

I have learnt a lot in carrying out the research for this White Paper and will certainly be implementing some initiatives within Reflex to improve our impact on the environment, both internally and in the services we provide to our customers.

I would like to conclude my thoughts with “Top Five” things for SCHOMS to think about from an environmental viewpoint.

1. **Work with partners that are environmentally aware – both integrators that can design and provide energy efficient solutions and manufacturers that are developing environmentally friendly solutions.**
2. **Think about how the use of videoconferencing could be expanded within your universities to produce significant savings in consumption of energy.**

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3. Look at the full-life cost of an audio visual investment. The lowest purchase price may not result in the lowest overall cost – both economically and environmentally.
4. Consider the benefits of incorporating campus wide room control and remote diagnostics solutions and the significant energy savings they can achieve.
5. Look after your investment. Ensure it is maintained properly, operated as intended and switched off when not in use.