CEDIA
Custom Electronic Design & Installation Association

Using Technology to Manage Energy in the Home

RIBA CPD ASSESSED MATERIAL

A **CPD** COURSE FOR SPECIFIERS

Introduction

Manage energy now and in the future

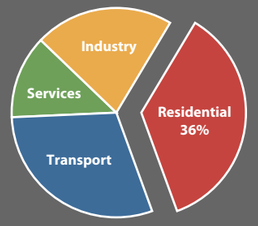
CEDIA - the Custom Electronic Design and Installation Association is an organisation of experienced companies involved in the design and installation of electronic systems for the home. With over 3,500 members worldwide, and around 200 in the UK alone, CEDIA offers a range of services to specifiers and end-users alike.

The homes you design may come with a 10-year guarantee of some sort, and they'll be used for much longer than that. CEDIA aims to make sure that they are useful throughout that period. A lot can change in that time - just think back ten years.

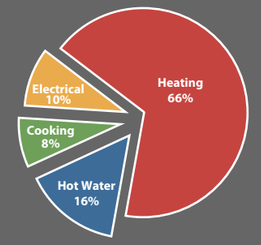
The past decade has seen two major developments - the rapid growth of the internet (adopted far faster than any comparable technology, including radio and television) and the growth in sustainability thinking amongst construction professionals.

This course explores the headline issues and the choices available, at the same time demonstrating how some simple technological solutions can make a huge difference - for both the homeowner, and the rest of us.

Split of domestic energy use in the UK



Homes are the worst offender...



Domestic energy consumption

Most European carbon gas emissions come from buildings - every study shows it to be over 25%. Most of those buildings are homes. You know that you can make a huge difference depending on the systems you specify for heating, cooling, lighting and power. You can also make a substantial difference if you consider how those systems are controlled.

Intelligent lighting choices and careful heating control, as well as other measures in Part L of the Building Regulations, are only part of the picture.

CEDIA members can help your clients minimise quiescent current consumption and manage energy use in a flexible and responsible manner.

Design for the future

There are essentially three options available for reducing traditional energy consumption:

- Conserving what you have
- Using alternative (typically renewable) sources
- Managing your use

The Commission for Architecture and the Built Environment (CABE) and the Royal Institute of Chartered Surveyors (RICS) reported that the attention paid to build quality and design has suffered in recent years, citing a survey outcome showing that 82% of new homes were not felt good enough in terms of character, design and most importantly sustainability.

Whilst most people making changes (such as getting double glazing or more energy efficient appliances) are doing so for cost saving or maintenance reasons an increasing amount of people are working to reduce their carbon footprint.

However, many projects, such as BedZed in London, and Vauban in Freiburg have shown that well-designed high-density eco-schemes can make a difference resulting, for example, in a 50% reduction in private car ownership.

Future-Ready Homes

Your clients have a range of requirements and expectations nowadays, not least to minimise clutter in their homes. It's possible, with good planning and a modest initial expenditure to get rid of the "wall-acne" of ugly plastic switchplates, thermostats and other controls and replace them with something more elegant. You can also provide for their changing lifestyle needs by planning the various home services correctly. Integrating the different subsystems - lighting, HVAC, audio/video, security, telephone and data can make things easier and more useful. Your client could, for example, turn all the lights off automatically when they set the alarm (perhaps having them revert to a "security mode" that replays their normal usage to deter burglars). An entryphone at the door or gate could be answered from a normal phone, with the guest admitted by pushing a button on the telephone itself. Add a concealed miniature video camera (viewable on any TV) and you have a discreet, effective access-control system.

The design of the lighting, as you know, plays a large part in how the house looks and feels. By adding some simple lighting-control equipment the client can create pathways of light through the house, or control a whole zone from a single location. They might, for example, want to look out at their beautiful garden from the funky new open-plan family kitchen/dining/living area - it's simple then to control the outside lighting from any switch location, or create a "mood" by pressing a single button as one enters the room. This adds drama, and makes it easier to enjoy the space to the full. Similar thinking can be applied to the environmental controls for heating and cooling - it's possible to use touchscreens, programmable to user preferences to heat just one area - not the whole house, or set the temperature before you arrive home.
With around 50% of CO_2 emissions from buildings alone, there are "green" reasons for planning this intelligently too.

BedZed is a low-energy housing project (one of a number) in south London. Around 80 sustainable homes were designed and built by Bill Dunster Architects as part of a collaboration with The Peabody Trust, Arup, Gardiner & Theobald and others. The ZedFactory is a new company aimed at realising more of these schemes, including cost-effective procurement and manufacture of low-energy element for their projects and those of others.

Many modern projects call for energy-efficient construction methods and low-energy solutions. The Merton Rule in London has amplified the need for contractors to address this, and also to provide a proportion of energy needs for purchasers through on-site measures.

The Merton Rule has forced contractors and developers to engage with the idea of on-site energy generation. This means that there is now a wider range of cost-effective equipment available for you to choose from when specifying your projects.

Greenhouse in Leeds addressing environmental impacts, economic regeneration and social inclusion factors, demonstrating energy efficiency in building design for both new build and refurbishment, giving a 60% overall percentage reduction in carbon dioxide emissions over building regulation requirements. On-site renewable energy technologies include open loop ground source, solar thermal and rooftop turbines and rain and grey water recycling facilities mean that residents will use typically 35% less mains water as well as reducing the amount of waste water. Residents of Greenhouse can view and monitor their energy use and utility bills via their TVs.

Vauban is a new suburb of Freiburg in Germany, where a beautiful and thoughtful community has been created, using high-quality materials and design, especially in the common areas of this high-density scheme.

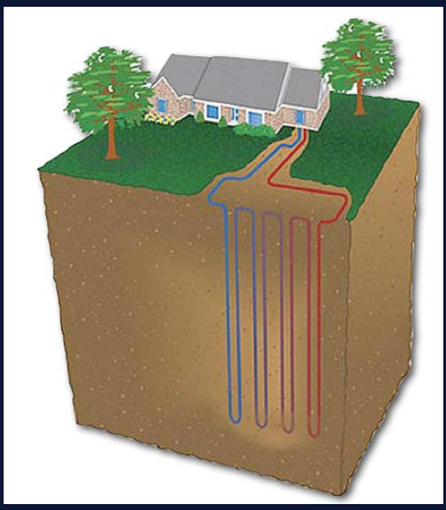
The Merton Rule is named after the council in the UK that adopted the first prescriptive planning policy that required new commercial buildings over 1,000 square meters to generate at least 10% of their energy needs using on site renewable energy equipment. In 2008, the UK government published its central planning guidance Planning Policy Statement - Planning and Climate Change that requires all UK local planning authorities to adopt a "Merton Rule" policy. Receiving Royal Assent in November 2008, the Planning and Energy Act 2008 enables all councils in England and Wales to adopt a Merton Rule as well as specify energy efficiency standards over and above that of building regulations. The policy has been criticised for assuming that in all cases, renewable energy generation represents the most effective method of reducing CO_2 emissions at any given location.

The policy has also met some resistance from developers because on site renewable energy increases their capital costs, but the revenue benefit accrues to the subsequent users. Developers face other issues too: energy efficient homes typically have less sellable space, because the high u-values come from thicker walls, and (in some cases) more complex HVAC solutions mean deeper ceilings. Central plant solutions such as CCHP are expensive, grey-water, recycling and composting facilities all add cost to areas where there typically were none at all before.

Alternatives

Many planning guidelines now state that "carbon emissions from the total energy needs (heat, cooling, power) of the development should be reduced by at least 10% by the on-site generation of renewable energy". This is irrespective of other efficiencies.

A range of of equipment that takes advantage of “alternative” energy sources is now available to housebuilders. This reduces the amount of fossil fuel consumption. Some of these systems need little or no management, working automatically to help other systems (like passive solar, which pre-heats water for heating and bathing) or ground source heat pumps, which can perform a similar function.



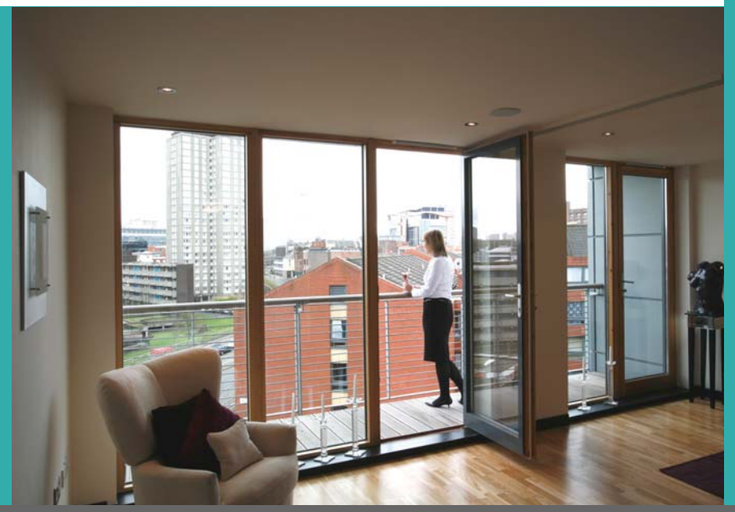
Sometimes the economies of scale are such that power is better generated using larger equipment to feed a number of dwellings, and community combined heat and power schemes are increasingly popular on larger developments.

Photovoltaic Systems collect energy contained in the light from the sun and convert it directly into electricity. Like other systems they can be connected to the grid, or work as a stand-alone solution. Many types of PV panels can easily be retrofitted.

Unlike some other alternative sources they require no maintenance, work silently, and need no additional land (if the property has a south-facing roof).

It is possible to specify some "building-integrated systems" - such as roof tiles and in-glazing solutions, and much current development is focussed on non-visible-light systems, some of which will combine with passive solar (water heating) systems.

It is possible to use standalone systems when there is no light, accumulating power in storage batteries - this typically in isolated locations. This energy is obviously best used for a non-critical task (signage, for example) or as a contribution to other loads.



Biomass Boiler typically burn woodchip and other organic material to provide space heating, domestic hot water and produce power for other uses.

Locally generated electricity can be contributed back to the national distribution system, but specifically must ensure any grid-connected systems use certified, approved components.

In general it is better to use any energy generated on site than to try and sell it back. The best approach is to contribute to overall load, rather than trying to solely power a single need (eg. lighting).

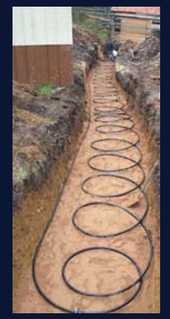
Heat pumps are systems that supply more energy than they consume by extracting heat from their surroundings. They can be used for cooling, space heating, pre-heating domestic hot water, and for heat recovery. They work just like a fridge, and tend to be over 300% efficient (a domestic boiler, by contrast, is around 75% efficient).

Ground source heat pumps are popular in North America and continental Europe, and are gaining ground in the UK. They typically generate around 3kW for each 1kW consumed, and involve pipes in boreholes 5-150m, or trenches 1-2m deep. There are three main parts: a heat source and extraction mechanism, a circuit of working fluid and the distribution system.

- heat can effectively be "compressed" - an ambient 5º gives 45-50º - perfect for underfloor heating
- heat exchangers mean they can be used for heating and cooling at the same time
- they are only seen as "renewable" if the electricity comes from a renewable source
- water source versions are also available

Ground source heat pumps are always more efficient than other heat pumps because the mean ground temperature in winter is always higher than the air temperature, and always lower in summer. Air temperatures, by contrast, are lowest at times of highest heating demand (the efficiency is maximised by having the highest source temperature and a low distribution temperature).

Most water source systems are closed-loop, although some "open-loop" systems exist, outputting into the water source. However, these are prone to fouling and corrosion.



Passive Solar Systems absorb the sun's energy and transfer it to a water-heating system, heating fluid (sometimes the regular water in the system) which is passed through pipes on the way to the hot water supply equipment in the home.
Systems typically use either evacuated tubes or flat-plate collectors installed on the roof surface, facing in a southerly direction.

Domestic **windpower** units are available from as little as £2,500 and allow the user to contribute some power back to the grid. Energy suppliers in the UK and most other European countries are now required to pay the owner/generator for the amount they supply. Despite this it is more cost-effective (and environmentally more efficient) to use the energy produced on site.

These units work by converting kinetic energy from the wind directly into electricity. They are typically mounted directly on the building, or occasionally on an adjacent tower. Choosing the correct location is important as their efficacy is related to the cube of the windspeed. Bigger units work better - the power generated being proportional to the square of the turbine blade diameter.

Many developers are now siting wind turbines some distance from the site and negotiate "clean supply" agreements with the generating company.

Part L

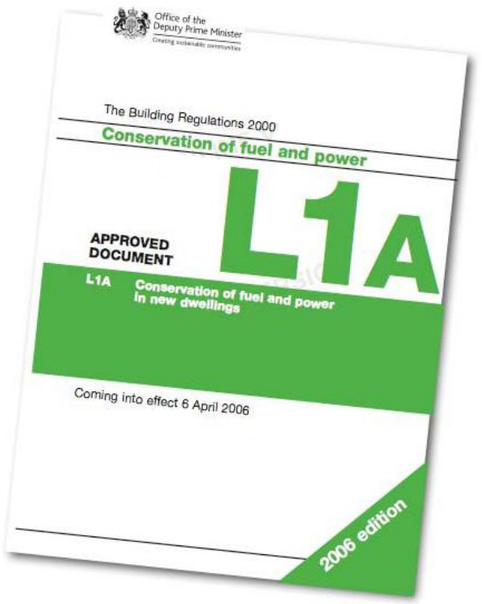
The 2007 Housing Green Paper addressed the necessity to reduce CO_2 emissions by 60% by 2050 to comply with the Kyoto protocol. The Green Paper set ambitious targets for future house building, aiming for 3 million new homes by 2020.

The Code for Sustainable Homes was introduced, building on (and replacing) the BRE Ecohomes system. It relates to new-build only. Whilst mandatory for schemes with public funding, there is a lot of discussion regarding how, and when, this will come into force for private schemes. At the time of writing economic pressures made this uncertain, but it reflects the UK government's commitment to reduce carbon gas emissions and provide energy-efficient homes.

New-build houses and apartments are likely to make up 30% of housing stock by 2050, so there is an urgent need to improve energy performance of these homes. Space and water heating make up the bulk of their consumption, and the Code for Sustainable Homes focusses on these areas, The provision of alternative energy sources will form the focus of some builder's efforts but good insulation, responsible energy management and the installation of efficient appliances are also recognised and rewarded.

The Code takes the thinking in Part L of the Building Regulations to the next stage. Most specifiers are used to ensuring their work complies with Part L, which is also about the conservation of fuel and power. It provides targets for limiting heat gains and losses through the building fabric, pipes, ducts and so forth.

Builders are required to provide energy efficient services as well as ensuring the homeowner is provided with sufficient information to easily make choices that enable the building to be operated in such a manner as to use no more fuel and power than is reasonable.

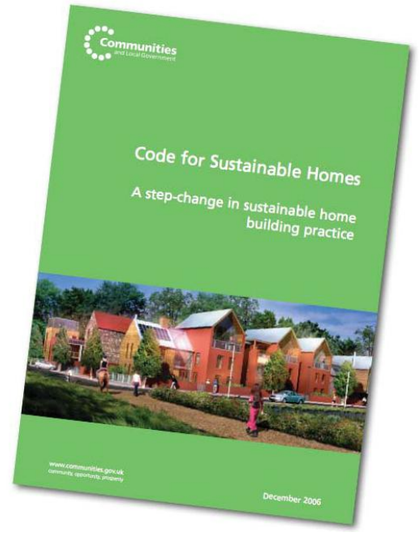


Lifetime Homes

"Lifetime Homes" are homes suitable for use by occupier at all stages of their life, so that they can live independently when older and less able, without significant modification to building fabric, fixtures or fittings.

Zero Carbon

Zero carbon means that, over the course of a year, the net carbon emissions from energy use in the home would be zero. This equates to Level 6 of the Code for Sustainable Homes. It is estimated it may cost builders as much as £50,000 to achieve this for every single dwelling.



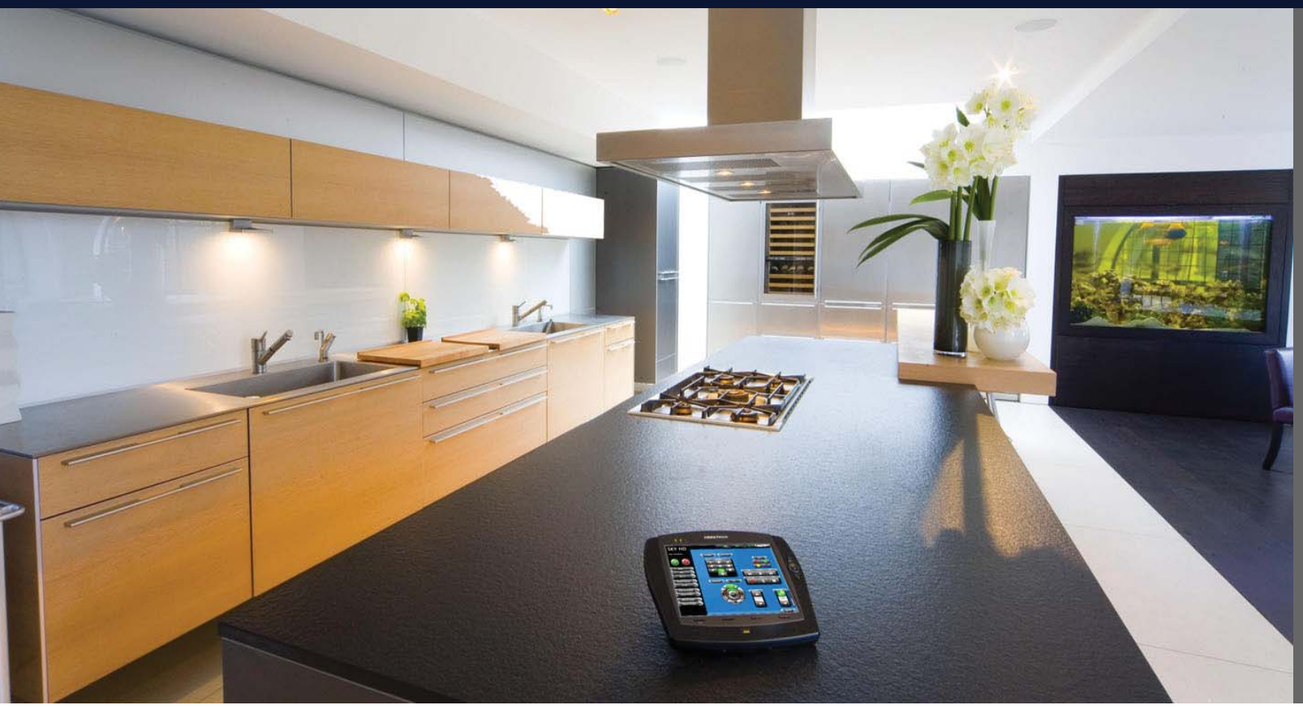
The Code for Sustainable Homes measures performance in the following areas:

- **energy**
- **water use**
- **material selection**
- **surface water run-off**
- **waste**
- **pollution**
- **health and well-being**
- **management**
- **ecology**

6 levels are achievable, from 1 star to 6 star, the highest level, which is carbon neutral.
Energy and water use have minimum criteria to meet each level, as do the selection of materials, and the treatment of surface water run-off.

Additional points can be awarded for the approach taken to pollution, health & well-being, building management and local ecology, which have no minimum standards. The approach is based on the BRE assessment methodology, but simplified. Level 1 is 10% better than Part L (2006). As with the Home Information Pack energy assessments ratings are produced by a team of independent assessors.
Some general common-sense design features are rewarded, such as the provision of dual-flush WCs, or clothes drying space, and other elements include points for provision of information about local amenities, guidance on selection of energy efficient white goods, and provision of composting facilities.
A "Lifetime Homes" approach is encouraged.
Level 6 homes have an absolutely minimal heating requirement, in line with the PassivHaus concept.
They are also exempt from stamp duty.

Control

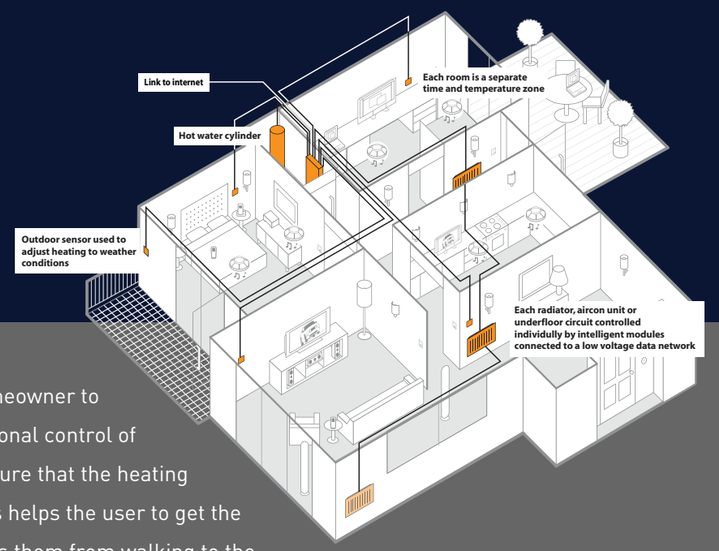


You can't start to help people make changes, particularly in existing dwellings, unless they know how much energy is used, and by what subsystems. It is straight forward to measure and chart this now. That gives the homeowner a fighting chance of making useful decisions. Simply modifying the heating or cooling target temperature by a couple of degrees makes an enormous difference. Because most of these systems are trying to make small changes the efficiency is against them. The 2nd law of Thermodynamics tells us that the greater the temperature difference the quicker the change. This means that one can save a huge amount of power with minimal discomfort.

A two-degree adjustment to thermostat settings (lower in winter, higher in summer if there is a cooling system) is enough to lower utility bills by 4% and prevent over 200kg of CO_2 entering the atmosphere. Of course this can be easily implemented as a choice (or automatic default) on user controls.

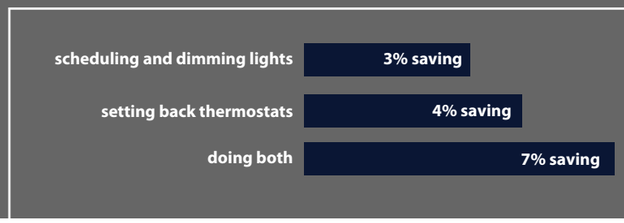
A touchscreen control system can help the homeowner make simple choices based on occupancy and cost. How much equipment do they need on at one time? What if the whole family is all in one room? Do they need lights, heating on elsewhere?

HVAC



Integrated controls system can allow the homeowner to control energy use in each room by offering zonal control of the heating and cooling systems and also ensure that the heating and air-conditioning systems don't fight. This helps the user to get the most of the system, more regularly, and saves them from walking to the thermostat or boiler cupboard. Remember that the grander the home (and the larger the consumption) the greater the opportunity for energy and cost savings.

Of course the electronic systems CEDIA members install also need power, and the dealer will calculate the electrical load and heat output of their systems so that the services engineer and others can deal with ventilation, and take the heat produced into account. In many cases this can be reused to heat, or help heat, adjacent spaces such as home cinema rooms.



If air conditioning systems are installed it is critical that a reliable interface is supplied so that they don't try and cool the space at the same time as any heating equipment is operating. In larger buildings a Building Management System (or BMS) is often installed to deal with this issue and provide a consistent user interface and building-wide controls. This allows the user to request a temperature and the system automatically decides what to do. Asking for 20° in the winter will require heating the space, whereas it'll mean cooling it in summer.
To stop the systems constantly "hunting" between heating and cooling most BMS installations allow for a dead-band of, say, two degrees where the system does nothing as the temperature falls or rises naturally. Only once it is that amount warmer or cooler than the target temperature will the system kick in. This reduces fan noise, wear and tear and energy consumption. Studies show that when the user has a simple, clear, reliable control interface they use their heating and cooling systems much more effectively - changing temperature to suit their needs, making sure systems don't run when they aren't in the space, and setting appropriate temperatures. A CEDIA dealer can easily work with the services consultant and the client so as to offer an eco choice with a wider dead-band. CEDIA members can make it easy for your clients to control these systems from wall-mounted positions or help them use it on a portable screen which might better suit their needs.

Lighting

Part L has enforced the use of low-energy fittings.

Did you realise that you can also save a huge amount of energy by dimming correctly, and using control systems to make the most of the available natural light? Of course, you can dim LEDs, fluorescents as well as traditional incandescent fittings.

You can create moods with scene-setting systems for different activities by zoning the lighting into circuits and then dimming each zone independently at the touch of a single button. Dimming systems also offer flexible control of interconnected spaces and the ability to turn off the whole house from one button as you leave.

The newest controllers often allow the homeowner to see (and sometimes record) the energy saving in real time.

Traditional dimmers waste a lot of electricity - diverting the energy not sent to the lamp into heat and noise. Modern dimmers switch on and off very quickly, so that only the desired proportion of power goes to the lamp. We don't notice this (in the same way we don't notice the frames change when we watch a movie in the cinema). This means that the electricity isn't demanded, and therefore not generated, and the homeowner makes a significant saving. In fact, because these systems feed the power through gradually, and the filament cools somewhat when the power is off, this sort of dimming really extends lamp life. Dimming by 25% means that the bulbs last four times longer.

There are other benefits too - because of the way our eyes work dynamically, we hardly notice a small amount of dimming, and we automatically adjust to larger amounts, meaning we can save energy without any impact on productivity or comfort.

Daylight

Managing the natural light coming into the space is as important as creating a scene from the electric light circuits on your project. Using blinds and shades can create a total effect. It can also reduce the solar gain in the space - particularly if interstitial blinds are used.

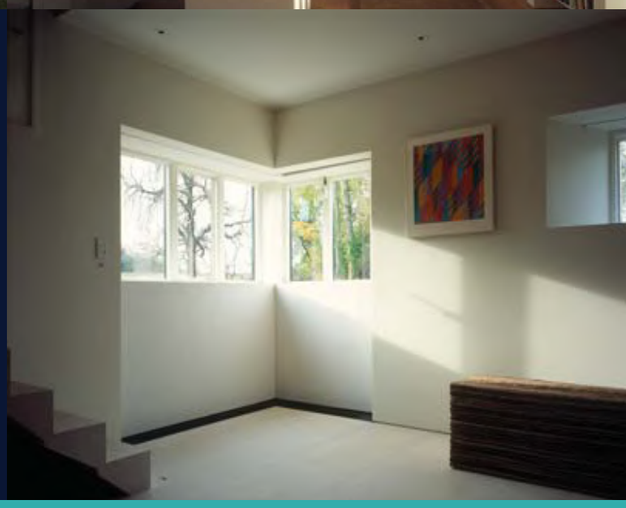
In fact blind fabrics can have different surfaces on the inside and outside face - allowing you to specify a consistent, reflective, finish for the exterior side, irrespective of the look you want to achieve internally.

Managing the natural light coming into the space is as important as creating a scene from the electric light circuits on your project. Using blinds and shades can create a total effect. It can also reduce the solar gain in the space - particularly if interstitial blinds are used.

In fact blind fabrics can have different surfaces on the inside and outside face - allowing you to specify a consistent, reflective, finish for the exterior side, irrespective of the look you want to achieve internally.

CEDIA

Simple engraved keypads allow the homeowner to control lights, blinds and temperature from one location.



Savings

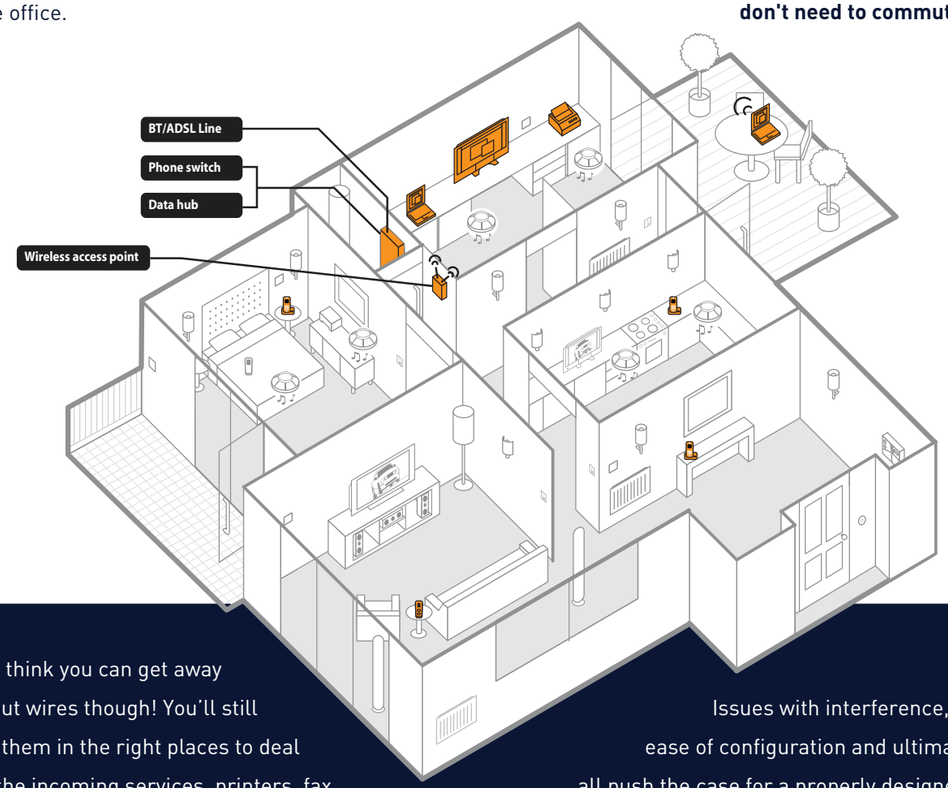
On large commercial projects the savings can be staggering. When the New York Times rebuilt their Manhattan HQ they used all the available lighting control technologies. They sensed occupancy, bringing lights on only when rooms are occupied, and worked also to automatically control the amount of natural light (and heat) entering the space using motorised blinds.

The anticipated consumption (using traditional controls was 1.28W per square foot, whereas actually the building only uses 0.38W per square foot. This saves them around £250,000 per year. It shows the sort of saving possible across large developments if lighting control is used intelligently, particularly in the common parts.

Other factors

The near-ubiquity of a Broadband (Meaning: fast and always on) Internet service allows residential customers a lot of flexibility - these days you can "be" at the office without going to the office. Modern telephone and IT systems allow one to work from home, at times that best suit one's life, as effectively (sometimes more so) as actually being in the office. Calls can be forwarded or put through without the caller perceiving where you ACTUALLY are, and you can use your company network as if you were in the office - receiving e-mail, printing, browsing the server and having access to resources as if you were sitting in the office.

A simple home telephone system can allow the user access to different lines (perhaps for work, home, and teenage kids) independently billed, but accessible from any location. It can link to the entryphone and cordless phones and allow conference calling, paging and voicemail just like a small office system. This all depends the correct wiring specification and installation of course. In addition a number of wireless technologies are now available, and WiFi is now pervasive. CEDIA's other "Designing Integrated Future-Ready Homes" CPD covers these topics in depth. **The Code for Sustainable Homes recognises the energy savings made by people who don't need to commute.**



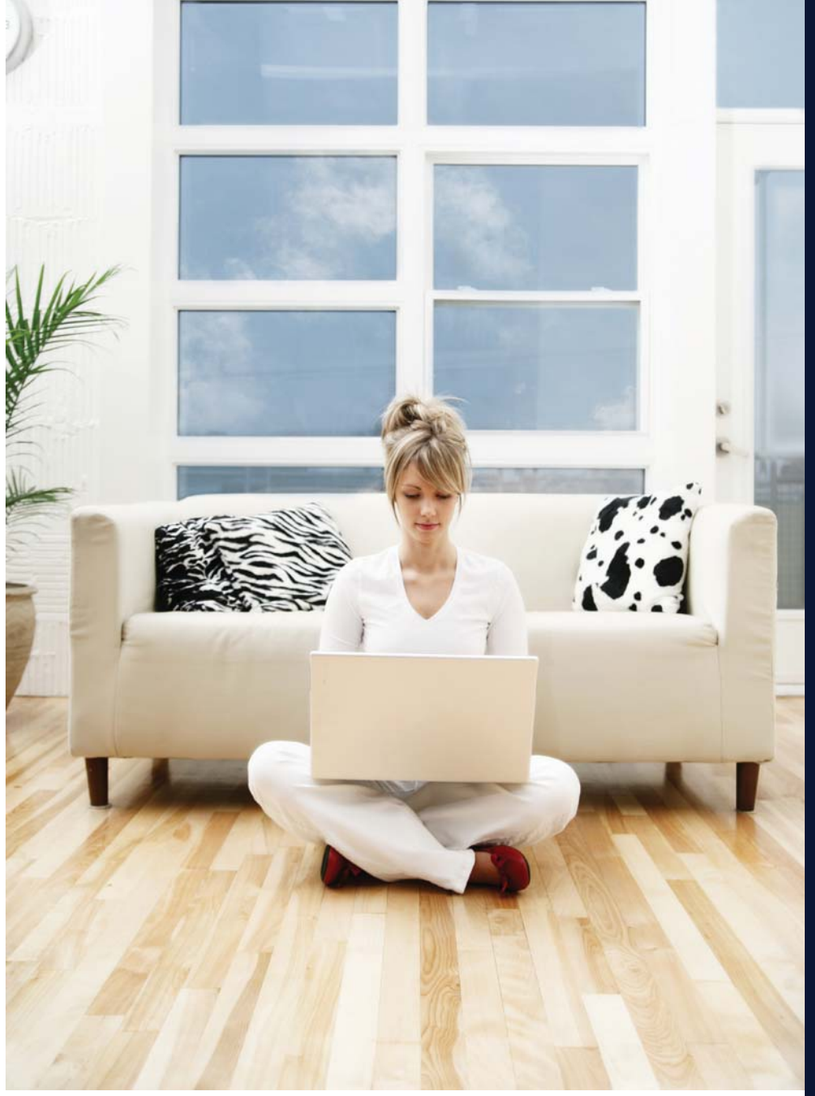
Don't think you can get away without wires though! You'll still need them in the right places to deal with the incoming services, printers, fax machines, normal TVs, speakers and almost all security, lighting and fire detection devices. Indeed not all not all buildings work well for wireless equipment - particularly those with a lot of steel work, or older masonry construction.

Issues with interference, security, ease of configuration and ultimate speed all push the case for a properly designed cable infrastructure rather than relying on wireless systems. It is also important to realise that most TV companies still require one or wo coaxial cables at least one coaxial cable for a full-quality service, although some hybrid services are starting to appear.

Future metering

We can seek to increase efficiency, avoid waste, sustain natural resources (and generating capacity) but we also need to use innovation to monitor and control demand. We can only do this by changing community and individual behaviour.

Energy suppliers are looking to meter electricity, gas and water more accurately (and more frequently) and bill on real data, in the hope that they shift peak demand by providing more information to the customer. This will only work if they can connect homes to their central systems. They then have the ability to offer load signature billing, and provide automatic remote control to shed or manage the load. Furthermore this connection allows for support of micro-generation in the home or community (eg. micro Combined Heat and Power units, which can contribute some electricity back to the grid).



Cumulatively even very small changes make a difference. For example, although the individual effect is minimal, even "wall-wart" power-supplies - the sort of things that charge your mobile phone - make a difference when considered on a large scale. Some studies say we need two power stations to run European equipment left on standby! CEDIA members can help your clients deal with this easily and reliably.

Many millions of customers worldwide already benefit from Automatic Meter Reading (AMR), and the UK Energy Minister recently stated: "more advanced metering is one of the technologies that could help empower consumers to manage their energy use more effectively in an age where energy consumption is growing fast". CEDIA members can help you ensure the homes you design are "connectable".

Aftercare

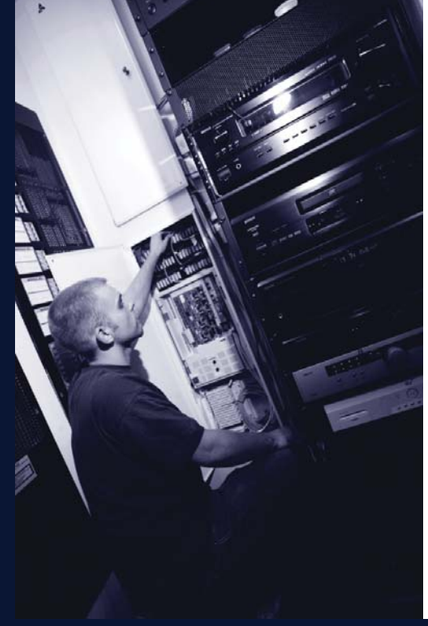
In the days of homeowner packs it is important that people can use, describe and maintain the systems they have in their home.

Most CEDIA members offer maintenance contracts, and although most equipment is boringly reliable, many clients appreciate that they can call for assistance, at home, when they need.

All larger installations are provided with comprehensive O&M documentation, which proves especially useful if the property is sold to new owners.

Maintenance response times typically vary from 4-hour 24/7 in-home support for "Life Critical" systems (such as lighting, security and telephone) to "next working day" for the entertainment and other systems.

Many companies ensure that their most experienced field engineer is responsible for maintenance work, and the controller will attempt to schedule the client's preferred person to make the visit. Pro-active visits are scheduled to make sure everything is running correctly, and reactive visits if a repair or replacement is needed. Loan equipment can be provided where appropriate.



If a maintenance package is agreed at the time of installation, the maintenance manager can make a site visit to introduce themselves to the client or client representative and respond to specific client expectations regarding all things to do with after care, service and maintenance companies build and maintain their knowledge of each individual client and system, so they can offer the most expeditious support – in some cases remotely.

CEDIA members can help your clients monitor and manager their energy consumption, and work with them to make sure that the best choices are easy to select and assess going forward.

It is also possible, as new products become available, to offer customised set ups & fun add-ons that the families really enjoy – for example, enhancing a home cinema so it works as PlayStation or Xbox gaming room. Members can also create photo slideshows, modify lighting scene settings, set up iTunes, or provide a DJ for special occasions and celebrations.

Glossary

BRE	Building Research Establishment
Carbon Dioxide	Carbon Dioxide (CO_2) which is produced whenever fuel is burned, is one of the main 'green emissions house gases' which contribute to global warming
CCL	Climate Change Levy
CERT	Carbon Emissions Reduction Target
CFL	Compact Fluorescent Lamp (a low energy light bulb)
CHP	Combined Heat and Power - usually boilers that generate power and heat
CCHP	Community Combined Heat and Power
CoSH	Code for Sustainable Homes
DCCP	Draft Climate Change Programme
DEES	Domestic Energy Efficiency Scheme
DIYHEC	Do It Yourself Home Energy Check
EEC	Energy Efficiency Commitment - a scheme by which energy suppliers promote energy efficiency to their customers, in order to achieve energy saving targets which are set and enforced on the supplier by government.
EEBPH	Energy Efficiency Best Practice in Housing
Fuel Poverty	A household is defined to be fuel poor if more than 10% of its income needs to be spent to achieve a satisfactory indoor heating regime, after including other energy services such as cooking and lighting.
GPG	Good Practice Guides (a series of guides published by BRECSU)
GSHP	Ground Source Heat Pump
HEED	Home Energy Efficiency Database - a database tracking the level of domestic energy efficiency measures across the country.
HEES	Home Energy Efficiency Scheme - the Welsh equivalent of Warm Front and Warm Deal - a government funded scheme to help cover the cost of basic energy efficiency measures, e.g. loft insulation, draught proofing, cavity wall insulation and heating controls
HVAC	Heating Ventilation and Air Conditioning
kWh	Kilowatt Hour
Kyoto Protocol	The international climate change conference which took place in Kyoto, Japan in December 1997, where developed countries agreed climate change targets to 201
PassiveHaus	A voluntary standard for ultra-low-energy buildings that require very little energy for space heating or cooking
Powershift	EST's clean fuel vehicle programme
PV	PhotoVoltaic
SAP	Standard Assessment Procedure (government endorsed energy rating system for homes, giving properties a score out of 120 whereby a score of 120 is the most efficient and 0 the least)
SME	Small or Medium Sized Enterprise
Warm Deal	Scottish equivalent of the English Warm Front Scheme
Warm Front	A government funded scheme targeting the Fuel Poor, to help cover the cost of basic energy efficiency measures, e.g. loft insulation, draught proofing, cavity wall insulation and heating controls.

Where to go from here

Building Regulations 2000, Part L1A
www.planningportal.gov.uk

The Code for Sustainable Homes
www.planningportal.gov.uk

Eco-Homes: Eco-nomic sense?
www.knightfrank.com

Al Gore's 20 minute talk on the climate crisis
http://www.ted.com/talks/view/id/243

Sustainable Energy Without the Hot Air
www.withouthotair.com

Self-Assessment Record

To be completed by those wishing to record further learning and knowledge enhancement for Continuing Personal / Professional Development (CPD).

SUBJECT | **Using Technology to Manage Energy in the Home**

FORMAT

DATE

LOCATION

PRESENTER

1 **What were the key issues covered and the learning benefits covered?**

2 **What can I put into practive by way of action points?**

A) Immediately?

B) Medium / long term?

3 **What further reading / research do I need to do?**

4 **Further learning time / value allocation:**

Please note: This form may be photocopied and retained amongst your personal CPD records. Completed photocopies might also be submitted by those who require to forward documentary evidence of CPD activity to their professional association or institute.

Further advice and guidance relating to the role of CPD within the construction industry can be obtained from:

THE CONSTRUCTION CPD CERTIFICATE SERVICE
The Coach House Ealing Green London W5 5ER
Telephone: 020 8840 4383 Facsimile: 020 8579 3991
Email: info@cpduk.co.uk Website: www.cpduk.co.uk

Notes

Notes

CEDIA Region 1
Unit 2, Phoenix Park, St Neots,
Cambridgeshire, PE19 8EP, UK

Tel: +44 (0) 1480 213744
Fax: +44 (0) 1480 213469
Email: info@cedia.co.uk
Web: www.cedia.co.uk