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REPRESENTING THE UK TECHNOLOGY INDUSTRY

Case Study Digest
Transport, Buildings and Energy Supply

The UK ICT Sector is:

- improving the efficiency of its own products and services
- helping to reduce emissions across the wider economy
- focusing action where it matters: transport, buildings and energy supply

Contents

Introduction

Last year, in our High Tech:Low Carbon report, we explored the role of the UK technology sector in tackling climate change. Our sector is in a unique position – on the one hand our products and services use energy, and we must do everything we can to optimise efficiency and improve performance. However, on the other hand, our products help other sectors to work more efficiently and reduce their emissions. So we believe that ICT has a vital role to play in helping us achieve our emissions reduction targets, both in the UK and the EU. In fact, we believe that the intelligent use of technology is the only way that we can genuinely decouple economic growth from energy consumption. Therefore technology will be a critical enabler in our progress towards a low carbon economy.

This position is reinforced by the European Commission's current initiative on ICT for Energy Efficiency, led by DG Infosoc, which supports the view that ICT has a very strong part to play in achieving the 2020 targets for the EU, both through action by the sector itself and more significantly as an enabler of the changes needed to make the transformation to a low carbon society.

We now want to focus our attention on what technology can do in three specific sectors, which between them account for the vast majority of UK emissions: These are transport, buildings and energy supply. The reason should be obvious – it makes sense to tackle the areas with the biggest scope for reduction.

This leaflet briefly explores each of these sectors in turn, with a short overview explaining in broad terms how ICT can be used to reduce emissions. Each summary is followed by some sample case studies which illustrate how UK technology companies are delivering significant energy savings through the intelligent use of ICT. The last section deals with virtualisation technologies which, rather than making high impact activities like travel more efficient, replace them altogether with low-carbon alternatives. Case studies illustrating the successful application of transport substitutes are therefore in this final section.

This short guide is only intended to highlight progress being made in these three very energy intensive sectors. The case study approach demonstrates that almost all the technologies featured, however futuristic they may seem, are actively being deployed today - and many have been at work for years.

For a full examination of the work that our sector has done to improve the efficiency of ICT products and services, and the wider role of technology across other sectors of the economy, please see our High Tech:Low Carbon report: **www.intellectuk.org/hightechlowcarbon**

For a complete set of case studies, including those demonstrating the substantial improvements that the sector has made in terms of the efficiency of its products and services, and how we are helping other sectors in the economy like agriculture and manufacturing, please see our case study library which is available online at: **www.intellectuk.org/casestudies**

Overview: ICT and transport

The transport sector is responsible for around 25% of total UK CO_2 emissions and they are rising faster than those from any other UK sector. This makes transport a particular priority if we are to achieve our 2020 emissions reduction targets. The ICT sector provides a whole range of applications that reduce emissions from transport. These include logistics, tracking and telematics technologies, satellite navigation tools, location finders and routers and advanced driver assistance systems. Many of these come under the heading of Intelligent Transport Systems (ITS). ICT also provides transport substitutes through teleworking and electronic conferencing technologies. These are addressed in the final section – virtualisation.

Intelligent transport systems

Intelligent Transport Systems (ITS) are tools that combine computers, databases, maps and sensors to assist drivers and improve transport infrastructure. They are particularly applicable to tackling congestion. Up to 50% of fuel consumption is caused by congestion and non-optimal driving behaviour so the EC supports the adoption of in-car ICT through its Intelligent Car Initiative. Telematics technologies are in-vehicle devices connected wirelessly to an external system. They are used increasingly to monitor and measure car performance and driver behaviour and are leading to substantial improvements in fuel efficiency.

ITS also include navigation tools such as satnav and dynamic route guidance systems, which incorporate real time factors such as congestion or roadworks and advise users accordingly. Dynamic navigation depends on the immediate availability of accurate traffic information, so the integration of satellite, communications and software technologies is crucial. These technologies are now used for thousands of applications worldwide from navigating single cars to controlling large aircraft fleets.

Intelligent routing of road transport can cut fuel and emissions by 20-30%. Satellite monitoring reduces aircraft stacking, streamlines flight routing, and re-routes shipping to avoid adverse conditions, cutting journey times and emissions. Streamlining air traffic through the intelligent use of technology could cut fuel consumption by 12%. ADAS (advanced driver assistance systems) are another form of ITS and include intelligent speed adaptation, adaptive cruise control and blind spot monitoring. Although designed to improve safety they regulate traffic flow and reduce emissions and journey times. Other approaches include clever software that measures vehicle emissions in real time or monitors internal tyre pressure to optimise fuel efficiency. New applications and technologies are emerging all the time.

Congestion charging and transport systems

ICT also provides the underlying infrastructure for economic instruments like road pricing. Road pricing is a demand management tool to reduce traffic, particularly at peak times, and move passengers from private to public or shared transport. Current schemes are entirely ICT-enabled. The London Congestion Charging scheme has achieved a 20% reduction in emissions. ICT also enables electronic public transport ticketing systems like London's Oyster card, which speed up passenger transit through traditional station bottlenecks, make public transport options simpler and cheaper (and therefore more attractive) to the user, and even feed back passenger movement data which facilitates forward planning and helps optimise the available capacity.

See the virtualisation section – (pages 10-11) for transport substitutes

Case studies – ICT and transport

Vehicle telematics and tracking: Microlise and Tesco

Driving style has a major effect on fuel efficiency. Microlise provides vehicle telematics technology that monitors how vehicles are being driven. Microlise also provides vehicle tracking software that assesses how efficiently vehicles are being utilised with a view to reducing fleet size. Tesco.com delivers to customer homes from more than 300 stores, with over 2,000 vehicles making more than 250,000 deliveries a week. Microlise's in-vehicle telematics and GPS tracking systems have enabled Tesco.com's home delivery business to optimise fleet efficiency so that another 50,000 deliveries can be handled without increasing fleet size, whilst improving fuel efficiency.

Measuring vehicle emissions: Lysanda's EcoLog

One extraordinary development in automotive software is Lysanda's Eco-Log® system, a pioneering technology that calculates the true emissions of a moving vehicle. This not only enables meaningful comparisons to be made between vehicles and enables efficiency claims by manufacturers to be authenticated, but it also provides intelligent feedback on driver behaviour, identifies poorly performing vehicles and allows problems to be identified and addressed.

Intelligent transport systems – Acis

Acis is implementing ITS in Dartford, UK to encourage the use of public transport. The system currently being adopted provides residents with an electronic display in their homes which tells them when the next bus will arrive. Buses also use TLP (traffic light priority) to improve speed through traffic lights and bottlenecks if necessary, improving reliability and regulating the service.

Highway lighting: Philips

In streets and highways, Philips has developed a new energy efficient lighting solution called Cosmopolis, which dramatically improves visibility whilst reducing energy demand by over 50%.

Smart container shipping: Thales

Smart container systems impart intelligence. A smart container is simply a standard container which has sensors, processing capability and communications devices that interact with a central database. The smart container has a tracking and tracing capability, protects the integrity of the container by identifying if and when it has been opened, monitors ambient conditions and maintains content inventory. While the objective is to improve security, environmental benefits include increased efficiency (from better certainty), reduced waste (storage conditions are known for perishable goods) and reduced physical interventions (because of the automatic inventory).

Road charging: IBM

IBM UK now manages the London Congestion Charge which has reduced emissions in the zone by 20%. IBM and partners also implemented an automatic road charging system in Stockholm in 2006 which has also dramatically reduced traffic congestion. Vehicles were automatically recognised and charged at control points as they entered or left the city centre during weekday rush hour. By the end of the trial, traffic was down nearly 25% with an estimated reduction in CO_2 of 41,000 tonnes. Public transport schedules had to be changed to reflect the faster travel speed.

See: www.intellectuk.org/casestudies for full case studies

Overview: ICT and buildings

Energy use in buildings accounts for around a third of the UK's carbon dioxide emissions and the energy used to heat, light and run UK homes accounts for over half of that. The UK government is taking a leading role in this area. Besides implementing the Energy Performance of Buildings Directive (which requires all publicly owned buildings to display actual energy usage), all new homes being built will comply with low and zero carbon standards. The objective is to foster technologies and innovation that will help drive down emissions from existing building stock. The government is introducing a combination of economic incentives and regulatory controls to help achieve this and aims to be the first country to set a timetable for delivering zero carbon homes.

There is scope for ICT and associated technologies to play a major role in achieving these aims through the application of smart building technologies. These include building and energy management systems, metering technologies, environmental sensors, lighting control systems, energy auditing and optimisation software, and communication networks.

Building management systems

Building management systems (BMS) are automatic means of controlling building services in order to maintain a comfortable working environment with the minimum amount of waste. Sets of data, such as occupancy levels and space measurements are combined with information from sensors both internally and externally. This information is processed by a central computer which adjusts the controls for temperature, ventilation and lighting to maintain optimum efficiency. It is anticipated that in the home, people will be able to run a BMS through their digital TV.

Energy management systems work in a similar way to BMS but may operate on a much larger scale – for instance across a large facility like a hospital, factory or even a town. They provide data on energy use and identify opportunities for power saving.

Advanced metering

Metering technologies include applications like smart meters - which monitor energy use in buildings intelligently and pinpoint areas of waste so that consumers or businesses can implement changes. Smart meters also provide a two-way intelligent communication device between customer and supplier.

Sensors

Environmental sensors include photosensitive elements that detect the ambient light levels and switch off internal lighting when the external light entering the building is at a certain level. Other lighting control systems within buildings include time-switches and movement sensors.

Lighting

In fact, artificial lighting accounts for around 19% of global electricity consumption, so improving the efficiency of lighting can have a major impact on emissions. Although there is plenty of scope for energy reduction by switching lights off, lights do need to be on at least some of the time, so it is important to make them as efficient as possible.

Case studies - buildings

LED lighting for buildings: Philips

Philips and the UK's National Theatre are working in partnership to replace this landmark London venue's lighting scheme with a state of the art, dynamic and energy efficient design. The first phase of the LED lighting solution provided by Philips will focus on the exterior and give the National Theatre a spectacular colour palette, illuminate new areas and provide a new video wall installation on the roof to replace the old dot "seefact" display. The second phase will revitalise the internal lighting and improve efficiency, and there will be an ongoing programme of improvement as Philips continues to develop even more sophisticated lighting technology. The LED solution will not only deliver dramatic visual enhancement, it will also reduce the energy needed to light the building's iconic exterior by 70% and deliver savings of around £100,000 per year.

A second partnership between Philips and the London O2 Arena, another landmark building, is using the latest LED technology to enhance the visual character of the building through better lighting and dramatically improve efficiency. The energy needed to light the building will be reduced from 426 KW to 147 KW - a reduction of 65%.

Office optimisation: IBM

ICT-related technologies create opportunities for companies to restructure their office environment so that the use of available office space is optimised. This means that temporarily unused space can be divested and as a result energy consumption can be reduced by up to 50%. IBM transformed their office structures at 8 locations in Europe, replacing desktops with notebooks, stationary phones with cordless substitutes, and copy, print and fax facilities with pooled, multifunctional devices. This enabled employees to be completely mobile within the building, using an open plan environment which improved flexibility and reduces space and energy requirements. Moreover, by combining this approach with new management concepts, such as working time flexibility, mobile working and home- or tele-working, further reductions are being achieved.

Smart buildings: Siemens

Siemens has developed an industry-leading technology that optimises the energy consumption of buildings. It uses specialised algorithms to calculate the actual ventilation and heating requirements and has already been applied to optimise energy efficiency in thousands of buildings world-wide, including hospitals, banks, industrial sites and schools.

Energy Management Systems: Capula

Capula's OSIsoft solution is an energy management technology. Kodak Park operates like a small town, covering 1300 acres with two power plants, 150 buildings and 11,000 employees. There was no central energy management system for the site and many of the buildings operated as silos. OSIsoft provided a single web-based portal for managing energy use across the entire site, which collated and delivered real-time data to engineers and energy managers. This allowed areas of waste to be identified, monitored and addressed. The system delivered dramatic energy and cost savings and provided tools that enabled Kodak to meet its reduction targets and optimise its energy assets. New opportunities for energy saving are continually being identified.

See: www.intellectuk.org/casestudies for full case studies

Overview: ICT and energy supply

The energy supply sector has the largest share of carbon dioxide emissions in the UK, well over a third of the total, mainly because of the inherent inefficiencies in generating and distributing electricity from raw materials. Because of the huge scale of these processes, even a fractional improvement in efficiency will make a dramatic dent in UK emissions and ICT has an important role.

ICT is already delivering improved efficiencies at the point of generation, including renewable power, for instance in the optimisation of wind farm operation. ICT is also of growing importance to the optimal generation and distribution of network power. For instance, electricity generation in the UK is finely tuned to align with forecast demand (which in turn relies on satellites and weather-forecasting computing). Green energy sources like wind power tend to be intermittent and widely distributed and there is an important balancing act involved to optimise the use of renewables within the grid without compromising the reliability of supply.

The distributed grid

As energy generation from renewables increases, ICT will also be an important enabler of the major grid reconfiguration that will be needed to cope with a more scattered pattern of generation. This is because sources of wind and wave power are not necessarily close to traditional sources of energy generation or indeed to major centres of population. The resulting grid will have a more distributed structure rather than its current centralised configuration. Moreover, successful integration of microgeneration and other renewable outputs into the national grid will also depend on technology. ICT is also a key enabler at the user end – for instance when trying to combine or integrate different types of fuel source to produce a single output.

Photovoltaics

The technology sector also manufactures and supplies solar-related technologies, both for the domestic and commercial markets. Light energy can be converted into electricity using solar cells or photovoltaics, which are usually based on silicon. More recently, thin-film technology is being developed which may improve efficiency and reduce the materials needed for each cell. Solar power is one of the few clean energy sources that can get appliances off the grid altogether and has few of the disadvantages of large scale wind or wave power which will require extension, and to some extent reconfiguration, of the national grid. Sadly, photovoltaics provide only about 1.8% of the energy supply in the UK, as opposed to 7% across the EU, so and there is significant scope for improvement here, simply by implementing existing technology.

The technology sector not only manufactures the latest solar applications, but also provides the essential software interfaces that allow solar technologies to work in conjunction with other heating solutions in the home. Furthermore, the technology sector is pioneering the reclamation of discarded silicon from computer-based applications so that it can be used in the solar heating sector, which is currently constrained by a global shortage of silicon.

Case studies - energy supply

Real time emissions monitoring – Capula

Emissions by power generators make up a substantial proportion of the UK's total carbon emissions. Capula is implementing its OSIsoft solution for power generators. Currently, information on environmental compliance is only available on a monthly basis, and issues are therefore managed reactively. The OSIsoft solution provides real-time, continuous information on emissions which is analysed and presented to operators and managers. The approach combines automation control, real-time data and business applications. It bridges traditional divisions between engineering, commercial and regulatory activities. The result is that generators are much better informed and can identify problems and implement changes immediately. This improves compliance with emissions targets and contributes to optimising carbon performance in energy generation.

Stabilising energy demand: Dynamic Demand

"Dynamic demand" is an emerging technology that could reduce the amount of electricity used by appliances like fridges and freezers during peak periods through the intervention of small electronic controllers inside the goods. This development could provide a more stable and efficient grid, removing some of the barriers to more renewable electricity generation in the UK which is variable in nature. If fully integrated across the network savings could be in the region of two million tonnes of CO_2 emissions a year - the equivalent of taking over 665,000 cars off the road.

Recycling silicon for solar power: IBM

IBM has developed an innovative new semiconductor wafer reclamation process which will enable 3 million wafers to be re-used annually. Semiconductor wafers are the thin discs of silicon used to imprint patterns that make finished semiconductor chips. The IBM process uses a specialised pattern removal technique to repurpose scrap semiconductor wafers into a form that can be used to manufacture silicon-based solar panels. The process enables the Intellectual property from the wafer surface to be removed efficiently and hence allows the wafers to be reused. The solar industry is currently being held back by severe shortage of silicon, which is one of the primary materials needed to manufacture solar panels. Re-using silicon in this way helps to stimulate the growth of renewable energy solutions.

Intelligent algorithms for smart grids: Siemens

Siemens' "learning" algorithms maximise the power generated by wind farms by introducing cooperation among wind turbines. The increase of power output is estimated at 1-5%. Siemens' offshore wind farms are generally controlled remotely via ICT solutions and even defects can be detected and often repaired remotely by software applications.

See: www.intellectuk.org/casestudies for full case studies

Overview: Virtualisation – including transport substitutes

The technology sector has an amazing capacity for virtualisation. Virtualisation is the de-materialisation of physical processes through the application of technology. The benefit of virtualisation is that traditional, high impact and high energy processes are replaced by low impact, low carbon technologies. The virtual replacement (or proxy) for a physical process usually uses far less energy (often several orders of magnitude less) but still enables people to achieve the same ends. The difference is the way they do it. Virtualisation technologies include travel substitutes like electronic conferencing. Electronic document technologies, e-commerce and in-silico modelling are all examples of virtualisation. The ICT sector also applies virtualisation technologies in its data centres. This effectively enables dramatic consolidation because the separate operations and applications of a number of machines can be handled by a single machine without losing functionality. This kind of practice can achieve power savings well in excess of 50%. Grid computing is also a form of virtualisation.

Electronic conferencing

Electronic conferencing now provides a viable alternative to physical presence and has enormous scope for reducing travel, particularly long distance air travel. Electronic conferencing includes tele- web- and video-conferencing. Modern 3-D videoconferencing suites exactly mimic a round table meeting, and sophisticated supporting tools enable participants to share and edit documents collaboratively.

In-silico testing and modelling

Computer aided (in-silico) modelling is not new – engineering, architecture and many forms of manufacturing have used computer aided design (CAD) for decades, which makes dramatic energy savings over physical modelling and also enables increasingly optimal products to be designed and produced. In-silico modelling techniques are increasingly used to simulate experimental biology, replacing energy intensive, expensive and sometimes controversial procedures.

Paperless office technologies

The paperless office is now a reality, not a futuristic scenario. Electronic document management systems enable businesses to capture and store documents without ever needing to print them. They also provide automated document records management, for instance, logging and storing revisions and version control. The objectives are usually cost saving, access and security but clear environmental benefits are emerging. Electronic document management reduces the need for hardware and shrinks space requirements.

e-Books

Accessing a newspaper through a PDA has been found to have 1/600th the energy impact of printing and distributing the physical version to the same reader. An e-Book can either be purchased online and downloaded as a file or on disk, or borrowed through an online library. Other online content such as music or video can be downloaded direct to disk, obviating the need for hardware, packaging or postage.

e-Commerce

e-Commerce developed as a viable alternative to traditional, paper-based processes. e-Banking has now become a way of life for many people, and more and more people are transacting online with government. The dematerialisation of processes like renewing a tax disc online saves energy, time and effort.

Case studies - virtualisation

Transport substitutes I - Electronic conferencing: BT

BT implemented electronic conferencing to reduce travel and improve productivity. Video, phone and web-based conferences were introduced across the organisation to replace face-to-face meetings. This new approach to conferencing has eliminated 300,000 face to face meetings and 1.5 million journeys made by BT staff. In the UK alone BT reduced their CO_2 emissions by 47,700 tonnes in one year. Electronic conferencing is playing a key role in helping BT achieve its own challenging emissions reduction targets.

Transport substitutes II - Homeshoring with Co-Op Travel Group

New technology is now enabling "homeshoring" where agents work flexible hours from home through a virtual call centre. The Co-Op Travel Group's Future Travel subsidiary is the largest virtual contact centre in the UK with 630 ABTA-certified home based staff. The environmental benefits include a reduction in energy requirements (because there are no central offices to heat and light), and minimal staff travel. The "rebound" effects are also minimised because the majority of workers are already home-based.

Transport substitutes III - Collaboration solutions: Thales nuVa

NuVa is a collaboration desk that allows teams of colleagues split geographically to work together and hold multi-way project meetings, using standard broadband connections to the internet. The nuVa collaborative desktop includes a number of support tools such as a synchronised document set for teams to use during their sessions. Benefits include improved staff efficiency, better time management, reduced travel and improved multi-site and off-site working.

Virtualising IT - Wyse Technology and Reed Managed Services

Reed Managed services wished to improve efficiency and reduce emissions by improving the efficiency of its IT systems. As well as changing to thin client solutions, the power efficiency of the servers in their data centres was optimised through virtualisation which in turn reduced space and cooling requirements. This combined approach resulted in energy savings of approximately 5.4 million KW hours of power, the number of storage drives was halved and the number of servers reduced by a factor of 20. It also resulted in a 20% reduction in Reed's annual IT budget and has provided a more cost effective way of working which will reduce operating costs for years to come.

Virtualising office processes - Digital Evidence Seals™: Evident Europe

Evident Europe provides Digital Evidence Seals™ that enable organisations to prove that digital data, documents and records have not been altered. An Evidence Seal™ is a simple piece of XML based data which is cryptographically appended to any digital data, over any digital medium. It proves, indisputably, the parties involved and provides independent validation, guarantees data integrity, durability, transparency and portability. A Digital Evidence Seal is a key enabler of the paperless office. Traditionally, documents had to be printed in hard copy to be authenticated, and then stored securely. Now, documents can remain in electronic format indefinitely, without risk.

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Intellect's mission is to use our expertise and knowledge to provide the highest quality of service and intelligence to our members in the information and communications technologies (ICT), electronics manufacturing and design, and consumer electronics (CE) sectors, including defence and space-related IT industries, helping them to make the right business decisions to deliver commercial solutions and achieve growth and profitability.

We do this by fostering improved business performance, encouraging thought leadership, and making the shaping of markets and influencing of policy possible.

We are constantly striving to provide work environments where our members can meet their potential and thrive in an atmosphere of excellence through working closely with the government, regulatory bodies, policy makers and businesses.

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