Epic

carbon reduction and e-learning

an epic white paper

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carbon reduction commitment

In the last few years thinking has moved from denying climate change is happening to working out how to move to a worldwide low carbon economy. The Carbon Reduction Commitment (CRC), which comes into force in April 2010, is a key part of the UK's strategy of how to encourage all to do more with less. Using energy more efficiently isn't just about saving money, it requires a complete shift in how organisations use energy and our current attitudes to energy intensive activities.

This White Paper seeks to explain what the CRC is, how it will affect all of us and the role of learning in promoting that change. It explores the relative carbon footprints of different types of training and looks at where e-learning fits into the picture.

what is the carbon reduction commitment?

The CRC (now known as the CRC Energy Efficiency Scheme) has been designed to generate a shift in behaviour and infrastructure within large organisations, driving down energy use and thereby reducing the amount of carbon released into the atmosphere. From April 2010, this new regulatory scheme aims to use the power of the market to persuade large companies and public sector organisations to use less energy.

How will the scheme work?

The scheme is based on the introduction of a 'cap and trade'[1] system which will gradually be tightened year on year:

- **In Phase 1**, from April 2010, organisations will be able to purchase an unlimited number of carbon allowances to cover their energy use at a fixed price of £12/TCO_2 (Total Carbon Dioxide). From the second year onwards, participants will annually have to purchase allowances, monitor energy use, report emissions and surrender allowances. It will cost organisations a minimum of £40,000 to purchase their allowances in April 2011's first sale, and more if the energy usage is greater than 6,000 MWh per year. Cash collected from allowance purchases will be recycled to participants six months later based on a public league table of performance. High performers will receive back more than they put in and low performers will get back less.
- **In Phase 2**, from 2013, the government will cap the number of allowances available each year and all allowances will be auctioned[2]. Penalties for being at the bottom of the league table will ratchet up. The risk – and cost – of not being energy efficient will increase over time as carbon allowances are restricted and their costs rise.

The overall aim of the system is to make organisations have a good hard look at where they can save energy and make those savings wherever they can. As the cost of carbon allowances rise, so energy savings which might once have been dismissed as too expensive or too difficult, will become more attractive. Put simply, all large organisations will have a major incentive to reduce carbon emissions resulting from their business activities.

Who is affected?

The CRC is targeting large, non-energy intensive, private and public sector organisations within the UK, whose combined electricity use through half hourly metering exceeds 6,000 MWh per year, at a typical cost of around £0.5 million a year.

The 5,000 or so organisations affected include: supermarket chains, large retailers, water companies, banks, large groups of companies, NHS trusts, local authorities and universities.

Money out of the window? The Carbon Trust estimates that UK Businesses waste 10-20% of the energy they buy.

What will this mean for organisations affected?

For most organisations, energy efficiency is already core business. However, the CRC will mean a step change in how energy efficiency is addressed, and the potential financial and reputational consequences will mean that change is driven from the top down.

Prudent large organisations have already started to prepare, and develop a carbon reduction strategy. Measuring, metering and monitoring all areas of the business are key to identifying where savings can be made.

Organisations can also gain credit in the early stages of the scheme by achieving the Carbon Trust Standard through demonstrating carbon measurement, management and reduction.[3]

Saving energy, of course, also means saving money. The Department of Energy and Climate Change (DECC) estimates that the CRC will save participants around £1billion per year by 2020 through energy efficiency measures that are not yet being taken up.

e-learning and CRC

The focus on energy efficiency means that organisations will be scrutinising all areas of their business, and the Learning and Development function will not be exempt. Rather, it will be central to driving home the message and reinforcing the new behaviours needed across the whole organisation. Training departments will not only need to be promoting the new mindsets, but will themselves need to be a model of energy efficient ways of working. And this could require considerable change.

Consider for a moment the likely energy use of a traditional trainer-led, classroom model for a major UK corporate:

- Delegates travel by car to regional training centres (one person per car!)
- Others fly in from offices overseas
- Expert trainers criss-cross the country from speaking slot to speaking slot
- Training rooms use large amounts of heat and light
- Course notes come as multiple page handouts, in non-recyclable plastic binders
- Delegates stay overnight in rooms using heat, light etc.

Each ream of paper used contributes 0.002 tonnes of CO_2.

In environmental terms, this is clearly inefficient. While there's always a place for face-to- face interaction, the CRC provides the impetus for looking again at the methods by which training is delivered and the opportunities that technology offers for promoting and sharing learning in digital ways.

These include:

- Virtual classrooms to minimise travel
- Web conferencing to replace meetings and travel
- Expert resources held digitally and accessed on screen when needed
- User generated content in the forms of blogs and wikis enabling sharing of best practice
- E-learning programmes to impart knowledge
- Online assessments
- Small just-in-time learning objects created quickly

Organisations looking to make year on year efficiency savings will be looking at each training requirement, and considering ways of combining human interactions with technology.

But more technology means more computer time and a higher carbon footprint?

Of course, there will be no savings if using digital learning causes more energy use than traditional training activities. There has been extensive debate on how much carbon is saved by moving functions from the 'real' world to the digital world. For example, a recent study looked at the energy and CO_2 emissions associated with delivering a single album of music to a customer, and compared purchasing from a shop with online purchase and postal delivery with downloading an MP3/4 file and using it digitally.

Despite the increased energy and emissions associated with Internet data flows, purchasing music digitally reduces the energy and carbon dioxide (CO_2) emissions associated with delivering music to customers by between 40 and 80% from the best-case physical CD delivery, depending on whether a customer then burns the files to CD or not. This reduction is due to the elimination of CDs, CD packaging, and the physical delivery of CDs to the household. Based on our assumptions, online delivery is clearly superior from an energy and CO_2 perspective when compared to traditional CD distribution.[4]

Using this model, it is clear that carbon savings will accrue from moving from hard copies to

digital learning resources through the elimination of printed handouts, and their associated energy usage. There are also savings to be made from heating or air-conditioning separate training rooms, travel and the running of training equipment to show the all important PowerPoints.

Against this will have to be balanced the extra hours that the computer will be on for the learner to use the e-learning. However, these extra hours of use are very small compared to organisations' overall use of energy to power computers and servers. The real savings come from getting people to change their behaviour through switch-off campaigns, the use of intelligent power management and replacement of old equipment with more energy efficient kit.

A survey conducted by the National Energy Foundation (NEF) and computer company 1E revealed that 1.7 million computers were left on over-night and at weekends in 2005, creating emissions equivalent to 120,000 4x4s and costing £115m in electricity. Monitors use about two thirds of the energy required to power the computer. Putting your com-puter into sleep mode reduces the amount of energy it uses by 60-70%. And if you can, turn it off. After just 16 minutes of not using your computer, it's more energy efficient to turn it off and restart it than to keep it on. Most IT equipment now has power-management features, so make sure these are activated.

carbon footprint comparison: e-learning/ technology based training and classroom models

A worked example

The following example is based on a real, private sector, UK based professional services firm, employing 5,000 staff – exactly the type of organisation which will be affected by the CRC. For the purposes of our illustration, we'll refer to them as *Reliable plc* and compare the possible carbon footprint of their current training delivery method with the emissions from a technology-led approach.

Current training provision

Reliable currently delivers an average of 2 days training annually for each member of staff. Until recently, this training was delivered entirely by face-to-face training, generally with sessions of 10-12 staff at a time, with a single trainer. Although UK based, *Reliable* has offices throughout Europe, with around 30% of staff based overseas. Training comprises a combination of two-day, one-day and half-day sessions, many delivered locally, but a large proportion delivered in UK training centres. Subjects include a variety of generic skills, such as health and safety, IT, finance, induction, management and leadership, as well as specific skills relating to the firm's business – risk, project management, ethical behaviour, values and sector-related competencies.

Whilst based on a real organisation, to enable the comparison, let's make a

few simple assumptions and simplifications about *Reliable's* training delivery. Let's assume:

- A total of 1,000 training sessions are delivered annually
- Half the employees are trained on site and hence have no additional travel on top of their normal work activities. Of the rest, 40% travel by car to a regional training centre each year and 10% fly
- Regional trainers mostly travel by car, with occasional short haul flights to the more distant regions
- Every trainee receives a printed handout for each session
- Whilst attending the training, employees switch off their computers for the equivalent of half a day while they are on the course (using their laptops during the evening!)
- Overnight accommodation is required for delegates on 2 day courses

Sound familiar? The above may not entirely match your own organisation's approach, but it's not an uncommon scenario, and based on real facts and figures.

Vision for 2013

So that's the current setup. But *Reliable* has a long term vision to ensure that by 2013, 80% of their training is delivered by e-learning and other technology based solutions, including webinars, Web 2.0 approaches and e-learning, and only 20% is face-to-face. (In real life, *Reliable* has already started this process, but for the illustration, let's assume they're starting now.)

E-learning and technology based solutions clearly avoid the majority of the above emissions as there's no need for travel or accommodation, and handouts are redundant. The only carbon cost of an e-learning/technology based solution is that of running a computer for the duration of the training. What's more, based on research showing a 40%-60% reduction in typical learning time from e-learning compared to face-to-face training, it's safe to assume

that every hour of face-to-face instruction is replaced by 30 minutes of e-learning.

Comparison of each model

The following table shows the CO_2 impact of moving to the 2013 vision. While the CRC itself does not include energy use from travel, we've included these to show a truer picture of the carbon cost of training, and also of course, to highlight the potential cost savings from e-learning delivery. (For a detailed list of our assumptions/calculations, please see Appendix B.)

As we can see, the effect is staggering, and don't forget, we haven't worked out the cost savings, just the CO_2 reductions.

By moving to their 2013 vision for training delivery, *Reliable's* training function will reduce carbon emissions by 202 tonnes a year, from 240 tonnes to just 38, a reduction of 84% - enough to convince even the most ardent environmental sceptic!

2010: Traditional training (2 days training per employee)	CO2 (tonnes)	2013: A combination of 20% face-to-face and 80% e-learning	CO2 (tonnes)
		Running 5,000 computers for 6 hours (30,000 hours in total)	1.32
Printing of 10,000 handouts each of 30 pages = 300,000 sheets of paper)	2.48	Printing of 2,000 handouts each of 30 pages = 60,000	0.49
Heating and lighting of classroom for 1000 x 1 day sessions	4.8	Heating & lighting of classroom for 200 sessions	0.96
Trainees car travel (2,000 staff travelling 50 miles = 100,000 miles)	35.08	20% of this figure	7.01
Trainees air travel (500 staff travelling 500 miles = 250,000 air miles)	120	20% of this figure	24
Trainer car travel (990 sessions x 50 miles = 49,500 miles)	17.54	20% of this figure	3.508
Trainer air travel (10 x 500 miles = 5,000 air miles)	2.4	20% of this figure	0.48
Hotel/training centre accommodation (2,000 overnight stays)	59.06	All need for hotel/training centre accomodation is removed due to shortened length of face to face training	0
Less energy savings from not switching on computers for a day on each day's training	-1.76		N/A
Total	**240**	**Total**	**38**

How green is e-learning?

The above calculation raises an interesting issue – just how 'green' is e-learning, i.e what's the reduction in carbon emissions from replacing a specific classroom course with e-learning?

In fact, the answer depends on the size of the target audience - the greater the audience, the greater the reductions to be derived from using e-learning. For illustration, let's assume that *Reliable* needs to deliver compulsory compliance training to all 5,000 staff.

This is currently delivered face-to-face, in half-day workshops, 10 staff at a time.

As shown in the following table, converting a half day workshop to 2 hours of e-learning reduces the carbon footprint by 57.5 tonnes, from 58 tonnes to just 0.5 – a reduction of over 99%!

Half day face-to-face workshop	CO2 (tonnes)	2 hours of e-learning	CO2 (tonnes)
		Running 5,000 computers for 2 hours (10,000 hours in total)	0.44
Printing of 5,000 handouts, each of 20 pages = 100,000 sheets of paper)	0.82		0
Heating and lighting of classroom for 500 x 0.5 day sessions	1.2		0
Trainees car travel (2,000 staff travelling 50 miles = 100,000 miles)	35.08		0
Trainees air travel (50 staff travelling 500 miles = 25,000 air miles)	12		0
Trainer car travel (500 sessions x 50 miles = 25,000 miles)	8.77		0
Trainer air travel (5 x 500 miles = 2,500 air miles)	1.2		0
Less energy savings from not switching on computers for a day on each day's training	-0.88		N/A
Total	**58**	**Total**	**0.5**

how we worked this all out

So, in this example two hours of e-learning reduces carbon emissions by 57.5 tonnes. As explained, this analysis is based on 5,000 staff. If *Reliable* had 10,000 staff, then the carbon footprint reduction would double. If they had 20,000 staff it would quadruple and so on.

Carrying this to its logical conclusion, based on some recent e-learning programmes Epic has delivered to over 250,000 staff in less than a year, the savings are even more extreme.

The conclusion is clear. E-learning is very green!

At Epic we don't pretend to be carbon experts, but we are careful with our energy use. All organisations are different and their energy use and efficiency will depend on a wide range of factors - location, type of business, age of equipment and buildings etc. To make this calculation we used standard calculators available on the web:

- Carbon costs for travel are derived from www.carbonfootprint.com, which uses emissions figures published by DEFRA
- Carbon costs for printing were taken from http://h71028.www7.hp.com//enterprise/us/en/solutions/hp-carbon-footprint-calculator.html
- Carbon costs for hotel stays were taken from http://www.carbonfund.org/site/pages/carbon_calculators/category/assumptions

We tried a number of different variables and, interestingly, for organisations which need to train a large, dispersed workforce we couldn't find a situation where e-learning used more carbon than traditional training - the difference was only one of degree.

For simplicity, this calculation doesn't include the carbon costs of creating either traditional training or e-learning. These costs could include computer use for research, printing and travel.

At Epic we monitor our electricity use as part of our adherence to the ISO 14001:2004 environmental management standard, and are committed to reducing this wherever we can.

We have calculated our own direct energy costs for creating a one hour e-learning programme as 0.44 tonnes of CO_2. Adding a further 0.08 tonnes for travel, the carbon footprint for the creation of this programme could be as low as 0.52 tonnes, only a fraction of the savings outlined above.

making the cultural change - the transition to a low carbon organisation

E-learning will be central to getting the message across – and above all, that should be a positive message. While climate change is undeniably the most serious environmental problem facing us all, the emphasis needs to be on the effect of positive action and how each small choice we make contributes to a larger whole. Simply having knowledge of climate change is not enough – and doom-laden pictures of dead dolphins tend to lead people to believe that the problem is too big and there is nothing effective they can do. Instead, we need to know what we can do and more importantly, what effect it will have.

A recent study by the Energy Saving Trust[5] (October 2009) found that although British children were the most knowledgeable in Europe about the science behind climate change, they came bottom of the league in energy saving in simple matters such as switching off lights and leaving appliances on standby. So it isn't all about knowledge – it's about creating a climate of positive action where positive behaviour is rewarded, where new ideas are encouraged, and where participants are able to

experiment with different actions so that they can understand the outcome of their choices – all areas where e-learning excels.

Several of Epic's major clients have already commissioned climate change e-learning programmes to deliver these messages, including E.ON, Envido and O2.

So what about smaller companies?

As organisations become more energy conscious and as sustainable procurement rules percolate downwards, all smaller supplier companies will need to tighten up their approach to carbon emissions in order to remain in the supply chain. Organisations subject to CRC will be unimpressed by smaller organisations who wish to do business with them yet don't take their climate change responsibilities seriously. Not all organisations have ISO 14001 accreditation or EMAS, but in future all will need to show clear, verifiable evidence of their actions to reduce energy consumption.

Kieran Brocklebank, Head of Strategy and Performance, Supply Chain, at United Utilities said:

"Sustainability is fast on the heels of health and safety to become a minimum criterion for tenders. We want to deal only with more responsible suppliers as it helps our reputation: and more sustainable suppliers are usually lower waste suppliers, and more competitive."

The end of the beginning

With the exceptions of a few diehards who probably still believe the world is flat, it is now accepted that the world's climate is changing, and this change is anthropogenic, or man-made. Large scale burning of fossil fuels (particularly coal and oil) since the industrial revolution have released large amounts of CO_2 and methane into the atmosphere, which have built up to the extent that they now prevent the Earth's heat escaping as quickly as it once did. Consequently, the world's temperature is gradually warming. Even if we stopped all emissions tomorrow, the timelag effect of emissions from previous years would still cause the temperature to keep climbing for the next 50 years.

The question now is not if climate change is happening, but how to react and adapt to it – and how to move to a carbon neutral economy that gradually reduces carbon emissions for the future. The UK government is committed to reducing UK emissions by 34% from 1990 levels, and the CRC is a key part of that whole strategy, as set out in 'The UK Low Carbon Transition Plan.[6] This plan will require all organisations to look at new, more energy efficient ways of working, which in turn will require new ways of learning. The world is gradually adapting to the consequences of climate change, and innovative ways of learning have a role to play in that adaptation.

conclusions

Most large organisations are already taking steps to prepare for the Carbon Reduction Commitment - installing energy meters to measure energy use and conducting energy audits. All will be looking for ways to save energy, whether on heating, lighting or ventilation, through efficiency measures in IT or installing an energy management system.

E-learning clearly has a role to play is reducing the carbon footprint of any large organisation. Using a simple set of assumptions, by replacing just one classroom course, an organisation of 5,000 staff could reduce the footprint of that training by over 99%. For larger scale roll-outs, the impact can be even greater. E-learning is very green!

However, the most effective means of savings energy will be through changing behaviours - how people use computers, how they travel and how they learn. Training and development will be a key part of this change. Training managers will need to be fully engaged with the change and alert to the possibilities that technology offers for reducing energy consumption.

Using e-learning as the medium to reinforce messages will not only help employees to understand the new ethos but will help reduce the overall carbon footprint too.

If you have any comments on this White Paper you can contact the author, Sarah Axon, at sarahax@epic.co.uk

Epic is proud to be the first UK e-learning company to achieve the ISO 14001:2004 Environmental Management Standard.

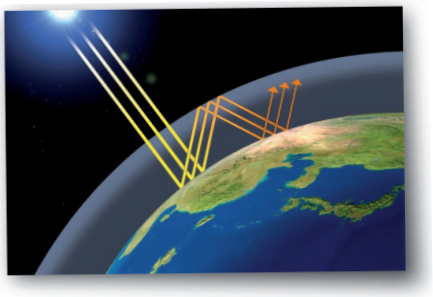
appendix a: beginner's guide to carbon emissions

What are carbon emissions?

Carbon emissions usually refer to the man-made production of a series of gases that accumulate in the atmosphere and help to warm it. Strictly speaking, not all of these so-called greenhouse gases contain carbon. Some use the phrase as shorthand for emissions of carbon dioxide, which is the most important greenhouse gas produced. Often the emissions of other greenhouse gases are measured by converting them to the equivalent quantity of carbon dioxide needed to produce a similar warming effect – denoted as CO_2[eq].

Why do they matter?

They trap heat sent from the Earth's surface in a process known as the greenhouse effect. Sunlight, either direct from the sun or reflected back from shiny parts of the Earth, can pass straight through. But sunlight absorbed by the Earth and then re-emitted as thermal energy – such as from a tarmac road on a sunny day – is absorbed. As carbon emissions build up in the atmosphere, so the amount of heat they trap and send back to the surface increases. This steadily increases the temperature of the Earth's surface and drives global warming.



Where do they come from?

Mostly from energy use: fossil fuels such as oil, gas and coal have driven the world's economies since the industrial

revolution and have released carbon emissions in the process. Almost all aspects of our lifestyles rely on access to cheap energy – from transport to central heating, which, in turn, rely on fossil fuels. Energy-intensive industries such as steel and cement have particularly high carbon emissions. Besides energy use, activities such as agriculture produce greenhouse gas emissions, either directly through changes in land-use or indirectly from fertilisers.

How much is produced?

About 26 billion tons of carbon dioxide every year, and rising. World emissions have increased sharply since 2000, mainly driven by the coal-driven economic boom in China. Carbon emissions are closely tied to GDP, so as the economy grows, so do emissions. The recession may reduce emissions slightly, but is not expected to have a significant impact in the long term.

Can they be reduced?

Only by the world using less energy, or making the switch to renewable energy such as wind power, which does not produce carbon pollution. Both are proving hard. Demand for energy is expected to soar over the next few decades and efforts to develop and introduce renewable alternatives are patchy at best. Another possible solution is to trap emissions underground, but the technology required is unproven on a large scale.

What about the Kyoto Protocol?

The 1997 Kyoto agreement is the world's only attempt to regulate carbon emissions. It set targets for rich countries, who collectively were supposed to reduce emissions by about 5%.

While some countries such as Britain are likely to meet their 2012 target, many are way over budget. The US famously refused to participate in Kyoto, which significantly weakened its impact. The first phase of Kyoto expires in 2012, and the world is still trying to agree a successor.[7]

appendix b: assumptions relating to Reliable's training delivery

Below are the assumptions used when calculating the carbon emissions of *Reliable's* training function. As outlined earlier, whilst simplified, these are based on a real professional services firm:

- A total of 1,000 training sessions are delivered annually (5,000 staff, each with 2 days training, with 10 staff attending each session)
- Of these 1,000 sessions, 200 are 2-day courses, 600 are 1-day courses and 200 are half day workshops
- 50% of employees are trained on site and hence have no additional travel on top of their normal work activities
- 40% have a single 50 mile round car trip to a regional training centre each year and 10% have a 500 mile round flight
- Regional trainers travel by car for an average of 50 miles per round trip and make 500 mile round trip flights to 10 of the more distant regions
- Every trainee receives a 30 page printed handout for each session
- Overnight accommodation is required for delegates on 2 day courses
- When replacing the face-to-face training, *Reliable* converts the training sessions into 6 hours of e-learning in total for each employee
- The half day compliance workshop converts to 2 hours of e-learning

Of course, your own training and development function will work to a different set of parameters, but the logic will remain the same.

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