Admin office, University of Bath | Marcus Ginns

Our Big Energy Challenge
A final review

Centre for Sustainable Energy

Our Big Energy Challenge was a 3-year campaign designed to save energy and save money.

It involved the main public sector bodies in Bath & North East Somerset and combined high-tech energy monitoring with staff awareness.

This report details its impact and legacy and the lessons learned from the project's delivery.

"With the help of Our Big Energy Challenge I was able to identify and quantify where and what energy was used. For the first time I could see the way forward to reducing it"

Robin Stedman, Estates Projects Manager, Bath & North East Somerset Primary Care Trust

Our Big Energy Challenge
Introduction

Our Big Energy Challenge was a three-year initiative that aimed to reduce by 10% the amount of gas, electricity and oil used by public-sector bodies in and around the city of Bath. It began in April 2006.

The budget for the project was £1.7m of which £932,000 was match funding (both cash and in-kind) from the project partners and £772,000 was grant funding from HM Treasury's Invest to Save Budget which seeks to encourage improvements to the delivery of public services.

The project was devised and led by the Centre for Sustainable Energy (CSE), a Bristol-based sustainable energy charity. A range of public-sector organisations took part in the project, all of whom are members of Bath & North East Somerset's Local Strategic Partnership (LSP, see box). Between them, these bodies had a combined energy spend estimated at £4.5m in 2005.

The launch of the project coincided with a steep rise in energy prices. As a result, some partner organisations faced increases in their electricity, gas or oil bills of up to 50%. The potential impact of this on front-line services (e.g. street cleaning, health care, books) was undoubtedly a motivating factor for many of them to become involved in the initiative.

Our Big Energy Challenge took a two-pronged approach. Firstly, there was a technology-focussed programme of capital investment to improve energy monitoring and management. This involved the installation of state-of-the-art monitoring equipment which was used to profile the patterns of energy use at particular buildings and identify those with the greatest potential for improvements in energy efficiency. In addition there was £138,000 available for investment in capital measures such as smarter lighting, more sophisticated heating controls and better insulation.

Who took part
Bath & North East Somerset Council • University of Bath • Royal United Hospital Trust • Somer Housing Trust • City of Bath College • Bath Spa University • Norton Radstock College • Avon and Somerset Constabulary* • Bath & North East Somerset Primary Care Trust • Council for Voluntary Services* • Racial Equality Council* • Avon Local Councils Association

Secondly – and because CSE's thirty years of experience suggests that technology alone is not enough – there was also a programme of staff engagement. This 'prong' of the project aimed to help the organisations' 14,000 employees to become more energy aware and to adopt energy-saving behaviour in their workplace, such as switching off lights and machinery when appropriate, and not leaving office equipment running overnight.

Central to this effort was the recruitment of around 150 staff from within the partner organisations as **energy champions**. These volunteers – ranging from university professors to council administration staff – received formal training in energy issues and colleague engagement to help them promote the project internally and support others' efforts to save energy in the workplace. Training for other occupational groups – such as estates, catering, security and sports centre staff – was also undertaken.

So, was the 10% target met? Because of the poor level of energy monitoring prior to the project, it's frustratingly difficult to be sure. But we think the answer is 'yes, it was'.

In brief, we calculate that the combined savings from *technical* measures represent over 4% of the LSP's estimated annual energy use. To this, we can add savings made by people changing their *behaviour*, which, although difficult to quantify, can yield a further 5-10%. Ongoing *monitoring* of energy use across the participating organisations should reveal opportunities for further cuts in energy consumption, and these, studies show, can lead to further savings of typically around 5%.

This report details the steps taken in Our Big Energy Challenge, the impact and positive legacy of the project, and the lessons learned that can be applied to future initiatives.

Technical measures

"If you don't measure it, you can't manage it." This maxim summed up the approach of Our Big Energy Challenge when it came to helping partner organisations spend some £300,000 on energy saving measures. Top of the shopping list came energy monitoring kits.

At the start of the project, the level of energy monitoring being undertaken varied widely across the organisations meaning it was difficult in some cases to establish a 'baseline energy consumption' against which to assess future savings. It also made it trickier to identify opportunities for energy saving through data analysis, for example by noting moments of unexpectedly high rates of consumption.

Various monitoring and targeting (M&T) systems and associated equipment were therefore specified in an attempt to bring all the sites up to a minimum level of monitoring. These included 'smart' meters, portable data logging equipment, software analysis packages and even the introduction of old-fashioned meter-reading regimes.

Alongside this, site surveys were undertaken to assess the opportunities for energy saving measures. The main factors taken into account were cost, savings achieved, ease of installation and the likelihood of replicating the measure elsewhere in the organisation. This latter point was especially relevant to the larger bodies (such as the Council and universities) where pilot projects were funded which, if viable, could be rolled out on a site-wide basis.

Installations of capital measures began in mid-2007 and were completed two years later. Of the £300,000 capital funding, 37% was spent on M&T equipment and 47% on energy saving equipment such as 'smart' lighting, additional insulation and advanced heating controls. The remainder was spent on specialist consultancy, including the design and specification of measures, and managing their installations. The table overleaf shows the range of measures that were installed at the main sites.

In some cases, 100% grant funding was offered in order to ensure that an energy-saving measure at a specific organisation was taken forward. In other cases, works were part-funded by the organisations themselves, broadening the scope of what was achieved and ensuring that organisations were directly involved in specifying and procuring.

In some instances, the support of Our Big Energy Challenge opened the doors to other sources of capital funding as well. The two universities participating in the project were

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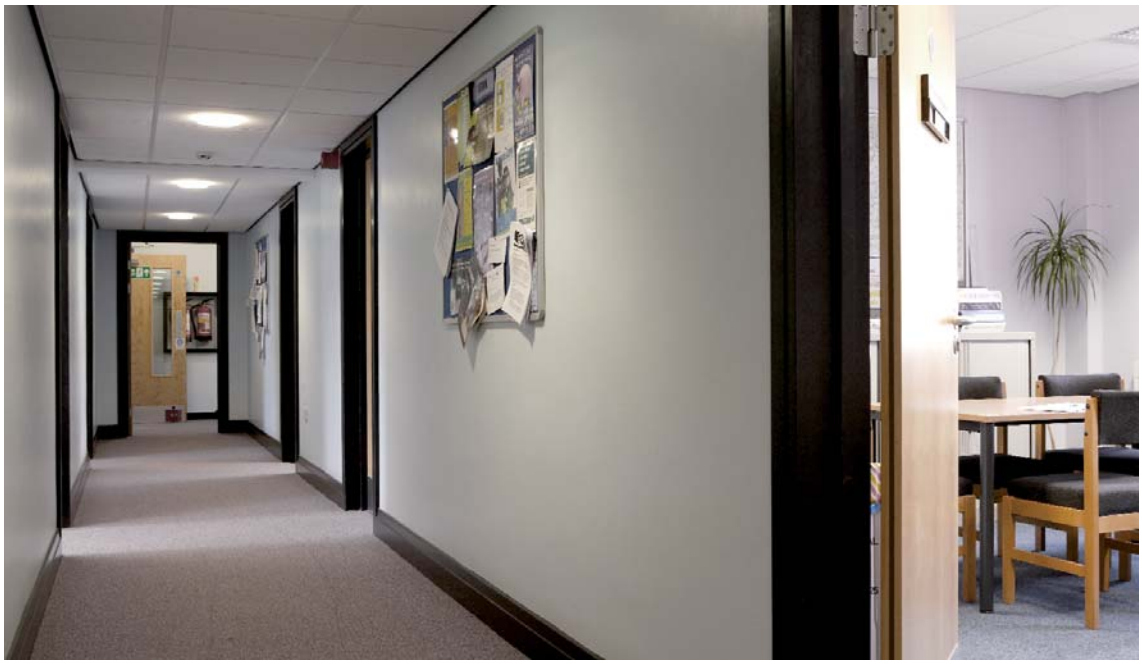

Bath police station | Marcus Ginns

Our Big Energy Challenge
Technical measures

continued ...
successful in their bids to the Carbon Trust Salix scheme, resulting in an additional £62,000 of interest-free loan funding for energy-saving measures.

Savings were mostly estimated through technical modelling, e.g. in the case of lighting refurbishment projects, using the reduction in power ratings and the estimated 'switch on/switch off' times. Further savings verification will emerge as installations are monitored and 'real' measured consumption data becomes available. (See p7-8 for case studies, and p10 for more about savings.)

A considerable amount of technical support was required by most organisations – especially those with only limited energy management resources or technical know-how. This was particularly relevant to the installation and commissioning phase, where external project management was required along with post-installation training and 'hand-holding'.

At the start of the project, energy management across the organisations ranged from minimal (e.g. simply an administrator who paid the energy bills) to quite sophisticated (in one case an energy manager with a support engineer). All participating organisations were encouraged to form an 'energy team' involving, for example, facilities staff and an energy champion representative (see p5).

Main measures funded (or part-funded) by Our Big Energy Challenge

Organisation	Measure
Bath & North East Somerset Council	Smart meters (various locations) Portable power monitoring kit Lighting upgrade (Guildhall and Hollies buildings) Voltage optimisation unit (Library) Hot water pipe lagging (Hollies building) Point-of-use water heating (Guildhall) Switched timers for office appliances (various locations)
St Martin's Hospital (Bath and North East Somerset PCT)	Advanced heating controls (Ward 3) Site-wide automatic M&T system with new submetering
Royal United Hospital	Installation of oxygen trim controls to all four boilers Installation of inverter to boiler No 1 Boiler sequencing controls Boiler water meters
Bath Spa University	Lighting refurbishment (Sydney block) Site-wide automatic M&T system with new submetering
University of Bath	Variable Speed Drives on boiler house fans Dessicant air dryer (to replace purging dryer) Heat meters for district heating system Metering panel (sports complex)
Somer Housing Trust	Portable power monitoring kit Computer network power saving software for server Upgrade for central boiler and controls (the Maltings)
City of Bath College	Site-wide automatic M&T system with new submetering
Norton Radstock College	Heat meters (various locations) Lighting refurbishment (Centurion Vocational Centre and library)
Avon & Somerset Constabulary	Lighting refurbishment (Bath and Keynsham stations)

Awareness raising

Technical improvements can be a great way to cut energy use, but people taking action themselves is also critical. This is where *energy awareness-raising* comes in, and in Our Big Energy Challenge much of this was directed through **energy champions**.

Energy champions were existing staff members from the participating organisations whose new role was to encourage energy saving – through raising awareness amongst their colleagues, setting an example themselves, and liaising with the energy manager or other appropriate members of staff. They took on this responsibility alongside their normal duties and were mostly volunteers driven by a commitment to cutting energy use, although some were encouraged into the role by their line-manager.

CSE provided training and materials as well as suggestions for actions that energy champions could take. These included energy audits of their building, presentations to colleagues, idea-sharing sessions, energy newsletters, a poster campaign or the labelling of office equipment that could be safely switched off when not in use. But the energy champions could choose which initiatives they wished to take and, as a result, the activities, the time dedicated to the project and the degree of success varied across the energy champion network.

The number of champions varied between organisations, but in general, each organisation recruited at least one per department or per area of the building. The support available for the energy champions varied from very good (a member of staff dedicated to managing the network) to virtually none. Unsurprisingly, the organisations that formally supported their champions got more out of them.

The original project plan for Our Big Energy Challenge had been to raise staff awareness through training courses (for champions) and short group-based presentations (for other staff). Once the project was underway, however, the organisations requested that the presentations were done online.

www.bigenergychallenge.org

Consequently, a web-based presentation was designed, and made available to all staff taking part (as well as members of the public). Despite the encouragement of a quarterly prize draw for staff who completed the presentation, it got fewer visitors than hoped. Nevertheless, several energy champions reported that when they went through the presentation with small groups it proved an effective and useful tool.

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Council offices, Bath | Marcus Ginns

"I'd known for some time the NHS Trust was wasting energy but could not identify where or how it was happening. With the help of Our Big Energy Challenge I was able to identify and quantify where and what energy was used. For the first time I could see the way forward to reducing it" **Robin Stedman, Estates Projects Manager, Bath & North East Somerset Primary Care Trust**

Our Big Energy Challenge
Awareness raising

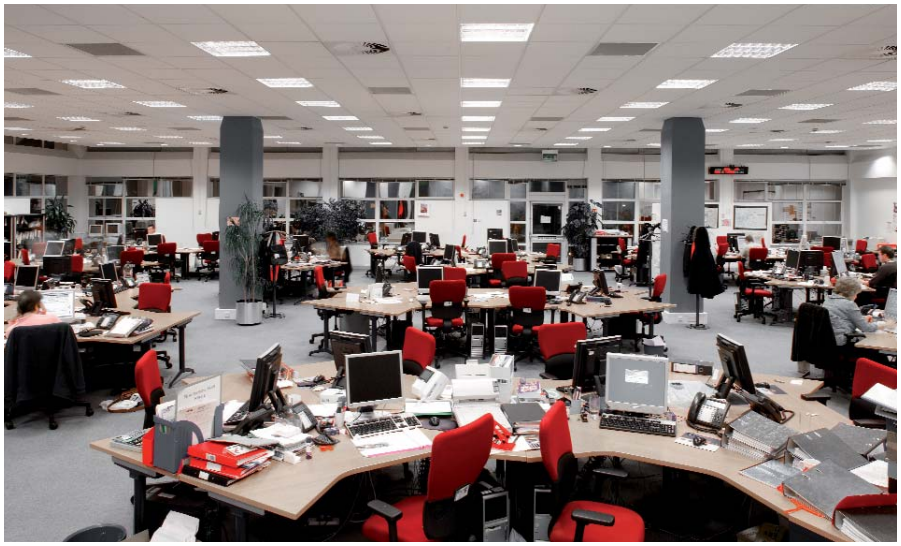
continued ...

Some organisations recognised that for many of their employees an online energy-awareness presentation was not appropriate – particularly for middle managers and groups of staff from high energy-use functions such as catering, cleaning, facilities and estate management. To meet their needs, the project designed and ran bespoke face-to-face training sessions, which led to motivated staff identifying and implementing significant changes to reduce energy usage.

One pleasing outcome of the project was the degree of inter-organisational communication it engendered. Energy champions from across the Local Strategic Partnership were in regular contact, sharing ideas and training sessions. A half-day energy champions conference was held in 2008 to encourage this development.

So, what factors helped the awareness-raising to be successful? Over the course of the project, several themes emerged, of which these are just a few:

- Projects like this one work better when undertaken in the context of an established corporate policy on energy and environment and when an organisation can demonstrate commitment to a 'green' agenda.
- If a member of an organisation's energy or sustainability team is present at training courses and other energy-awareness raising events, this provides credibility and demonstrates managerial buy-in.
- Awareness-raising is strengthened if it goes hand-in-hand with technical innovation – e.g. by publishing energy-use data in a simple form and encouraging staff to suggest energy-saving ideas.
- Energy champions benefit from a defined structure, encouragement to try their own ideas, and knowing where to go for help.



Materials produced for the project included mugs, giveaways, posters, and banner stands. The project funded some high-quality photography – examples of which are included in the report – shot on location in buildings belonging to organisations taking part in the project.

Finances & project management

The total budget for Our Big Energy Challenge was £1.7m. This comprised of £932,000 of match funding (both cash and in-kind) from the project partners, plus £772,000 of grant funding from the government's Invest to Save Budget (see www.isb.gov.uk).

Of the grant funding, £300,000 went on capital measures with the remainder spent on other aspects of the programme such as project management, publicity materials, staff training and awareness-raising. The chart below summarises how the grant funding was apportioned.

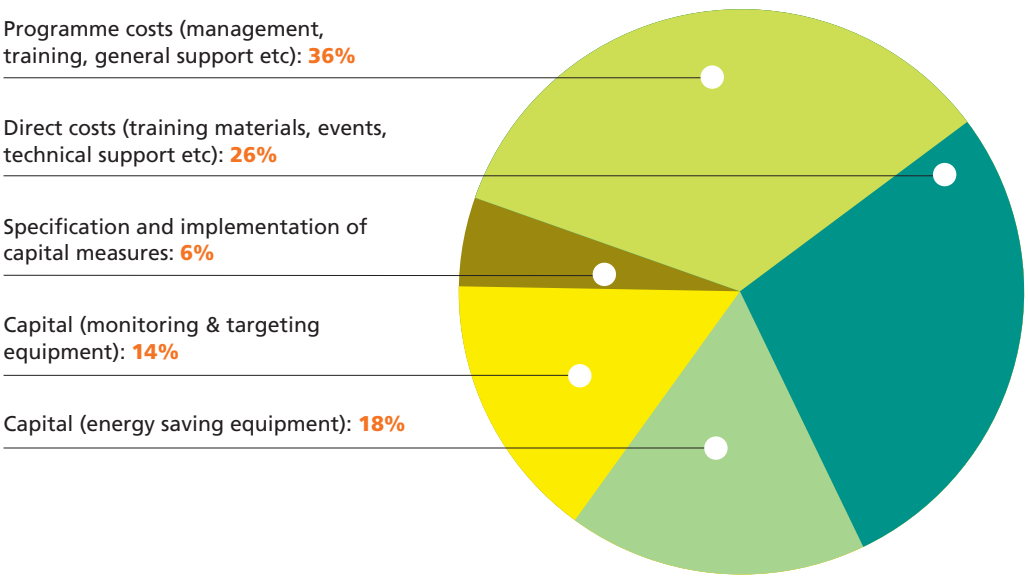
Reporting requirements of the Invest to Save Budget meant that a costed implementation plan was needed from the start, even though at that time it was impossible to fully evaluate the individual needs of each organisation or how long the initial fact-finding stage of the project would take. The implementation plan was therefore updated part-way through the project to take into account unforeseen delays in the first year and subsequent changes to the spending schedule.

A range of skills was required to support the various project tasks. Alongside the core project team at CSE, expert technical support was enlisted for the specification and implementation of capital measures, and a design and communications agency was engaged for the development of awareness-raising materials and the website. Many individual members of staff from the partner organisations also contributed valuable experience to both the technical and awareness-raising initiatives.

In addition to submitting six-monthly reports to HM Treasury, project reporting was mainly undertaken through progress updates to a steering group. This met on a quarterly basis and consisted of key representatives from the main participating organisations. A project review was held in early 2008 to take stock of achievements, and assess what was required to keep Our Big Energy Challenge aligned with its targets and objectives.

Managing a three-year project with a budget of this size involving twelve organisations was a challenging task, and required a close working relationship to be developed with key individuals from each site.

How Our Big Energy Challenge spent its grant funding



"Our Big Energy Challenge has helped to get energy and carbon management onto the agenda across our Local Strategic Partnership, and the desire to continue to work in partnership has contributed to the development of a new Environmental Sustainability Partnership in Bath and North East Somerset, focussed on tackling climate change together" **Jane Wildblood, Corporate Sustainability Manager, Bath & North East Somerset Council**

Our Big Energy Challenge
Case studies

Among the dozen or so organisations taking part in Our Big Energy Challenge there are lots of success stories. Here are four case studies that take a look at different aspects of the project.

1) Raising energy awareness: Bath Council's Green Week

The energy champions of Bath & North East Somerset Council used their annual Green Week, held every October, to reinforce the profile of Our Big Energy Challenge. Felicity Nuttall, a Sustainability Project Officer, said: "We raised awareness of energy saving habits across the council and are confident this will lead to further CO_2 and cost savings."

The event was actively supported by the Council's team of 47 energy champions who staffed information stands, lent copies of 'An Inconvenient Truth' and wrote an energy saving blog. They also periodically left chocolates on the desks of staff who remembered to switch their computer monitors off when they went home – this little reward led to a decrease of 5-10% in the number of computers left running overnight. "Not only did Green Week achieve its aims and objectives," adds Felicity, "but it also proves that there is a groundswell of opinion among staff for actions to cut energy use and tackle climate change. Several staff have been inspired by Green Week to put themselves forward for the role of energy champion."

Energy champions in other partner organisations have reported similar successes when 'piggybacking' energy-awareness onto other events or activities.

2) Technical innovation: seeing the light at Bath Spa University

Bath Spa University has a tradition of 'thinking green' and it didn't take long for them to seize the opportunities that Our Big Energy Challenge had to offer.

One of the University's main objectives was the improvement of the lighting in two buildings: the Sydney student residences (photo, right) and the Newton teaching block. Here, a series of improvements was undertaken which involved both changing the actual lighting itself, and installing controls. The cost was significant; virtually every single bulb and light fitting in both buildings was replaced, but the consequent reductions in operating costs made the investment well worthwhile.

The majority of the lights are now governed by sensors which measure the level of natural daylight or detect movement, and switch on or off accordingly. Corridor lighting in Sydney Building that used to burn 24 hours a day, now switches off automatically after two minutes. It's a similar story with teaching rooms in the Newton Building; here, the facilities used to be illuminated long after lectures or seminars were over, but now the lights go off when they are unoccupied or when daylight levels are adequate.

Since these changes were made, a number of individual lighting circuits were monitored by the project's technical team and they show a significant reduction in peak energy use. The cost of the lighting programme is in the region of £36,500 with estimated energy savings of £3,630 and nearly 50 tonnes of CO_2 a year.

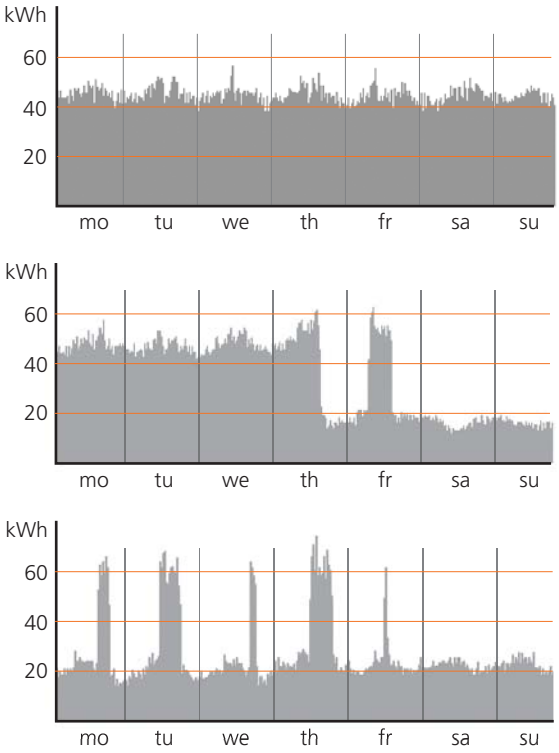
3) The impact of energy champions: £35,000 saved at physics lab

An energy champion at Bath University unearthed savings that will cut the campus's electricity bill by £35,000. Harry Bone, a technician in the Department of Physics and his colleague, technical manager, Alan George, used data gathered for Our Big Energy Challenge to identify key changes to the running of research laboratory building '3 West North' (3WN). These included closing down selected pieces of equipment at weekends along with other measures that could be made without risk to the experiments and teaching work that takes place there.

3WN contains an array of lasers, lathes and furnaces, a lecture theatre and classrooms. It is an energy intensive building that previously had an annual electricity bill of around £70,000. Now, thanks to the efforts of one energy champion the university will save 380,000 kWh or 160 tonnes CO_2 every year, worth £35,000 at today's prices. A combination of technology, information and people make big savings!

Weekly energy use at 3 West North

Top: energy use is consistently high all week, and costs £80,000 a year. Middle: energy use slashed at weekends. Bottom: energy use now significantly reduced



4) Measuring and monitoring: healthy savings in hospital

In 2007/08, the energy bill of St Martin's Hospital was an eye-watering £275,000. No surprise, then, that cutting consumption was a priority. However, the hospital lacked detailed consumption data, without which the prime targets for energy savings could not be identified. To address this, an automatic monitoring and targeting system was installed to measure electricity, gas and water consumption in selected areas. The cost was covered by Our Big Energy Challenge and came to around £13,500.

The system quickly identified several buildings where electricity and gas savings could be found, including Ward 3 where a new Building Management System (BMS) was installed. This enables greater control of the heating system, leading to dramatic reductions in heating costs as the ward changed from residential to day use, allowing the heating system to close down at night and at weekends. The Carbon Trust estimates that the installation of this kind of monitoring technology can save around 10% of energy costs. At St Martin's this could save £15,000 annually in gas bills alone.

Spurred on by this success, the hospital is now refurbishing parts of the original listed Victorian building that are badly in need of updating. An extensive list of measures is planned, including the following:

- Improvements to the hot water system
- A new and highly controllable central heating system
- Renovation of draughty old windows
- Tearing down internal partitions to allow more natural light to enter
- 'Smart' lighting with movement sensors, low wattage lamps, LED emergency lighting, etc.
- Renovation of ceiling and floors to cut heat loss and reduce heating need

Did it work, and will it last?

Did we hit our 10% target? It's difficult to be sure, but we think the answer is 'yes'. However, until Our Big Energy Challenge put the spotlight on energy use, most of the organisations involved didn't have accurate records of their energy use and expenditure, so a true benchmark could not be set. Additionally, the effect of energy savings made through *behavioural change* proved difficult to measure.

However, we can calculate that the combined savings from the *technical measures* funded by the project are around 7.5m kilowatt hours a year – equating to 4% of energy use and worth several hundreds of thousands of pounds. Added to this are savings that the partners have achieved by adding their own resources to those of the project.

Sites with the best energy monitoring made the most progress. The University of Bath reported a 7% reduction in electricity use over two years, while, across the city, Bath Spa University, cut its energy use by 9%. Combining these savings with those from grant-funded measures we estimate a saving of close to 7%.

However, this figure does not include all savings realised through behavioural measures, which, although difficult to quantify, can yield savings of 5-10%*. Taking the lower of this range, we can therefore conclude that our target of reducing energy use by 10% over three years has been reached. This corresponds to annual savings across the Local Strategic Partnership of around 18.5m kilowatt hours, over 5,600 tonnes of CO_2 and over £700,000 in bills.

Perhaps the most important legacy is the seed of change the project has sown among the partner organisations. By changing the way they perceive and use energy we believe the project has stimulated a degree of institutional change around energy management.

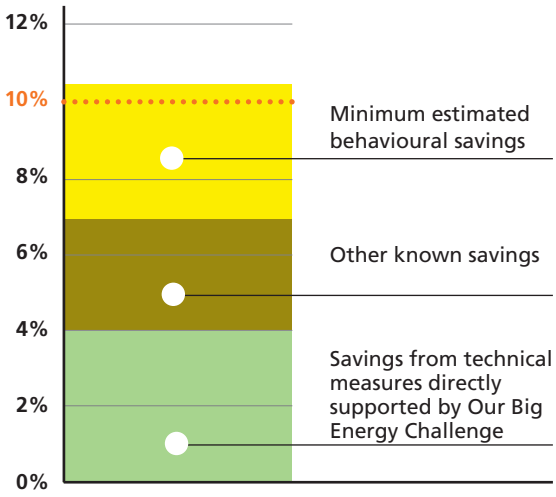
In many ways the energy champion role has been key in achieving this through awareness-raising at all levels. The improved energy monitoring kit implemented through Our Big Energy Challenge forms part of this and certainly helps to formalise energy reporting. The partner organisations should now be a lot more confident in answering the question "what was your actual energy consumption last year?" Indeed, a Carbon Trust study* demonstrates that advanced metering alone can identify an average of 12% carbon savings, with 5% savings typically being implemented.

By demonstrating a range of energy saving technologies through actual pilot projects, the partners have also broadened their knowledge base and understanding of how energy efficiency can be fitted into their organisation.

Over the course of the project, national and local policy drivers on climate change and sustainable energy have evolved dramatically, with a number of initiatives such as the Carbon Reduction Commitment Energy Efficiency Scheme directly affecting some of the larger organisations. At the local level, Bath & North East Somerset Council has recently set a carbon dioxide reduction target of 45% by 2026.

The council is also setting up an Environmental Sustainability Partnership, the chief purpose of which is the development of a climate change initiative for the district. This new partnership will build directly on the legacy of Our Big Energy Challenge, and the first priority will be the development of comprehensive carbon management plans and a new target for the public sector organisations.

Reaching 10%: percentage CO_2 savings compared to 2006/07 baseline



* Carbon Trust publications CTG001 and CTC713

Our Big Energy Challenge
Lessons learned

Working with such a variety of organisations proved challenging at first as each had different resources, skills and experiences. The plan for delivering Our Big Energy Challenge therefore evolved significantly over the first year, and in hindsight we have identified three critical actions that organisations must take if they are serious about wanting to save energy.

The **first** action is the establishment of top-level commitment from the start, ensuring that energy management is given a high organisational priority. This, in turn, facilitates the **second** action – the allocation of resources in terms of staff roles and responsibilities to enable the development and implementation of a sustainable energy strategy and action plan. The **third** action is all about evaluating current performance so that future improvements can be measured and benchmarked i.e. ensuring an adequate level of energy monitoring is in place as soon as possible (which can mean a 'back-to-basics' approach and manual meter readings).

However, while these actions might be crucial to the eventual success of any project like this, in Our Big Energy Challenge they were not fully in place from the beginning. Of course, high-level approvals *had* been made by partners, not least to secure the Invest to Save Budget funding. But once the project started it became clear that these actually represented a rather limited understanding and commitment. This took a bit of time to realise and address, and the project would have benefited from earlier attention to the resulting management challenges such as organisational change, cross-departmental working and political buy-in.

That said, it could be argued that, had all the challenges been properly understood at the outset, the participating organisations may have been tempted to water down their ambitions, leading to outcomes below what the project eventually achieved.

So while these three actions are critical, they do not necessarily represent the real initial catalyst of a successful energy saving initiative. In the case of Our Big Energy Challenge that catalyst was the core of committed members of staff from many organisations, brought together and driven by an external agency in the form of CSE which – unlike the core group – had the project as its day-to-day priority.

It is also worth re-emphasising the importance of energy champions in any long-term energy saving initiative. Without them, Our Big Energy Challenge would have struggled to get off the ground. But to work well energy champions need to be resourced and coordinated, and fed with raw material to work on, like usable consumption data. Timing is also important; an energy-champion programme should be launched at a point where it can take advantage of improvements in energy management (whilst bearing in mind that accurate monitoring of energy savings from *behavioural measures alone* requires specialised equipment and expertise).

The different needs and achievements of the wide variety of organisations involved in Our Big Energy Challenge demonstrate that no single energy-management 'model' suits all. Technical solutions are site-specific, and this is just as true for awareness-raising campaigns. Differences in working practices and staff culture require a tailoring of the approach both to disseminating information and materials, and in the actual energy saving tips themselves.

Last, but certainly not least, we've realised that there is great value in organisations having the opportunity to share experiences and expertise in all aspects of energy management. Local Strategic Partnerships can provide the means to facilitate this and should offer encouragement and incentives through regular seminars or meetings and by setting strategic targets.

Police station front office | Marcus Ginns

"This project has proved invaluable in raising awareness throughout the university community. It has helped us develop a network of keen and motivated energy champions, and created real momentum for further improvements in the future" **Peter Phelps, Energy & Environment Manager, University of Bath**








Photo credits Top two rows: Police station front office; Guildhall photocopying room; PCT physio room; PCT dentistry department; University IT suite; Police station kitchen area, all Marcus Ginns | Bottom row: scenes from the Big Energy Challenge event held at the Guildhall, Bath in February 2008, all Paul Groom.

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Our Big Energy Challenge

Making Bath and North East Somerset more energy efficient

Organisations participating in Our Big Energy Challenge

- Bath & North East Somerset Council
- University of Bath
- Royal United Hospital Trust
- Somer Housing Trust
- City of Bath College
- Bath Spa University
- Norton Radstock College
- Avon and Somerset Constabulary*
- Bath & North East Somerset PCT
- Council for Voluntary Services*
- Racial Equality Council*
- Avon Local Councils Association

* = Bath and North East Somerset branch or division

ISB

HM TREASURY
CABINET OFFICE

Our Big Energy Challenge was funded by the project partners (right) and HM Treasury's Invest to Save Budget which seeks to encourage improvements to the delivery of public services (www.isb.gov.uk).

Specialist technical support was provided by Ken Gale of Expert Monitoring Systems (07801 768 530), an accredited Carbon Trust consultant.

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