

Improving the energy performance of existing public buildings through monitoring, energy management and fostering of behavioural change

In a nutshell

SUMMARY
<p>It is best practice to:</p> <ul style="list-style-type: none">• train key staff with direct responsibility for building and energy management in energy efficiency; the training needs to include theoretical and practical sessions supported by proper manuals and guides;• engage all staff in actions that influence energy use (e.g. switch off lights, set a correct room temperature), focusing specifically on well-respected and influential members of staff (e.g. behaviour change champions);• plan and run behaviour change campaigns to drive energy efficiency across the public administration; firstly, the target audience of each campaign needs to be identified and then specific energy-efficient actions can be properly promoted among the targeted staff;• adopt Energy Performance Certificates and Display Energy Certificates, which rate the energy performance of a building, in order to display them prominently in the building or to use them as an engagement tool in specific awareness-raising campaigns.
Target group
All public administrations
Applicability
This best practice is applicable to all public administrations
Environmental performance indicators
<ul style="list-style-type: none">• Total annual energy use per unit of floor area, expressed as final energy (kWh/m²/year)• Percentage of staff engaged and who continue to be engaged one year after the launch of an awareness campaign (%)• Hours of environment-specific training provided per full time equivalent (FTE) employee and year (hours/FTE/year)
Benchmarks of excellence
N/A

Description

Public authorities have significant control over the energy performance of their current buildings. Very often they also have a large potential for improvement. However, sometimes the influence of a public authority on changes to the building fabric is limited (e.g. because of lack of funds or when it does not own the building it occupies). Moreover, increasingly, Public

Administration bodies are under growing pressure to reduce their spending and increase efficiency. This is currently being driven by substantial cuts in public funding. It is therefore important that low and no cost interventions are available to ensure that municipalities can improve the energy performance of buildings even without significant investment.

Items covered within this section, and applicable in an EU-wide context, include:

- Staff engagement and training and behaviour change campaigns
- Energy Performance Certificates (EPCs)/ Display Energy Certificates (DECs)

The following sections present these aspects in 2 sub-best practices.

Staff training and behaviour change campaigns

Description

Behaviour change campaigns (staff engagement) and training can have dramatic effects on the energy consumption of buildings. These low cost and widely applicable interventions can drive energy efficiency across Public Administration and inspire staff to lead more sustainable lives both in their work place and back at home. Numerous opportunities for energy reduction which are within the control of building occupants can be easily implemented through behaviour change campaigns, staff engagement and training.

Behaviour Change Campaigns:

Over recent years behaviour change campaigns have been increasingly used in Public Administration as a low cost mechanism to drive reductions in energy consumptions, water consumption and waste production.

There are many important elements to consider in the implementation of a successful behaviour change campaign. Understanding the target audience is paramount; this will vary within different areas of Public Administration bodies. In general it is best to include all staff in behaviour change campaign to ensure that maximum impact is delivered and all Public Administration employees are engaged and empowered to deliver reductions in energy consumption over a sustained period. In order to ensure that the campaign is a success it is important to focus attention on “Behaviour Change Champions” and to use multiple channels of communications; this will also ensure that costs are kept to a minimum and resources can be focused in key areas.

Behaviour Change Champions: These champions should be well respected and influential in the organisation but do not necessarily need to hold a position of significant responsibility. Training efforts and engagement activity should be channelled through Champions who will help communicate the various aspects of the campaigns and ensure that actions be followed up on.

Multiple Channels of Communication: To encourage positive environmental behaviour to reduce energy consumption it is important that the campaign is run in conjunction with an effective communications plan. In order to create maximum awareness for the plan numerous channels for communication should be implemented, these could include;

- E-bulletins and newsletters
- Campaign website or webpage
- Social media (e.g. Twitter and Facebook)
- Posters
- Stickers
- Tools, resources and training guides (for more information on this please see the staff training section)

Encouraging and incentivising behaviour change will ensure that staff are engaged over the long term. Campaigns which are participatory and fun will also be more effective. Using social norms is often a very effective way to drive collective energy saving; social norms can be powerful motivators of change. Examples of ways in which social norms can be used to change behaviour include the following:

- Publishing monthly performance league tables showing progress towards a previously agreed target. This helps to induce a competitive element to inter-departmental performance and a strong incentive for departments to avoid the reputational loss of being seen to perform poorly.
- Installing real-time energy displays in Public Administration buildings feeding into online reports can have a significant impact. This can help to ensure that awareness of the programme is maintained, while also giving departments much richer data about their ongoing performance. By making these real-time displays available to the public this can further encourage positive behaviour change through transparency and accountability of Public Administration to the public. Best practice in Public Administration organisations implementing this include Frankfurt-am-Main (Frankfurt am Main, 2014) and the UK Government's Department for Energy and Climate Change (Carbon Culture, 2014).
- Breaking down conventional social barriers and expectations can help reduce energy consumption. For example changing strict dress codes in the summer can enable people to wear more appropriate clothing and therefore reduce the amount of air-conditioning required. One very successful example of this is the 'Coolbiz' campaign launched by the Japanese Government in 2005 (Japan Times, 2014)

The gamification of campaigns and an element of competition will further drive the success of positive behaviour change. Humans are naturally motivated by competition and inspired by team working. Collective energy saving between teams or Public Administration buildings will ensure that a campaign has the greatest impact possible. User driven projects using behavioural economics and the gamification of energy through online platforms and real-time data can be incredibly successful and engage with many employees. For example the UK Government's 10:10 campaign worked with 1,000 staff at the Department for Energy and Climate Change's (DECC) Headquarters using gamification and an online platform to get full commitment from 40% of employees which resulted in significant saving in energy consumption (DECC, 2014).

Incentivisation is a good mechanism to motivate positive changes in behaviour. Incentives can range from financial payments to gifts and public recognition. Good examples of this include using small gifts (e.g., chocolates) to reward people for switching of their computer monitor and putting post-it notes on computers with their monitors left on informing the employee that they have missed out on getting a free chocolate. Financial incentives can be awarded to departments, buildings or organisations who demonstrate significant reductions in energy consumption. E.g the Euronet 50/50 gives back 50% of the financial savings made by schools and other Public Administration buildings to spend on energy saving programmes (Euronet 50/50, 2014). Where appropriate, financial rewards can be given to key individuals in the organisation. These key individuals should have a direct responsibility for energy management and consumption in Public Administration buildings. For example Energy and building managers, caretakers and cleaners all have a direct role in energy management within buildings. Cleaners and caretakers are often overlooked, however, they are often the last members of staff in the building and can therefore save significant amount of energy by switching off lights and electronic appliances at the end of the day. Frankfurt-am-Main is a front runner in this aspect of incentivisation and has a long history of staff engagement; since 1998 they have been paying bonuses to building and energy managers for saving energy in their Public Administration buildings (Frankfurt-am-Main, 2014).

Staff Training:

Behaviour change campaigns on their own are often not enough to ensure that significant reductions in energy use are achieved and that these reductions are long term. In order for this to happen it is important that key individuals in the organisation receive in-depth training so that they can manage buildings properly to deliver energy efficiency. Key staff should include any energy champions and members of staff with direct responsibility for building and energy management (see above – e.g. Energy and Building Managers, Caretakers, Cleaners, Facilities Management).

It is important that training is tailored to the specific role of individuals. E.g. cleaners should be trained in the importance of turning off lights and appliances at the end of the day and which appliances are safe to turn off. Caretakers and Facilities Management should be trained in building controls and heating and power systems. At the very least, training should cover the following areas

- Adjustment and controlling of the proper room temperatures and application of natural or mechanical ventilation
- Lighting, applying the appropriate and efficient lighting equipment and bulbs etc.
- Thermostatic valves and changing default settings in heating and power systems
- Check of the boiler insulation and lagging

- Training on the orientation of the building and proper use of the sunshades if applicable in the building.

There are various methods for training, as mentioned it is important for the training to be tailored to the specific audience in question. Training should involve a mix of presentations and learning in conjunction with site visits and practical sessions to ensure that all participants are able to carry out measures on the ground. To ensure that the training has a long lasting effect, manuals and guides should be produced. Guides should include information on energy saving measures, room temperature information and rules for room temperatures, inspection manuals and schedules for inspection, checklists, carbon footprint calculators and monthly energy report templates. One best practice example of a guide for Energy managers come from Sustainable Energy Ireland and covers sections for Energy Managers, Senior/Middle Management, Technical Managers/Engineers and Human Resources (Sustainable Energy Ireland, 2005)

It is possible to train all staff in energy efficiency through less resource intensive methods, such as including the importance of saving energy in staff inductions and distributing Environmental Education Guides to all staff. These guides should raise environmental awareness and should provide hints and tips to help improve the environmental performance of Public Administration buildings. One good example of this is the *Green Office Guide* (Barcelona City Council, 2014) created by Barcelona City Council.

Energy Performance Certificate (EPCs)/ Display Energy Certificates (DECs) as engagement tools

Description

Energy Performance Certificates (EPCs) and Display Energy Certificates (DECs) were introduced in the UK (similar schemes exist throughout the EU) under the impetus of the Buildings Energy Performance Directive (EPBD) starting in 2003 (European Commission, 2014). The principal objective of the Directive is to promote the improvement of the energy performance of buildings within the EU through cost-effective measures. The certificates rate the building on an A-G scale (A being the highest efficiency) and are presented in a similar way to other efficiency ratings for items such as refrigerators.

EPCs assess the energy efficiency of the fabric of a building, based on the U-values of materials and installed technologies and estimates of their performance under real conditions. DECs assess the actual energy consumption of a building, benchmarked against an “average” building of the same type, e.g. school or hospital.

The reports are produced by independent accredited assessors, although these can be employed by the organisation that is responsible for acquiring a report (with appropriate independence safeguards). The assessment usually consists of a site visit and survey, followed by data input into approved software to generate the report in a standard format.

One of the requirements of DECs is that the poster has to be displayed in a prominent place clearly visible to the public, e.g. near the building’s entrance. This is the minimum requirement however and some administrations have chosen to use the poster as an engagement tool, either through a specific campaign or through its display.

One example of the successful implementation of DECs, the European Display Campaign is a voluntary scheme designed by energy experts from European towns and cities. When started in 2003 it was initially aimed at encouraging local authorities to publicly display the energy and environmental performances of their public buildings using the same energy label that is used for household appliances. Since 2008 private companies are also encouraged to use Display for their corporate social responsibility CSR activities (Display, 2014).

With its strong emphasis on local communication campaigns and large variety of communication tools Display goes beyond the basic requirements of the EPBD.

General information:

EPCs and DECs are produced by accredited assessors with a visit to the site usually required. However, the following information should be provided for the assessor to make an accurate and useful assessment:

Building type and use

- Building floor plans
- Breakdown of usage of different parts of the building (e.g. café, office, sports hall)
- Occupancy hours for staff and public
- Meter locations, areas/buildings covered and units used (m³, kWh)

Energy Consumption

- Details of high energy usage equipment, e.g. boilers, pumps
- At least 12 months' energy consumption – gas, electricity etc.
 - meter readings
 - billing information

Environmental benefits

The achieved environmental benefits from staff engagement and training relate to reductions in energy consumption and correlating reductions in carbon dioxide emissions. Stand-alone energy efficiency technologies and building energy management systems have limited impact on in isolation. In order to drive real change in carbon reduction it is vital that Public Administration staff are engaged, trained, educated and enabled to change their behaviour to create reductions in energy consumption.

EPCs and DEC in themselves do not directly impact on CO₂ emissions; they are a tool that can be used to:

- a. Allow the public to hold public authorities to account for their CO₂ reduction commitments
- b. Act as an engagement tool for public authorities to engage with their own staff and citizens on energy efficiency in buildings
- c. Measure the energy performance of the building and improve it continuously over time through implementing the measures recommended in the accompanying Advisory Report
- d. Support the business case for making energy efficiency improvements

Side effects

There are no negative impacts on other environmental pressures relating to this best practice. In fact it is often the case that raising awareness about energy consumption often fits into wider engagement campaigns concerned with the environment. As a result staff engagement and training can have positive and long lasting effects on waste reduction, sustainable transport and other environmental areas. It is important that, where possible, educational material (e.g. training guides, manuals and checklists) available in soft copy to ensure that the use of paper is minimised.

Applicability

This best practice is potentially applicable across all typologies and scales of Public Administration areas and applicable across Europe.

EPCs and DEC are required for many buildings, particularly in the public sector, particularly in the public sector, but can be undertaken voluntarily by any building. Awareness campaigns and energy efficiency measures are optional, but are applicable in any type of building.

EPCs are required for all buildings that are rented, sold or under construction (in both private and public sector). DEC are currently required for all public buildings with a floor area of > 500 m².

EPCs and DEC can be used to show commitment to environmental targets without necessarily taking any action in practice ("ticking the boxes"). No action is specifically required from an organisation after receiving their EPC/DEC, although some legislation is now being introduced in some member states based on the ratings, e.g. the UK Energy Act 2011 makes it illegal from 2017 to let property that falls below a specified minimum EPC rating.

Economics

Many behavioural change interventions are no cost, however, for staff training and engagement there will be implications for staff time. In many cases financial incentives are offered in return for reductions in energy use, these are often met by the saving made by energy saving interventions. E.g. Euronet 50/50 <http://euronet50-50max.eu/en/>

There is a cost associated with measuring energy performance; this will vary greatly depending on the type of technology used and the extent to which it is deployed. E.g. the costs of intelligent metering project in Leicester were between 3,750 and 4,500 per building depending on the metering system. However, many buildings demonstrated short payback periods of below a year due to the saving opportunities resulting from raised energy awareness and saving identifies by the half hourly consumption information and follow up actions. The current annual savings in Leicester are in the order of 250,000 Euros per year (Intelligent Energy Europe, 2007).

The cost of obtaining an EPC or DEC is relatively low per building, although it can be relatively costly for smaller organisations. Usually the cost will be in the range of €500-5,000, although this will vary.

EPCs and DEC's do not save money directly, but can identify the potential cost savings from implementing behaviour change and energy efficiency measures.

Driving forces for implementation

The key driving force behind staff engagement and training is the ultimate reduction in energy use (and GHG) and costs associated with energy. By ensuring that Public Administration staff understands the effect they have on the energy consumption of their buildings, they become empowered to act. Behaviour change campaigns provide the incentives for staff to ensure that they minimise their energy use, and staff training ensures that members of staff responsible for specific areas of Public Administration operations have the knowledge and the skills to ensure that energy is used as efficiently as possible.

National or local legislation can also be an overarching driving force; in 2008 the UK government implemented the Climate Change Act, requiring government to reduce CO₂ emissions by 80% by 2050 and to set 5-year carbon budgets to achieve that goal.

Most public authorities and organisations will be required to produce EPCs and DEC's on a regular basis or on specific occasions, e.g. the sale or rental of a building. The EU-wide Buildings Energy Performance Directive (EPBD) has been implemented in member states since 2003. However, generally the only requirement is to obtain the report, not to actually implement any of the suggestions. There are, however, often benefits of using the reports as a basis for public and staff engagement as well as making the case for measures that save carbon, energy and costs.

For organisations or buildings that obtain an EPC or DEC voluntarily, often the motivation is to get some initial information on the current performance of the building in order to identify potential cost and CO₂ savings.

Reference organisations

Barcelona City Council, Catalonia

An impressive staff engagement and behaviour change campaign involving the publication of a *Green Office Guide* and using numerous channels for communication.

Department of Energy and Climate Change, UK

Signing up to an independent campaign to commit to reducing energy consumption by a significant amount. Used technological interventions and behaviour change to drive energy efficiency.

Geislingen, Germany

Staff training and engagement project across 80 facilities in the city to reduce the municipality energy, water and waste cost from 1,7000,000 Euro.

Leicester City Council, UK

Energy saving project using intelligent metering and behaviour change. Over 600 people were trained and various engagement materials were distributed.

Lahti Municipality, Finland

Lahti has set a target to become a leading environment-focused city. Lahti has adopted the Green Office environmental system developed by WWF and also compiled and Eco-Guide for all employees.

Sustainable Energy Ireland:

Developed a guide to enable Energy Managers to reduce the energy consumption of their buildings. Contains specific sections for Energy Managers, Senior/Middle Management, Technical Manager/Engineer and Human Resources.

Hamburg, Germany

The "Fifty-Fifty" project - Pupils examine their school

<http://www.display-campaign.org/example477>

Ivani?-Grad, Croatia

Prominent display of poster during renovation

Odense, Denmark

School district heating

<http://www.display-campaign.org/example162>

Cork County, Ireland

Administrative building

<http://www.display-campaign.org/example538>

Literature

10:10 Carbon Cutting for everyone [Online]. Available at: <http://www.1010global.org/uk/2011/07/what-government-learned-1010> [Accessed 23rd July 2014].

Barcelona City Council (2014). *The Green Office Guide* [Online]. Available at: http://www.bcn.cat/agenda21/A21_text/guies/GreenOfficeGuide.pdf [Accessed 23rd July 2014].

Carbon Culture (2014). *Department for Energy and Climate Change building energy performance* [Online]. Available at: <http://www.carbonculture.net/orgs/decc/> [Accessed 23rd July 2014].

Carbon Trust (2014). *Heating, ventilation and air conditioning, saving energy without compromising comfort* [Online]. Available at: https://www.carbontrust.com/media/7403/ctv046_heating_ventilation_and_air_conditioning.pdf [Accessed 23rd July 2014]

Communities and Local Government (2014). *Behaviour Change and Energy Use* [Online]. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48123/2135-behaviour-change-and-energy-use.pdf [Accessed 23rd July 2014] Data.gov.uk (2014). *Government reduces its carbon emissions by 13.8% in 12 months* [Online]. Available at: <http://data.gov.uk/departamental-performance-co2-emissions-reduction-date> [Accessed 23rd July 2014].

DECC (2012). *Improving Energy Efficiency in Buildings; Resource Guide for Local Authorities* [Online]. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/65578/6746-improving-energy-efficiency-in-buildings-resource.pdf [Accessed 23rd July 2014].

EC Directorate General for Energy and Transport (2014). *Case Study Nr 285; ZREU, Germany; Energy saving project Geislingen* [Online]. Available at: <http://www.managenergy.net/download/nr285.pdf> [Accessed 23rd July 2014].

ECEE (2014). *Energy savings from intelligent metering and behavioural change in local and regional public sector buildings* [Online]. Available at: http://www.ecee.org/library/conference_proceedings/ecee_Summer_Studies/2007/Panel_3/3.219/paper [Accessed 23rd July 2014].

- ECEEE (2014). "Low hanging fruits" or cost-effective energy and water saving using intelligent metering and monitoring systems [Online]. Available at: http://www.eceee.org/library/conference_proceedings/eceee_Summer_Studies/2007/Panel_4/4.282/paper [Accessed 23rd July 2014].
- Euronet 50/50 (2014). *Save energy and have fun. Everybody wins!* [Online]. Available at: <http://www.euronet50-50max.eu/en/> [Accessed 23rd July 2014].
- Frankfurt-am-Main (2014). *Hochbauamt – Energiemanagement* Stadt Frankfurt-am-Main [Online]. Available at: <http://www.energiemanagement.stadt-frankfurt.de/> [Accessed 23rd July 2014].
- HM Government (2012). *The Greening Government Commitments; annual report on government departments' progress against 2015 targets in 2011-12* [Online]. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69624/pb13846-greening-government-commitments.pdf [Accessed 23rd July 2014].
- Intelligent Energy Europe (2007). *Energy Saving from Intelligent Metering and Behaviour Change, Final Report* [Online]. Available at: http://ec.europa.eu/energy/intelligent/index_en.htm [Accessed 23rd July 2014].
- Intelligent Energy Europe (2014). *ENERinTOWN Case Study; Energy Saving Project Geislingen, Germany* [Online]. Available at: http://www.enerintown.org/download.ashx?f=ENERinTOWN_Case_Study_Geislingen.pdf [Accessed 23rd July 2014].
- Japan Times (2014). *Sweaty workers ditch ties as Cool Biz enters 10th year*, Japanese Times [Online]. Available at: <http://www.japantimes.co.jp/news/2014/05/01/business/sweaty-workers-ditch-ties-cool-biz-enters-10th-year/#.U8-HmPldVvo> [Accessed 23rd July 2014].
- Sustainable Energy Ireland (2005). *Building Energy Manager's Resource Guide* [Online]. Available at: <https://www.seai.ie/uploadedfiles/publications/Building%20Energy%20Managers%20Resource%20Guide1.pdf> [Accessed 23rd July 2014].
- Barcelona City Council / The Ajuntament De Barcelona (2014). *The Ajuntament and soctenible programme*. [Online]. Available at: <http://www.ajsosteniblebcn.cat/ca> [Accessed 23rd July 2014].
- UK Government data release (2014). *Government Reduces its carbon emissions by 13.8% in 12 months* [Online]. Available at: <http://data.gov.uk/departmental-performance-co2-emissions-reduction-date> [Accessed 23rd July 2014]
- Display (2014a). *Display Campaign Shining Examples* [Online]. Available at: <http://www.display-campaign.org/about844> [Accessed 01 August 2014].
- Display (2014b). *Big Posters in Municipal Buildings* [Online] <http://www.display-campaign.org/example827.html> [Accessed 29 September 2014].
- European Commission (2014). *European Commission: Energy efficiency* [Online]. Available at: http://ec.europa.eu/energy/efficiency/buildings/buildings_en.htm [Accessed 01 August 2014].