Growing Sustainable Tourism

Afon Gwyn

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Agenda

- Energy Saving Advice
- Feed in Tariff

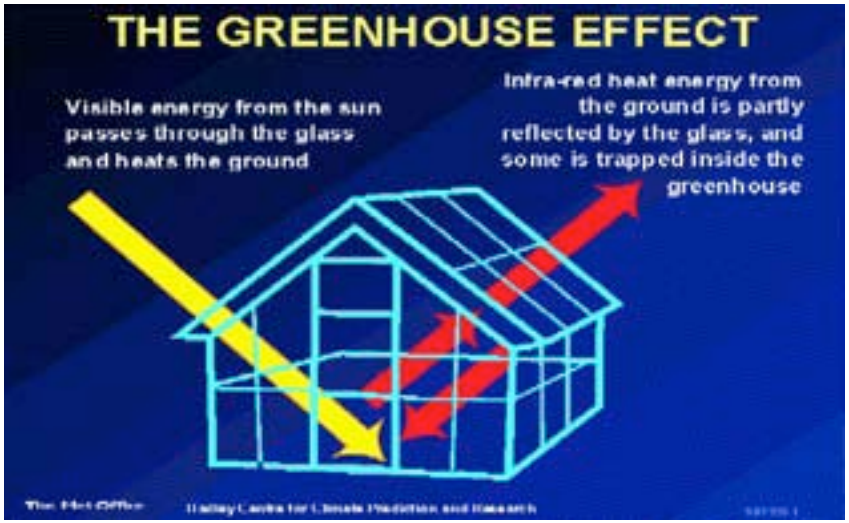
- PV "Rent a Roof"
  - ***Financial Benefits***
  - ***Financial risks***
  - ***Installation***
  - ***Ownership and maintenance***
  - ***Change in property ownership***

- Renewable Heat Incentive

- Summary

Green House Effect- Good or Bad?

- Climate change results from the 'enhanced' greenhouse effect



- Without the greenhouse effect there would be no life on earth!

Problem or Solution?

- Carbon Dioxide represents 60% of the effect of all Greenhouse Gases
- Are you part of the problem?
- What can you do to be part of the solution?

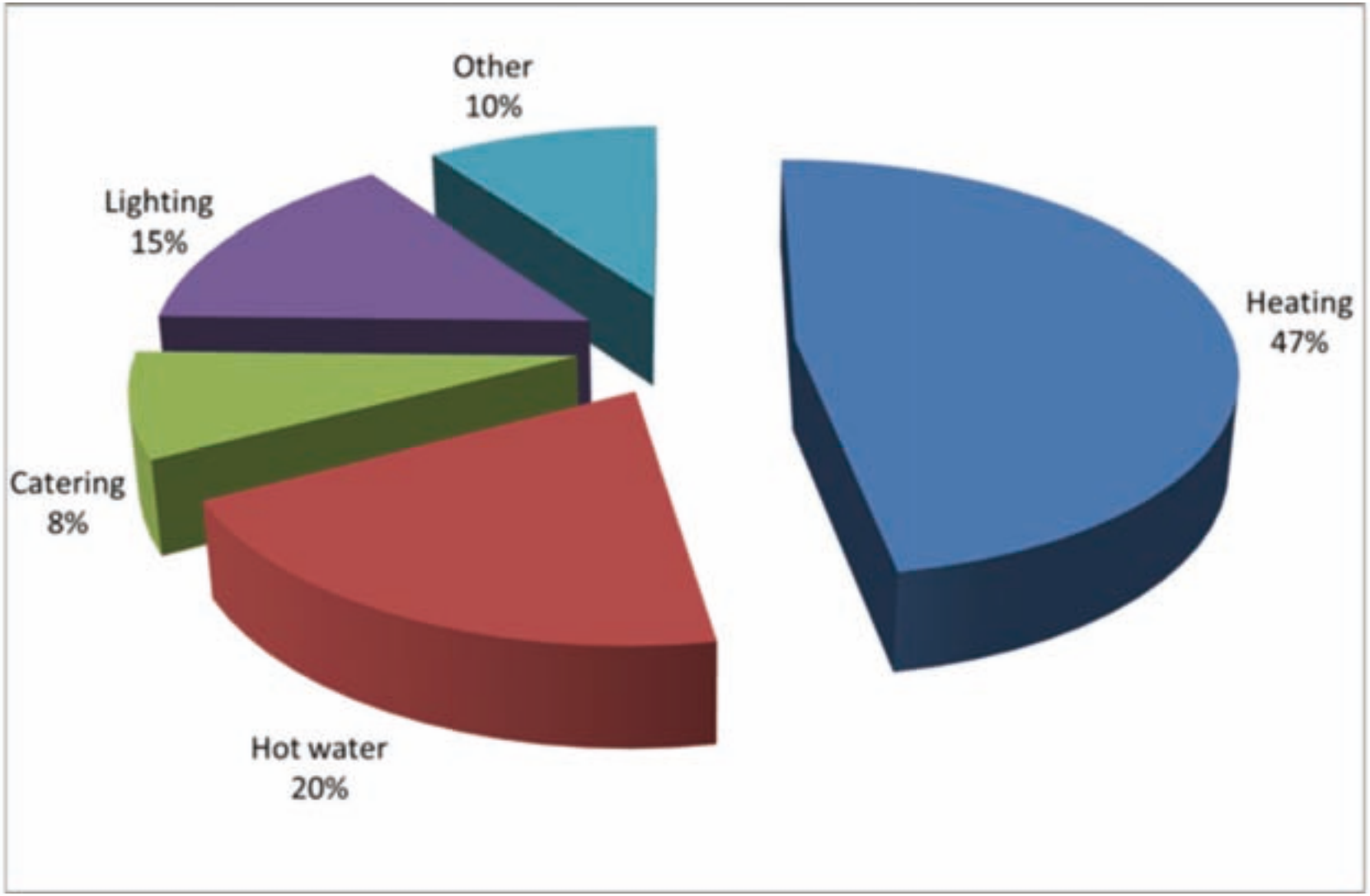
Key Deliverables

- The emphasis is that good housekeeping alone can save Hotels significant amounts of money/ reduce carbon emissions
- Simple Changes can have big impacts
- You don’t have to have the latest equipment just use what you have!

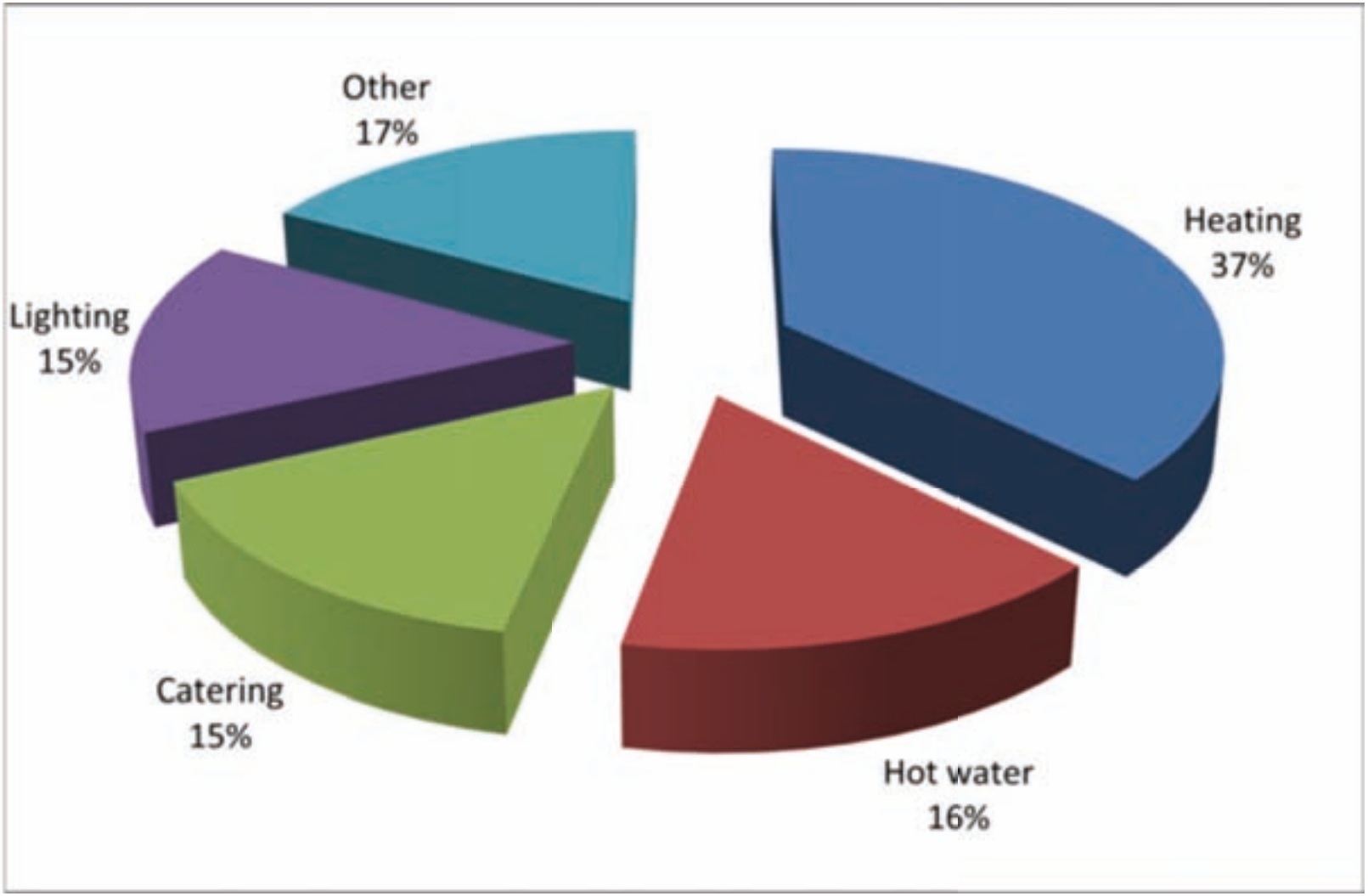
Do you know your annual energy bill?

?

Where is energy used on site?



What is the energy cost on site?



In control with the Five Step Plan

Introduction to the 5 Step Plan

- Step 1 Review
- Step 2 Energy Purchase
- Step 3 Monitoring & Targeting
- Step4 Waste identification
- Step 5 Projects
- Step 6 Start over again

How much fuel & power are we using?

- **Reading meters**
  - Taking readings from gas, electricity, and water meters. N.B. true readings against estimates!
- **Fuel bills and what they mean**
  - Studying bills and extracting the relevant information. Reconciling with meter data.
- **Assessing energy performance by comparison with benchmarks**
  - Working out how much energy has been used and comparing it with benchmark figures

Monitoring & Targeting

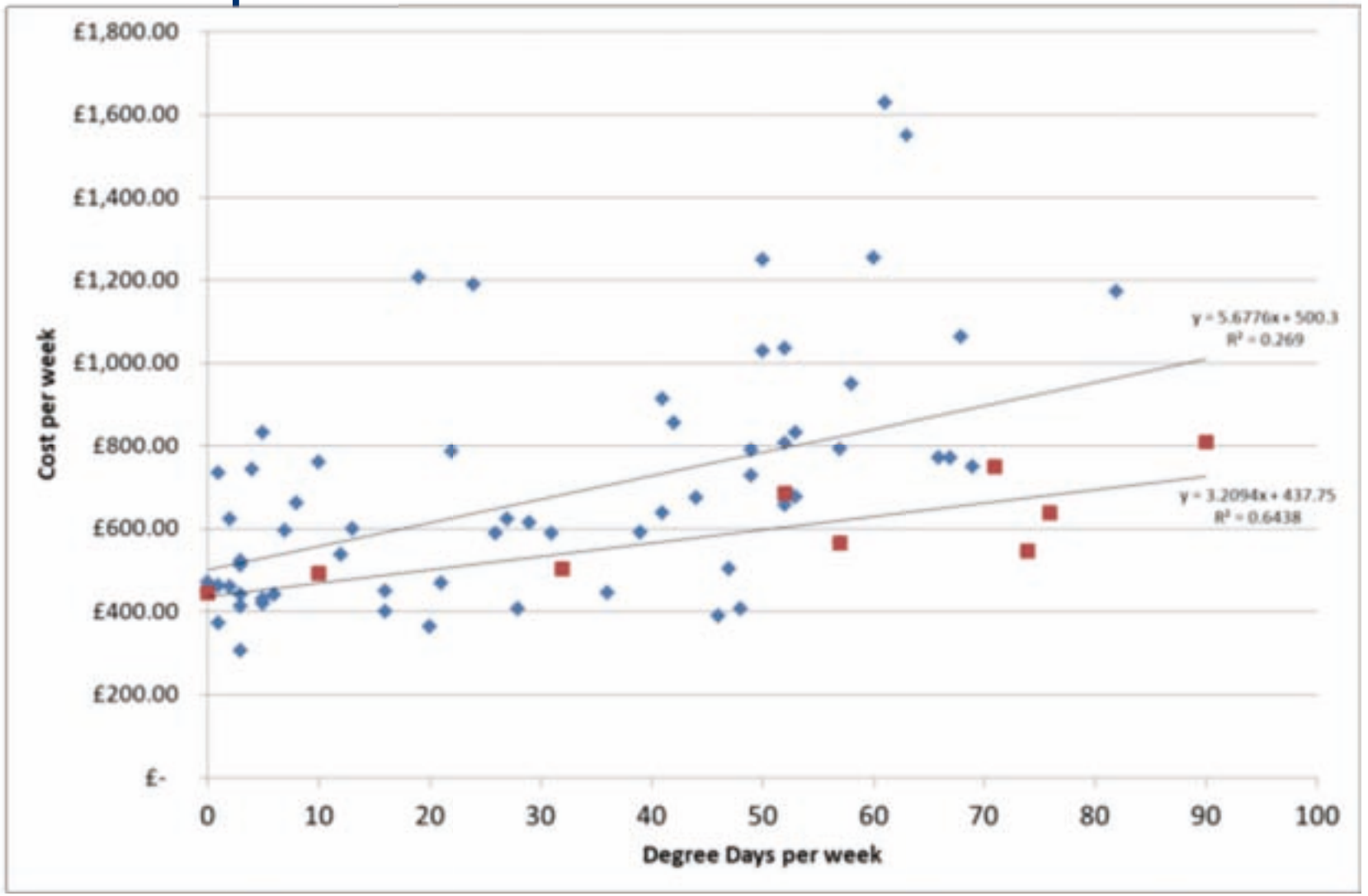
How can we measure energy efficiency?

- kWh/m^2
- kWh/visitor
- Compare with degree days
- Compare with previous performance
- Set Targets

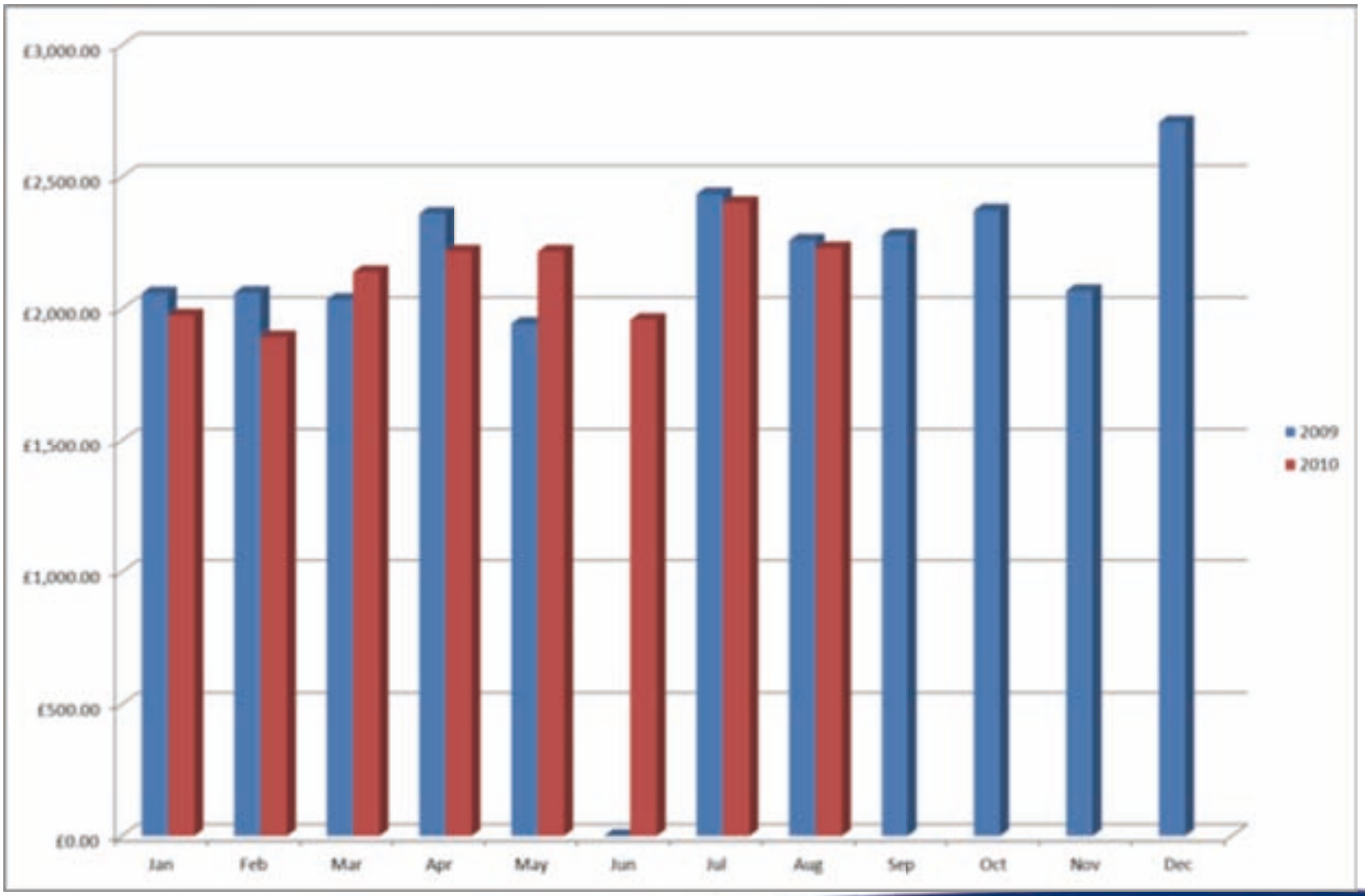
Monitor and Target Consumption

- Provides management with the information they need to keep energy usage and thus cost under control and to forecast budgets based on current costs and performance
- Half hourly electricity monitoring regime
- Comparison of gas/oil consumption with degree days both show you the control of the heating and hot water systems and the improvements that have been made at the organisation

Monitor and Target Consumption



Monitor and Target Consumption



Benchmarks

	Fossil Fuel good practice (kWh/m^2)	Fossil Fuel typical practice (kWh/m^2)	Electricity good practice (kWh/m^2)	Electricity typical practice (kWh/m^2)
Hotel	175	300	31	43

Energy Waste - discovering potential!

UNNECESSARY
Equipment and light fittings that are redundant

POORLY CONTROLLED
Timer and/or temperature controls wrongly set

INEFFICIENT
Poorly maintained boilers
Use of standard lamps instead of energy saving lamps

INAPPROPRIATE
Use of inappropriate fuels
Electric space heating

Waste Identification
Where to start?

DO IT! Checklists

Raise Issue Staff - Listen
Identify 'quick wins'

Areas to start:

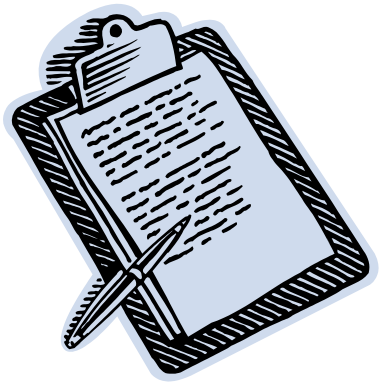
- Bar Area / Catering
- Lighting & Controls
- Heating & Controls

ECG036 – Energy Efficiency in Hotels

What is an energy walk-round?

A walk around your premises to:

- ✓ Assess what uses energy
- ✓ Assess when energy is used
- ✓ Identify areas for savings
- ✓ Common sense – practical ideas
- ✓ Open minded, creative



When should I conduct an energy walk around?

At different times of day and year as energy use changes. For example:

- At lunchtime
- At night or during weekends
- When the cleaners are on duty
- Beginning and end of heating season
- When clocks change

Getting Started

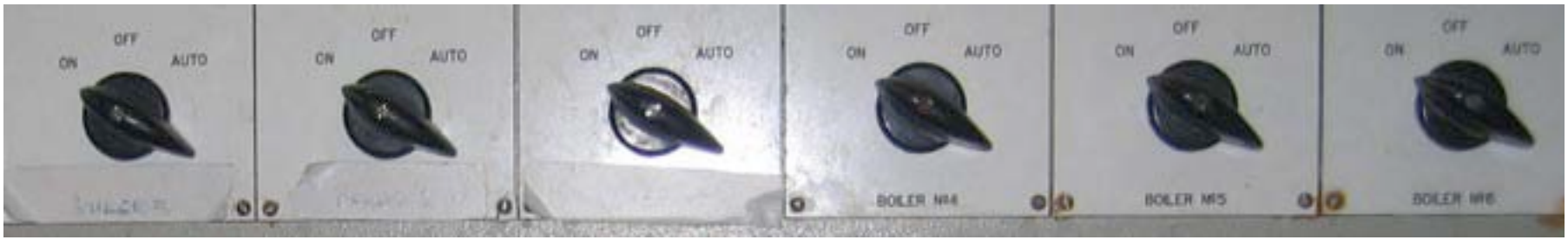
	BOILERS, CONTROLS AND HOT WATER	fossil saving %	electricity saving %
NO COST	Ensure systems come on only when, where and to the extent they are needed.	1	2
	Establish a daily routine for checking control settings, especially where they may have been over-ridden in response to unexpected circumstances.	1	1
	Use your existing equipment effectively. Check that timers, programmers, optimum start controls and weather compensation controls are set up and operating correctly.	3	1
	Isolate parts of systems which are not in use, for example, seasonally. Remove redundant pipework during refurbishment.	1	0
	Ensure plant is regularly and correctly maintained.	0.5	0.5
	Review hot water thermostat accuracy and temperature settings periodically. Reducing temperatures will save energy – but take precautions to avoid the risk of Legionnaire's Disease.	1	0

“Top Ten” low-cost projects to start saving carbon

1. Turn off unnecessary lighting & equipment
2. Adjust heating controls / temperatures to suit activity
3. Keep doors and windows closed when heating or cooling
4. Replace lights with energy saving equivalents
5. Regularly maintain plant and equipment
6. Draught proofing
7. Insulate heating pipework and fittings
8. Use daylight
9. Train catering staff in the cost of energy
10. Turn off office equipment when not in use
11. Inform colleagues on all of the above!

Staff Energy Awareness Training

- One of the best ways to get savings
  - Lights left on?
  - Heating controls left on?
  - Air Con left on?
  - Doors and windows left open?
- Cleaners and staff to report issues



An awareness campaign should address two things:

Motivation – a willingness to save energy

- Why, what is in it for me?
- What is in it for my organisation?

Awareness – of how to save energy

- Where do we use energy?
- How much do we use and what does it cost?
- What can be done and how much can we save?

Dehumidification or Heating

- Dehumidify instead of electric heating
  - Save £600
  - Under 1/2 year payback
  - Interest free loan?

Heating Controls

- 1 °C Increase = 8-10%
- Equals £13-£17 per room per heating season

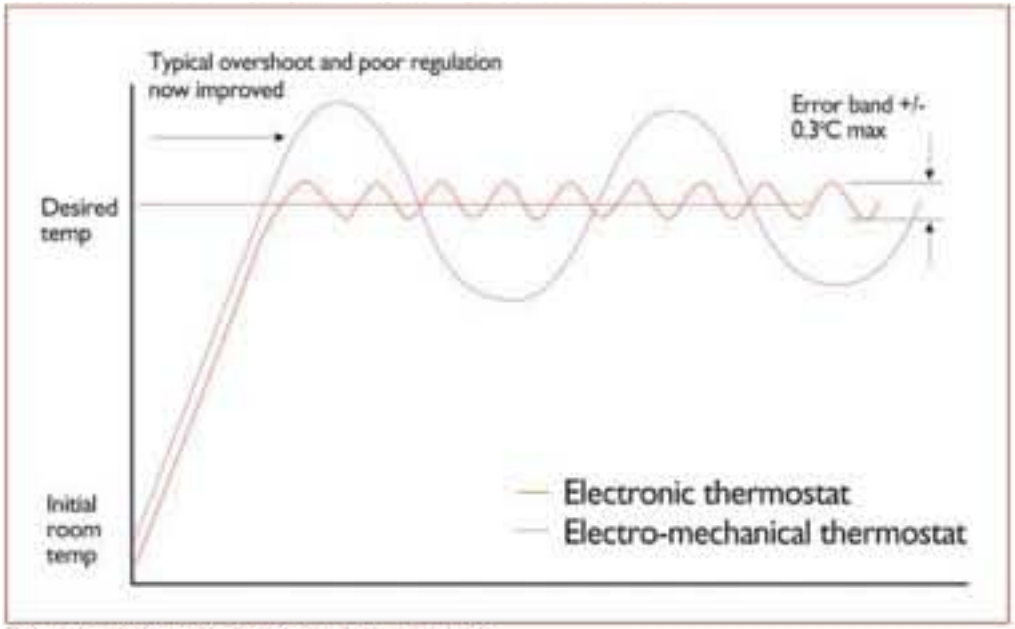
Heating Controls

Heating Controls

- A 'comfort' heating setting of around 20 - 21 °C for the exact period your rooms are occupied,
- A 'set back' lower ECO temperature of around 15 °C for the period your rooms are unoccupied, or at night time.
- This way your heating uses only a small amount of energy overnight - and your living space does not cool down completely.
- Early in the morning, and in the evenings when returning home, have your controller set to return to 'comfort' and your rooms will be warm again very quickly.

Heating Controls

- New Heating Controls
  - Save £600
  - ~3 year payback
  - Interest free loan?



Being electronic, control is totally silent and reliable.

Heating Controls

- New Heating Controls
- Key fob less than £50
- Also allows setback if not in

Pipe Insulation

- 10m = 3,250kWh heatloss
- £100 per year waste
- £1 per meter to buy
- Easy to fit
- Almost instant payback!

12v Lighting

- 20W Conventional
  - 3,000 hours
- 4W LED
  - 50,000 hours
- Save £12 per year in reception / common areas
- Save £3.50 in bedrooms
- Cost £12.50

Candle Lighting

- 60W Conventional
  - 2,000 hours
- 45W Halogen
- Save £11.30 per year in reception / common areas
- Save £3.30 in bedrooms
- Cost £1.79!

Candle Lighting

- 25W Conventional
  - 2,000 hours
- 5W Halogen
- Save £15 per year in reception / common areas
- Save £4.40 in bedrooms
- Cost £18!

Standard Lighting

- 60W Conventional
  - 2,000 hours
- 45W Halogen
- Save £11.30 per year in reception / common areas
- Save £3.30 in bedrooms
- Cost £1.79!

Standard Lighting

- 60W Conventional
  - 2,000 hours
- 20W CFL
- Save £30 per year in reception / common areas
- Save £8.80 in bedrooms
- Cost £5-8!

Renewable Options

- Biomass
- Wind
- Ground / Air Source Heat Pumps
- Solar
  - Photovoltaics
  - Solar water heating

Feed in Tariff

- The government is supporting the small-scale generation of electricity from renewable sources through the Feed-in Tariff (FiT) scheme. These payments are guaranteed for up to 25 years and they are also index linked - i.e. rise with inflation.
- Despite the name, the new FiT is actually a generation tariff
- Generators are paid for every unit of renewable electricity they produce,
  - Whether they use it themselves
  - Or sell it to the national grid

Technology (band)	p/kWh	Tariff life time (years)
Solar PV (4 kW or less, new build)	36.1	25
Solar PV (4 kW or less, retrofit)	41.3	25
Wind (up to 1.5kW)	34.5	20
Wind (over 1.5kW, to 15kW)	26.7	20
Micro CHP	10.0	10
Hydroelectricity	19.9	20

Renewable Heat Incentive

- The Renewable Heat Incentive (RHI) is designed to provide financial support that encourages the switch from using fossil fuel for heating, to renewables such as wood fuel.
- The Government is currently consulting on the design of the incentive which they are proposing to introduce in April 2011.
  - Air, water and ground-source heat pumps
  - Solar thermal
  - Biomass boilers
  - Renewable combined heat and power
  - Use of biogas and bioliquids

Renewable Heat Incentive

Technology	Scale	Tariffs (pence/kWh)	Tariff lifetime (years)
Small installations			
Solid biomass	Up to 45kW	9	15
Biodiesel (restricted use)	Up to 45kW	6.5	15
Biogas on-site combustion	Up to 45kW	5.5	10
Ground source heat pumps	Up to 45kW	7	23
Air source heat pumps	Up to 45kW	7.5	18
Solar thermal	Up to 20kW	18	20
Medium installations			
Solid biomass	45kW-500kW	6.5	15
Biogas on-site combustion	45kW-200kW	5.5	10
Ground source heat pumps	45kW-350kW	5.5	20
Air source heat pumps	45kW-350kW	2	20
Solar thermal	20kW-100kW	17	20
Large installations			
Solid biomass	500kW and above	1.6-2.5	15
Ground source heat pumps	350kW and above	1.5	20
Biomethane injection	All scales	4	15

Feed in Tariff (FiT)

- 3.9kW PV
  - £17,000
  - 29m^2 roof area
  - Generation = 3,346 kWh
- Income from offset electricity =£ 335
- Income from FiT =£1,382
- Total Income =£1,717

- Payback under 10 years

- Rent a roof?
- At 10% 25yr fixed loan repayments =£1873 p.a.
- Only pays back at 6% over 25 years (FiT only)

PV *"Rent a Roof"* ***Financial Benefits***

- Who's paying for the system and its installation?
  - Is that in full?
- Who gets (a) the feed-in tariff, (b) the export tariff, (c) the 'free' electricity?
- How is the energy measured, and how will the benefit to the consumer change if the rollout of smart meters requires the export to be measured rather than estimated (or 'deemed') as at present?
- How much is this worth to you, and has the provider calculated this on the basis of your actual use?
- Are there any guarantees for the kit and the financial benefits? What happens if it stops working and generating feed-in tariffs?

PV *"Rent a Roof"*
Financial risks

- If there is an up-front payment, is this a loan, and if so is it secured?
- Are you in effect lending me money to do this, either as a loan or a hire purchase deal?
  - In which case, how long for? What is the AER – annual equivalent interest rate – on the money?
- What happens if I want to pay off the remaining costs early? Can I have the feed-in tariff re-assigned to me?
- What happens if the company who pays the up-front cost goes out of business during the lifetime of the feed-in tariff?

PV *"Rent a Roof"* ***Installation***

- Who is liable for any damage done to the building, neighbouring buildings, patients and third parties during the installation?
- Who is responsible for scaffolding or any other kit that is left on site during the installation?
- Who is responsible for addressing any planning issues or electricity distribution company notification requirements?
  - Who pays any associated costs?
- Do I need to let my buildings insurer know that this installation is taking place?
  - Will I need their permission?

PV *"Rent a Roof"*
Ownership and maintenance

- Who owns the kit? And is that all of the kit – i.e. meter, wires inside the building etc. – or just the kit on the roof?
- Can we buy the whole system at a later date?
- Who pays for maintenance and repairs?
- Who's insuring the kit?
  - Against what?
- What happens if the system stops generating electricity because
  - a poor quality system has been installed?
  - the system has been incorrectly installed?
  - of damage on site?
- Who is responsible for removing the system once its useful life is over?

PV *"Rent a Roof"*
Change in property ownership

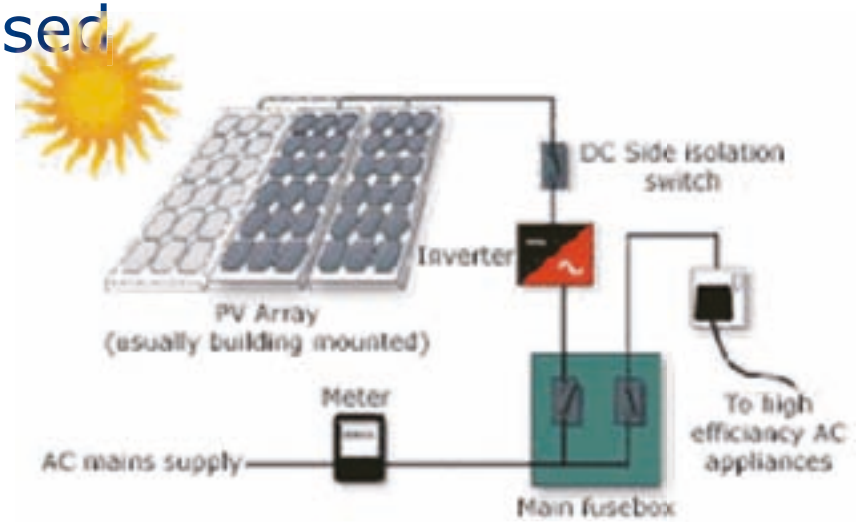
- What happens if sell the building and the new owners don't want to 'inherit' the deal?
- Who pays
  - for removing the kit
  - if my roof needs repairing or
  - if the kit is damaged beyond repair?
- Who can you trust?
  - Are the installers and product registered with the Microgeneration Certification Scheme (MCS)? See www.microgenerationcertification.org
  - Are they members of the REAL Assurance scheme (www.realassurance.org.uk)?
    - This aims to protect consumers, and is currently developing binding rules for its members that will prevent mis-selling by 'free' PV schemes.

PV *"Rent a Roof"*
Final Thoughts

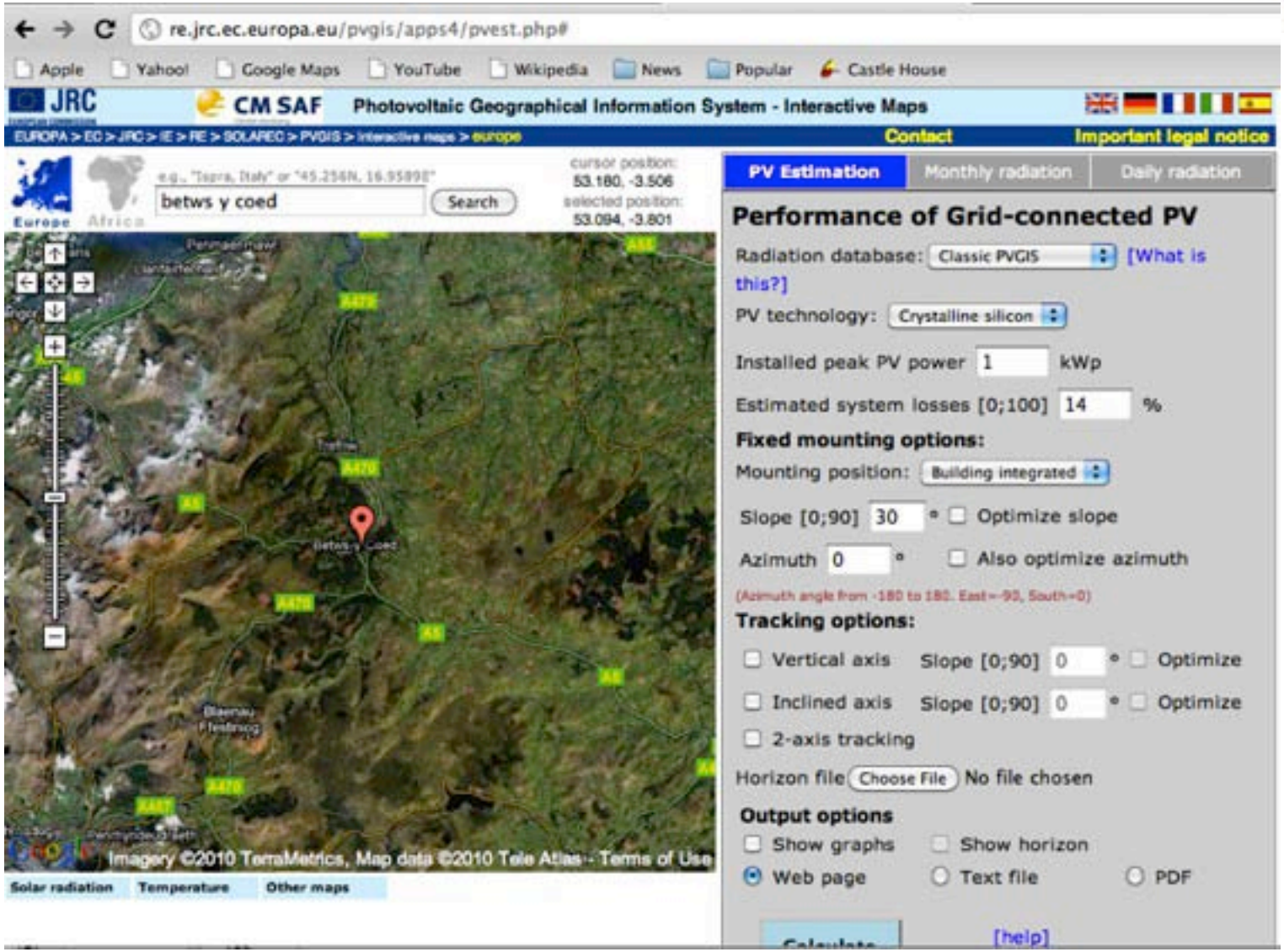
- Finally, not all hospitals will be able to benefit from such offers.
- As companies will try to maximize their profits,
  - they will target the roofs with the lowest costs (i.e. easy access for installing the panels)
  - highest electricity production (south-facing roofs in sunny parts of the country?)
- Are you better investing yourself?

Photovoltaics – Components of Installation

- Smallest functioning component is a CELL
- A MODULE is a collection of CELLS
- A STRING is a series of MODULES
- An ARRAY is a collection of STRINGS
- To convert the electricity and connect to a grid an INVERTER is used



Estimation Website - PV GIS

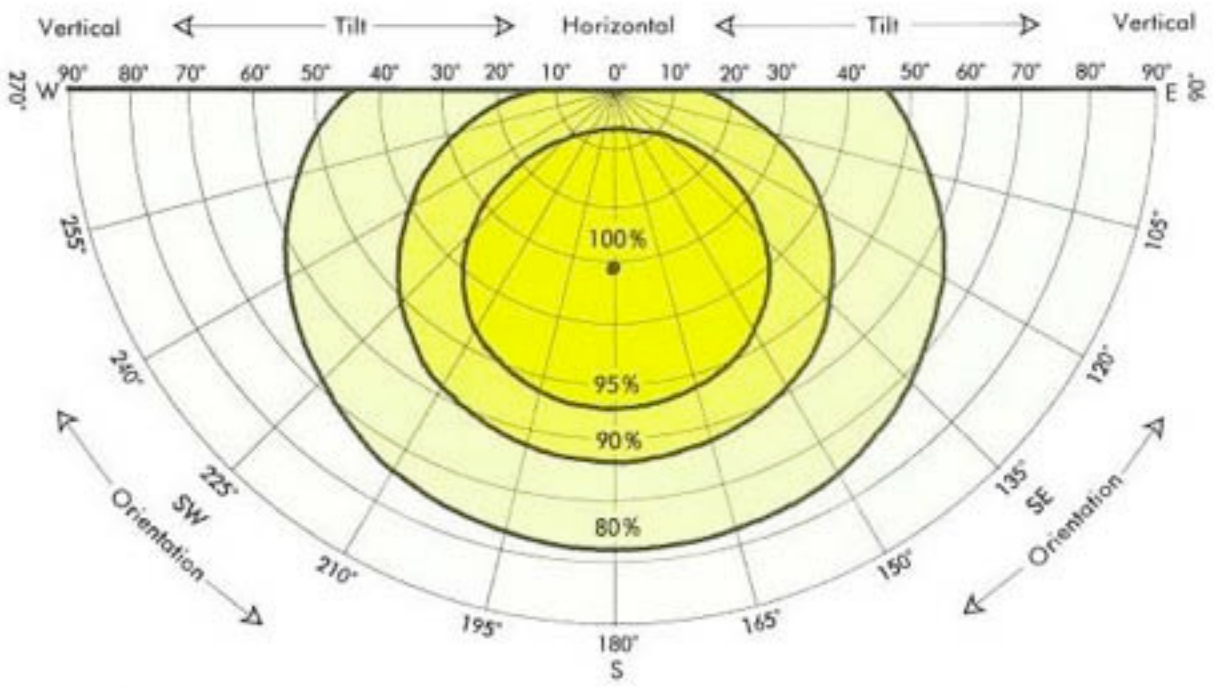


Estimation Website - PV GIS

Nominal power of the PV system: 1.0 kW (crystalline silicon)
Estimated losses due to temperature: 12.1% (using local ambient temperature)
Estimated loss due to angular reflectance effects: 3.0%
Other losses (cables, inverter etc.): 14.0%
Combined PV system losses: 26.7%

Fixed system: inclination=30°, orientation=0°				
Month	E_d	E_m	H_d	H_m
Jan	0.65	20.2	0.85	26.5
Feb	1.24	34.8	1.62	45.3
Mar	1.99	61.8	2.64	81.7
Apr	3.06	91.7	4.13	124
May	3.72	115	5.14	159
Jun	3.50	105	4.92	147
Jul	3.53	109	4.97	154
Aug	3.00	93.1	4.19	130
Sep	2.41	72.2	3.29	98.7
Oct	1.47	45.7	1.98	61.3
Nov	0.80	24.0	1.05	31.5
Dec	0.45	14.1	0.60	18.7
Yearly average	**2.16**	**65.6**	**2.96**	**89.9**
Total for year		**787**		**1080**

Where is it suitable?



100% corresponds to the tilt and orientation which gives the maximum total annual solar radiation (1045kWh/m²/y on a surface oriented due south at a tilt of 31°) on a fixed surface in London (51°36' N, 0°03'W)

Summary: PV

- Possible changes to the recently introduced feed-in tariff (FiT) in the UK are being muted, according to media reports, including the Financial Times.
- Lots of people get obsessed with the technical aspect of PV. This is irrelevant - What you should care about is:
  1. What is the life expectancy?
  2. How much does it cost?
  3. How much electricity will it generate?
  4. Can I effectively integrate the panels?

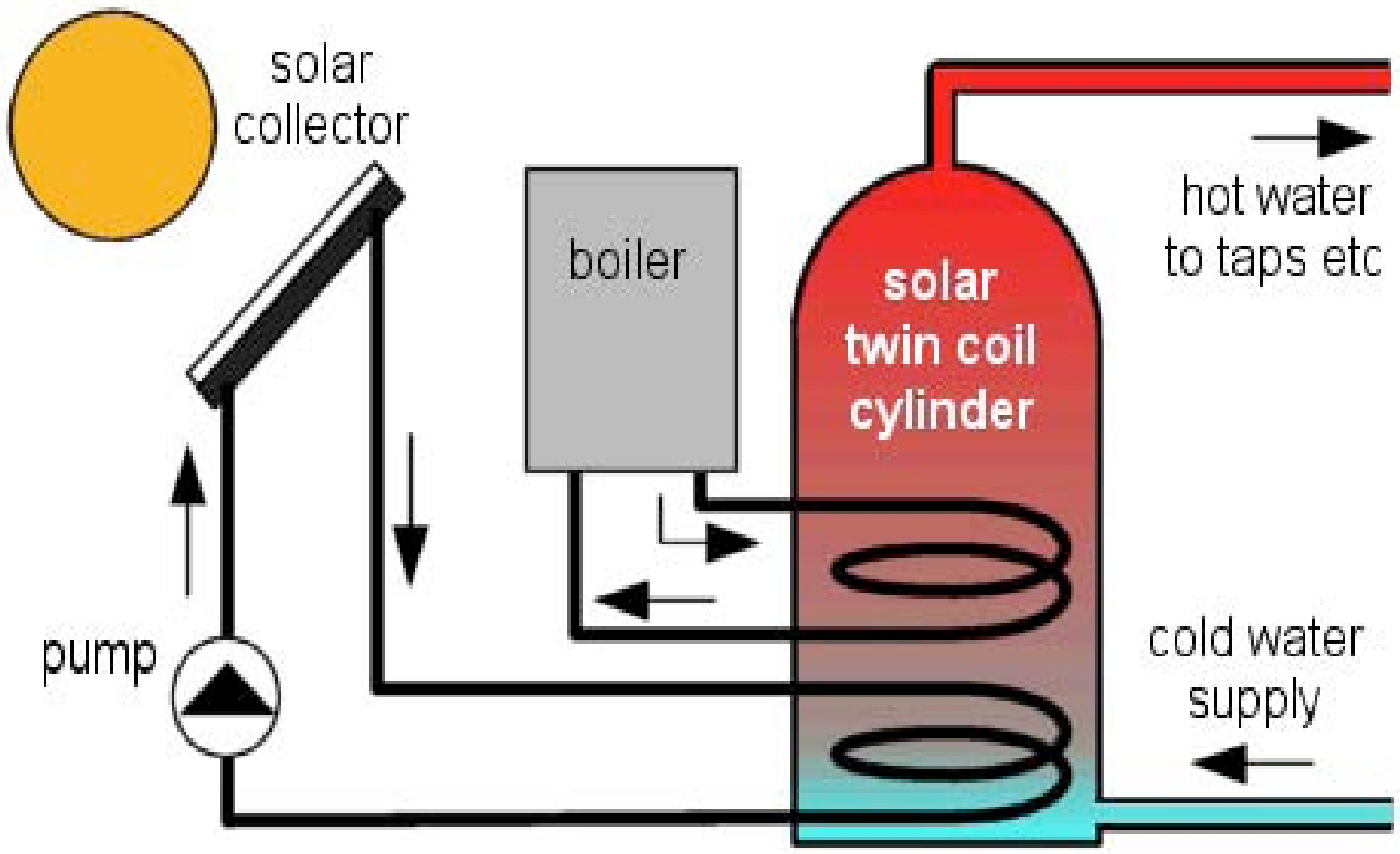
What Solar Water Heating Systems Contribute

Where sunlight is used to provide hot water either for heating or domestic hot water

- 300-500kWh per meter square per year

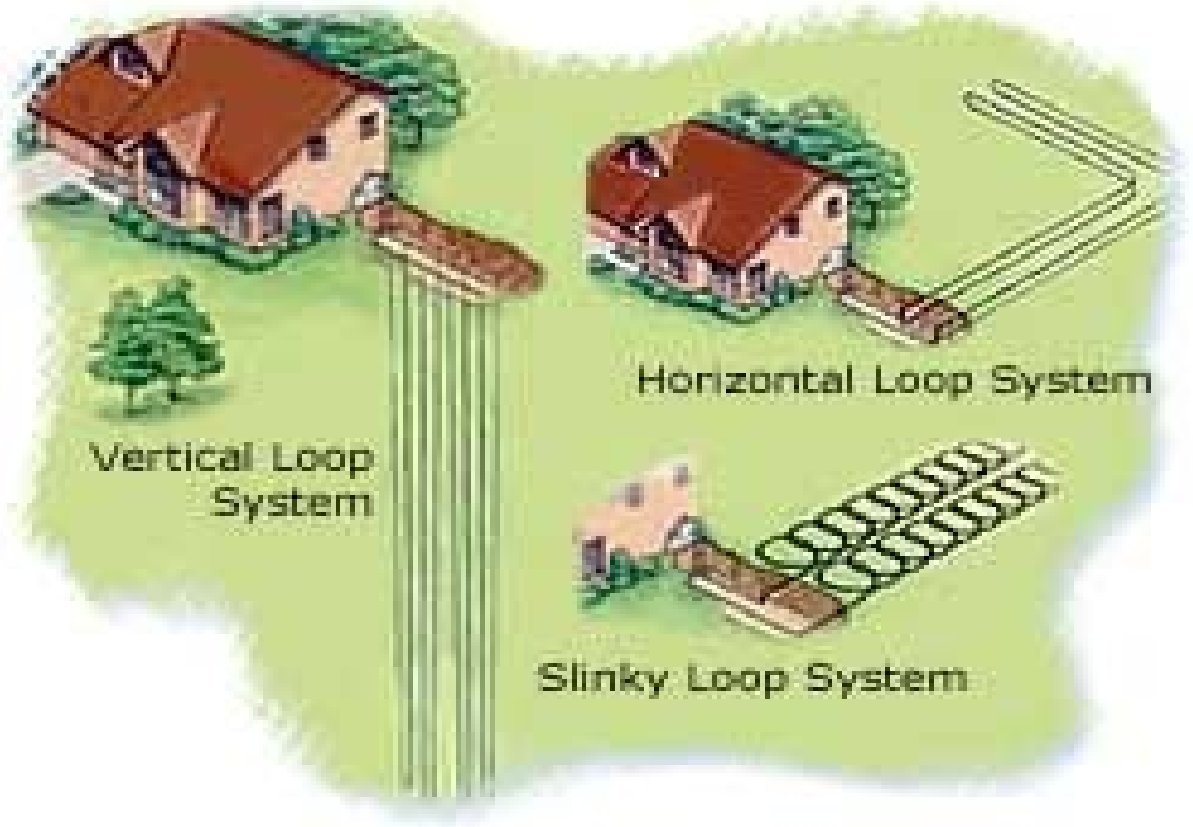
- Over 50% of hot water energy needs
  - 90% in the summer
  - 50% in spring and autumn
  - 20% in winter

Solar Water Heating – How does it work?



Heat Pumps – Ground Source

Where the ground heat is used to generate low grade heating and cooling



Heat Pumps – Ground Source

- Provide low temperature hot water Maximum 50deg C therefore heating system must be suitable.
- Underfloor heating perfect application
- Pipework lifespan 55 years
- Heat exchanger 12 years
- Little maintenance on pipework
- Heat exchanger requires annual service
- COP for every 1KW electric put in expect to get 3.5kW heating or cooling out
- Best carried out when there is other ground works being carried out… new build
- More cost effective against LPG, Oil and Electricity

Solid Fuel Combustion Choices - Pellets, chips and logs

- Logs
  - Aesthetically pleasing.
  - Existing but informal market woodland and arboriculture
  - Small boilers and heaters
- Chips
  - Bulk product from forestry and wood processing operations.
  - Large boilers to power plant
- Pellets
  - Quality controlled product from sawmill by-product
  - Competes with oil on convenience, storage and reliability

Pellets, chips and logs

	Density	Supply	Quality	Typical Application
Pellets	High	National	Very well defined. Domestic & commercial grades	Domestic small to medium commercial (up to 200kW)
Chips	Low	Community level say 50km radius	Varies widely EU standard proposed.	Small commercial to v large commercial & district heat
Logs	Medium	Local and informal	Varies widely no standards	Domestic & v small commercial (up to 50kW)

Specifying biomass heating – some lessons

- Both the fuel supply and the boiler must be closely specified for a successful project
- Size the boiler on the heating demand and profile of the building – not the nameplate on the old oil boiler.
- Control is different from oil firing. Turn down is less. For an uneven profile consider an accumulator and/or two boilers and/or a small oil boiler to take peak and summer hot water.
- Always install an accumulator with a log boiler

Summary of Biomass

- Biomass can make a viable alternative, especially in the rural areas off the mains gas network
- Options are diverse, with different feed options
- Viability of smaller biomass installations where there is limited labour is likely to be confined to pellets
- Paybacks are reasonable if replacing boilers
- Biomass is not a problem fuel!

Wind Turbines

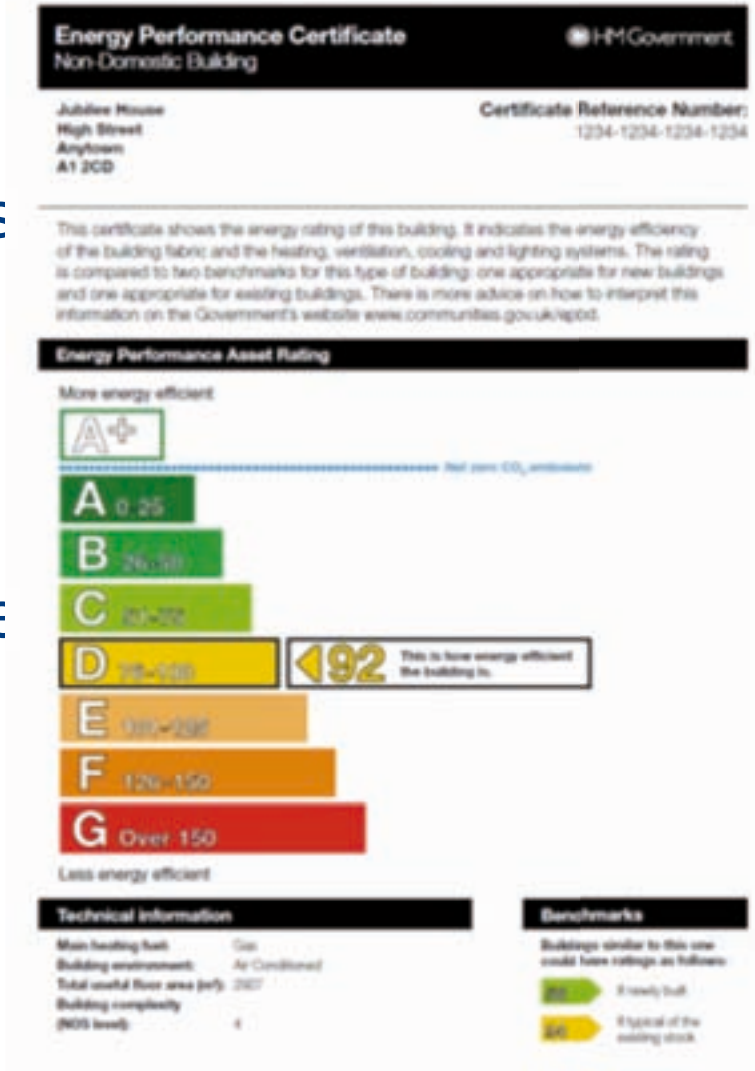
- 1.5kW Producing an energy yield equating to an extra potential income of up to £1.6K per annum (assuming a mean wind speed of 7m/s)
- Cost Approx £8.5k + VAT
- Reference Annual Generation
  - 2,403kWh @ 5m/s
  - 3,572kWh @ 6m/s
  - 4,632kWh @ 7m/s
- Rotor 3.2m diameter
- 12m Tilt-up Scissor Tower

Wind Turbines

- 10kW Producing an energy yield equating to an extra potential income of up to £14K per annum (assuming a mean wind speed of 7.5m/s)
- Cost Approx £40k + VAT
- Reference Annual Generation
  - 21,100kWh @ 5m/s
  - 30,400kWh @ 6m/s
  - 38,100kWh @ 7m/s
- Rotor 9.7m diameter
- Tower 12m, 15m and 18m hydraulic tilt-up, galvanised steel

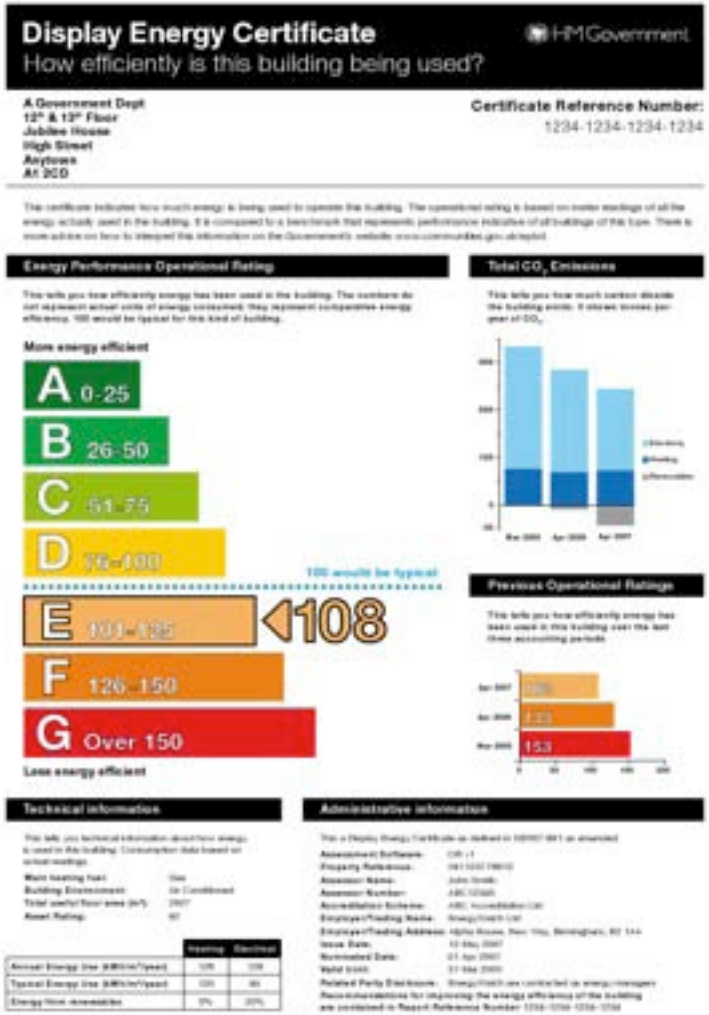
Energy Performance Certificate (EPC)

- An EPC, is an asset rating,
- It models the theoretical, as designed, energy efficiency of a particular building compared to a benchmark
- It is based on the performance potential of the building itself
  - (the fabric) and its services (such as heating and lighting).



Display Energy Certificate (DEC)

- A Display Energy Certificate (DEC), is an operational rating,
- It records the actual CO_2 emissions from a building over the course of a year,
- And benchmarks them against buildings of similar use.
- Extended to private sector?



Air Conditioning Inspections

- Air conditioning systems where the total system **cooling capacity** is greater than **12kW** (whether in dwellings or non-dwellings) will be inspected at intervals not exceeding 5 years.
  - **12kW total for building!**

- The inspection will include an assessment of efficiency, a review of their sizing and advice on improvements or replacements and alternative solutions. All systems require first inspection by ***January 2011***.
- 2015 deadline for complete R22 replacement

Contacts

- Carbon Trust

  Help line 0800 085 2005

  www.Carbontrust.co.uk/energy

- Energy Saving Trust

  www.est.org.uk

Making Business Sense of Climate Change