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The Merton Rule and policy context

Steve Cardis

Session overview

1. Background on the Merton Rule
2. Merton Rule policy context
3. What is the future of Merton Rule type policies?

1. Background on Merton Rule

How did the Merton Rule originate?

- As part of UDP preparation at Merton
- Identified need in Sustainability Appraisal ...but no national guidance existed
- An example of Localism 2009 EU Renewable Energy Directive – 15% of all UK energy to be sourced from renewables by 2020
- UK Renewable Energy Roadmap (2011) – identifies key technologies to meet 2020 target

Progress towards EU 15% 2020 target?

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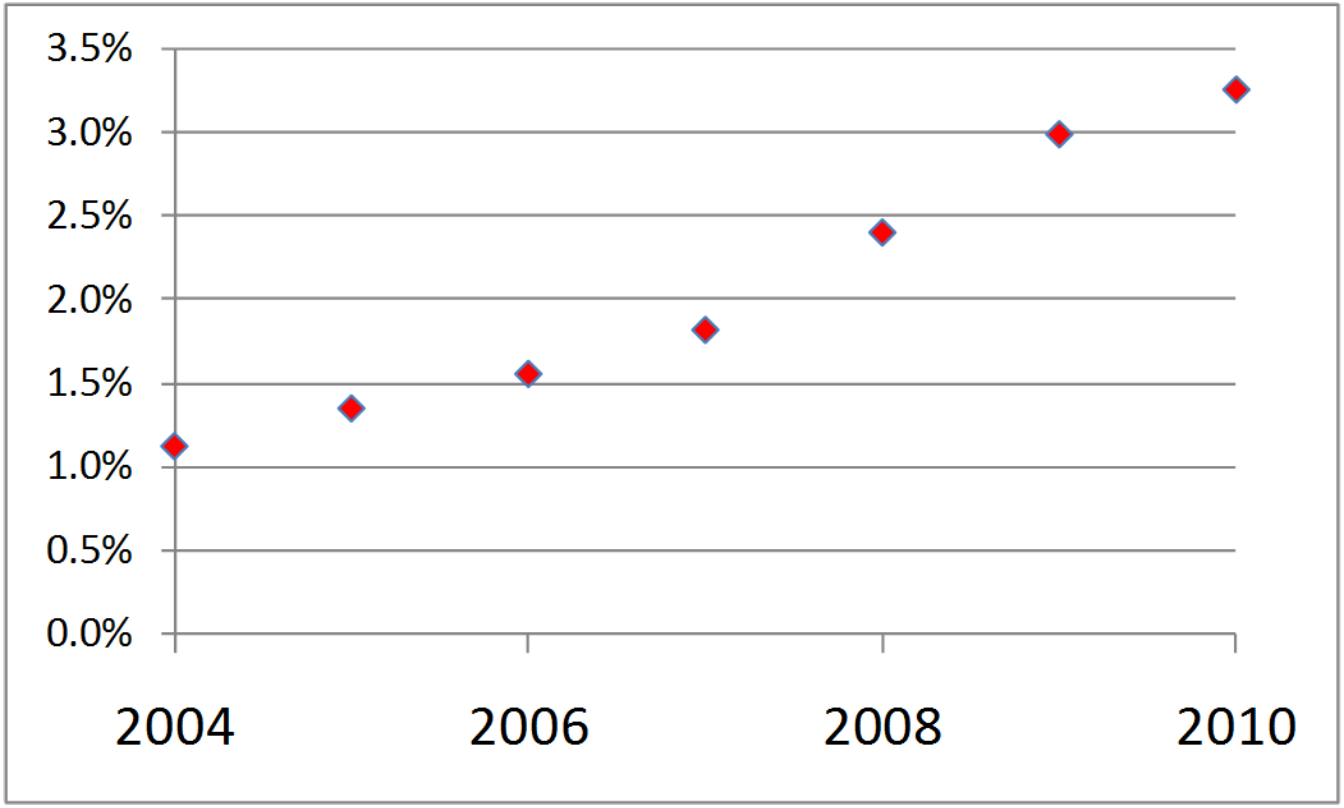

How did the policy develop?

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- Lead officer (Steve Cardis) seeking to adopt the policy but a group of officers worked on it
- Built local political support and linked to wider Council priorities
- Regional support of GLA was developed and worked together with them to build evidence base
- Renewable industry and green organisations were supportive – created the term 'Merton Rule'
- Professionals in building industry/consultants provided technical advice

What were the main barriers and how were they overcome?

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- Not in accordance with Government policy advice - led to objections from Civil Servants, risk at UDP Public Inquiry
- Developer broad support and evidence
- Lobbied politicians at Regional and National levels
- Renewables industry and green organisations knowledgeable on lobbying
- Final meeting with planning minister through local contact : the ‘vet story’

What are the key benefits of the policy?

- Puts planning at the forefront of addressing climate change
- Incentive to improve energy efficiency to reduce cost of renewable energy
- Stimulated an emerging green industry and helped to build that industry which was then struggling
- Allowed local ownership of policy by politicians/officers
- Public and businesses could take action to reduce their own CO_2 emissions

To what extent has it become a model for others?

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- Following approval of Merton Policy it was adopted nationally and copied in Wales and Scotland
- Widely adopted in regional guidance
- By 2007 170 LPA’s had similar policies and today 75% have
- Government guidance supported policy and included specifically in 2008 Planning and Energy Act

2. Merton Rule Policy Context

What is the main policy guidance?

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- 2003 Adopted by LB Merton
- 2004 GLA adopts supportive policy in London Plan
- 2005 PPS22 adopted by Government
- 2007 PPS1 and Climate Change Supplement adopted
- 2008 Planning and Energy Act
- 2010 Revised PPS1 draft
- 2011 Draft NPPF
- Regional guidance adopted at various dates

What is the present policy position?

- Government has maintained climate change policy aims and targets to reduce CO_2 emissions
- Existing national guidance remains until the NPPF is approved
- Regional Guidance has been removed except in London
- LDFs widely adopted and to be replaced by Local Plans and Neighbourhood Plans
- In Yorks & Humber a wide range of policy guidance in UDP/LDF/SPG and related evidence bases

What will be the implications of the NPPF?

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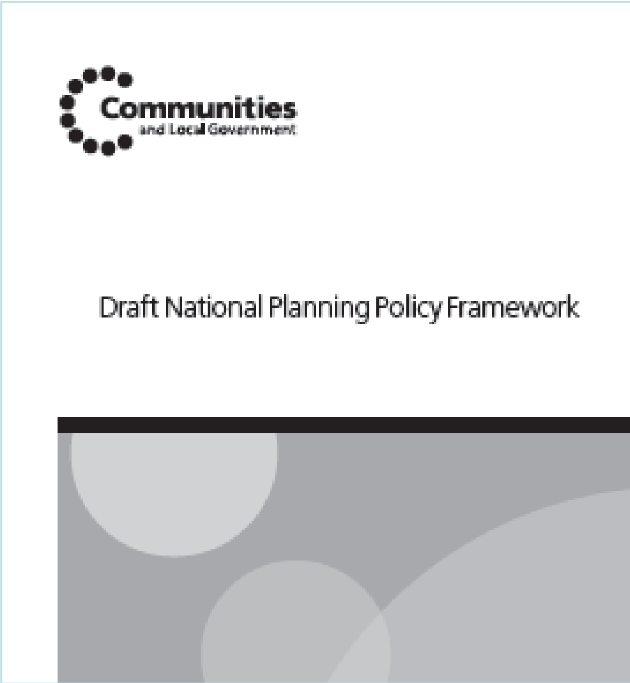
- It’s a draft so some uncertainty, but expect limited change on climate change guidance
- The draft is supportive
- However the guidance tests include evidence base and viability tests
- …hence importance of energy assessments to support developments
- Evidence base will need updating and any gaps filling



Are Merton Rule-type policies consistent with the draft NPPF?

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- Yes – see paragraphs 148-150
- But need evidence base and proof of viability
- Plan-led system so if in adopted or emerging plan will be supported
- Note status of 2008 Act

Implementation of policy…

- Policy wording and assumptions
- Energy assessments – what to measure?
- Planning conditions
- SPG
- Expertise of staff and specialist advice

Y&H – RE policy comparisons

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- 22 LPA's; 6 adopted policies; 5 at submission stage; 9 preferred options and 2 at earlier stages
- RE policies vary; most seek at least 10% but 3 seek 15% to 2015 and 20% to 2020
- Most refer to the Code for Sustainable Homes and BREEAM standards
- Targets generally seek Code 3 by 2010, Code 4 by 2012; zero carbon by 2016 only 4 years away
- BREEAM guidance does not generally set target levels. Some set 'very good' and a few set 'excellent' or 'outstanding'

Range of climate change guidance

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- Policies generally include: sustainable construction; flood risk and sustainable drainage; renewable energy and energy efficiency; green infrastructure
- Many have prepared SPD on climate change; two cover renewable energy; six on sustainable construction; one on flood risk
- Sheffield has a comprehensive climate change SPD
- Several new SPDs are under preparation or are proposed and many will include sustainable design and construction

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3. What is the future of Merton Rule-type policies?

National standards

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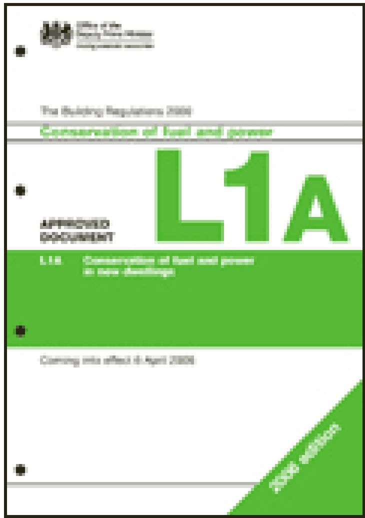
- Introduction of national sustainability standards in Code for Sustainable Homes and BREEAM – supported by PPS1 and NPPF
- Benefits of national standards
- Building Regulations 2010, 2013 and 2016
- Zero Carbon standards and Allowable Solutions



Low carbon development

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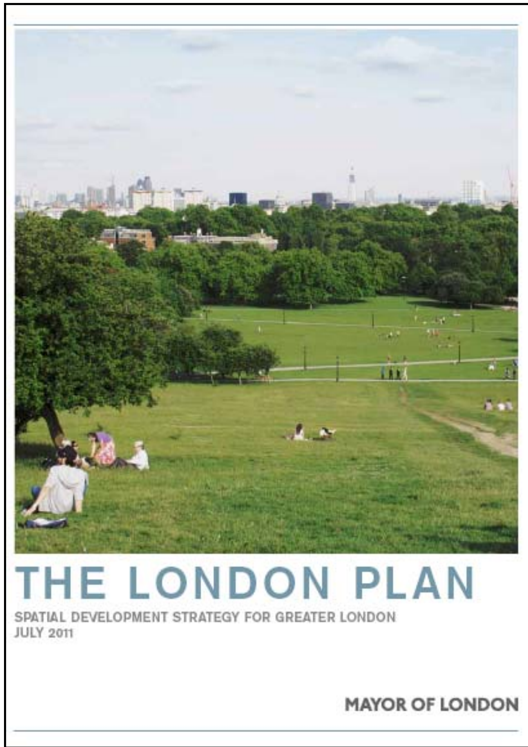
- National policy support
- Energy Hierarchy (London):

1. LEAN: Energy efficiency
2. CLEAN: CHP & District Heating
3. GREEN: Renewable energy



Decentralised energy generation and Local Energy Networks

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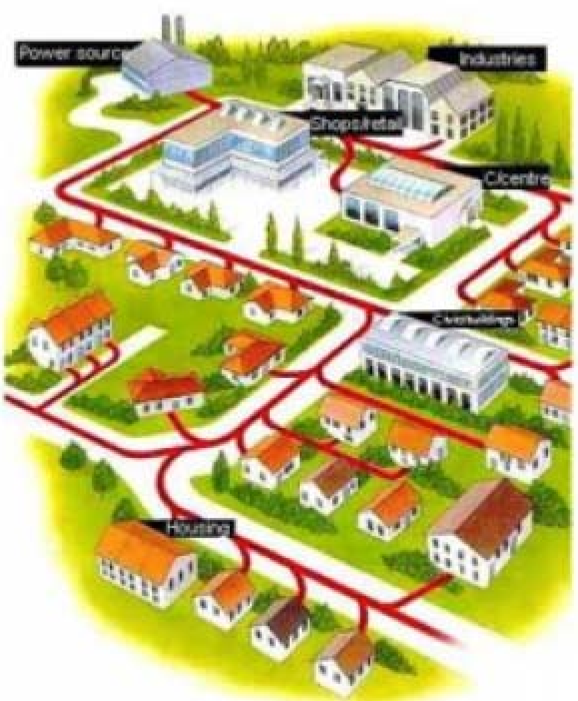
- Area wide approach to link development
- Heat assessments/mapping
- Local plan policies
- Low carbon energy options



Localism and support for microgeneration

- Public and local Member support for microgeneration but notable opposition to large scale renewable energy
- Evidence base to support local policies – Mitigation and Adaptation
- Low carbon policy options

Government energy strategy & initiatives

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- Feed-in Tariff
- Green Deal
- Renewable Heat Incentive
- Green Investment Bank

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Energy Statements for planning applications

Martin Holley

Session overview

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A. Energy Statements: policy & regulatory context
B. What makes a good Energy Statement?

A. Energy Statements: policy & regulatory context

What is an Energy Statement?

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- To demonstrate compliance with sustainable energy/climate change planning policy
- …but LA policies vary – as will the resulting scope & content required in energy statements
- Code or BREEAM Assessments are not substitutes

What developers need to do anyway: Part L 2010 Building Regulations

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- Part L 2010 – result in ~25% further reduction in regulated emissions from Part L 2006
- Criteria for establishing compliance:
  1. Achieving the Target Emission Rate
  2. Limits on design flexibility
  3. Limiting the effects of solar gains in summer
  4. Building performance consistent with Design Emission Rate
  5. Provisions for energy efficient operation of the dwelling

Routes to compliance

- **Housing 'base specification' – reflects what can be achieved with readily available materials & common construction methods, but does not meet Part L 2010**

Element	Specification
External wall U-value	0.20 W/m²K
Party wall U-value	0.00 W/m²K
Sheltered wall U-value	0.19 W/m²K
Ground floor U-value	0.15 W/m²K
Roof U-value	0.13 W/m²K
Windows U-value	1.40 W/m²K
Doors U-value	1.20 W/m²K
Thermal bridging (y-value)	0.08 W/m²K
Thermal mass parameter	250 kJ/m²K
Air permeability	7 m³/h.m² @50Pa

Source: *Part L 2010 Where to start: An introduction for house builders and designers.* NHBC Foundation

Routes to compliance – four examples

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Natural ventilation

Option A: enhanced fabric

- Airtightness of 6 m /h.m @50Pa
- Improved elemental U-values

Option B: solar thermal

- Airtightness of 7 m /h.m @50Pa
- 2 – 3 m² of solar thermal panels per dwelling
- Potential reduction in specification of elemental U-values

Option C: photovoltaic

- Airtightness of 7 m /h.m @50Pa
- 1.6 – 4 m² of photovoltaic panels per dwelling
- Potential reduction in specification of elemental U-values

Mechanical ventilation

Option D: MVHR

- Airtightness of 3 m /h.m @50Pa
- High efficiency MVHR system
- Potential reduction in specification of elemental U-values

Building Regs - what's coming?

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- Major revision in 2013 : Code Level 4, ~44% regulated emissions improvement over 2006 regs for housing
- Major revision in 2016: Code Level 6 'Zero Carbon' homes
- 'Zero Carbon' standard (draft) defines homes that meet a new Fabric Energy Efficiency Standard (FEES) which have all of the **regulated** CO_2 emissions due to fuel use mitigated by a combination of on-site low and zero carbon technologies, connected heat and Allowable Solutions

Building Regs - what's coming?

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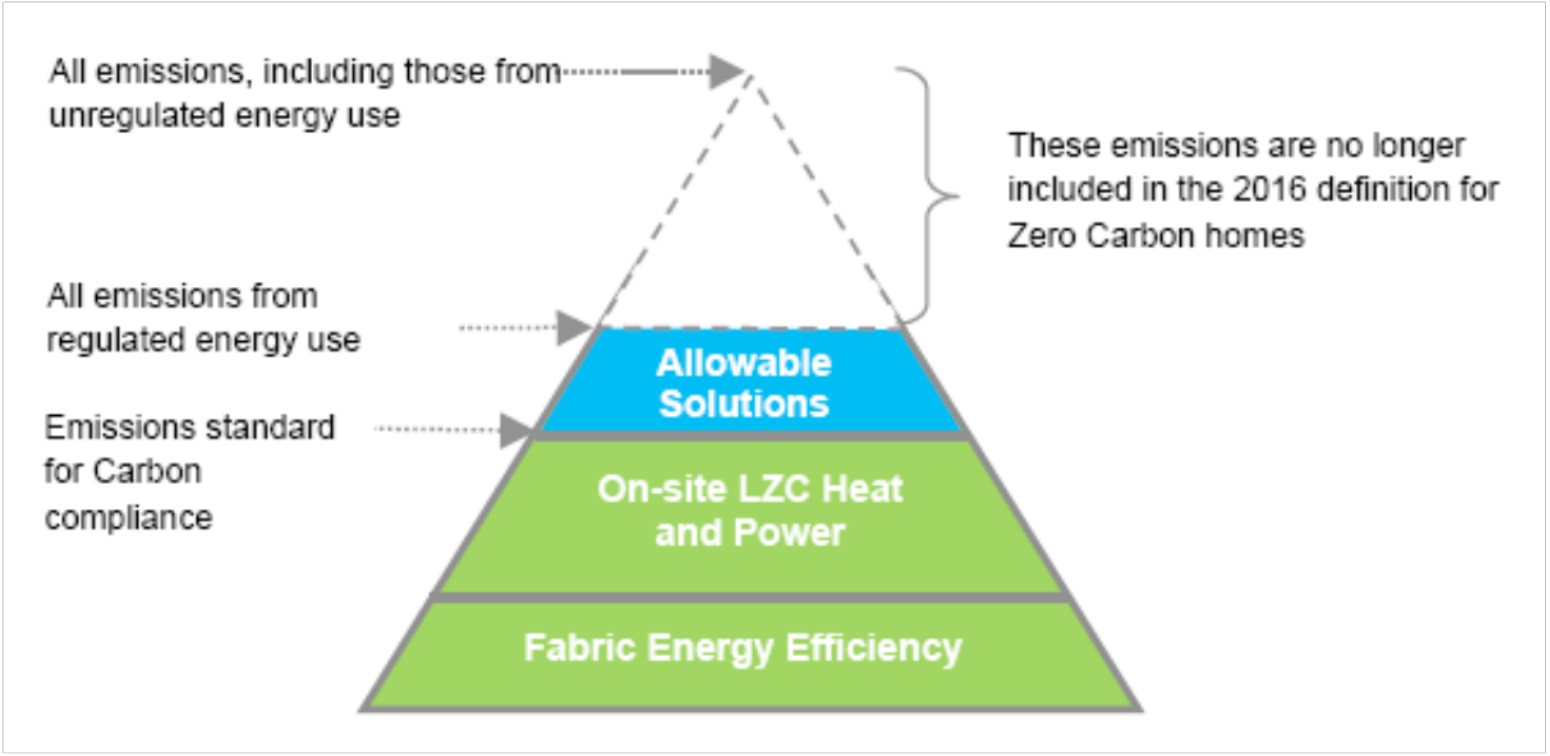
Proposed Zero Carbon Homes policy triangle



See: Allowable Solutions for Tomorrow's New Homes – Towards a Workable Framework. Zero Carbon Hub; July 2011

- **Q. How will Merton Rule policies integrate with the B. Regs trajectory up to 2016?**

Merton Rule policies

Generic example:

> *All developments above 1,000 m. sq. in size, or 10 or more residential units should incorporate on-site renewable energy generation measures which result in at least 15% reduction in CO_2 emissions unless it can be demonstrated that this is not technically feasible or financially viable.*

Questions a developer may have:

- 15% of what exactly – regulated or total emissions?
- Is there any flexibility if I go the extra mile with energy efficiency?
- Will this also apply when the B. Regs change in 2013?
- What are the accepted methodologies for doing the calcs?

Code for Sustainable Homes and BREEAM policies

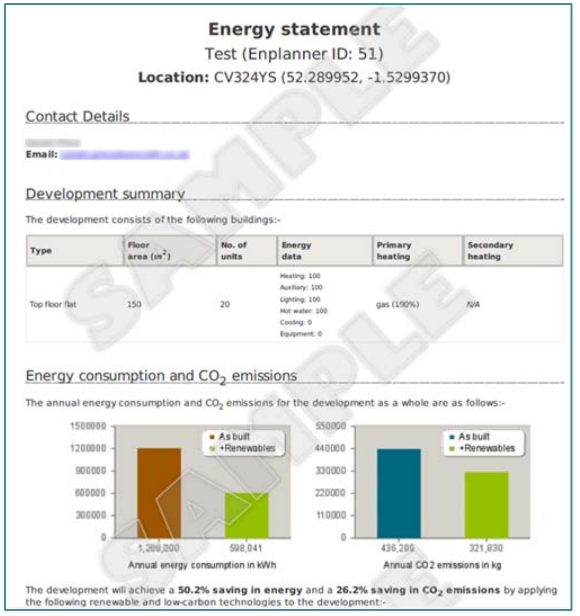
- Many LAs also include requirements for broader sustainable design i.e. CfSH and BREEAM e.g. Code Level 3 from 2010
- Credits are ‘tradable’ to some extent but minimum standards exist for the higher ratings in certain assessed categories
- E.g. ENE 04 (Low or Zero C Technologies) in BREEAM has a mandatory minimum no. of credits for achieving ‘Excellent’ or ‘Outstanding’
- Levels of renewable energy deployment cannot be determined by these ratings alone

B. What makes a good Energy Statement?

What should an Energy Statement contain?

Depends on policy requirement, but generally:

- Description of development
- Baseline emission calculations
- Description of energy efficiency and/or efficient energy supply measures (if needed)
- Outline of feasibility for renewable energy measures
- Energy and emission reduction calculations



Energy statement

Test (Enplanner ID: 51)

Location: CV324YS (52.289952, -1.5299370)

Contact Details

Email:

Development summary

The development consists of the following buildings:-

Type	Floor area (m^2)	No. of units	Energy data	Primary heating	Secondary heating
Top floor flat	150	20	Heating: 100 Auxiliary: 100 Lighting: 100 Hot water: 100 Cooling: 0 Equipment: 0	gas (100%)	N/A

Energy consumption and CO_2 emissions

The annual energy consumption and CO_2 emissions for the development as a whole are as follows:-

The development will achieve a **50.2% saving in energy** and a **26.2% saving in CO_2 emissions** by applying the following renewable and low-carbon technologies to the development:-

Description of development

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E.g.

- Size, no. of storeys, no. of dwellings, floor & roof area
- Location map and aerial view of site to show orientation and immediate surrounding area
- Estimated build schedule incl. any phasing
- Building usage and ownership

Baseline emission calculations

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Methods used and summary outputs for establishing regulated and unregulated emissions

- **Regulated emissions**: covered under Part L of the Building Regulations (space heating, hot water, fixed electricity) – established using SAP or SBEM
- **Unregulated emissions:** not covered by Part L (e.g. appliances) – more difficult to establish. Can use e.g. Code for Sustainable Homes calculator, NHER software or CIBSE Fuide F

	Total Energy Demand [kWh/yr]	**Associated Total CO_2 [tonnes/yr]**
Hot water	23,028	4,467
Space heating	32,732	6,350
Fixed electrical	6,438	2,717
Part L Total	**62,197**	**13,534**
Appliances/non-regulated	20,964	8,847
Total	**83,161**	**22,381**

Baseline emission calculations

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- Need to check that correct carbon emission factors have been applied to each fuel for converting energy to CO_2

Energy (kWh/yr) x Carbon Factor

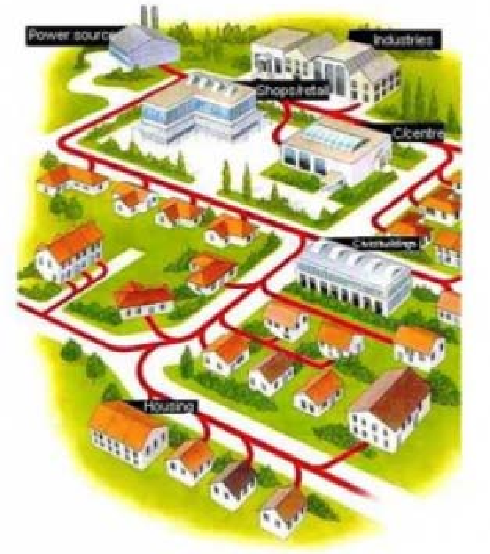
= CO_2 emissions (kg or tonnes/yr)

Carbon Factors e.g. SAP 2009 V.9.90:

- Gas: 0.198 $kgCO_2$/kWh
- Electricity: 0.529 $kgCO_2$/kWh
- Woodchip: 0.009 $kgCO_2$/kWh

Description of energy efficiency and/or efficient energy supply measures (if needed)

- Description of proposed energy efficiency measures that go beyond B.Regs e.g. lower U-values
- Description of proposed efficient energy supply measures e.g. use of Combined Heat and Power (CHP) with district heating
- Expected energy and emission savings from each measure (from SAP/SBEM modelling)



Outline feasibility for renewable energy measures

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- Description of proposed RE measures e.g. technology type, size/output rating, location, areas it serves etc.
- Demonstration of why this measure and not other RE technologies were taken forward
- Expected annual energy yield and associated emission savings

Energy and emission reduction calculations

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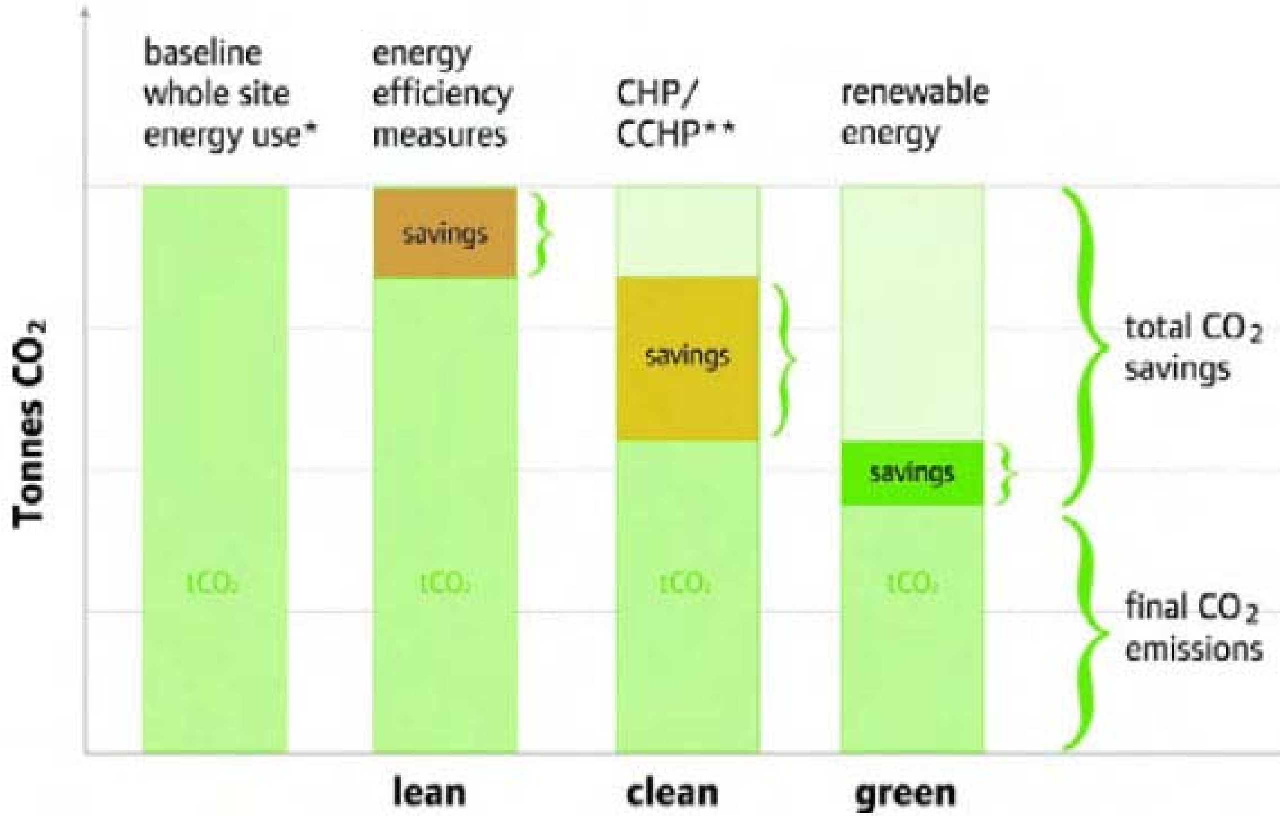
- Summary of expected energy and emission savings from all measures in relation to the relevant baseline(s)
- Comparison with policy requirement

	Energy Demand [kWh/yr]	Energy Savings from each step [%]	CO_2 emissions [tonnes/yr]	CO_2 emission savings from each step [%]
Scheme baseline (regulated + unregulated)	83,161	–	22,381	–
Scheme after energy efficiency	73,875	11.2	19,955	10.8
Scheme after CHP/DH	73,875	0	19,955	0
Scheme after renewables	58,482 (minus renewables output)	20.8	16,522	17.2

Energy and emission reduction calculations

Energy hierarchy approach:



note *calculated using current Building Regulations (at time of publication 2006) plus the CO_2 emissions associated with other energy uses not covered by Building Regulations.

** including district heating and cooling.

source GLA, adapted from the London Climate Change Agency

Guidance on producing an Energy Statement

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Examples of types of guidance for LAs and developers to demonstrate and verify compliance with climate change policies:

- Written guidance and checklists: issued by many LAs but vary in quality
- Spreadsheet tools: also used by some LAs
- Web-based services such as:
  - C-Plan www.sustainabilityplanner.co.uk/ and
  - Enplanner http://enplanner.com/

Guidance on producing an Energy Statement

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"Local planning authorities have a key role to play in encouraging other parties to take maximum advantage of the pre-application stage. They cannot require that a developer engages with them before submitting a planning application, but they could encourage take-up of any pre-application services they do offer."

Draft National Planning Policy Framework,
July 2011

Policy enforcement?

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- LA internal resources: Planning Policy & Development Management – closer working relationships and joint skilling-up
- Database of RE installations
- Additional policy requirements around monitoring and data collection?
- Requiring BREEAM post-construction reviews and Code for Sustainable Homes Post Construction Assessments

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Promoting sustainable energy policy and practice

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Renewable Energy Technologies – the essentials

Martin Holley

Session overview

A. Types of renewables
B. Technology overview
C. RHI & FiT

A. Types of renewables

Renewables ‘for buildings’

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Microgeneration technologies e.g.

- Solar PV & Solar Water Heating
- Small-scale wind
- Ground/water/air-source heat pumps
- Biomass (woodfuel) heating
- Micro-scale hydro (not covered below)

Renewables ‘for buildings’

Community-scale technologies e.g.

- District heating/cooling with renewables
- Renewable combined heat and power (CHP)
- …plus other scaled-up ‘microgeneration’

B. Technology overview

Solar energy

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- **Solar photovoltaics (PV) or solar water heating**
- **Ideally suited to south-facing roofs (between south-east and south-west) with a 30-40 degs pitch from horizontal**

Effect of tilt & orientation on energy yield

	Inclination (°)	West						South						East
		-90	-75	-60	-45	-30	-15	0	15	30	45	60	75	90
Vertical	90	56	60	64	67	69	71	71	71	71	69	65	62	58
	80	63	68	72	75	77	79	80	80	79	77	74	69	65
	70	69	74	78	82	85	86	87	87	86	84	80	76	70
	60	74	79	84	87	90	91	93	93	92	89	86	81	76
	50	78	84	88	92	95	96	97	97	96	93	89	85	80
	40	82	86	90	95	97	99	100	99	98	96	92	88	84
	30	86	89	93	96	98	99	100	100	98	96	94	90	86
	20	87	90	93	96	97	98	98	98	97	96	94	91	88
	10	89	91	92	94	95	95	96	95	95	94	93	91	90
Flat	0	90	90	90	90	90	90	90	90	90	90	90	90	90

Courtesy of Chris Jardine, ECI

Solar Water Heating

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- Two main types – flat panels or evacuated tubes
- Low maintenance but needs hot water storage tank
- Rules of thumb (domestic):
  - supplies 50-60% of annual hot water needs
  - 3-4m^2 panel area for 3-bed dwelling
  - panel outputs 300-500$kWh/m^2/yr$
  - tube outputs 500-600$kWh/m^2/yr$
- Potential issues – shading, orientation, roof-loading

Solar Water Heating

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CO_2 offset:

- **Generally assumed to displace mains gas**
- **Ideally need to factor in efficiency of the gas boiler it is 'replacing'**
- **E.g. If SWH system outputs 1,500 kWh of heat in one year, then:**
  - **Equivalent gas use = 1,500 kWh x 100/90* = 1,667 kWh**
  - **CO_2 offset = 1,667 kWh x 0.198** = 330 kgCO_2**

*assumes a boiler efficiency of 90%
** CO_2 factor for mains gas in kgCO_2/kWh

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Flat plate collector

Tube collector

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Solar Photovoltaics (PV)

- Panels or slates/tiles
- Rules of thumb:
  - Annual generation in UK typically around 800-900kWh per installed kW
  - Need around $8m^2$ of high efficiency panels for a 1kW system, or approx. $1m^2$ per 100kWh annual output
  - Need ~twice the roof area for flat roof installations *cf.* pitched
- Potential issues – shading, orientation, roof-loading, grid connection

Solar Photovoltaics (PV)

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CO_2 offset:

- **Assumed to displace mains electricity**
- **E.g. If PV system outputs 1,700 kWh in one year, then:**
  - **CO_2 offset = 1,700 kWh x 0.529* = 899 kgCO_2**

* CO_2 factor for mains elec in kgCO_2/kWh

More examples…

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Over-tile systems

Flat roof

PV tiles

Curtain wall (transparent panels)

PV louvres

Standing seam roof

Biomass (woodfuel) heating

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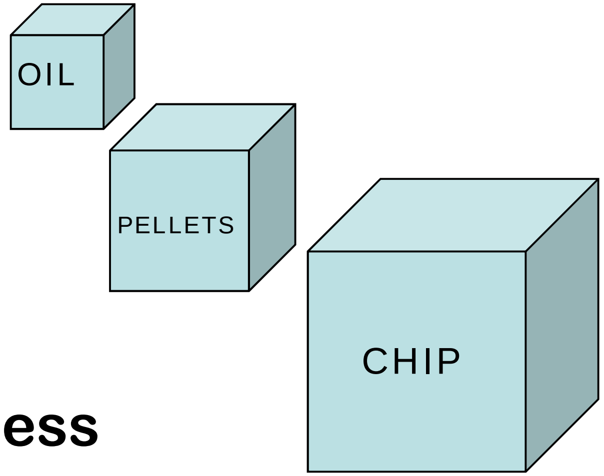
- Uses clean woodchip, logs or pellets
- Woodchip – cheaper than gas, but needs 10x the volume of oil in energy terms
- Need to consider:
  - Space for boiler and fuel store
  - Location of flue
  - Method of fuel delivery and access
  - Smoke Control Area or Air Quality Management Area?
  - Higher maintenance requirement – ash disposal & regular checks/servicing



Applications

- Stoves/ room heaters
- Some models can be fitted with back boiler for hot water
- Larger scale boilers, provide space and water heating
- Household scale can be log/pellet (rarely chip)
- For larger buildings – small farms, schools, institutions, etc. – wood chip or pellet boiler
- District heating – large centralised boiler and heat main

Biomass (woodfuel) heating

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CO_2 offset:

- **Generally assumed to displace mains gas but need to factor in efficiency of the biomass boiler, the gas boiler it is 'replacing' and CO_2 factor for biomass**
- **E.g. If biomass system will deliver 40,000 kWh of heat in one year, then:**
  - **Wood energy needed = 40,000 kWh x 100/87* = 45,977 kWh**
  - **CO_2 emissions from wood = 45,977 kWh x 0.009** = 414 kgCO_2**
  - **Equivalent gas use = 40,000 kWh x 100/87* = 45,977 kWh**
  - **CO_2 emissions from gas = 45,977 kWh x 0.198** = 9,103 kgCO_2**
  - **CO_2 offset = 9,103 – 414 = 8,689 kgCO_2**

*assumes both biomass & gas boiler have efficiencies of 87%
** CO_2 factors for woodchip and mains gas in kgCO_2/kWh

Wood boilers

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Biomass CHP/district heating

- Central energy plant serving two or more buildings (or block of flats)
- Biomass district heating suited to a range of scales but biomass CHP generally only viable at large scale
- Plant usually sized on heat load – so understanding the annual heat load profile is important
- SAP has specific CO_2 factors for CHP/district heating calcs
- Same issues around fuel deliveries/storage as for biomass heating above

Biomass CHP/district heating

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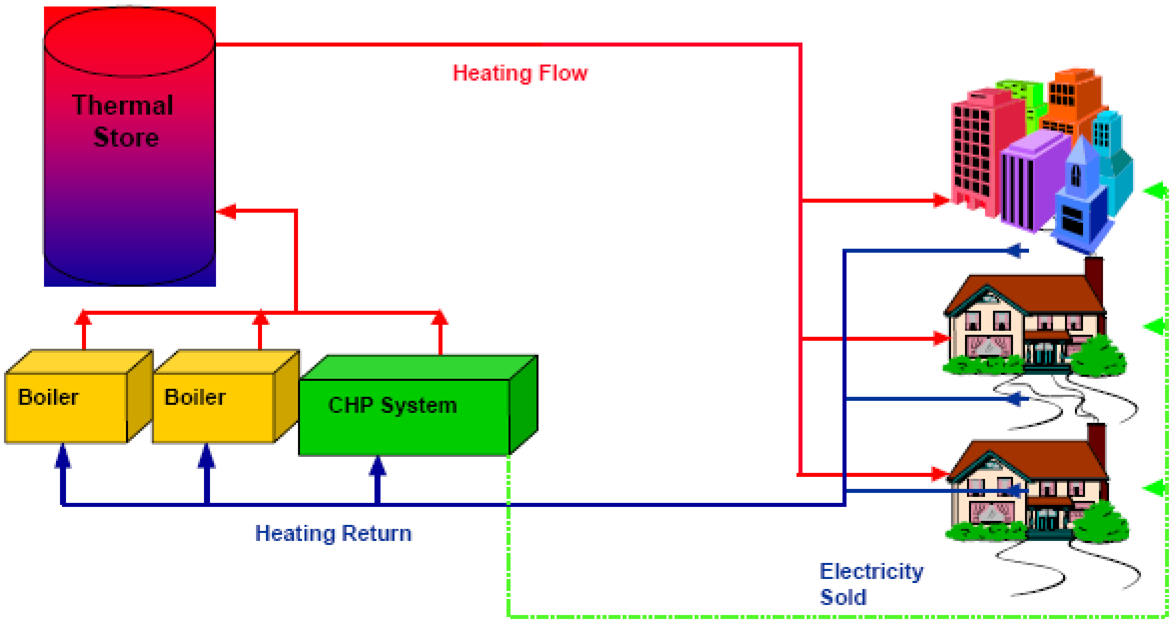

Ground Source Heat pumps

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- Collects and 'concentrates' heat from the ground via vertical bore holes or horizontal trenches for use in buildings (heating or cooling)
- Powered by electricity but relatively efficient
- Best in new or well-insulated buildings
- Rules of thumb:
  - 10m trench of coils = 1kW of heat
  - 75-100m of boreholes = 3-5kW of heat
  - trenches/boreholes spaced at 5m apart
  - Coefficient of performance (CoP) typically 3-4 i.e. for each unit of electricity used, 3-4 units of heat are delivered

Ground Source Heat pumps

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CO_2 offset:

- Generally assumed to displace mains gas and electricity for heating and cooling applications respectively
- Need to factor in gas boiler to be 'replaced' and electricity used by the heat pump: e.g. if a heat pump system with CoP 3.5 will deliver 40,000 kWh of heat in one year, then:

  - Equivalent gas use = 40,000 kWh x 100/87* = 45,977 kWh
  - CO_2 emissions from gas = 45,977 kWh x 0.198** = 9,103 $kgCO_2$
  - Elec used by HP = 40,000 kWh x 1/3.5 = 11,429 kWh
  - CO_2 emissions from HP = 11,429 kWh x 0.517** = 5,909 $kgCO_2$
  - CO_2 offset = 9,103 – 5,909 = 3,194 $kgCO_2$

*assumes gas boiler has an efficiency of 87%

** CO_2 factors for mains gas and standard tariff elec in $kgCO_2$/kWh

Ground loops

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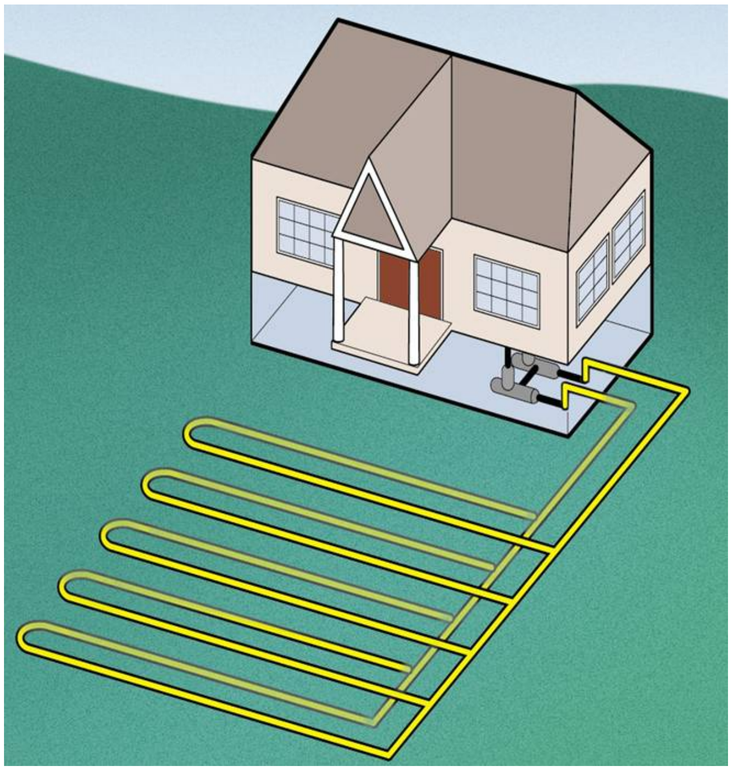

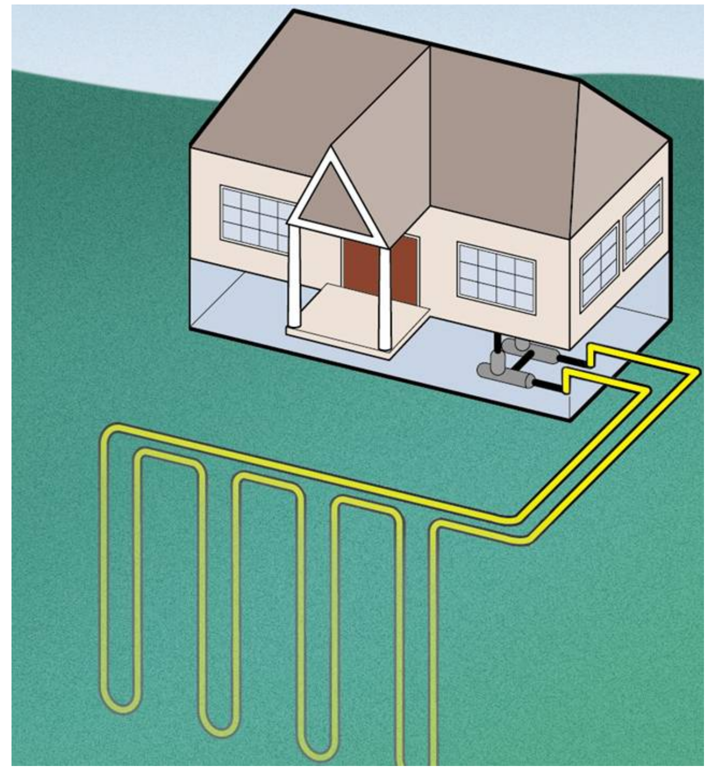

- Heat pump is closed loop, containing refrigerant
- Ground loop also closed loop - containing water and antifreeze

Vertical ground loops

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Images courtesy of Penwith Housing Association

Spiral coil ground loops

Courtesy of GeoScience Limited: Minehead

Courtesy of Gamblesby Village Hall Committee

Other horizontal ground loops

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Air source heat pumps

- **Visually similar to air conditioning unit - located outside on an exterior wall**
- **Extracts heat from ambient air (even in winter) but in UK suffers from a lower CoP *cf.* ground source**
- **Stated CoP should be at least 2.5**
- **Potentially noise issues in residential applications**

West Lothian installation – photo from Heatking Ltd

Wind power

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- **Can be stand-alone or roof-mounted**
- **Stand-alone typical <100kW machines on 10-30m mast (small-scale); up to 3MW machines on 100m masts (large scale)**
- **Roof-mounted typical 0.5-1.5kW machines**
- **Site must demonstrate a reasonable annual average wind speed (typically >5.5m/s)* without nearby obstructions to wind e.g. buildings or trees**

*can check online using a postcode:
www.energysavingtrust.org.uk/Generate-your-own-energy/Wind-turbines/Wind-Speed-Prediction-Tool

Wind power

- Energy yields vary with turbine type, turbine capacity and annual average wind speed. An 11kW turbine may typically output up to 38,000 kWh/yr with an annual average wind speed of 6m/s
- Potential issues – noise, visual impact, vibration (roof-mounted), structural safety, grid connection, local ecology, access for maintenance
- Micro/small-scale systems to be treated as permitted development from Dec 2011
- CO_2 offset – same principle as solar PV

Applications

Micro-scale (roof-top)

Small-scale

Medium-/large-scale

Sub-micro scale?

C. RHI & FiT

Renewable Heat Incentive

Centre for Sustainable Energy

Phase 1 (non-residential)

- A tariff paid for each kWh of heat generated guaranteed for a period of 20 years
- Started end of Nov 2011
- Open to the industrial, commercial and public sectors, not-for-profit organisations and communities
- Tariffs are subject to annual RPI uplift
- Payment amounts based on metered heat
- Phase 2 (start Oct 2012) will expand the scheme to residential and include additional technologies

Renewable Heat Premium Payment

Centre for Sustainable Energy

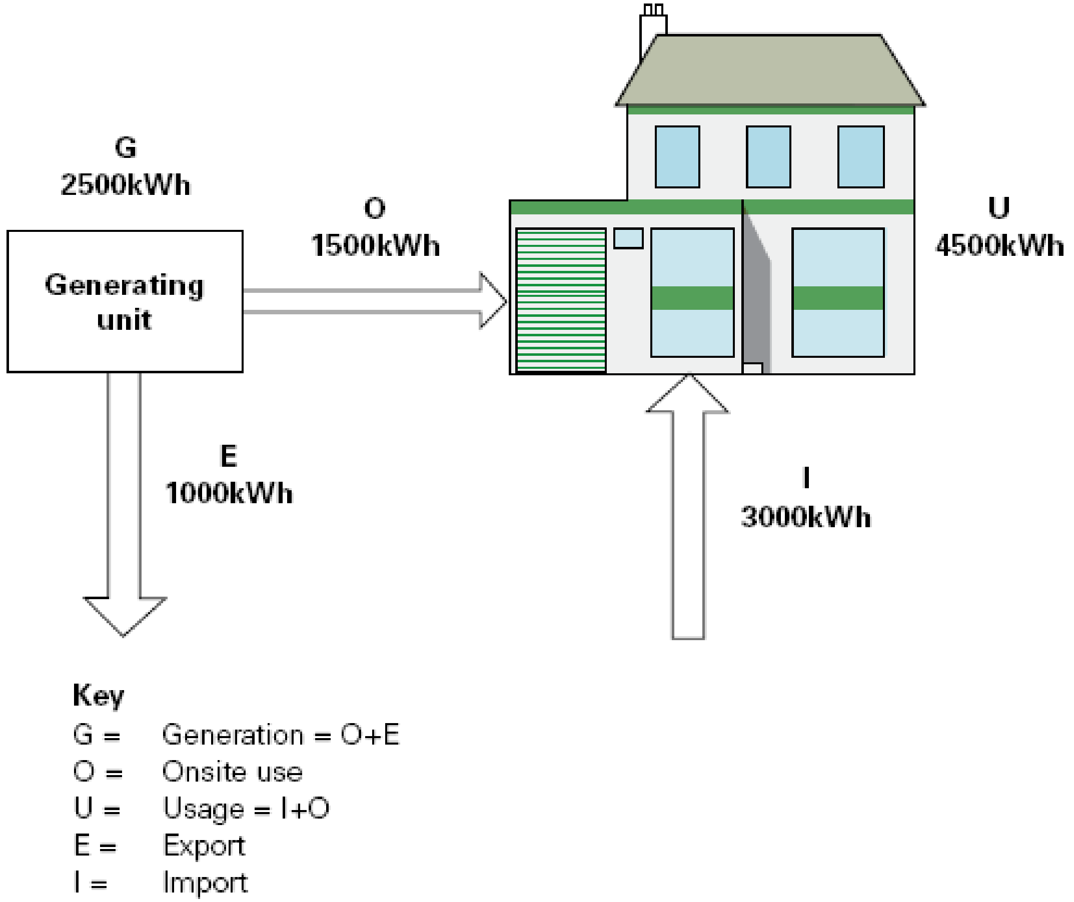
- **Interim support (Aug '11 – Mar '12) for households prior to RHI Phase 2:**

Heat Technology	Payment per installation	Eligible households
Air source heat pumps	£850	All households in England, Scotland & Wales **not heated by gas** from the grid
Biomass boilers	£950	
Ground/water source heat pumps	£1,250	
Solar water heating	£300	All households in England, Scotland & Wales

Feed-in Tariffs

- Three strands of benefit for generators using energy on-site:
  - Generation tariff
  - Export tariff (3.1p/kWh)
  - Offsetting imported electricity

Figure 5:
Illustration of potential electricity flows for an on-site generator



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