Small Scale Renewable Energy for Planning Committee Members

13th July 2010

Gill Fenna & Steve Wrigley
Quantum Strategy & Technology

CLASP. CLIMATE CHANGE LOCAL AREA SUPPORT PROGRAMME

CLASP - Climate Change Local Area Support Programme

- NW wide programme for LAs and LSPs
- Technical and Leadership support
- Many activities: see www.clasp-nw.info
- Contact Ailsa Gibson ailsa@clasp-nw.info
- Managed by Liverpool City Council
- Main funder: NWIEP

CLASP. CLIMATE CHANGE LOCAL AREA SUPPORT PROGRAMME

Programme

- Small-scale Renewable Energy in context
- Planning Policy and Guidance
- Renewable & Low Carbon Technologies
- Low Carbon Buildings
- Issues for Developers
- Discussion & Questions

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Small Scale Renewable Energy in Context

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Small-scale Renewable Energy

- Renewable or low carbon energy source designed to supply a single building or development
  - Photovoltaics, wind, hydro, for electricity
  - Biomass, solar thermal, heat pumps for heat
  - Biomass, anaerobic digestion, waste for heat and/or power
  - Heat distribution networks
- Not large scale electricity supply to the grid
  - Wind farms, wave, tidal

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National Legislation

- Climate Change Act 2008
  - 80% reduction in CO2 emissions by 2050
  - 34% reduction by 2020
- EU Renewable Energy Directive
  - 15% renewable energy by 2020
- Renewable Energy Strategy
  - 30% of electricity (from 5.5% in 2009)
  - 12% of heat energy (from negligible amount)
  - 10% of transport energy (from 2.6%)

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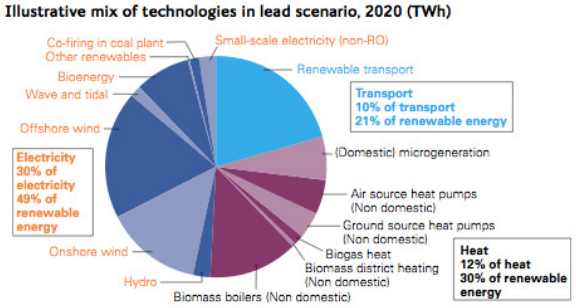
Renewable Energy Strategy



Source: DECC analysis based on Redpoint/Trilemma (2009), Element/Pöyry (2009) and Nera (2009) and DfT internal analysis

NW Targets – RSS 2006

	Installations	Output MWh
Off-shore Wind	5	4248
On-shore Wind	100+	1723
Energy from Waste	22	1108
Biomass CHP	15	514
Anaerobic Digestion	15	145
Solar PV	50,000	125
Wave / Tidal	3	107
Small Wind	20,000	38
Hydro	12	7

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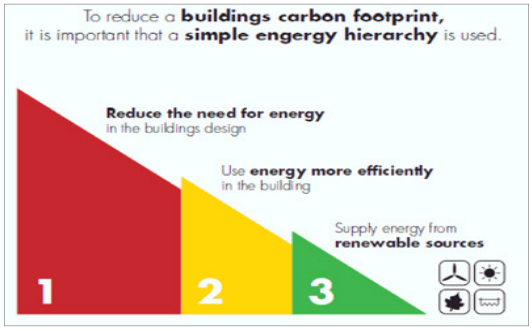
Energy Hierarchy



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A Few Definitions

- Energy Output
  - Electricity, heat, transport fuel
  - Measured in kWh, MWh etc
- Power / Rating
  - Capacity to deliver energy
  - Measured in kW, MW etc
- CO2
  - Emissions of carbon dioxide linked to use of fossil fuels
  - Variable conversion factors for different energy sources, (currently 0.19 kg/kWh gas, 0.56 kg/kWh grid electricity)

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Planning Policy & Guidance

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PPS 22: Renewable Energy (2004)

- Allows for Local Planning Authorities to set local requirements for renewable energy in new developments
- Based on the "Merton Rule" – 10% of energy in large developments had to come from renewable sources
- Most Regional Spatial Strategies incorporated targets.
- Over 100 local Planning Authorities incorporated into local planning documents, with variations
  - Bolton - RSS plus interim targets up to 60% for large developments
  - Kirklees – 30% renewable energy requirement on all developments with council involvement
  - Rochdale – RSS plus CSH Level 3 and BREEAM Very Good with minimum energy efficiency

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PPS1: Planning & Climate Change Supplement 2006

- Objectives
  - Secure the highest viable resource and energy efficiency and emissions reductions
  - Secure the fullest possible use of sustainable transport (including freight)
  - Minimise vulnerability and provide resilience to climate change (adaptation)
  - Enable the community to tackle climate change
- Local Development Documents
  - Expect a proportion of the energy supply to come from decentralised and renewable or low-carbon sources

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NW Regional Spatial Strategy 2006

- Policy EM18
  - Local Authorities should set out targets for the energy to be used in new developments to come from decentralised and renewable or low carbon energy sources
  - In advance of local targets, new non-residential developments over 1,000m2, and residential developments of 10 or more homes, should secure at least 10% of their predicted energy demand from decentralised and renewable or low carbon sources, unless it can be demonstrated not to be feasible.
- *2010 update: since the abolition of the RSS, EM18 can continue to be used as a supporting document (but not a requirement) along with PPS1 & PPS22.*

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Use of EM18 or local requirements

- How many of you have a renewable energy requirement?
- How well is it working?
- What are the issues?

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PPS1 Supplement Consultation (incorporating PPS22) March 2010

- "Planning for more renewable and low carbon energy development should be at the heart of good planning: it is neither optional or additional"
- "Applications for cutting edge, well-designed buildings should not be turned down simply because they do not look familiar"
- Regional targets for renewable energy should be set consistent with national targets: local authority-wide targets are expected to be unnecessary by 2013 but may be set for specific developments

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PPS1 Consultation 2010 – Local Authority Role

- LCF 1
  - Assess their area for opportunities for decentralised energy (to supply more than one building)
  - Map the heat demand and possible sources
  - Secure opportunities for district heating based on energy from biomass, surplus heat or waste
- LCF 4
  - Design policies to support and not unreasonably restrict renewable and low carbon energy developments
  - Support opportunities for community-led developments
  - Allocate strategic sites key to delivering decentralised energy in the Core Strategy

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Sustainable Energy Action Plan – Greater Manchester

- Blueprint for priority actions for a low-carbon Greater Manchester
- Recommendations to cover:
  - Developing a consistent approach to spatial energy planning across GM
  - Removing barriers to planning permissions for renewable energy
  - Education to support community-level energy supply
  - Promoting micro-generation and business development
- Mapping of potential low carbon energy supply capacity
- Low carbon energy requirements incorporated into regeneration area planning

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Regional Strategy 2010

- Strong focus on renewable energy and low carbon technology, including retro-fitting of houses and other buildings
- To continue as a non-statutory high-level framework

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Permitted Developments (2008)

- Roof-mounted solar thermal and PV permitted unless;
  - panels when installed protrude more then 200mm.
  - they would be placed on the principal elevation facing onto and visible from a highway in buildings in Conservation Areas and World Heritage Sites.
- Stand-alone solar thermal and PV permitted unless;
  - more than 4 metres in height
  - installed less than 5 metres away from any boundary
  - above a maximum area of array of 9m2
  - situated within any part of the curtilage of the dwelling house and would be visible from a highway in Conservations Areas and World Heritage Sites.

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Permitted Developments (2008)

- Wood burning boilers and stoves, and CHP, permitted unless:
  - flue exceeds 1m above the roof height
  - installed on the principal elevation and visible from a road in buildings in Conservation Areas and World Heritage Sites.
- Ground source & Water source heat pumps permitted
- Air source heat pumps, micro-wind and small wind not permitted at this stage, but 2009 consultation proposed
  - 45dB noise limit for first installation at a site
  - Microgeneration Certification Scheme compliance mandatory
  - Safe-guarded areas for radar communications
  - Size and location limits for visual impact
  - Exempted areas e.g. AONBs, Conservation areas etc

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Renewable & Low Carbon Technologies

Steve Wrigley

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Renewable Energy

Solar

Gravitational

Geothermal

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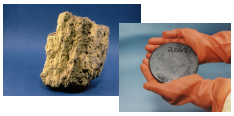
Non Renewable Energy

Coal

Natural Gas

Oil



Uranium

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'Zero' Carbon Technologies

- Solar water (heat)
- Solar Photovoltaic (electricity)
- Wind Turbines (electricity)
- Hydro,Tidal & Wave (electricity)

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'Low' Carbon Technologies

- Heat pumps (heat)
- Biomass (heat and electricity)
- Nuclear (electricity)

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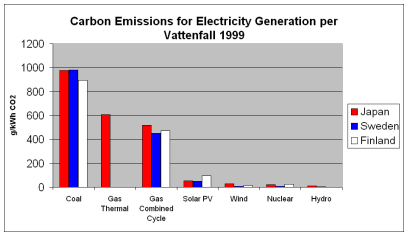
BUT!
Nothing is totally Carbon Free
(Life Cycle Analysis)



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The Technologies

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Solar Photovoltaic (PV)

- Bolt on panels or integrated tiles
- Needs SE-SW aspect without shade
- Usually grid connected
- Reliable, little maintenance
- Can claim FITs
- Relatively expensive
- Good for domestic or industrial

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Wind Turbines

- Wind speed > 5 m/s
- 5 to 20 kW on 9-25 m towers
  - 6 kW: large six bed home
  - 15 kW: Six, three bed houses
- Good for commercial sites
- Limited use for residential
  - Flicker (neighbours)
  - Noise
  - Needs unobstructed air flow
- Building mounted – some issues with output (poor siting), structural integrity

15 kW Proven 20 high

6 kW Quiet Revolution 14m high

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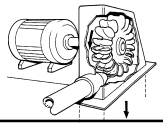
Micro Hydro (<100kW)

- Needs existing weir
- Reliable & cheap
- Lengthy planning & licensing process
- Good resource in NW due to industrial heritage
- Good for communities

Halton Weir (Lancaster)



Pelton Turbine

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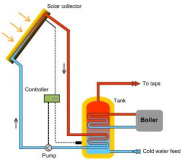
Solar Hot Water (Thermal)

- 40–60% of hot water demand
- Needs SE-SW facing roof
- Reliable proven technology
- Plumbing modifications needed
- Good for domestic applications
- Be aware:
  - Must be a need for the hot water (cold feed appliance issue)
  - Some systems use electricity



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Biomass Heating

- Wood burning stoves for small homes
- Biomass boilers for large homes & non residential
- Issues:
  - Fuel storage & delivery
  - Planning & environmental (eg flues & smokeless zones
  - Ash disposal
  - More efficient with steady demand

250 kW boiler
(40 t per month woodchip)

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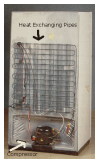
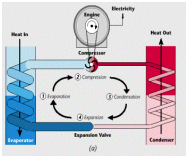
Heat Pumps





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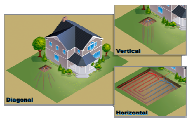
Ground Source Heat Pumps

- Horizontal pipes need large area
- Vertical pipes costly
- Needs electricity to run
- Coefficient of Performance (COP) 3-4
- Most efficient with under-floor heating
- Can install pipes in lakes
- Most suitable for new build



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Air Source Heat Pumps

- Lower COP (2-3) than GSHP
- Most efficient with underfloor heating (air / liquid)
- Issues with visual impact and noise (externally mounted)
- Can assist with Part F of building regulations; ventilation (air /air)
- Needs electricity supply

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Emerging Technologies

- Anaerobic digestion
- Fuel Cells

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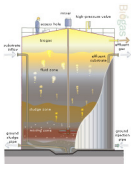
Anaerobic Digestion

- Bacteria break down organic material without oxygen
- Biogas used to generate electricity
- Remaining solid matter used as fertiliser
- Good for farms and sewage treatment plants
- Can use household waste



Sainsbury's awards AD contract to Biffa

Thursday 04 February 2010 | Organics News

Sainsbury's has signed a three-year contract with waste management firm Biffa to send food waste from 40 of its Midlands stores to the Birmingham-based firm's anaerobic digestion facility in Leicestershire.

Supermarket giant Sainsbury's has singled out anaerobic digestion (AD) as its preferred method of organic waste treatment and intends to treat all its food waste using AD by 2012.

Material collected under the agreement will be sent to Biffa's 1.5MW Warrisp AD facility in Leicestershire, where it will be broken down to create biogas and used to generate electricity for the National Grid.

Since October 2005, Biffa has worked with Sainsbury's to provide recycling and waste management services to around 600 stores. Under this agreement, Biffa has also overseen a waste oil recycling scheme, management of confidential paperwork and back-of-store residual waste collection, treatment and disposal.

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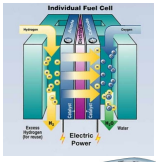
Fuel Cells

- Chemical reaction to produce electricity
- Combines Oxygen and Hydrogen to produce water plus electricity
- Needs a cheap reliable hydrogen source
- Uses now : hospital & server back up, remote location needs
- Future: cars & gadgets



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Other Concepts

- Combined Heat and Power
- Energy from waste
- District Heating

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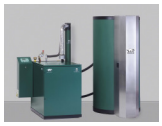
Combined Heat and Power

- Generation of electricity and heat
- Large scale Power stations to small industrial sizes
- Needs a constant heat base load
- Good for hospitals, leisure centres, universities etc



Dachs CHP 5kWe & 12kwth
Gas fired

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Energy from Waste

- Controlled burning of municipal waste to provide steam for power generation
- Recyclable materials removed first
- Can be designed as CHP if there is a local need for steam (e.g. district heating or industrial process)

Teeside 30MW plant
390k tonnes waste

Planned 100MWe at Ineos Claw Runcorn
850k tonnes waste
(PFI Viridor & Laing)

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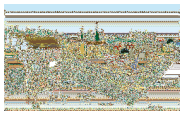
District Heating

- Central Boiler
- Hot water distributed via insulated underground pipes
- Good for new build communities, hospitals and universities
- Good when combined with a CHP plant
- 60% Danish population supplied by district heating



Lancaster University

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Low Carbon Buildings: Code for Sustainable Homes & BREEAM

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Code for Sustainable Homes

- Mandatory standards on
  - Environmental impacts of materials
  - Management of surface water run-off
  - Storage of non-recyclable and recyclable waste
  - Construction site waste management
- Code Level mandatory standards on
  - CO2 emissions
  - Indoor water consumption
- Credits for
  - Health & well-being
  - Pollution
  - Ecology

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Code for Sustainable Homes 2007

Date	Requirement	CO2 savings vs 2006
2008	All new homes accredited	
2010	Level 3	25%
2013	Level 4	44%
	Level 5	100%
2016	Level 6	Zero carbon

THE CODE FOR SUSTAINABLE HOMES

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CSH Process for Developers

- Choose an assessor & register the site with BRE
- Design Stage assessment report
  - Advice on achieving standards
- Design Stage certificate received
- Build homes
- Post-construction Stage assessment
  - Site visits required
  - Staged assessment for larger developments
  - Confirmation/revision of Code Level
  - Final Certificate received

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CSH Level 3

Built by Appledore Developments for West Kent Housing Association

Over 15,000 CSH3+ Accreditations since 2007 – 89% of total

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CSH Level 4

Illingworth, Halifax

82 homes for Pennine Housing built by Bramall Construction

First saleable homes to CSH4

- Solar panels
- Air heat recovery
- 300mm cavities
- Low u-value materials

All social housing now to CSH4

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CSH Level 5

Astling Green, Blackpool - Great Places Housing Group

•Super-insulation and highly air-tight

•Mechanical ventilation & heat recovery

•Photovoltaic panels

•Highly efficient boilers

•Rainwater harvesting

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CSH 6

BRE Watford Innovation Park

Barratt Green House, designed for the volume market

- High thermal mass for retaining heat and summer cooling
- Mechanical ventilation and heat recovery
- Triple glazing maximising natural daylight

First Commercial Developments

- Hanham Hall, Bristol, 195 homes, Barratt's
- Upton, Northampton, 6 homes as part of larger development
- Mountsorrel, Leicestershire, 5 homes

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CSH Costs for Developers

Code Level	Additional Cost in 2008	Additional Cost in 2010
3	4 - 7%	3 - 4%
4	8 – 15%	6 - 8%
5	13 – 32%	25 – 30%
6	24 – 52%	30 – 40%

Sources: Cost Analysis of The Code for Sustainable Homes, 2008, DCLG

Code for Sustainable Homes: A Cost Review, 2010, DCLG

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BREEAM

- 9 Categories: Management, Health & Well-being, Energy, Transport, Water, Materials, Waste, Land Use & Ecology, Pollution
- Points system with minimum criteria for each category for different award levels
- Separate rating systems for different building types: offices, schools, hospitals, industrial units etc
- Award levels: Pass, Good, Very Good, Excellent, Outstanding
- Aim to achieve zero carbon non-residential buildings by 2019 through changes to Building Regulations

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BREEAM

Environmental Assessment Award

This is to certify that

National Assembly for Wales,
Cardiff Bay,
Wales

has achieved the rating of

EXCELLENT

Under

Bespoke BREEAM

This assessment was carried out at the
DESIGN STAGE

Signed on behalf of Building Research Establishment Ltd

Date 24 January 2006

External Assessor	Steve Webster	On behalf of	TPS Consult
Client	National Assembly for Wales	Contractor & Works Manager	Taylor Woodrow Construction Ltd
Lead Capacitator & Architect	Richard Rogers Partnership	Mechanical & Electrical Engineer	BDSP Partnership

This non-mandatory assessment has been carried out at the design stage. No assumptions should be made about performance of aspects not covered by the assessment report. BREEAM is a registered trademark of the Building Research Establishment Ltd.

BRE

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BREEAM Very Good

- Speculative office development, Colchester
- Standard construction
- PV panels on roof

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BREEAM Very Good

- Speculative office East Kilbride
- Low carbon impact materials
- High standards of insulation
- Energy efficient services and controls
- Natural ventilation, thermal mass and solar shading
- On site wind turbine

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BREEAM Excellent

- Accommodation at Lancaster university
- Timber frame – off-site panels
- Integrated controls & metering
- Solar water
- Cheaper than standard construction

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BREEAM Outstanding

7 More London, PWC offices

- Vegetable oil heating
- Solar water
- Targeted heat transfer
- Natural day-lighting
- 70% energy savings

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Issues for Developers

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Costs

- Capital costs up to 10% higher for CSH Level 4, but
  - Developers of social housing now used to delivering
  - Costs coming down as gain more experience
- Costs for CSH 5/6 and BREEAM Outstanding higher due to scale of renewable energy installations
  - Expected to decrease over time as well
- Certification - time commitment for processes, fees, providing evidence

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Drivers

- Competitive edge & recognition of potential for skills development
- Higher standards for certain developments e.g. Social Housing, English Partnerships, Regeneration areas, some public partnership developments (e.g. Kirklees, WDA)
- Client pressure – carbon reduction targets & Carbon Reduction Commitment costs for business & public sector (e.g. Asda, Tesco, M&S)
- Energy security – data servers, critical services, communications centres
- Financial – long term cost savings for clients

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Feed In Tariff

- Introduced 2010 for all new and some existing small scale (<5MW) installations of PV, hydro, anaerobic digestion, wind and pilot micro-chp schemes
- Payment for every kWh renewable electricity generated
- Additional payment for any exported to grid
- Value depends on technology to give 5-8% return on investment, e.g.
  - Less than 4kW PV, 36.1 p/kWh
  - Over 2MW Hydro, 4.5 p/kWh

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Renewable Heat Incentive

- Due to be introduced April 2011
- Payment for metered or calculated heat output from
  - Biomass, biogas, some biodiesel
  - Ground & air-source heat pumps
  - Solar thermal
- Tariffs expected to be from 2p/kWh (ASHP) to 18p/kWh (solar)
- Individual and shared (district heat) systems

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Ownership & Management

- FITs/RHI paid to the system owner – some companies setting up leasing arrangements
- Maintenance costs for most technologies
  - Who pays?
  - Information/education for clients
- Long term management of large-scale infrastructure (e.g. district heating, hydro) must be considered at planning stage
  - Usual approach is Energy Services Company (ESCo)
  - Growing number of community/not for profit groups

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Grid/Network Connection

- Relatively straight-forward for single building small systems
- Potential grid capacity issues for larger developments and delays in connection
- Potential high costs associated with connection and additional metering
- District heating network connections as yet untested in most areas

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Experience & Capacity

- Larger developers getting used to some technologies – mainly solar
- Smaller builders wary of costs and installation skills needed
- Skills/confidence gap for installation and maintenance
- Supply chain capacity
  - Shortage of kit & installers for some technologies
  - Lack of UK expertise and equipment (especially heat)
  - Growing supply chain in NW for most technologies & support from Envirolink/NWDA
- Risks associated with larger/communal technologies

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Planner Knowledge

- Lack of understanding of the technologies and how they meet the requirements
- Lack of consistency in requirements and evidence needed
- Lack of information provision for smaller construction companies
- Little pro-active advice for small projects e.g. extensions
- Not being demanding enough

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Discussion

- How do you know that what's proposed will meet the requirements?
- How do you deal with conflict with other policies?
- How well prepared are your planning officers?

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Contacts

CLASP
Ailsa Gibson
ailsa@clasp-nw.info 07931 583707

Quantum
Gill Fenna – gill.fenna@quantumst.co.uk
Steve Wrigley – steve.wrigley@quantumst.co.uk
0161 924 2388

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