Programme

- 08.30 Constructing Excellence Wales Introduction
- 08.35 Overview of RHI Applications
- 09.00 Technology Overview
- 09.30 Legal Overview
- 10.00 Coffee
- 10.30 FIT Update
- 11.00 Final questions and close

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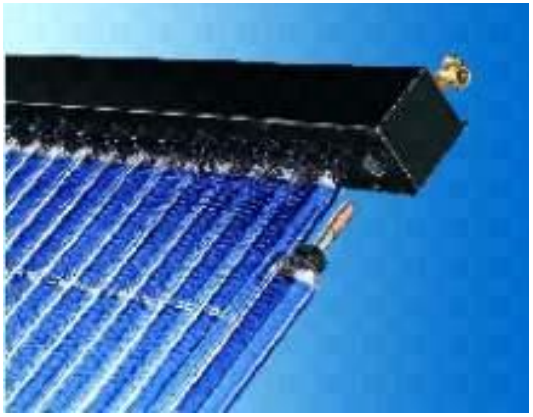
CONSTRUCTING EXCELLENCE IN WALES

HUGH JAMES


Overview of the Renewable Heat Incentive

Jonny Williams
BRE Wales and South West

BRE Overview

- Interested is everything "clean and green" in the built environment
- Focus on consultancy, research, training, testing and innovation.
- BRE has 650 staff, a global leader in the sustainable built environment
- Established in 1921

BRE Innovation Park, Garston, Watford

BRE Wales and South West

- A team of 12 people
  - renewable energy - low energy design - thermal modelling
  - retrofit and refurbishment –master-planning
  - timber in construction - passivhaus

- Work is government initiatives, consultancy and research programmes

- Links with Cardiff University, Bath University, University of Wales, Strathclyde University. Approximately 20 PhD students.

The Welsh Passivhaus, Ebbw Vale

Ecoterrace, Penrhiwceiber

What is the RHI?

- World first financial incentive for renewable heat
- p/kWh subsidy to compensate for:
  - Renewable heating cost compared to fossil fuel alternative
  - 12% rate of return (lower for solar thermal)
- Tariff Payments over 20 years
- Eligible renewable heat technologies
- Phase 1: Non-domestic – end of 2011
- Phase 2: Domestic – October 2012 (with Green Deal)

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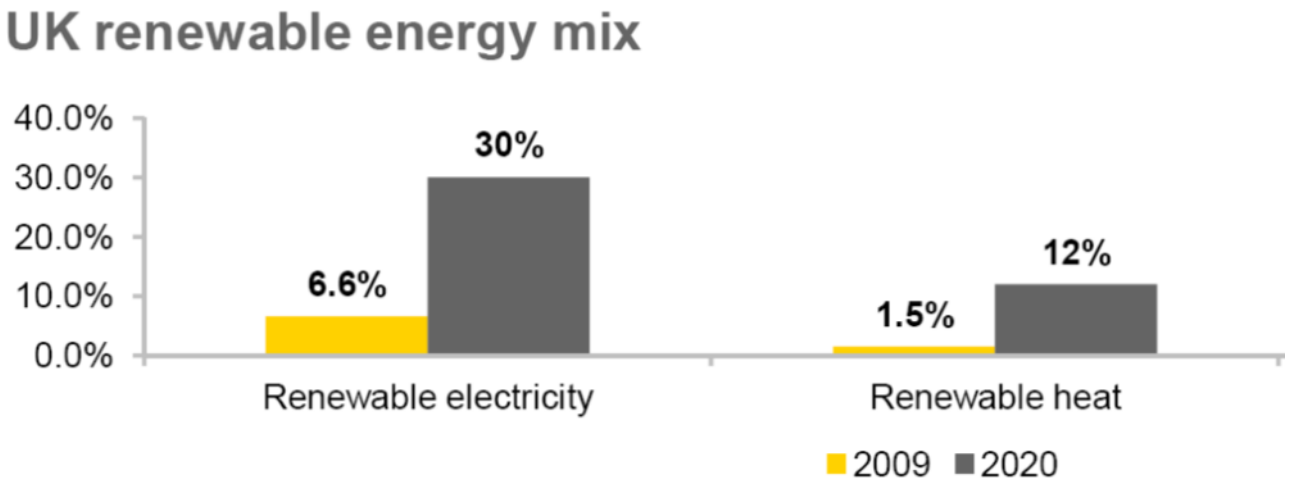
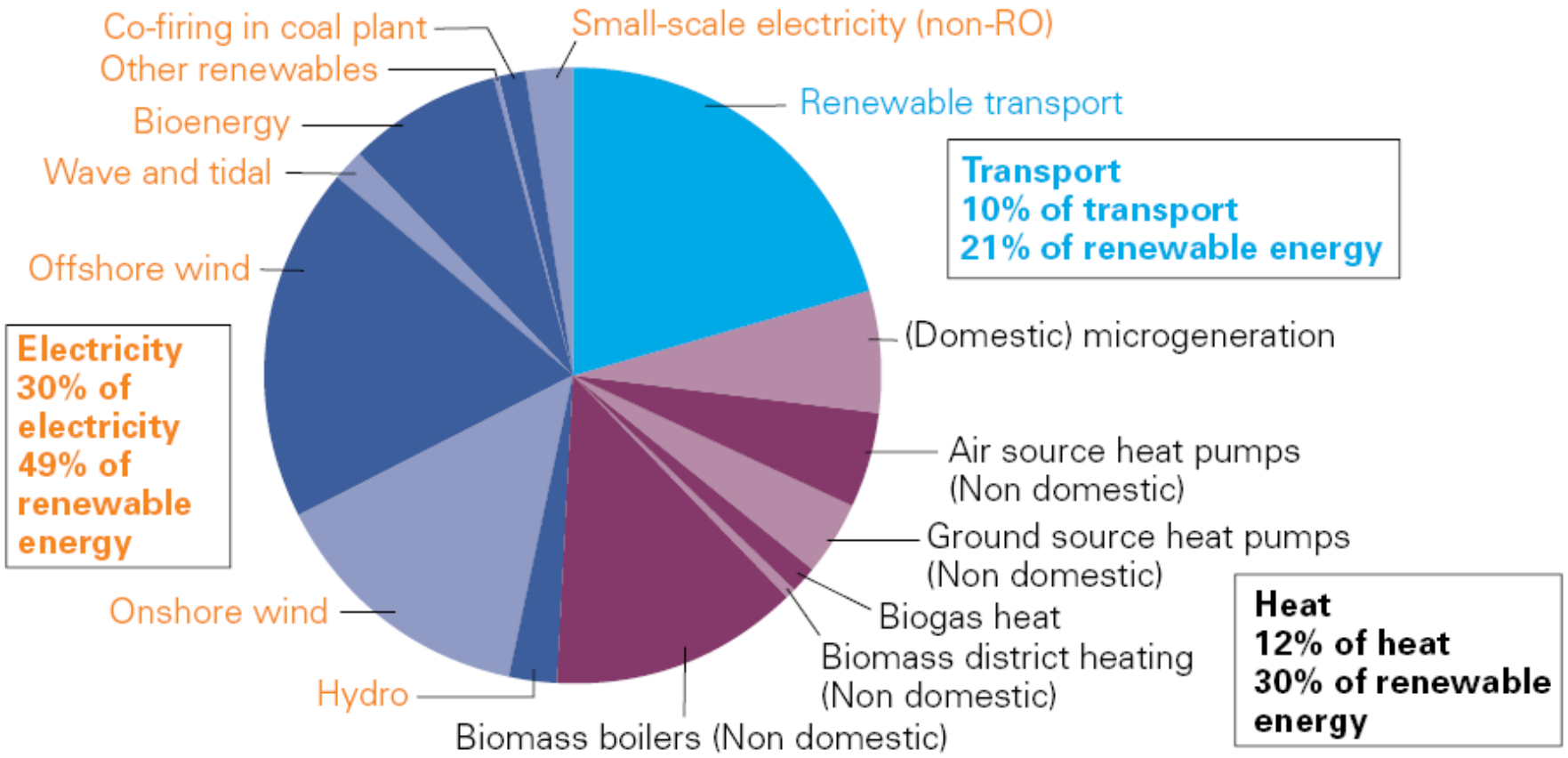
Why do we need the RHI?

- To help the UK meets its EU renewable energy targets of 15% by 2020, reduce carbon and improve energy security
- Heat production is responsible for 49% of the final energy consumed in the UK
- 54% of heat use is domestic; 30% industrial; and 16% commercial/public sector



Mix of renewable energy technologies in 2020 (TWh)



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

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Non-domestic (Phase 1)

- Launched 28th November
- Targeting large energy users, businesses, industrial, public sector
- Communal systems included, i.e. flats
- Cost effective renewable heat with clear measurement mechanism
- Includes district heating systems, but no uplift
- Tariffs for 20 year duration
- Separate Renewable Heat Premium Payment for domestic

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Phase 1 Tariff levels

Eligible technology	Eligible size	Tariff (p/kWh)	Tariff duration (years)	Support calculation
Solid biomass; municipal solid waste (inc CHP)	< 200kWth	7.9 (Tier 1) 2.0 (Tier 2)	20	Metering Tier 1 applies annually to the tier break, Tier 2 above tier break
	200-1,000 kWth	4.9 (Tier 1) 2.0 (Tier 2)	20	
	> 1,000kWth	2.7	20	
Ground source heat pumps; water sourced heat pumps; deep geothermal	< 100kWth	4.5	20	
	> 100kWth	3.2	20	
Solar thermal	< 200kWth	8.5	20	
Biomethane injection and biogas combustion, except from landfill gas	Biomethane all scales Biogas combustion < 200kWth	6.8	20	Metering

Tier break is based on a 15% load factor which is equivalent to 15% of hours in the year.

= kWth x 1,314 hours

Phase 1 – Eligibility requirements

- Non-domestic or single installations heating multiple domestic premises
- Metering of all installations – heat to be delivered through water or steam
- Heat meter must meet the Class 2 requirements of EU Measuring Instruments Directive (MID) 2004
- Ofgem will require submission of a schematic diagram of the plant
- Useful heat in buildings (space, water or process)
- MCS products and installers where applicable up to 45kW
- Support for technologies classed as renewable
- Installations from 15 July 2009 eligible for tariffs
- Ongoing reporting requirements

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Renewable Heat Premium Payments (RHPP)

- £15m worth of vouchers available from 1 August 11 – 31 Mar 12
- All technologies must be off mains grid (except solar thermal)
- Aims to subsidise the cost of installing renewable heating systems
- Participants will be asked to provide feedback
- Designed to boost confidence in technologies and generate feedback to aid understanding on how best to maximise the systems' performance
- Estimated under spend of £4.5m by close of scheme
- Also a social housing RHPP fund now closed (£175k / provider)

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RHPP Domestic Voucher Values

Technology	Voucher Value	Install cost
Solar Thermal Hot Water	£300	£4k
Air Source Heat Pump	£850	£6k-£8k
Ground Source or Water Source Heat Pump	£1250	£10k-£15k
Biomass boiler	£950	£10k-£12k

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Why is RHPP only for off gas grid?

Example: Replacing an existing heating system in a 3 bed semi detached home

		Air source heat pumps	
		Savings from typical performing system 220%	Savings from good performing system 300%
Gas	£/yr	-£130	£70
	$kgCO_2/yr$	-105	750
Electric	£/yr	£330	£530
	$kgCO_2/yr$	4,600	5,455
Oil	£/yr	-£40	£160
	$kgCO_2/yr$	700	1,560
Solid	£/yr	£175	£370
	$kgCO_2/yr$	4,475	5,330

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Phase 2 – Non domestic & Domestic

- To be launched in October 2012
- Includes single domestic users (Green Deal)
- Consideration of further technologies
  - Direct air heating (furnaces, kilns, ovens etc)
  - Air source heat pumps – key technology
  - Bioliquids
- Possible dedicated tariffs for
  - CHP
  - Geothermal
  - Solar thermal and biogas combustion >200kW
- Emissions limits for biomass boilers

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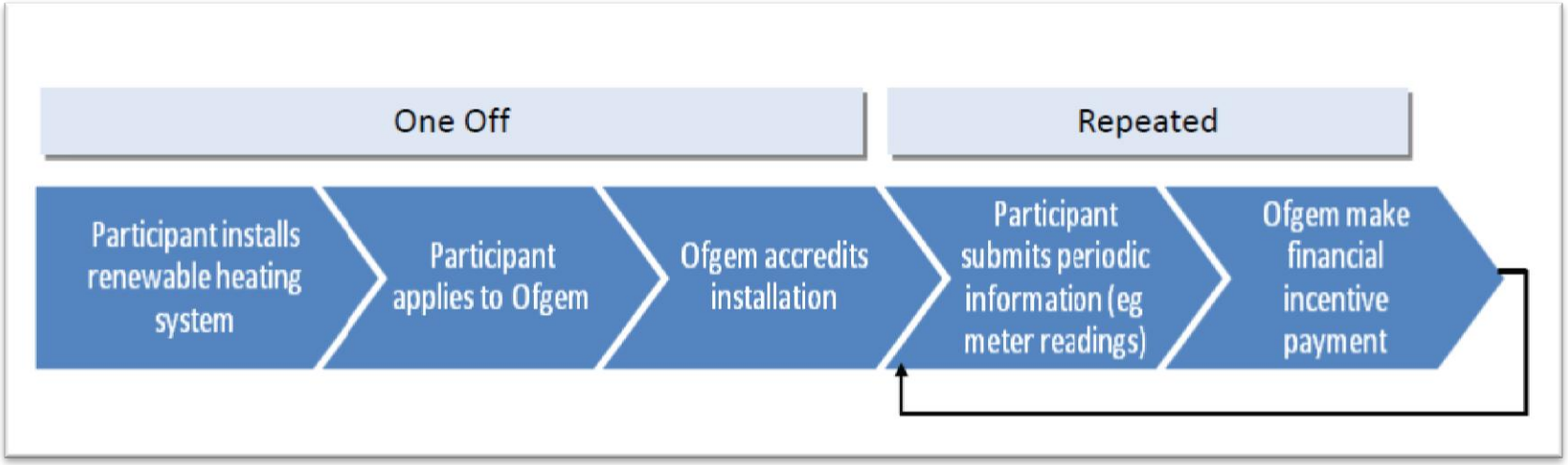
Phase 1 application process



Guidance publicised to support applicants 10 Nov 2011

- Volume One -Eligibility and how to apply
- Volume Two -Ongoing obligations, payments

www.ofgem.gov.uk/rhi

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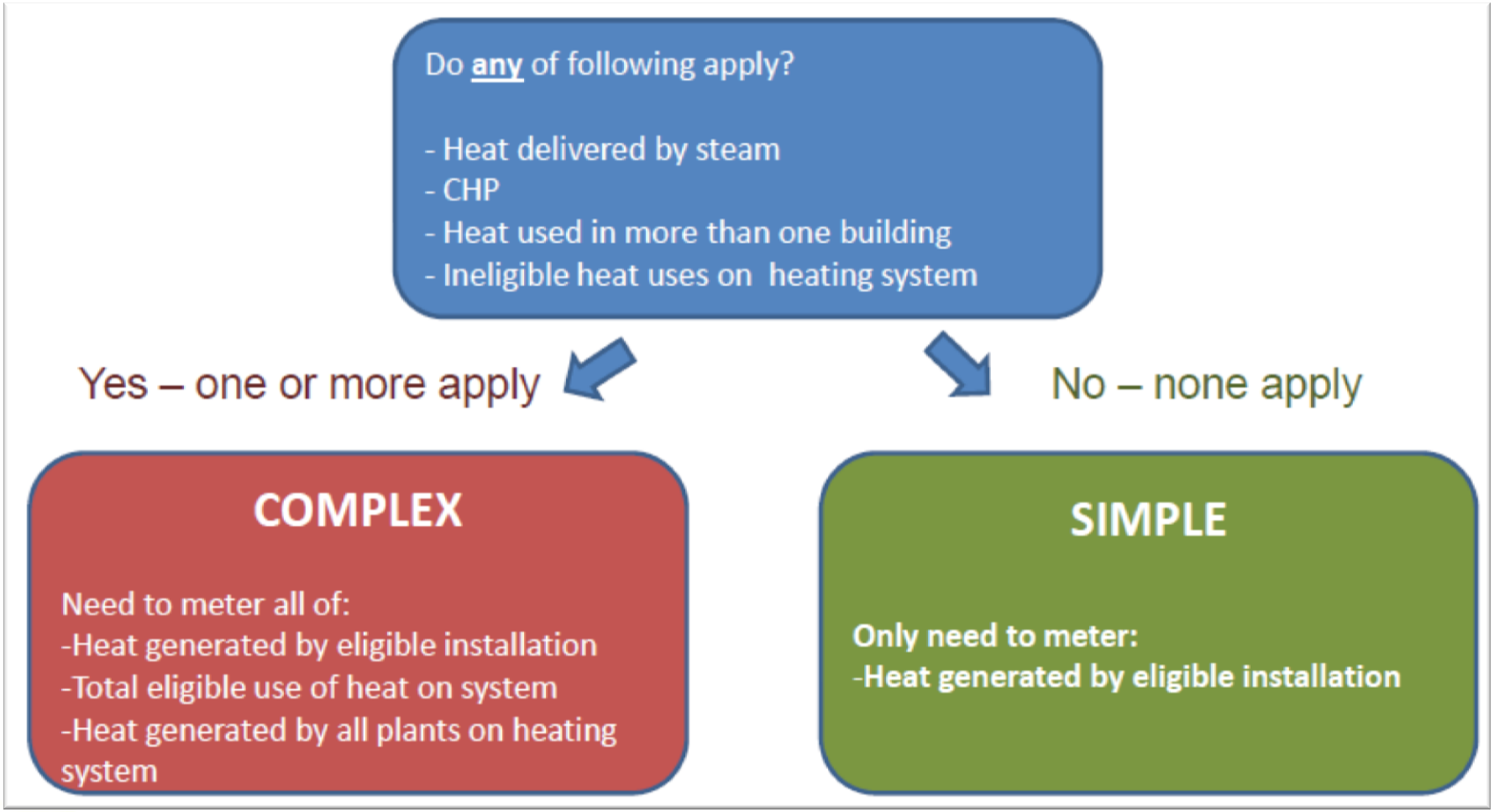
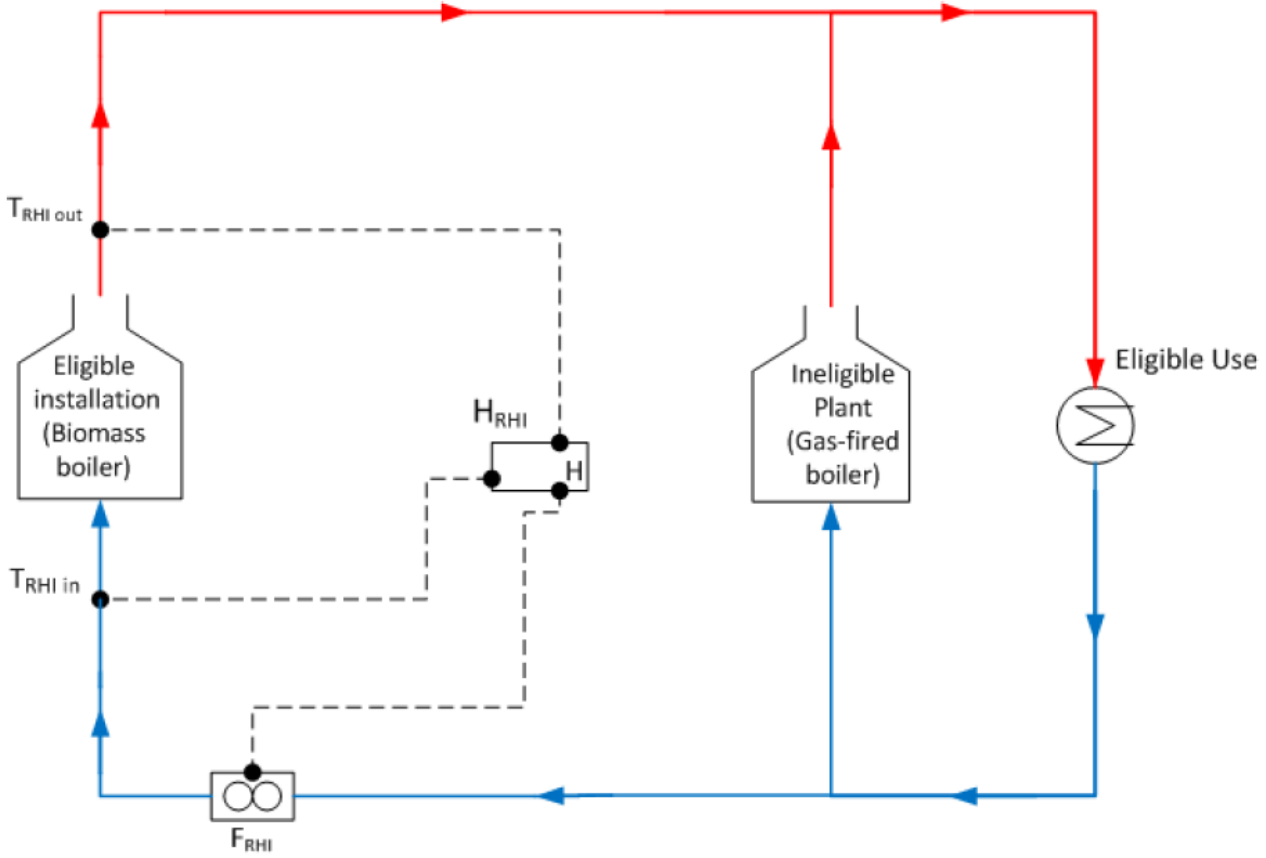
Information for applications

- Installer details
  -Receipts, commissioning certificates
- Non-domestic evidence
- Grants paid/surrendered
- Manufacturer certification of meters
- Schematic diagram
  - Plant
  - Pipework
  - Building boundaries
  - Metering

Simple or complex metering?



Simple metering example



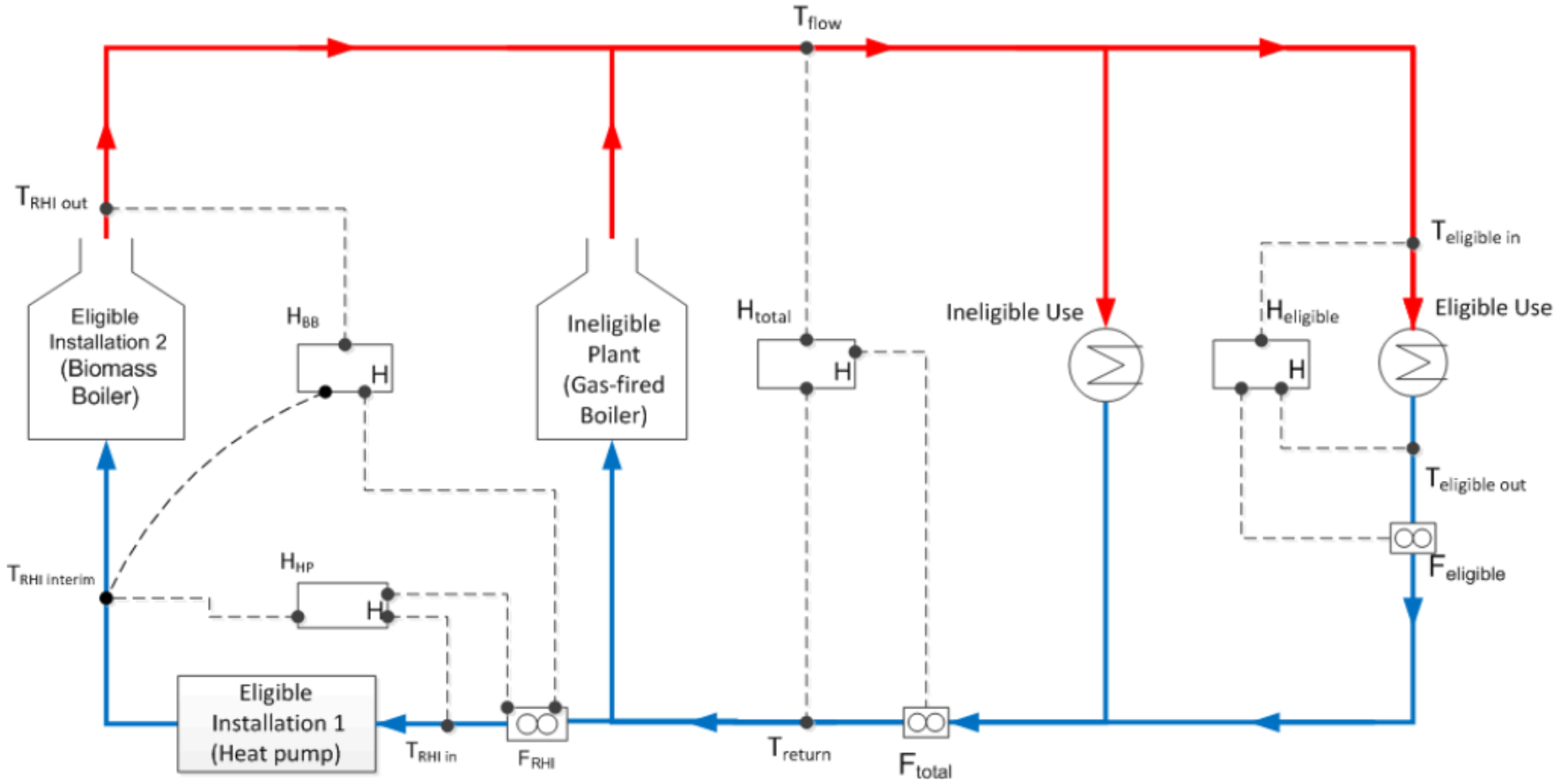
Key

H — Calculator/Digital Integrator

Flow Meter

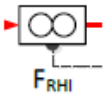
$T_{RHI\ out}$ — Temperature sensor

Complex metering example



Key

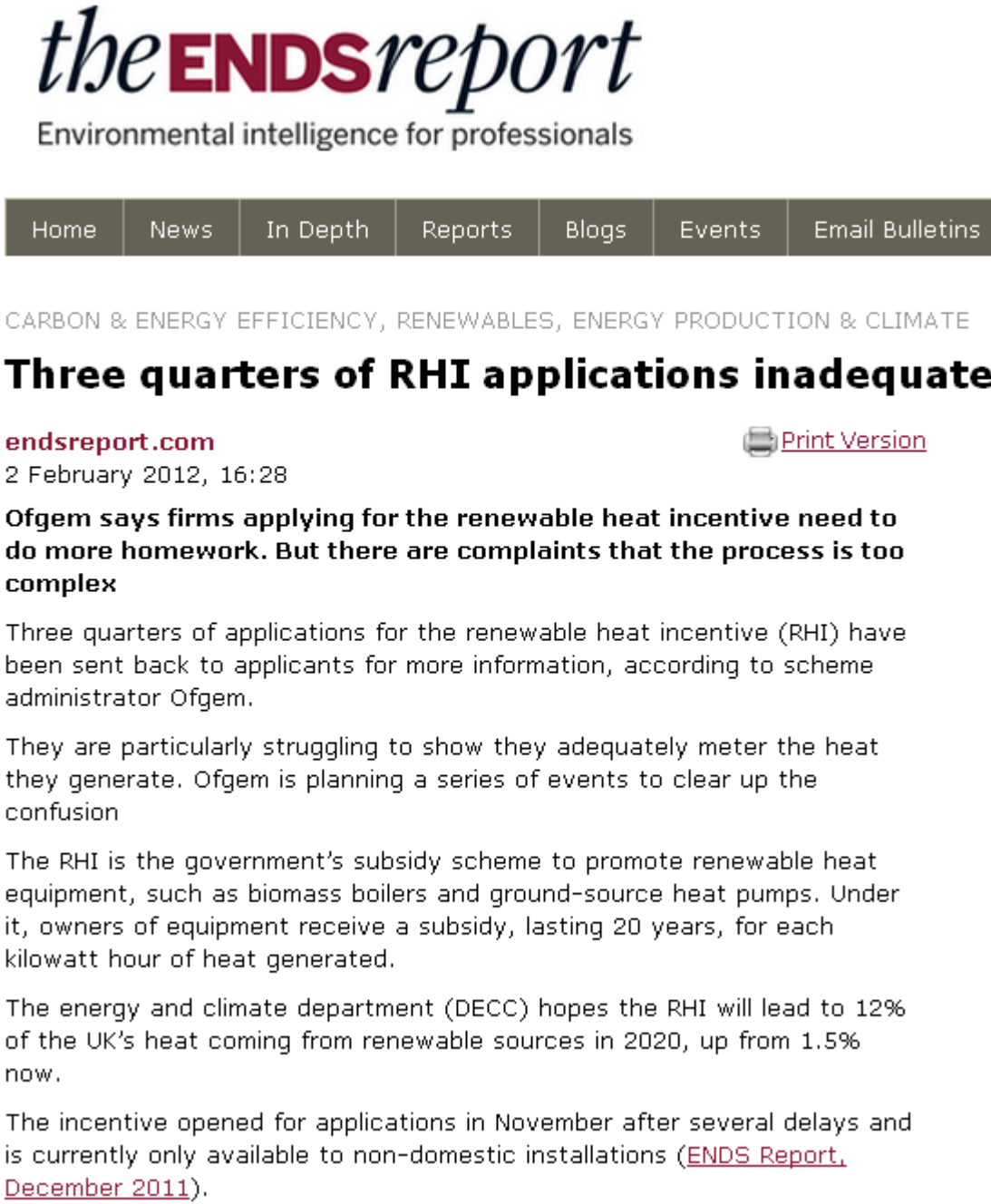
Calculator/Digital Integrator



Flow Meter

Temperature sensor

- Applications have struggled with metering so far.
- Essential to follow the guidance document requirements



the ENDS report

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CARBON & ENERGY EFFICIENCY, RENEWABLES, ENERGY PRODUCTION & CLIMATE

Three quarters of RHI applications inadequate

endsreport.com

Print Version

2 February 2012, 16:28

Ofgem says firms applying for the renewable heat incentive need to do more homework. But there are complaints that the process is too complex

Three quarters of applications for the renewable heat incentive (RHI) have been sent back to applicants for more information, according to scheme administrator Ofgem.

They are particularly struggling to show they adequately meter the heat they generate. Ofgem is planning a series of events to clear up the confusion

The RHI is the government's subsidy scheme to promote renewable heat equipment, such as biomass boilers and ground-source heat pumps. Under it, owners of equipment receive a subsidy, lasting 20 years, for each kilowatt hour of heat generated.

The energy and climate department (DECC) hopes the RHI will lead to 12% of the UK's heat coming from renewable sources in 2020, up from 1.5% now.

The incentive opened for applications in November after several delays and is currently only available to non-domestic installations (ENDS Report, December 2011).

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Key ongoing obligations

- Submission of periodic data
- Maintenance of equipment
- Calibration of meters
- Notification of any major changes to installation or heating system –including ownership
- Keeping of records
- Annual declaration
- Compliance with any document audit / site inspection request
- Biomass sustainability reporting

DECC and OFGEM roles

DECC

- Develop overarching policy framework and supporting legislation
- Set tariffs for different technologies
- Specify detailed eligibility criteria and scheme rules in RHI Regulations

Ofgem

- Formally administer the scheme on behalf of Government and in line with the RHI Regulations
- Accredit installations to the scheme
- Assess Fuel Measurement and Sampling proposals
- Provide guidance and support to participants
- Receive, assess and process generation and FMS data
- Calculate and make payments to participants
- Ensure compliance with scheme rules
- Undertake fraud prevention and detection activities

Administration

- Ofgem E-Serve
  - Manage applications including eligibility criteria and compliance
  - Make incentive payments
  - **0845 200 2122**
  - www.ofgem.org.uk/rhi
  - RHI.Enquiry@Ofgem.gov.uk
- EST
  - Manage RHPP voucher scheme
  - **0800 512 012**
  - www.energysavingtrust.org.uk
- MCS Certifying bodies
  - www.microgenerationcertification.org

ofgem E-Serve

energy saving trust

Microgeneration Certification Scheme

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Technologies which can be funded

Heat pumps; ground & water source

Solar thermal hot water

Biomass Wood-fuelled boilers

Technologies not covered today

- Anaerobic Digestion (AD) / biogas / biomethane
- Deep geothermal
- Waste combustion (biomass proportion of municipal waste)

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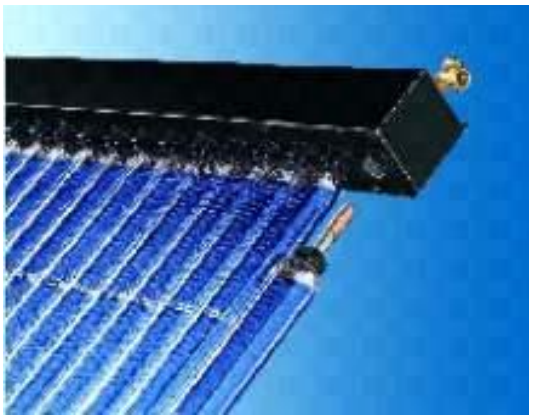
Topical issues concerning eligible technologies

- Basics of how they work
- Energy output
- Practical considerations
- Costs

Heat pumps
Solar thermal
Biomass



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Heat pumps – eligible types in phase one

Ground source	✓
Water source	✓
Air source	✗

Where system capacity < 45kWth - products must be MCS approved or equivalent

> 45kWth - products need to be approved by Ofgem

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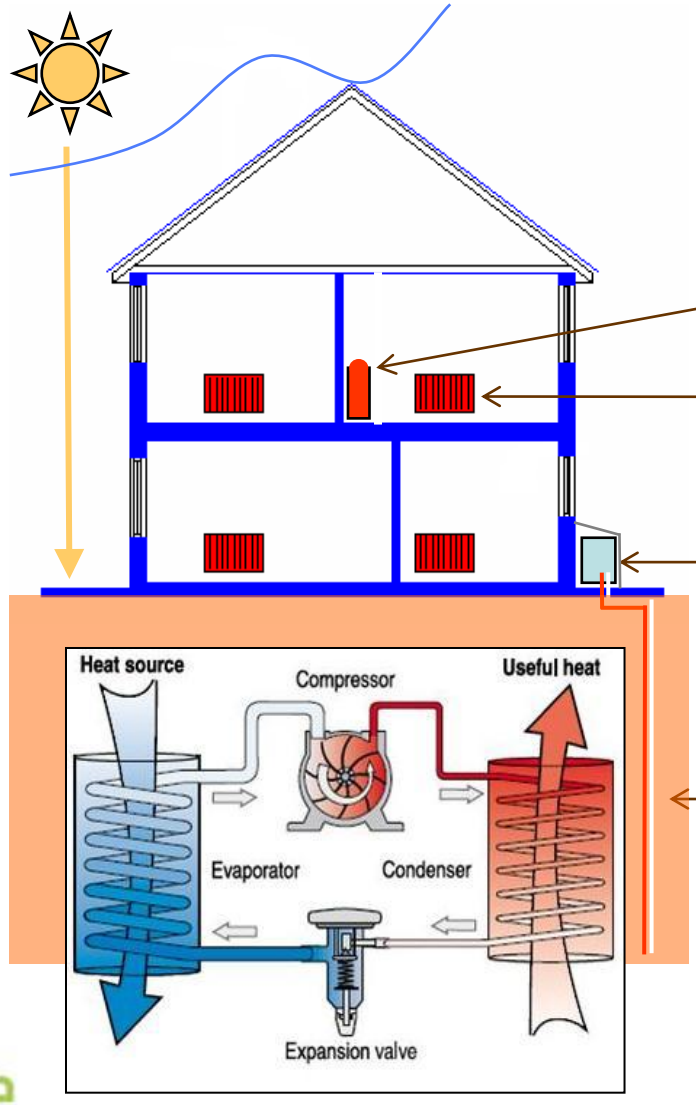
Heat pumps – basic of how they work



Hot water cylinder

Heat distribution system – radiators or under-floor

Heat pump & circulating pump – can be inside or in external enclosure

Ground / water loop – (not to scale) can be vertical or horizontal

Heat pumps in commercial buildings

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GeoEnergy

Heat pumps – energy output

- this depends upon the size of the system installed and product efficiencies
- difference between the low grade temperature output and the target temperature for buildings dictates how much additional energy is required
- efficiency measured by Coefficient of Performance (CoP). This must be a minimum of 2.9
- systems can provide buildings space energy needs for 20 years

Assumptions underpinning LCBP2 (2010)

CoP	Under floor heating	Radiators
GSHP	3.2	2.25

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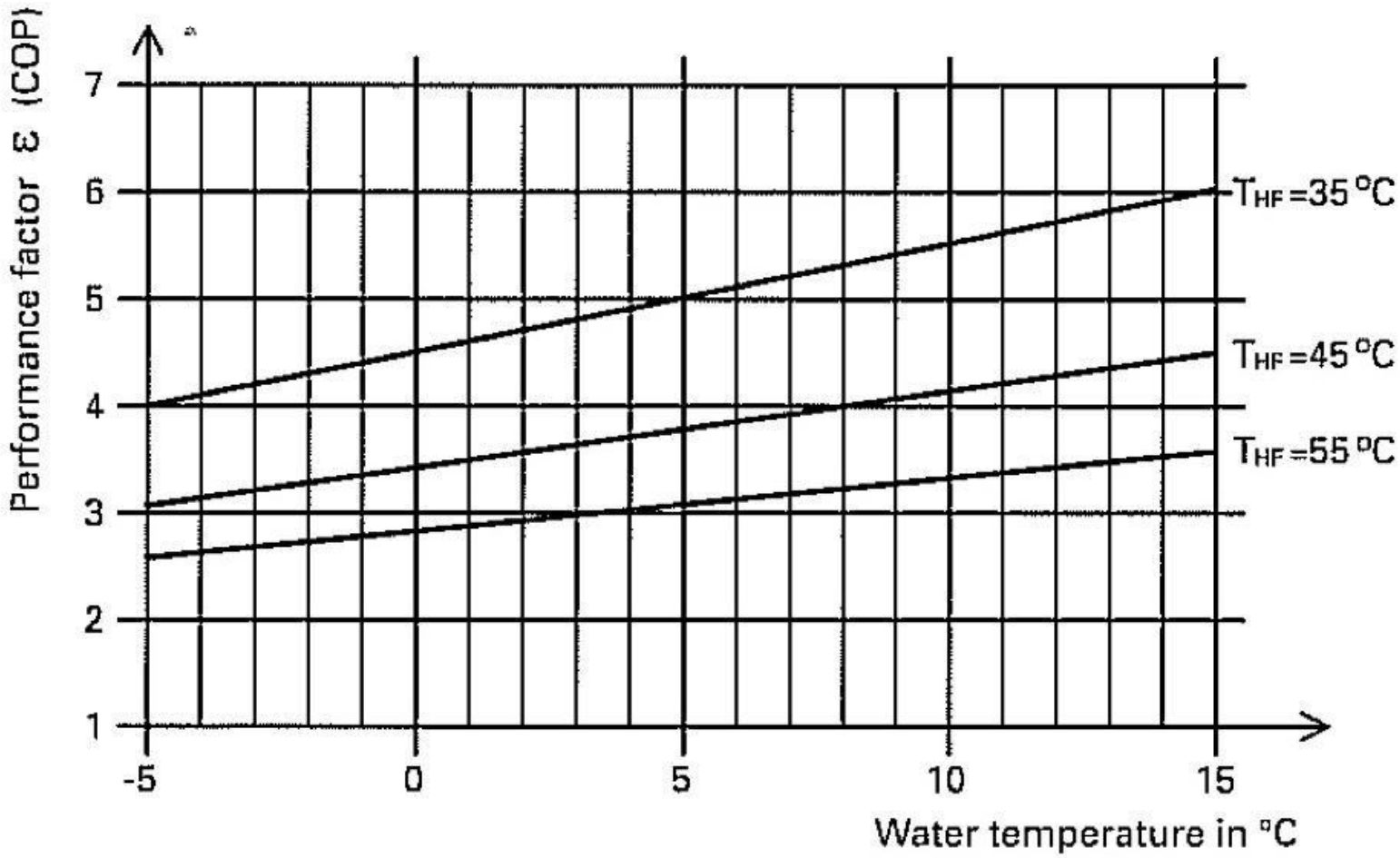
COP and SPF


Performance factor ε (COP)
7
6
5
4
3
2
1
-5
0
5
10
15
Water temperature in °C
THF =35 °C
THF =45 °C
THF =55 °C

Heat pumps – practical considerations

- Suitable property?
  - Well insulated buildings
  - Heat distribution system
- Sizing
  - 100% design space heat load?
- Location
  - Space requirements
  - Heat extraction
  - Noise/vibration
- Power requirements
  - Start up

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Heat pumps – payback with RHI

technologies	**Electricity**	**LPG**	**GSHP**
Heat requirement (kWh/y)	112,500	112,500	112,500
Fuel Requirement (kWh/y)	112,500	130,814	37,500
Fuel Unit Cost (p/kWh)	14	7.4	14
Fuel Costs (£/y)	**£15,750**	**£9,680**	**£5,250**
Maintenance Costs (£/y)	£1,300	£1,300	£1,000
TOTAL OPERATING COSTS	**£17,050**	**£10,980**	**£6,250**
RHI Income (£/y)			£5,063
GSHP payback calculation			
installation costs for new system (45kW)			**£75,000**
Operating costs savings (£/y)	£10,800	£4,730	
RHI Income (£/y)	£5,063	£5,063	
Net Savings	**£15,863**	**£9.793**	
PAYBACK (approx.)	**4.7**	**7.7**	

Note
CoP = 3

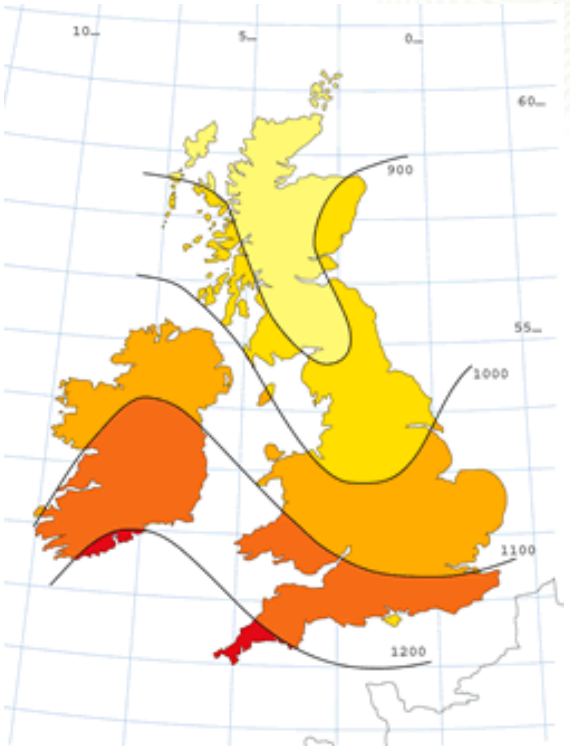
RHI unit price of 4.5p/kWh

Solar thermal - eligible types

Flat plate	✓
Evacuated tube	✓

< 45kWth - products must be MCS approved or equivalent

> 45kWth - products need to be approved by Ofgem



	< 900 kWh/m^2
	> 900 kWh/m^2
	> 1000 kWh/m^2
	>1100 kWh/m^2
	>1200 kWh/m^2

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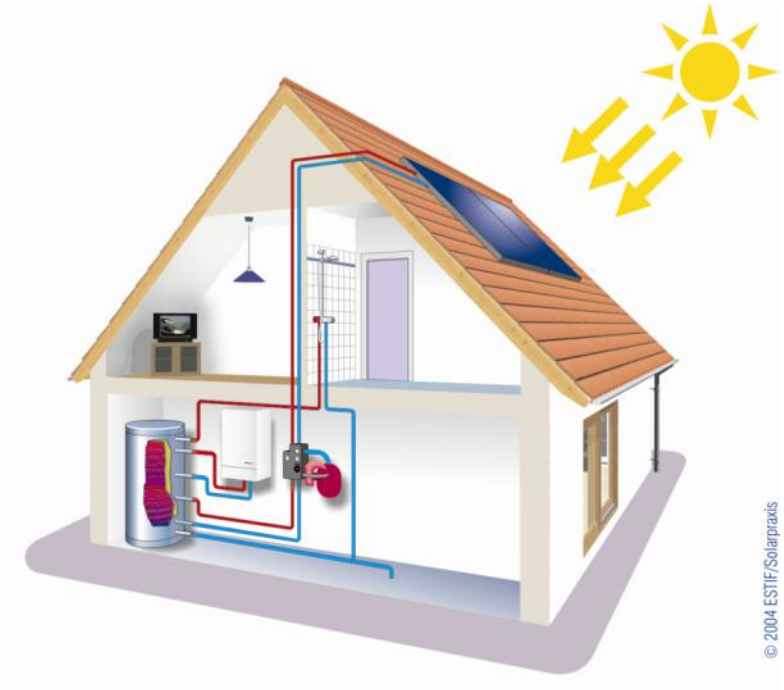
Solar thermal – basics of how they work

- Provide hot water
- Worth having anywhere in the UK
- Sun heats the fluid in the collector
- Fluid serves a heat exchanger in a water cylinder

<u>When to consider</u>

In buildings where there is a sizeable hot water demand throughout the year

(e.g. detached/semi-detached houses, schools, community centres, sports centres, swimming pools, etc.)



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Solar thermal – energy output

- this depends upon the size of the system installed and product type
- orientation (or azimuth) optimal between 30° SE through to 30° SW
- elevation optimal between 30° – 45° from horizontal
- systems can provide significant proportion of buildings hot water needs for 20 years

Assumptions underpinning LCBP2 (2010)

Flat plate	Evac. tube
450 kWh/m^2	550 kWh/m^2

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Solar thermal – practical considerations

- Location/mounting
  - Same as PV
  - Away from opening skylights
- Can reach very high temperatures
  - >200ºC during stagnation
  - High temp joints, clips, insulation
- Dedicated solar volume
  - Space or time
- Legionella control
- Combi boilers

Effect of orientation and pitch on array performance (% of ideal)

	East	South-east	South	South-west	West
Vertical	58	69	71	67	56
80	65	77	84	75	63
70	70	84	87	82	69
60	76	89	93	87	74
50	80	93	97	92	78
40	84	96	100	95	82
30	86	96	100	96	86
20	88	96	98	96	87
10	90	94	96	94	89
Horizontal	90	90	90	90	90

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Solar thermal – payback with RHI

technologies	**ELEC**	**GAS**	**ST**
Heat requirement (kWh/y)	8,718	8,718	8,718
Fuel Requirement (kWh/y)	8,718	10,137	10,137
Fuel Unit Cost (p/kWh)	14.0	6.1	0.0
Fuel Costs (£/y)	£1220	**£618**	**£0**
Maintenance Costs (£/y)	£900	£900	£900
TOTAL OPERATING COSTS	£2,120	**£1,518**	**£900**
RHI Income (£/y)			£741
ST payback calculation			
installation costs for new system			**£21,672**
Operating costs savings (£/y)	£2120	£618	
RHI Income (£/y)	£741	£741	
Net Savings	**£2,861**	**£1,359**	
PAYBACK (approx.)	**7.6**	**16**	

Note:

RHI unit price of 8.5 p/kWh

Biomass boilers – eligibility criteria

Solid biomass via *dedicated* biomass boilers	✓

< 45kWth - products must be MCS approved or equivalent

> 45kWth - products need to be approved by Ofgem

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Biomass boilers – how they work and energy output

How they work:

- combustion of wood based fuel in a boiler or stove
- fuel types in this context are logs, wood chips and pellets
- produces space heating and hot water

Energy output

- governed by size of boiler and quantity of fuel
- influenced by energy content of fuel (its calorific value)
- influenced by the efficiency of the boiler used

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Biomass boilers – practical considerations

- Boiler usually sized to meet heating and hot water
- Particularly suited to year round constant heat demand
- Fuel should ideally be sourced locally
- Adequate storage facilities should be provided
- Running costs
- Provided the fuel is good quality;
  - Very clean burn – DEFRA exempt list for approved products
  - Very efficient
  - Very little ash
- Note: multi fuel type burners are not eligible

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Biomass – payback with RHI

technologies	LPG	BIOMASS
Heat requirement (kWh/y)	63,000	63,000
Fuel Requirement (kWh/y)	73,256	70,000
Fuel Unit Cost (p/kWh)	9	4.7
Fuel Costs (£/y)	**£6,593**	**£3,290**
Maintenance Costs (£/y)	£1,300	£1,300
TOTAL OPERATING COSTS	**£7,893**	**£4,590**
RHI Income (£/y)		£4,788
Biomass payback calculation		
installation costs for new system (80kW)		**£36,000**
Operating costs savings (£/y)		£3,303
RHI Income (£/y)		£5,530
Net Savings		**£8,833**
PAYBACK (approx.)		**4.1**

Note:

RHI unit price of 7.9 p/kWh

What to look out for

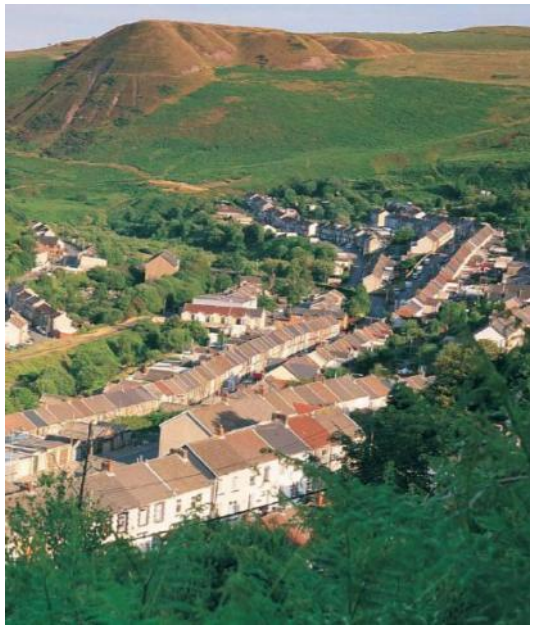
- Check for RHI eligibility
- Distribution and storage costs
- Make sure project management team is in place
- Carry out options appraisal
- Select technology / ies
- Get quotes – from MCS installers for 45kW and below
- Identify other eligible funding
- Complete Ofgem accreditation

……all of the above takes time!!!

Renewable Heat Incentive

BRE Services:

- Identify of suitable buildings
- Model energy supply and demand profiles
- Accurate predictions of energy generation and income
- Advise on maintenance and running costs
- System specification
- Chip or pellet for biomass systems?
- Support tender evaluation
- Checking of specifications
- Technical support for investment cases
- Impact on building users



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Conclusions

- RHI is a world first!
- Scheme is now live for Phase 1 installations
- Launch of Phase 2 including domestic in Oct 2012
- Tariffs will provide 12% ROI (less for solar thermal)
- RPI linked tariff
- On-running administration requirements
- Must be MCS certified for installations <45kW
- £860m cap limit

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Thank you very much for your attention

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