

Energy supply

We need to low/zero carbon energy-
but at what level should we focus?

Houses



Cities



Scale

or Countries



Small is beautiful?

Small generators can be nearer loads- less
transmission losses

Can save up to 10% for electricity ...

Also may be more cost effective for heat
production/ distribution

On-site energy supply options:

Renewables

Micro- wind



Electricity

PV solar



Electricity

Solar Heating



Others : Biomass for heat /electricity

Low Carbon

Micro CHP



Stirling Engines
Fuel Cells -gas fired

Others :

Electric powered

Heat Pumps



*The energy available from the wind is the **square** of the blade diameter.*

So a machine with blade diameter ten times that of a micro device, can generate 100 times more power than the micro device - 10 times more than 10 micro devices.

*The energy in the wind is also the **cube** of the wind speed.*



Larger machines are likely to be in much windier areas. Just doubling the wind speed from 4m/s (poor inner city site) to 8m/s (good elevated rural site) would yield 8 times more potential energy output.



Micro wind in the city

' In many urban areas they are unlikely to pay back either their carbon emissions or the home owner's costs for installation and maintenance'.

Building Research
Establishment Dec 2007

PV Solar



Connecting: solar
installation at Perivale



Nano solar

The technology is
improving...

..and prices
are falling.

But PV is still
expensive:
£5,000-10,000 per house



Solar PV Tiles

High efficiency solar heat collector



Just about cost effective at the individual house level- depending on gas prices . But cheaper if bought and installed in bulk

Solar heat

Grouped schemes best- with shared Thermal store



Small is not always beautiful

‘The economics of all distributed energy technologies improve with increasing scale, leading to lower cost energy and lower cost carbon savings and justifying efforts for community energy projects

It is only when action occurs at scales above 50 households, and ideally at or above the 500 household level, that significant carbon savings become available.’

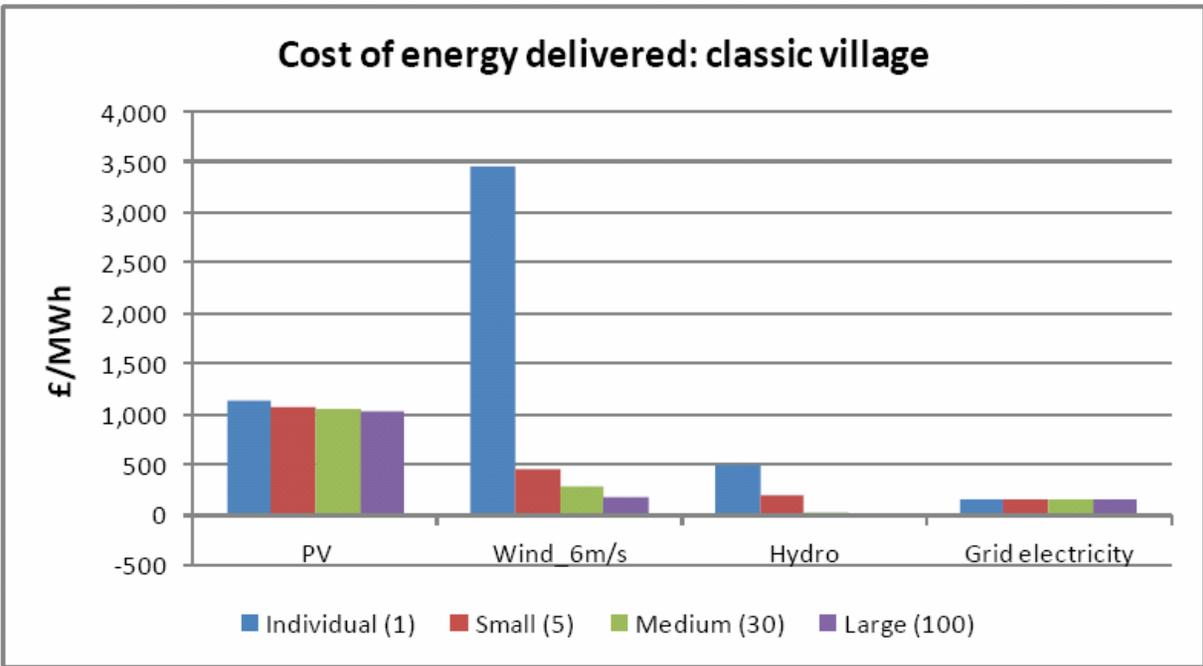
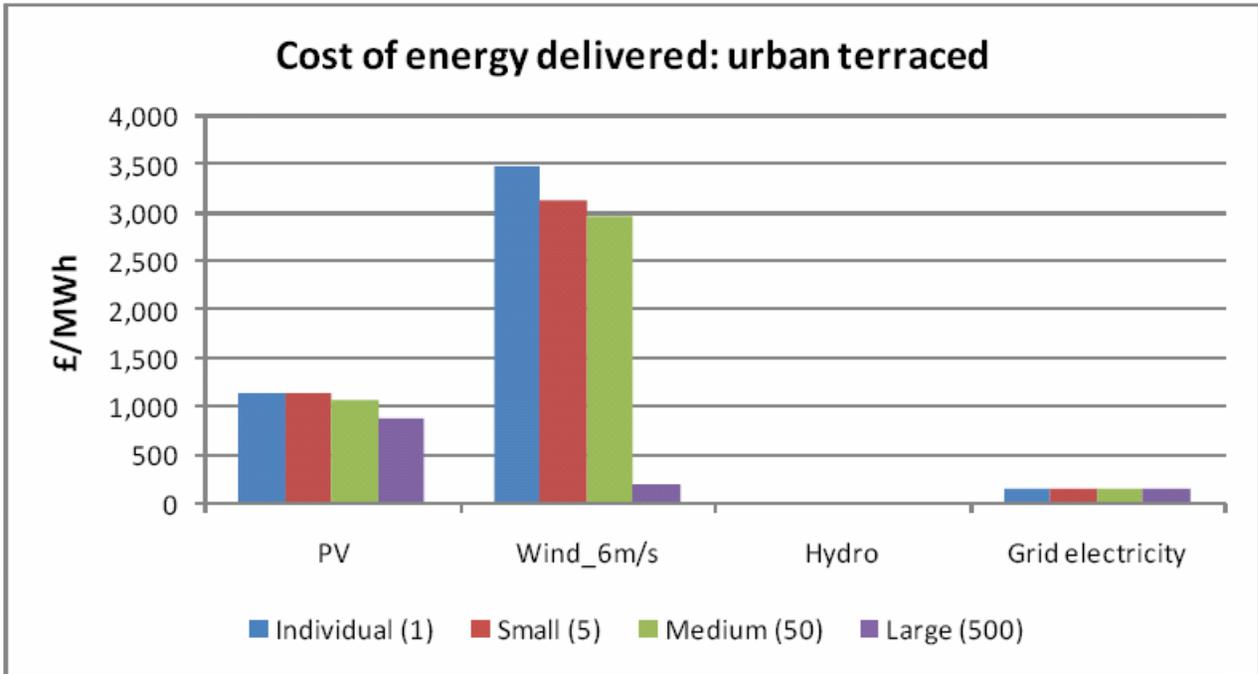
‘Power in Numbers’ Energy Saving Trust 2008

COMMUNITY SCALE

BIG ENOUGH TO BE
TECHNOLOGICALLY AND
ECONOMICALLY EFFICIENT

SMALL ENOUGH TO BE LOCALLY
OWNED OR CONTROLLED

and local projects can help in local
economic and social regeneration



‘Where possible, communities should be encouraged to work together to deploy the largest possible turbines, as opposed to series of individual installations’.

‘Power in Numbers’,
EST 2008

Powergen's Domestic Micro CHP Unit Combined Heat and Power



MicroCHP

Whispergen

Supplies electricity
as well as heat-

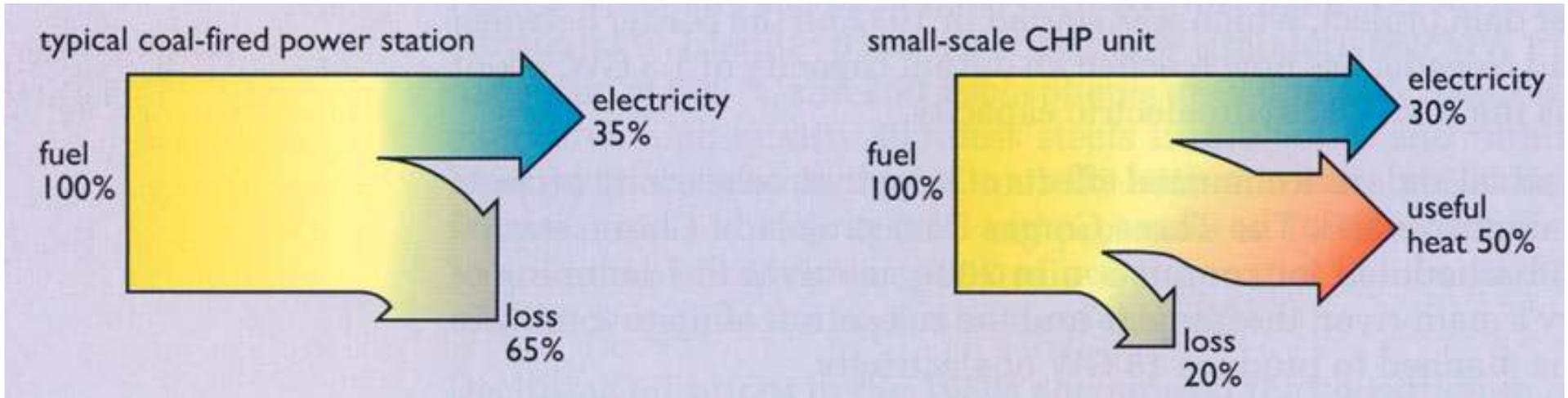
So in theory a more
efficient use of gas .

Also avoids energy losses
in long distance
transmission of electricity to
homes...

8 kW (thermal)
2 kW (electrical)

..but since you only run it
when you need heat, the
overall annual electricity
conversion efficiency is
low- 11%?

Combined Heat and Power - up to 80% efficient



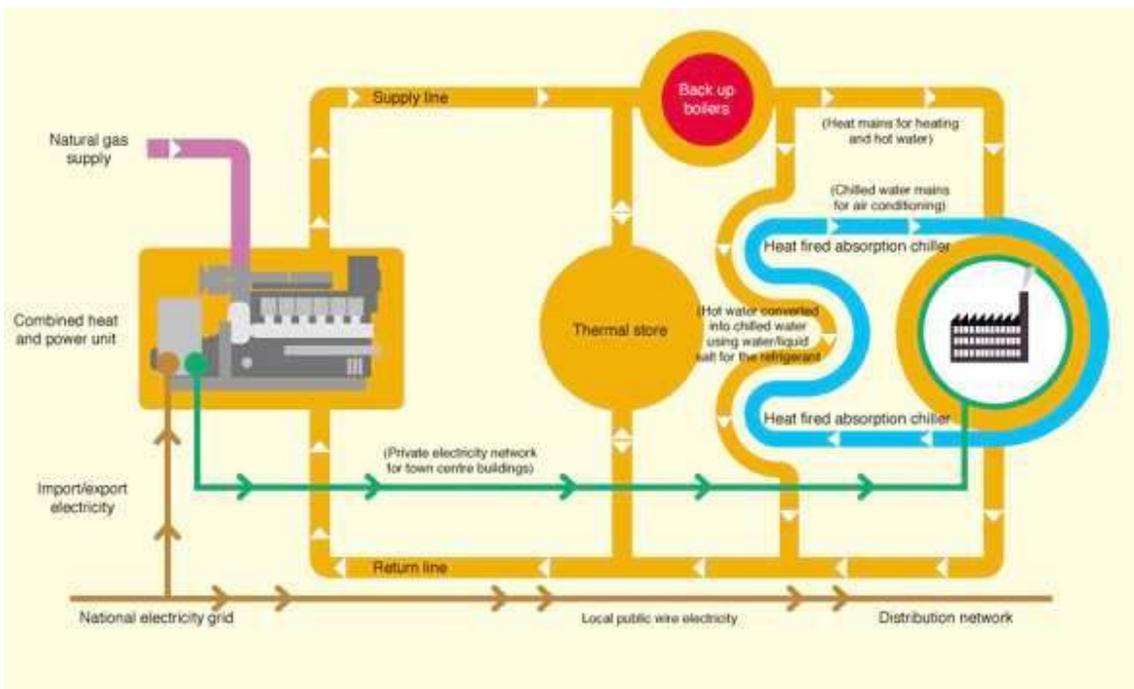
But more efficient at community or city scale - averages out individual house usages



Laying District Heating mains

Woking Borough Council

Savings from energy efficiency invested in PV solar, mini-CHP and a fuel cell, all linked by a private wire electricity grid and by a district heating network



Result:

Net savings of 77% of carbon emissions since 1990

But mainly it's just switched from electricity to gas....

By 2006 it had 2848kWe/3874kWth of CHP, a 200kWe fuel cell and 532kWpeak of PV solar,

Limits to autonomy- London

The Climate Change Action Plan produced by Mayor of London Ken Livingstone set a target to move a quarter of London's energy supply off the National Grid and on to more efficient, local energy systems by 2025.

“We cannot switch all our energy over to renewable energy just yet, as the renewable energy produced today cannot meet all of London's energy demand”

London Strategy Document.

An earlier proposal included an overall target of obtaining 14% of London's electricity from renewables by 2010, 4% from internal sources, the rest being **imported**. (Mayors Energy Strategy, 2004).

PV Solar is one of the big hopes for the future



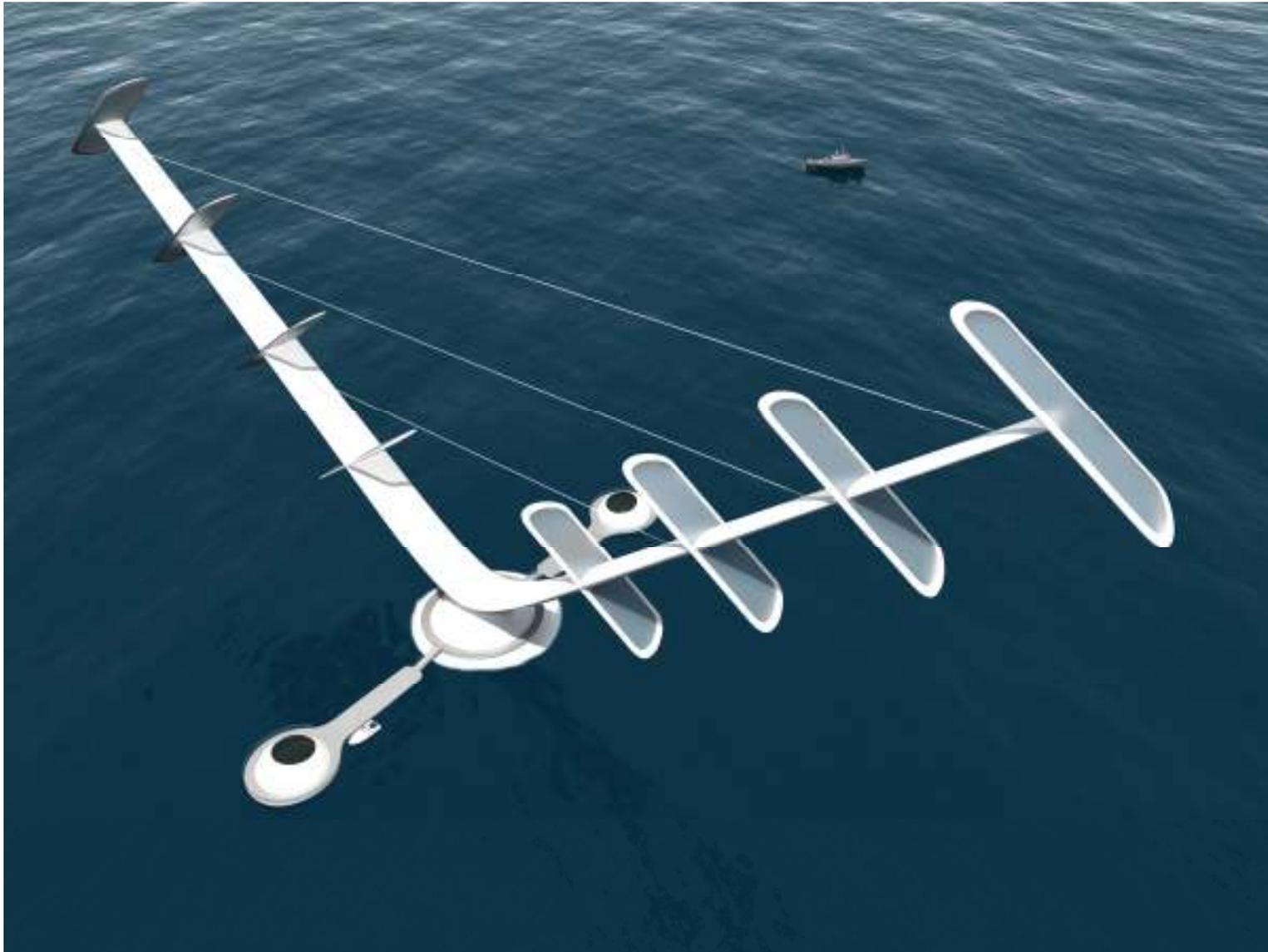
But there are many other new ideas...

Semi-Submersible Tidal Turbine

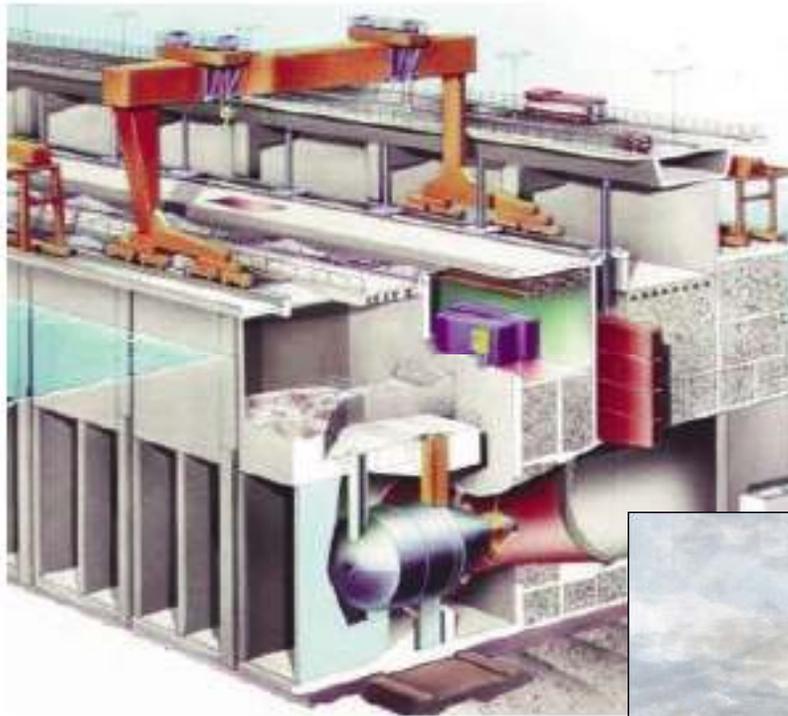


Tidal Stream Consortium Scotland

10 Megawatt floating wind turbine system



Big stuff- new review of Severn options $> 1\text{GW}$



Severn
Barrage
8.6GW



Tidal Lagoon

Severn Tidal Fence
1.3GW

