

GAIN CONFERENCE 2011
10th November



**A RENEWABLE FUTURE: PRACTICAL
MICROGENERATION SOLUTIONS**

**Presented by: Tim Pollard, Director,
Sustainable Building Center**



Agenda

- Definitions
- Drivers
- Products

'two nations divided by a common language'



What is Renewable Energy?

Renewable energy - energy from renewable sources means energy from renewable non-fossil sources, namely wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogas

Renewable Energy Directive (RED)





Bioenergy

Coal

Combined Heat and Power

District heating

Geothermal

Hydroelectricity

Hydrogen and fuel cells

Microgeneration

Microgeneration Strategy

Heat pumps

Micro Combined Heat and Power (CHP)

Micro-hydro

Micro and small wind turbines

Solar Photovoltaics (Solar PV)

Solar thermal

Microgeneration is a term used for the generation of low, zero or renewable energy at a 'micro' scale. It covers energy generation resource that is decentralised, not centralised.

- Micro-electricity technologies are:
 - solar PV,
 - micro-wind turbines,
 - micro-hydro and
 - micro-CHP.
- Micro-heat are:
 - heat pumps (air, water and ground source),
 - biomass and
 - solar thermal

Consultations

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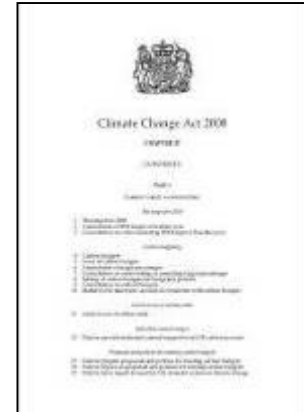
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Market Drivers



The BIG Challenge



Existing Domestic Buildings

- 26 million homes
- 50% of homes over 50 years, 20% over 100 years
- At least 80 per cent of the homes that will be standing in 2050 have already been built
- 7 million houses need to be refitted by 2020, which equates to 1,700 homes a day, or one a minute.

Existing Non Domestic Buildings

- 1.8 million buildings
- Non-domestic buildings, including offices, hotels, shops, schools, hospitals and factories, account for 18% of the UK's carbon emissions.
- 70% of non-domestic buildings pre-date Part L (1985)

By 2050 we have to reduce our carbon by 80%

2050 – A long way away?



Closer than 1970



Energy Prices & Consequences

A year of energy price rises		
Month 2010-11	Company	Price rise
November	Scottish Power	Gas: 2% Elec: 8.9%
December	Scottish & Southern	Gas: 9.4%
	British Gas	Gas: 7% Elec: 7%
January	Npower	Gas & Elec: 5.1%
February	E.On	Gas: 3% Elec: 9%
March	EDF	Gas: 6.5% Elec: 7.5%
August	Scottish Power	Gas: 19% Elec: 10%
	British Gas	Gas: 18% Elec: 16%
September	Scottish & Southern	Gas: 18% Elec: 11%
	E.On	Gas: 18% Elec: 11%
October	Npower	Gas: 15.7% Elec: 7.2%
November	EDF	Gas: 15.4% Elec: 4.5%

SOURCE: COMPANY ANNOUNCEMENTS

"We are importing 50% of the gas that comes into Britain and we are having to compete for sources from the Middle East - Japan is importing huge amounts of gas on ships and that was gas that used to come into the UK market. It is an inconvenient truth that unit prices of energy are going to go up."

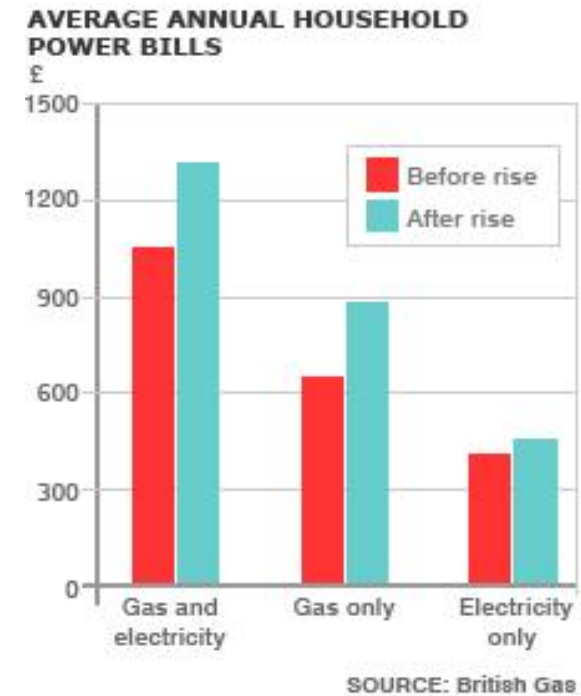
"In my opinion unit prices will only go one way unless someone discovers huge amounts of gas and imports it into the UK: the international price for gas I am afraid is going up."

Phil Bentley, MD - British Gas

Energy Prices & Consequences

Since 2004, the average annual energy bill has more than doubled, from £522 to its current level of £1,132. That averages an inflation-busting 11 per cent each year

National Energy Action predicted 6.6 million households in fuel poverty which is an increase of 1.2 million households in less than a year



Micro Wind



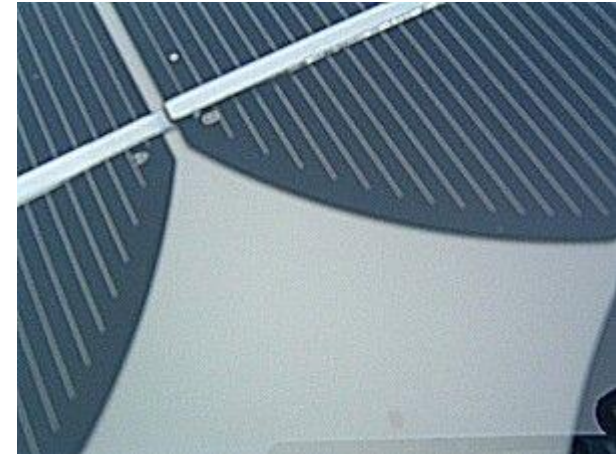
Photovoltaics - The Science

- Semiconductors
- Absorption
- Electrons – current
- Power – wattage
- The power of the un-obscured midday sun is 1000W per m²
- The average raw power of sunshine of south-facing roof in Britain is roughly **110W/m²**



Monocrystalline

- **Monocrystalline** cut from a single crystal of silicon
- The most efficient & the most expensive to produce
- Efficiencies of **13-17%**



Polycrystalline

- **Polycrystalline** are a slice cut from a block of silicon, consisting of a large number of crystals.
- Slightly less efficient & slightly less expensive
- Efficiency of **11-15%**



Panels

- By far the most popular
- Best value for money
- Panels differ in size & efficiency
- Hangers appropriate to roof
- Poly or Monocrystalline
- Portrait or Landscape
- Self-cleaning
- Usually 25 year performance



Tiles

- Sits flush with the roof
- Poly or Mono
- Back mounted contact strips - increase effective collector area and reduce surface glare



Film

- Thin-film PV consists of an amorphous & microcrystalline silicon film
- Between 80 & 90 Wp & c8% efficient
- Low weight

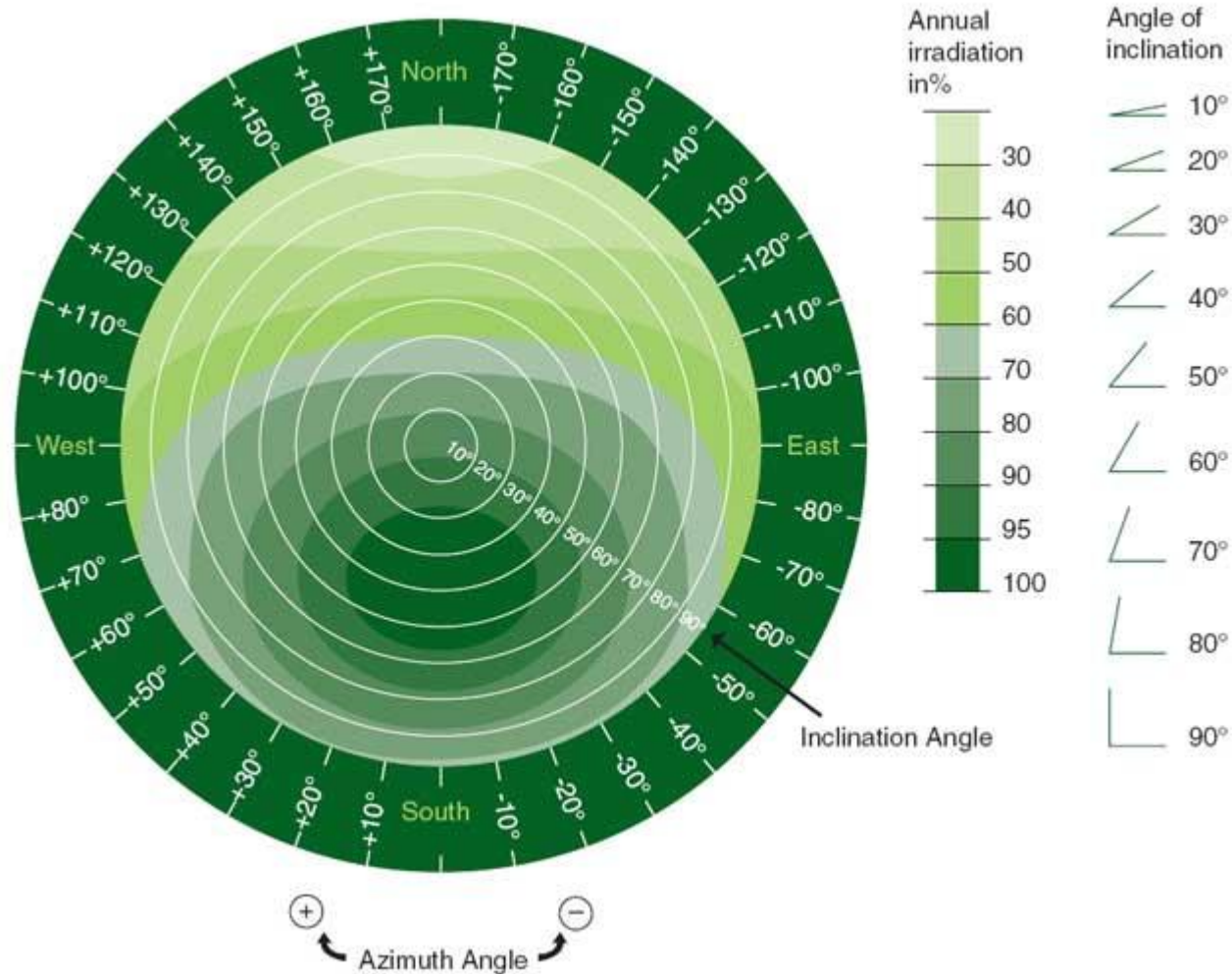


Durability & Installation

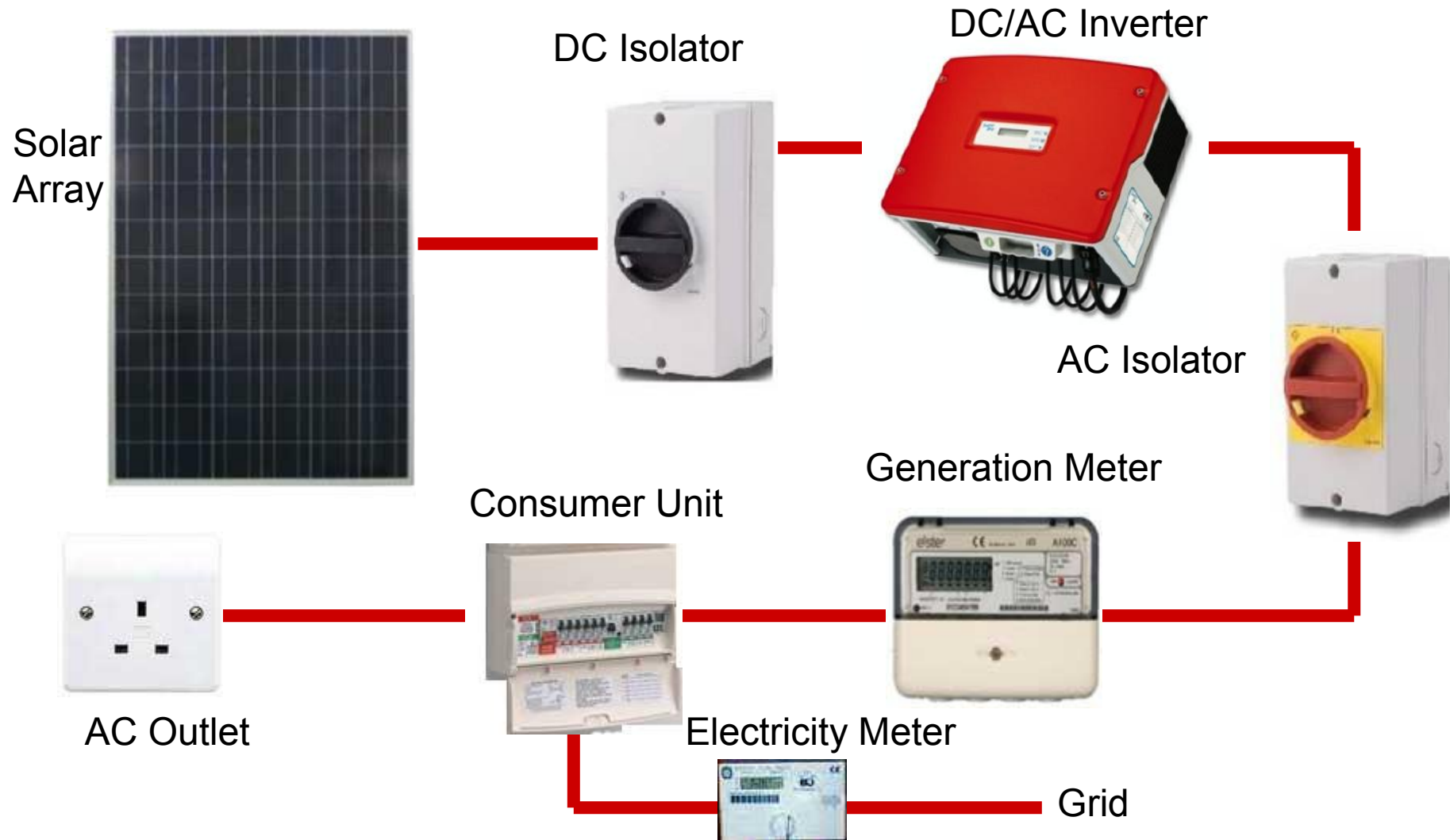


- Solar modules have a manufacturers warranty of 25 years and a working lifetime of 40 years and beyond.
- During the lifetime of the system, you may well need to replace the inverter
- Orientation, shading and the temperature
- The best UK orientation is south facing at 30 - 40°
- PV roof systems fall under permitted development

Relative efficiencies by orientation



Typical Installation



Mythconceptions

(by Prof David MacKay)

- ***“The energy required to make a solar panel is much bigger than the energy it’ll deliver.”***
- The energy yield ratio (the ratio of energy delivered by a system over its lifetime to the energy required to make it) of a roof-mounted, grid-connected solar system in Central Northern Europe is **4** [An energy yield ratio bigger than one means that a system is ‘A Good Thing’, energy-wise.]
- ***Aren’t photovoltaic panels going to get more and more efficient as technology improves?***
- I am sure that photovoltaic panels will become cheaper; I’m also sure that solar panels will become less energy-intensive to manufacture, so their energy yield ratio will improve.
- Photovoltaic panels with 20% efficiency are already close to the theoretical limit. I’ll be surprised if this estimate for roof-based photovoltaics ever needs a significant upward revision.

Feed In Tariff Consultation

Source	Scale	Generation Tariff (p/kWh)	Proposed Generation Tariff	Duration (years)
Micro-CHP	<2 kW	10.5	10.5	10
Solar PV	≤4 kW new	37.8	21.0	25
Solar PV	≤4 kW retrofit	43.3	21.0	25
Solar PV	>4-10kW	37.8	16.8	25
Solar PV	>10 - 50kW	32.9	15.2	25
Solar PV	>50 - 100kW	19.0	12.9	25
Solar PV	>100 - 150kW	19.0	12.9	25
Solar PV	>150 - 250kW	15.0	12.9	25
Solar PV	>250kW - 5MW	8.5	8.5	25
Solar PV	Standalone	8.5	8.5	25

FIT Consultation

- apply the new generation tariffs from **1 April 2012** to all new solar PV installations with an eligibility date on or after an earlier 'reference date' which we propose should be **12 December 2011**
- introduce new **multi-installation** tariff rates for aggregated solar PV schemes i.e. where a single individual or organisation owns or receives FIT payments from more than one PV installation, located on different sites. The new tariff rates would apply to all new PV installations that are part of an aggregated PV scheme and have an eligibility date on or after 1 April 2012
- introducing a new **energy efficiency requirement** for FITs for solar PV. The new requirement would apply to all new solar PV installations with an eligibility date on or after 1 April 2012 For that energy efficiency requirement, we are seeking views on whether the owner or occupier of a building should have to:
 - bring the property up to an energy performance certificate (EPC) rating of **level C** or above; or
 - undertake **all the measures** that are identified on an **EPC** as potentially eligible for **Green Deal** finance.

Multi-installation generation tariff

Solar PV tariff band	(p/kWh)
4kW (new build)	16.8
4kW (retrofit)	16.8
>4-10kW	13.4
>10-50kW	12.2
>50-100kW	10.3
>100-150kW	10.3
>150-250kW	10.3
>250kW-5MW	8.5*
stand alone	8.5*

Micro CHP – Why?

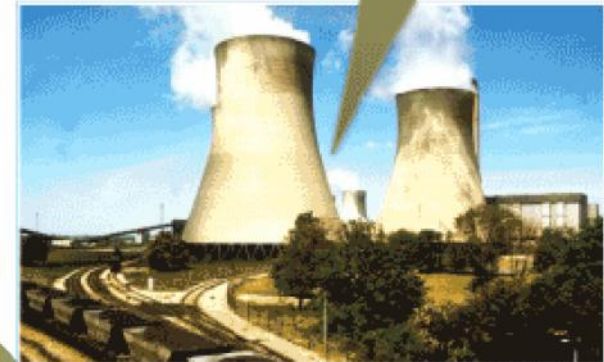
Large CHP,
up to 80%
efficiency



Small CHP, up
to 85%
efficiency

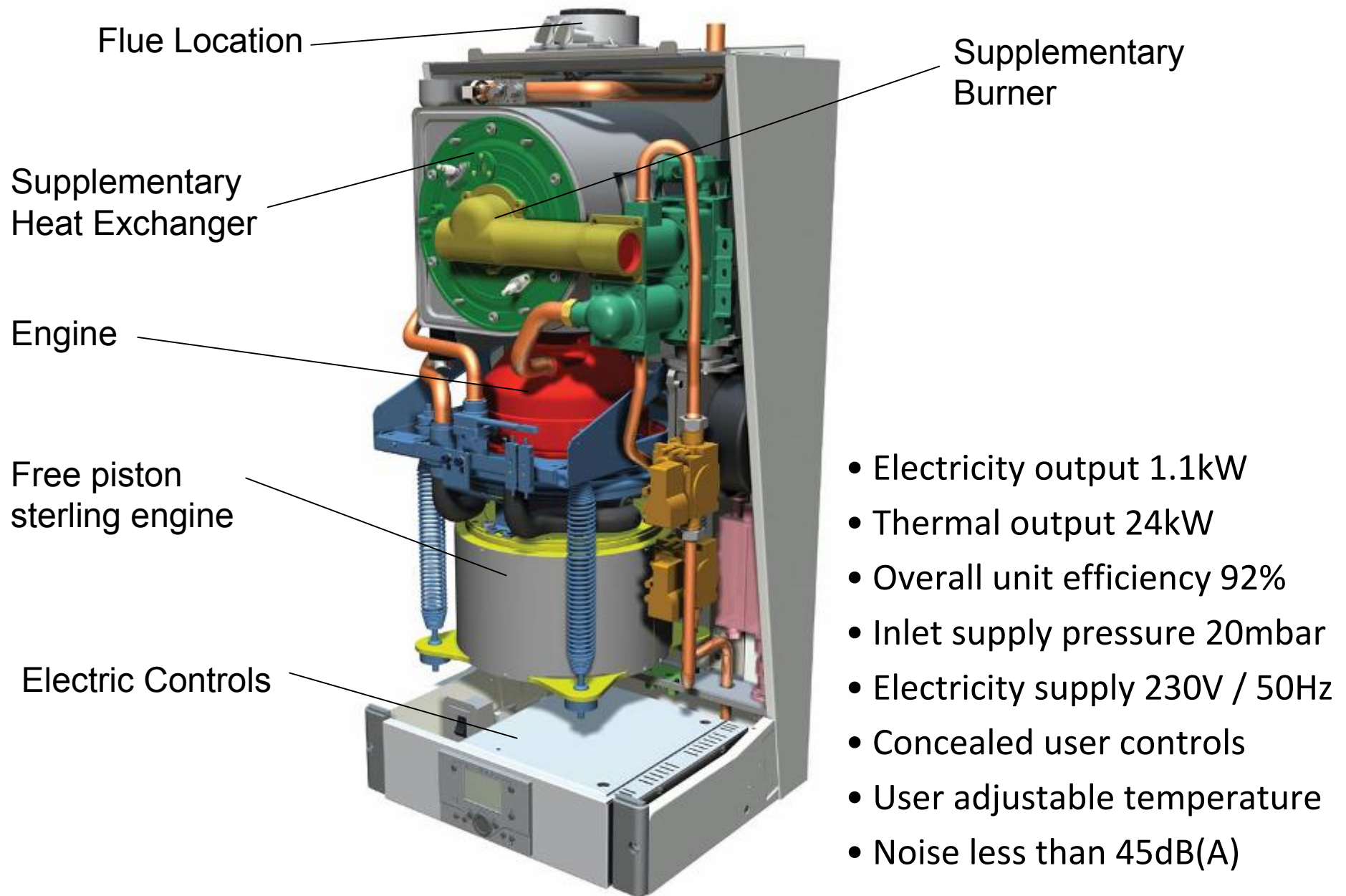


Power Station,
35-40%
efficiency



Micro CHP,
up to 90%
efficiency

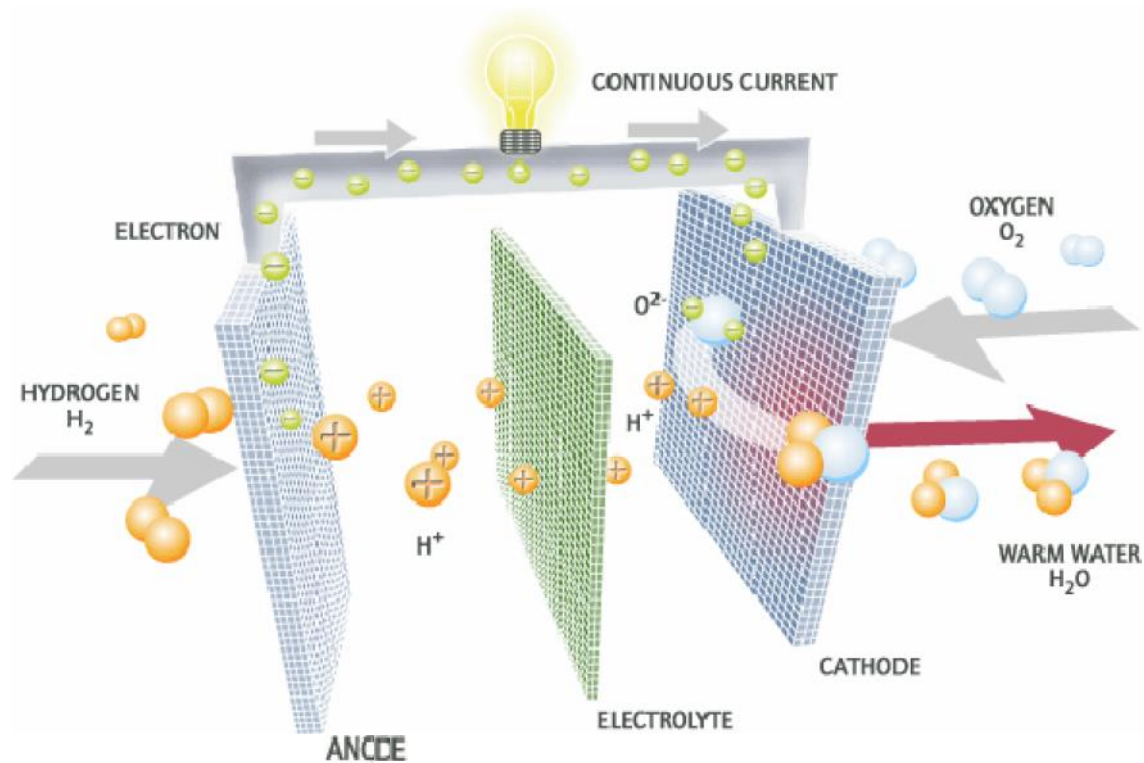




Fuel Cells

3 elements:

- anode,
- cathode
- electrolyte



Thank You



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