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CHP COMES OF AGE

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DAVID SHAW



SenerTec GmbH

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SenerTec GmbH
Kraft – Wärme – Energiesysteme
Carl – Zeiss – Straße 18
97424 Schweinfurt

- 115 employees
- a BAXI Group subsidiary
- market leader mini-CHP in Europe





UK Energy Policy

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Ed Milliband, Secretary of State for Energy and Climate Change

Sustainability – energy policy must be compatible with tackling climate change.

- by 2050 reaching the zero option, ie. near zero-carbon electricity.
- won't be credible in 20 years to build coal-fired power stations and meet carbon budgets.

Security – people need to have access to energy, so that the lights stay on.

- by 2020 a third of power plants will be closed due to age / rising environmental standards.

Affordability – energy at the lowest prices possible, consistent with the need for investment.

- do more to help with energy efficiency and insulation.



Targets

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80% reduction in greenhouse gas emissions by 2050

- *UK the first country in the world to have a legally binding framework to help adapt to climate change.*

CHP capacity of 10,000 MW by 2010

- *latest official statistics show that every 1 MW of CHP operating in the UK helps reduce carbon emissions by 510 to 760 tonnes every year.*

CHP is also at the heart of Conservatives' Energy policy





The great escape...

huge heat losses

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Every year we waste enough energy from power generation to heat most of the buildings in the UK.



HM Government



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2007 Energy White Paper

Specified microgeneration technologies for carbon reduction by producing and using heat and electricity at a local level, **including combined heat & power.**



dti
MEETING THE ENERGY CHALLENGE
A White Paper on Energy
MAY 2007



Combined Heat and Power

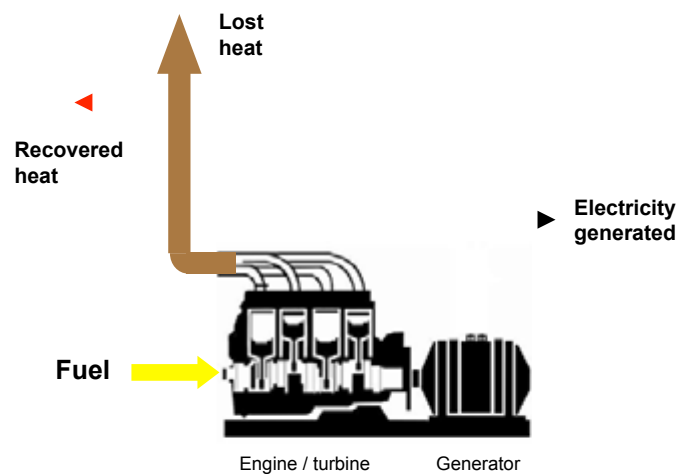
- is the simultaneous production of electricity and heat.
- is a carbon reducing technology.
- is a mature, reliable technology.
- has better payback than all other 'renewables'.

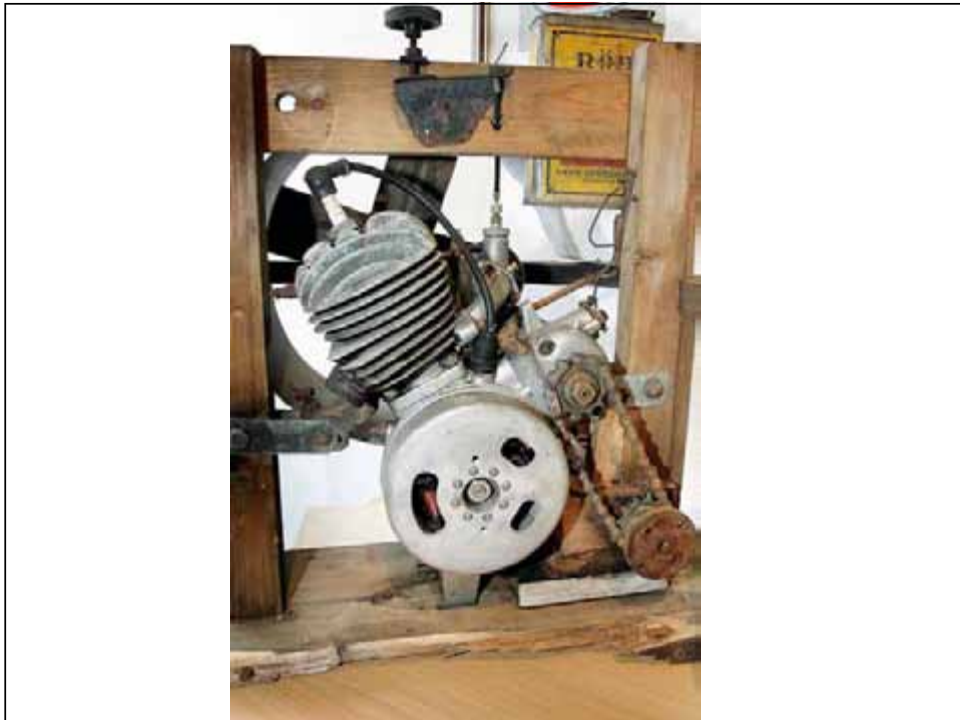
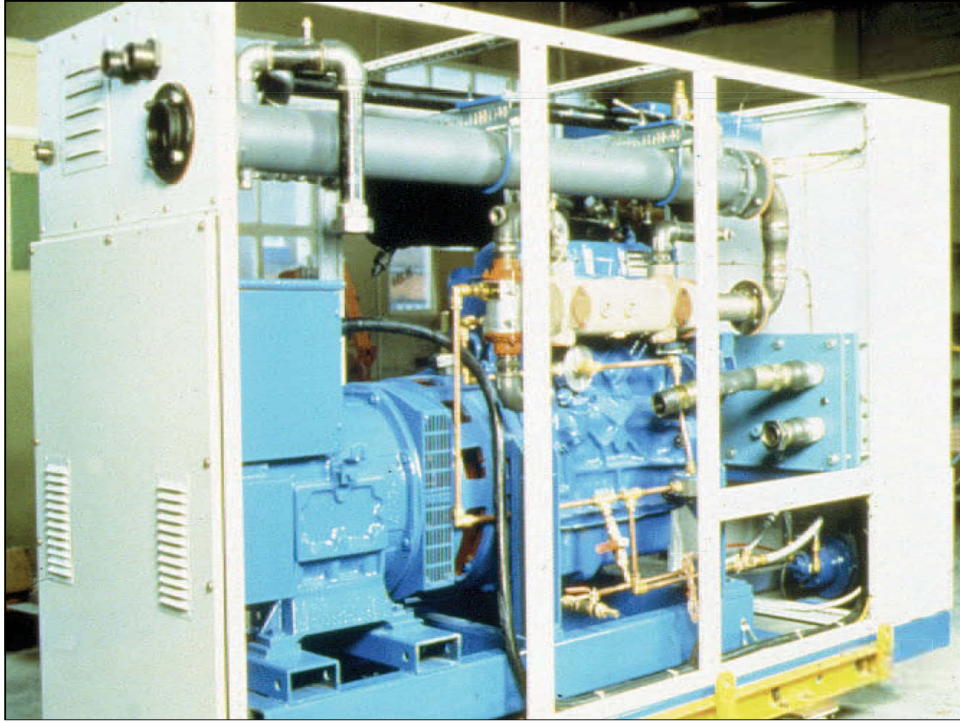
but...

- in some cases, has been disappointing!



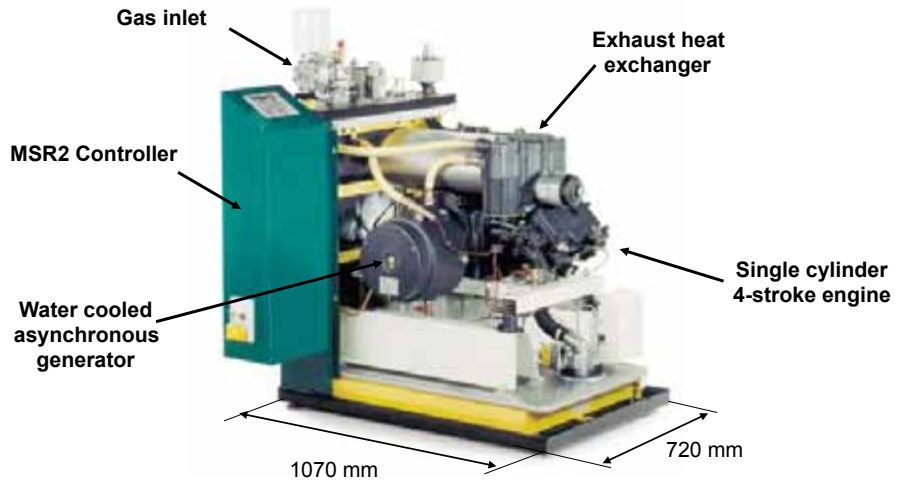
Traditional CHP



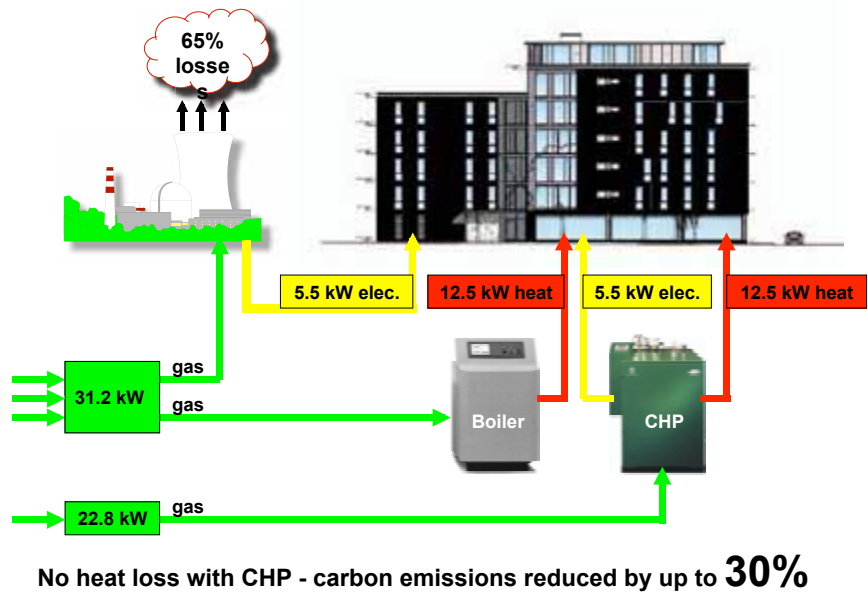




Main components of mini-CHP BAXI - SENERTEC.UK



Carbon saving technology BAXI - SENERTEC.UK





Stanhope Street, Newcastle **BAXI - SENERTEC UK**



Big out....

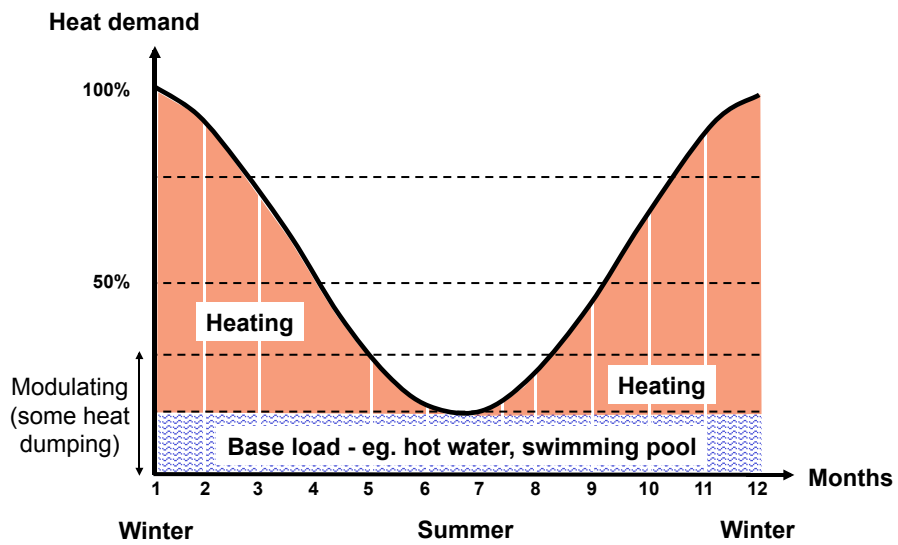


....small in



CHP heat output

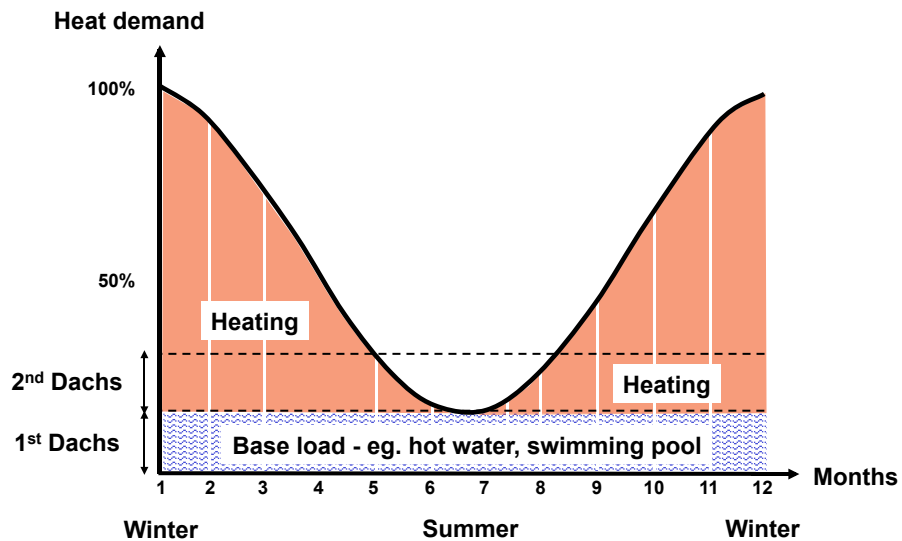
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CHP heat output = base load

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The Key to Success

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Avoid disappointment!

The key rule for successful Combined Heat & Power

...keep it small.

Carbon Trust field trial suggests CHP heat output approx. equal to 10% of installed boiler capacity.



Suitable types of Building

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- sheltered accommodation
- apartment blocks
- leisure centres
- schools
- hospitals
- hotels
- etc.



London Fire Brigade

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Results -

- running hours > 6,500 /annum
- overall efficiency 78% (gross)
- CO2 reduction 23%
- cost savings 26%
- payback about 11 years



Wimbledon Fire Station
Dachs SE Condensing



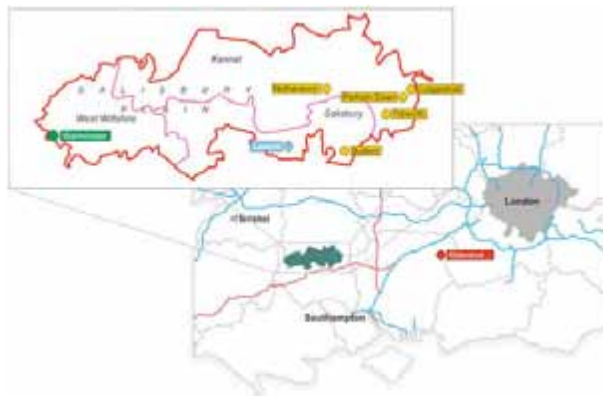


MOD Aspire Contract

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New accommodation blocks for British Army - Aldershot/Salisbury

Approx. 40 Dachs supplied.
- more than 100 by 2012.



On-campus private wire network



German Palace

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Veitshöchheim Palace in Bavaria, built in 1680, was used as a summer residence by the Würzburg prince bishops and is set in magnificent Rococo gardens. A Dachs mini-CHP unit manufactured by SenerTec at its factory in nearby Schweinfurt provides heating and electricity for this beautiful and historic building.





UK Government policy for carbon reduction targets ?

Stick and Carrot !

Sticks

Regulations, regulations, regulations!

- Building Regulations
- Merton Rule
- Display Energy Certificates
- Energy Performance of Buildings Directive
- Code for Sustainable Homes, etc.

Carrots

Promises, promises, promises!

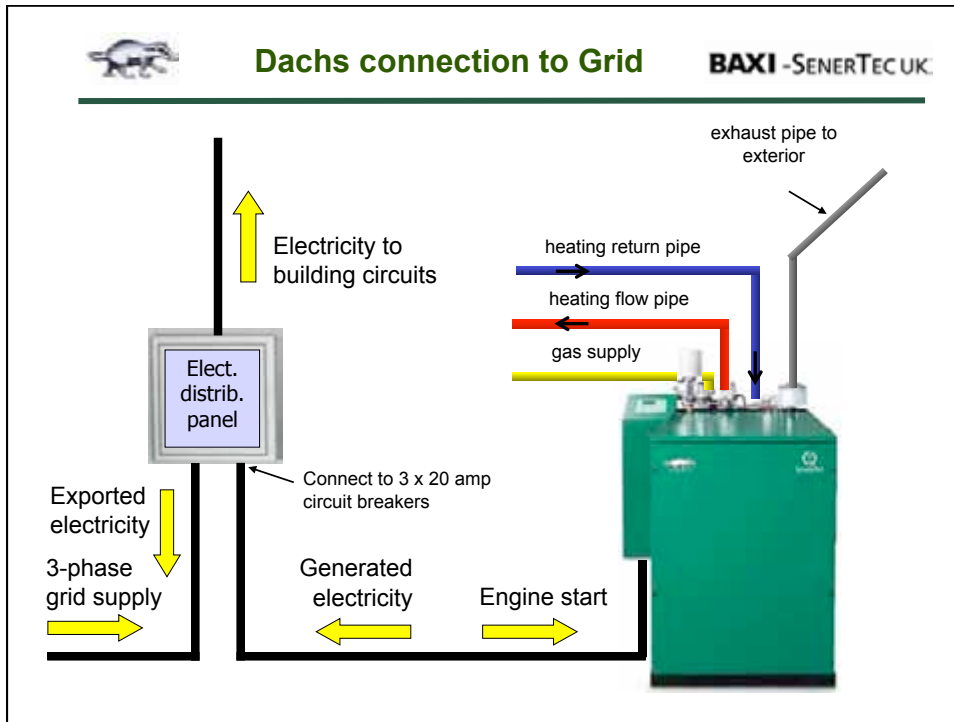
- Feed-in-Tariffs – now in Energy Bill (initially opposed, now possibly before election)
- (minor existing tax incentives – CCL exempt to 2012; ECA; 5% VAT)



*Feed-in tariffs: electricity

- (1) The Secretary of State may modify –
 - (a) a condition of a particular licence under section 6(1)(c) or (d) of the Electricity Act 1989 (c. 29) (distribution and supply licences);
 - (b) the standard conditions incorporated in licences under those provisions by virtue of section 8A of that Act;
 - (c) a document maintained in accordance with the conditions of licences under section 6(1) of that Act, or an agreement that gives effect to a document so maintained.
- (2) The Secretary of State may exercise the power in subsection (1) for the purpose only of –
 - (a) establishing, or making arrangements for the administration of, a scheme of financial incentives to encourage small-scale low-carbon generation of electricity;
 - (b) requiring or enabling the holder of a distribution licence to make arrangements for the distribution of electricity generated by small-scale low-carbon generation;
 - (c) requiring the holder of a licence to make arrangements related to the matters mentioned in paragraph (a) or (b).





Engineering Recommendation G83/1
September 2009

RECOMMENDATIONS FOR THE CONNECTION OF SMALL-SCALE EMBEDDED GENERATORS (UP TO 16A PER PHASE) IN PARALLEL WITH PUBLIC LOW-VOLTAGE DISTRIBUTION NETWORKS

Energy Networks Association
Engineering Directorate

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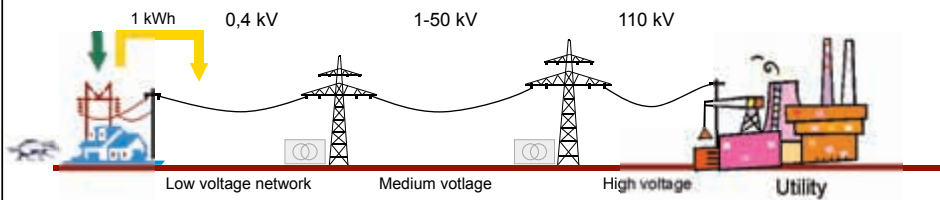
Engineering Recommendation G83/1 provides guidance on the technical requirements for the connection of SSEGs in parallel with public low-voltage distribution networks.

For the purposes of G83, a SSEG is a source of electrical energy rated up to and including 16A per phase, single or multi-phase, 230/400 volts ac.



German Feed-in-Tariffs

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Feed-in-Tariff

5.11	€ Cent/kWh	CHP bonus
0.04-2.00	€ Cent/kWh	Avoided network usage
6.55	€ Cent/kWh	Quarterly price (Baseload price at EEX)

Approx. total FiT

12.5	€ Cent/kWh	feed-in-tariff (if exported)
11.5	€ Cent/kWh	feed-in-tariff (if used)

Renewable energy law approx. 20.0 € Cent/kWh (only for renewable fuel)

Installation grant €7,362 (for Dachs)



EST Report – November 2008

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Energy Saving Trust Report

Power in Numbers: the benefits and potential of distributed energy generation at the small community scale

Conclusions

Significant CO2 savings are available if communities can be supported in acting at a community scale.

The technology with the lowest cost carbon savings is CHP at both individual and largest community size. Gas CHP can provide energy at a cost comparable to or **cheaper than a conventional gas boiler** in the urban town centre and dense urban communities at the medium and large scales

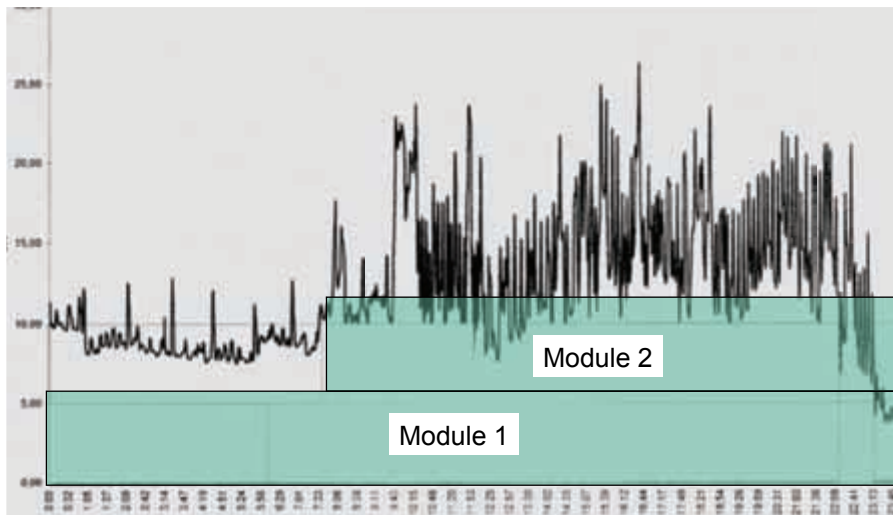
CHP is the most suitable option for **schools, police/fire stations, sheltered accommodation and leisure centres** (with swimming pool).

Technologies which do best at a community level tend to require **district heating systems**, suggesting support for district heating could be an important part of a strategy to protect communities against rising fuel costs.





CHP output = electrical demand BAXI - SENERTEC UK



Smart Meters

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Smart Meters

- allow businesses to manage their energy consumption and costs by identifying areas for potential savings.
- like a fuel gauge on a car – use it to understand what you are using and change your behaviour accordingly.
- value of smart metering is what you do with the information.
- main benefits is that it facilitates the Smart Grid (series of connecting devices that will allow the control of electricity flow).
- Carbon Trust results suggest that advanced metering can potentially save over 12 per cent.
- and they successfully implemented savings of more than 5 per cent.
- on average, companies which took part in the trial saved more than £1,000 a year.





Smart Grids

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Smart Grid

- smart meters are the end point of the smart grid.
- feedback from smart meters allows operators to identify power outages more quickly and smooth peak demand.
- less power is needed and they can more closely match production to demand.
- avoids the need to build new power stations or transmission infrastructure.
- also helps to reduce transmission losses – Europe lost the equivalent of 35 power stations' output in such losses last year.
- allows other energy sources to be included, eg. CHP.
- two-way communication is vital to measure how much power from CHP is being fed into grid.



Dynamic Demand

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Dynamic Demand Technology

- utilities will communicate directly with appliances in your home such as fridges, aircon, etc.
- instruct them to turn off for short periods at times of peak demand.
- DD allows continuous real-time matching of electricity demand and generation output (grid balancing).
- ensures stability and security of the transmission system and the maintenance of satisfactory voltage and frequency.
- In return, pay less for your power.
- Appliances fitted with DD expected to reduce the number of “part loaded” generators needed to maintain system security and quality of supply.



ASHRAE

- US engineers predict that we could be living in an all-electric economy by the middle of this century.
- US electricity consumption is on course to rise by 40 per cent in the next 20 years
- cost to the US taxpayer \$900 billion for the infrastructure - rise to \$3 trillion to manage the carbon emissions associated with energy production
- using 'smart' grids that would make power generation more efficient and dramatically reduce infrastructure costs.
- The **Gridwise initiative** was born after the power blackouts in August 2003 that plunged large swathes of the US West Coast into darkness. Engineers realised then that power crises would become more common and an alternative approach was needed
- a smart grid (electronet) could save the US taxpayer \$108 billion and improve reliability.



'Blackouts will be common in 7 years'

(National Grid CEO)

- regular blackouts within seven years if the Government does ensure that more power stations are built.
- acute shortage of generating capacity because a string of ageing nuclear and coal-fired plants were due to be retired from service.
- under a business-as-usual scenario, Britain would lack sufficient generating capacity to meet peak demand around 2015.
- six nuclear power, representing more than half of the UK's total nuclear capacity and 7.5 per cent of total electricity capacity are due to close by 2018.





Installed Dachs units in Europe **BAXI - SENERTEC UK**



SenerTec Centers

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SenerTec Center Lautenbach



SenerTec Center Schweinfurt



SenerTec Center Hamburg



SenerTec Center Hessen-Süd





SenerTec Center, Hamburg

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Service

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Solutions for Larger Buildings **BAXI - SENERTEC UK**

- ❑ up to 10 Dachs units can be linked
- ❑ integrated sequence control software
- ❑ modems for remote monitoring



SENERTEC
KRAFT WÄRME ENERGIESYSTEME



short manual

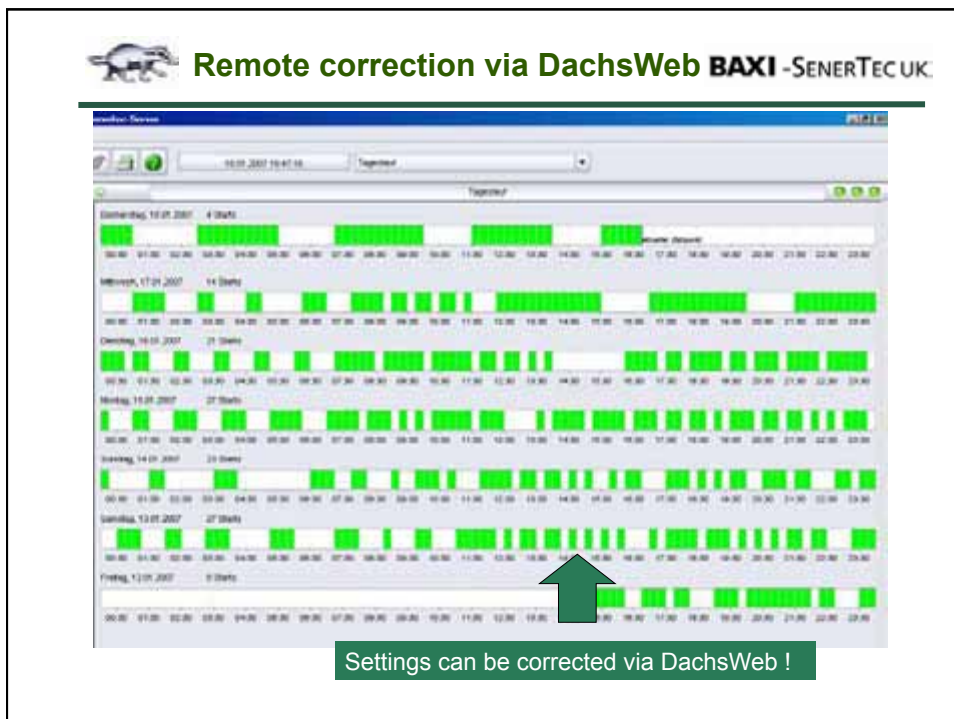
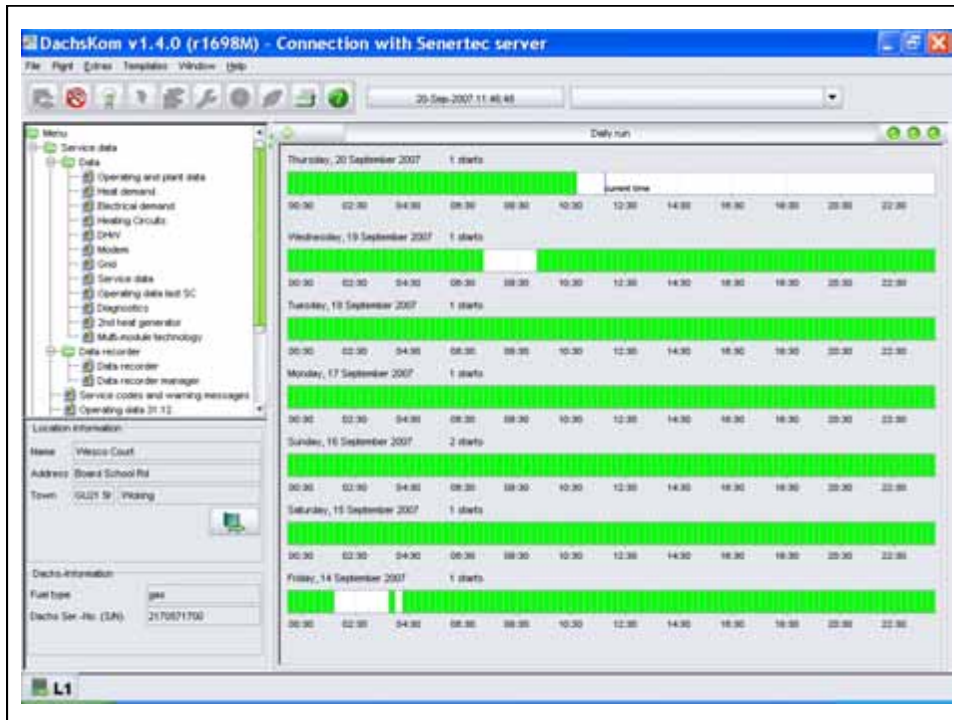
Dachs communication system
Instructions to DachsKom and DachsWeb

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DachsWeb / DachsKom

Remote internet monitoring

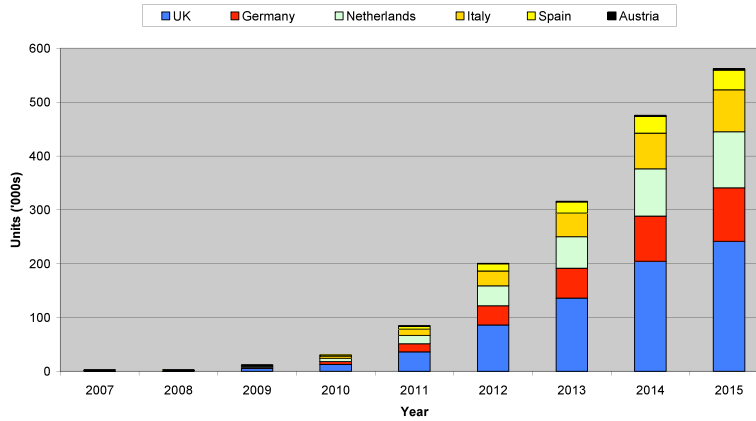




Micro-CHP Market Trends

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mCHP installations per annum 2007 to 2015



Source: BSRIA & COGEN reports - mid range (best outcome) analysis UK



Baxi Ecogen

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- Heat only appliance at launch - sealed and open vent systems
- Stirling engine, operates to $6kW_{th}$
- Supplementary heat exchanger, operated to $18kW_{th}$
- Spool valve air control
- Further appliance derivatives to follow



Baxi Innotec

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Technical data:

Electrical power:	1.5 kWel net
Thermal power:	~ 2.9 kWth
Additional heat generator:	15 kWth
Total efficiency:	> 80%
Fuel pressure:	20-45 mbar
Grid connection:	230 Volt / 50 Hz
Dimensions:	~ 0.6 x 0.7 x 1.6 m
Noise:	< 55 dB(A)



Field Trials currently in the UK and Europe



Dachs

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Total Dachs installed	> 20,000
Total operating hours	> 378,400,000
Total electricity generated kWh	> 2,040,000,000
Total CO2 saving in tonnes	> 1,210,000

CHP has come of age
.....it will help to future-proof your electricity needs



...and more than 20,000 Dachs users can't be wrong!

www.baxi-senertec.co.uk

