

ECONOMIC DEVELOPMENT COMMITTEE

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Date: 10 July 2002

Time: 14.00 - 17.30

Venue: Committee Room 1, National Assembly Building, Cardiff Bay

Title: Paper from MicroGen.

MicroGen - Smart Power

At a time when energy efficiency and environmental issues are at the forefront of thinking for Governments, businesses and individuals, interest in Micro Combined Heat and Power systems (Micro CHP) has never been higher.

MicroGen, is an innovative Micro CHP system for individual homes and small businesses, that not only generates heat as any normal boiler, but also produces electricity from the same compact unit. It will directly replace a household's existing central heating system and can be used in the majority of homes with a gas supply.

MicroGen Concept Model

New Innovation using established Technology

- The Stirling engine was invented in 1816 by Rev. Robert Stirling, a minister for the Church of Scotland, who was inspired to invent an engine because steam engines of his day would often explode, killing or maiming those who were unlucky enough to be standing close by.
- Applications of this technology are used in the Space Shuttle, in sub-marines and in cryo-coolers.
- The MicroGen team has championed the design of a unique variant of the Stirling engine, with a linear

free moving piston being the only moving part, making it highly reliable.

- Comprehensive pre-launch trials and testing are taking place in homes, laboratories and a dedicated MicroGen test facility.
- Expertise from some of the leading companies in the energy industry has contributed to the project, with over 100 direct staff, engineers, contactors and consultants working on the MicroGen project.
- BG has invested around US\$30million in developing the technology from initial concept and securing key intellectual property rights.
- BG and its partners are set to invest a further US\$40million in development of the MicroGen product through to launch. This investment will include capital investment in tooling and facilities.

How does it work?

- The MicroGen system uses new technology that converts the energy in natural gas supplied to the home into heat, hot water and electricity.
- The system uses heat normally wasted by conventional boilers to drive the novel Stirling engine, which produces electricity directly for use in the home.
- Electricity is generated when the piston in the Stirling engine moves through an alternator, driven by a pressure wave.
- The pressure wave is created by a large temperature differential when a gas flame heats the top of the Stirling engine. The bottom of the engine is cooled by the incoming water return from the radiators (or water tank).
- The heat generated by this process is then used to heat the hot water and radiators via a heat exchanger.
- The system will be powered by natural gas, the cleanest of the fossil fuels, and it is anticipated that this will be followed by Liquefied Petroleum Gas variants.

Helping the Environment

- **Air quality can be greatly improved by replacing polluting large-scale power generation with cleaner, high efficiency MicroGen units, which generate at the point that customers need power.**
- Typical benefits include a 40% reduction in Nitrous Oxides (NOx) emissions and a reduction in Carbon Dioxide (CO2) emissions of around 1.5 tonnes per annum.

Benefits for both Consumers and Regional Social Landlords

- MicroGen will provide more affordable energy for tenants and householders, lending it to schemes aimed at tackling Fuel Poverty and helping those on low incomes.
- The SAP rating of homes fitted with a MicroGen unit is likely to increase substantially over and above those gained by installing conventional boilers.
- MicroGen will also significantly reduce the carbon output of a RSL's housing stock, making a substantial contribution over and above that of any conventional combination or condensing boiler.



Guaranteed Heat and Electricity – even in the event of a Power Cut

- It is anticipated that MicroGen will have an optional feature allowing the system to provide heating, hot water and emergency electrical power in the event of a power cut.
- This means a reduction in the loss of winter warmth should storms cause electricity supply failures. This is particularly advantageous for vulnerable households, which are reliant on warmth during the cold months.

Market Barriers – How can Government help?

Replacement boilers are usually an unwelcome and unplanned purchase. Research indicates that customers are unwilling to pay a price premium for a promise of savings in the future. Government can help to kickstart new energy saving technology through the application of specific incentives, particularly in the early years.

Specific examples of where Government can be of assistance include:

1. VAT

VAT payable on fuel usage is currently 5%. However, VAT payable on energy saving devices such as micro-CHP units is 17.5%. If we are to encourage fuel savings and achieve CO₂ emission reductions then this anomaly must change.

5% VAT does apply to energy saving materials and this includes central heating and hot water system controls. A customer who installs a micro-CHP unit, which is among the most efficient energy saving devices available, should also benefit from the lower rate of VAT.

The Government has recognised the energy savings achieved from micro-CHP and its contribution to alleviating fuel poverty. It has introduced a reduction in VAT to 5% on domestic micro-CHP installed under the Warm Front Scheme. This VAT reduction needs to be extended to all micro-CHP installations.

2. Access to enhanced capital allowances

Enhanced capital allowances are currently available for boilers installed under the Affordable Warmth Scheme. Extending the access to enhanced capital allowances to all micro-CHP installations including those where the appliance constitutes a "fixture" in the customer's home, would make an important contribution to encouraging energy efficiency, reducing the cost of heat and in protecting the environment.

3. Inclusion of micro-CHP in accreditation and support schemes

Various accreditation and support schemes exist (EEC, CHPQA, SAP) to encourage the use of energy efficient products. However, there is currently no provision for micro-CHP in any of these schemes. Inconsistencies and differences in evaluation methodology and processes for inclusion in the schemes combine to make this whole area difficult, time-consuming and costly for new products such as micro-CHP to access.

Support from Government is needed to facilitate the inclusion of micro-CHP in these schemes. This will provide some financial incentives for micro-CHP and also provide the customer with valid comparison methods (e.g. SAP and SEDBUK) by which, for example, efficiency of appliances can be compared. Customers can then make informed choices about energy efficiency.

It is accepted that final inclusion of micro-CHP in these schemes cannot take place until sufficient field data has been collected, however, it is critical to the success of micro-CHP that provision is made for its inclusion on an interim basis prior to extensive field trials.

The condensing boiler has taken almost 20 years to penetrate the market place in any real numbers and we need to learn from this experience and prevent the same problems occurring in the micro-CHP market.

Grant support is required to stimulate markets particularly in the new build and private consumer sectors. This needs to reward early adopters for embracing this new technology by meeting a significant portion of the additional purchase price over a condensing or conventional unit.

This needs to be a partnership approach by all parties – if all local authorities, RSLs, house builders and Government bodies all placed orders for micro-CHP units, then the economies of scale needed to produce these units on a mass production line, would easily be met, helping to make the product even more competitive.

Specification

- It is intended that a range of models available with an anticipated heat output range of 4 kilowatt up to 36kw.
- This could be increased further for properties requiring greater output by modulating two or more MicroGen units together, making it suitable for small commercial applications or residential schemes.
- MicroGen is intended for production in both stored hot water and combi-boiler variants.
- The unit is designed to fit in the majority of homes with a gas supply and has been designed to wall mount, with both rear and side flueing options.
- The unit is no bigger than some of the larger combi boilers on the market.
- MicroGen is designed to produce up to 1.1kw of electricity and runs simultaneously with

any extra demand taken from the national grid.

Frequently Asked Questions

Does it need extra maintenance?

The MicroGen appliance is designed to have the same maintenance requirements as a conventional boiler.

Who can install it?

The MicroGen system is designed to be installed by appropriately trained gas engineers and plumbers.

How does it connect to the electricity system in my home?

The appliance would be connected to the electricity system by our installers when the appliance is fitted. No mess and no complications - it is a simple connection to the existing electricity mains.

I don't like the idea of combining electricity, gas and water in one appliance - is it safe?

Almost all boilers have an electrical connection along with gas and water connections; hence, MicroGen is not new in this respect and is completely safe.

What is its life?

MicroGen is designed to have a life comparable with conventional boilers.

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