



**SUSTAINABLE
POWER^{LTD}**



Powering a **Sustainable Future**

www.sustainablepower.eu

Sustainable Power a UK company specialising in the development and production of high efficiency mCHP co-generating appliances for the SME and larger residential market

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Introducing the **Spice2e**

Spice2e, mCHP

Wouldn't it be great if we could significantly reduce our energy bills AND do something really positive to help protect our environment?

The **Spice2e** electricity-generating micro combined heat and power appliance, (mCHP for short), is a small, compact, floor-standing, gas-engine based appliance that generates electricity whilst heating your water/ premises.

Designed and developed in-house by the former seven-time Subaru World Rally Championship R&D engineers the **Spice2e** has almost twice the electricity generating capacity and at least double the energy efficiency of any competing mCHP on the market today with an overall efficiency of >96% and maximised reliability. **Spice2e** not only allows the appliance holder to significantly reduce their carbon emissions but also provides an attractive financial investment.

The **Spice2e** mCHP is specifically tailored to the UK market environment, including the UK Government's Feed in Tariff (FIT) 2kWe subsidy limit.

The appliance has been principally designed for use in small and medium sized enterprises ("SMEs") such as:

care homes - hotels - community housing
leisure complexes - hospitals - larger residential
LPG & off grid - government buildings



Spice2e – micro combined heat and power appliance (mCHP)

By providing the ability for the appliance owner to generate electricity at their own premises directly from low carbon natural gas, huge savings can be achieved averaging £4,200 per year from utility bills and up to a further 15% in overall efficiencies.

Cost & Carbon Savings

Cost Savings

The **Spice2e** delivers over **3,400** litres of hot water @60 degrees and up to 48KWe on a daily basis to the appliance holder and generates average **savings of £4,200 p.a** from the site holders utility bill and up to a further **15% in overall efficiencies**.

Feed in Tariff's (FIT's)

"FIT's" are a Government-backed measure, part of the **Clean Energy Cashback**, a scheme that pays individuals and business alike for generating their own low carbon electricity.

The **Spice2e** has been specifically designed to produce 2kWe in order to take full advantage of the 2kWe Feed In Tariff limit (FIT), set by the UK Government. It is therefore ideally suited to produce not only exceptionally low levels of CO₂, but also to maximise the electricity produced and thus the FIT subsidy paid by the UK Government over a ten year fixed payment period.

The Generation Tariff (13.24p / kWh)

A fixed income for every kWh you generate whether you use it on site or export it to the national grid.

The Export Tariff (4.6p / kWh - 50% assumed exported)

An additional fixed income for every kilowatt hour of electricity self-generated sold back to the national grid.

* These rates are paid for 10 years and are index linked and tax free.

Reduction in Energy Costs

Due to self-generating of electricity for the cost of gas, you are purchasing less energy via utility companies at the normal rates so overall costs and efficiencies are greatly reduced.

Carbon Savings

Current electrical power generation use large centralised power generating plants using, generally, natural gas or coal as their primary energy source. On average, in the UK, this process creates electricity at an efficiency rate of around 40%

The subsequent transportation of the electricity to the end use causes further losses of 5-8%. As a result the electricity delivered to wall sockets from the grid represents only c.35% of the original energy fed into the process.

Electricity generated by the *Spice2e* is 62% more carbon efficient than electricity supplied by the National Grid, calculated on a CO₂gm/Kw basis. The Spice 2e produces less than 210 CO₂gm/Kw whereas the National Grid produces over 675 CO₂gm/Kw. This provides each **Spice 2e** appliance holder with the ability to reduce their carbon footprint by up to **5 tonnes per annum**.

	Via National Grid	Generated by Spice2e
Cost of Electricity kwh	14.5p	4p/ -11.5p *FIT included
CO Produced kwh	517 g/kwh	202 g/kwh
Energy Efficiency	<35%	97%

The current review limit for mCHP FIT is 30,000 units however the next target (between 100-300,000) is currently under review and will probably calculated on a digression basis as with PV and wind.

Cost Savings

31% Estimated IRR on the installation of a *Spice2e* appliance

Indicative Unit Economics of each unit with a running time of 8000 hours pa. based on electricity increasing at 6.5% pa

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Hours of use pa	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000
CHP unit rating (kW)	2	2	2	2	2	2	2	2	2	2
Electricity Produced pa	16000	16000	16000	16000	16000	16000	16000	16000	16000	16000
Cost of gas per kWh	0.035	0.037	0.039	0.0412	0.0435	0.046	0.0485	0.0513	0.0541	0.0572
Retail electricity price/kWh	0.14	0.1491	0.1588	0.1691	0.1801	0.1918	0.2043	0.2176	0.2317	0.2468
Electricity Cost at Grid Prices	2240	2385.6	2540.66	2705.81	2881.68	3068.99	3268.48	3480.93	3707.19	3948.16
Total Gas Cost for electricity production	560	591.36	624.48	659.45	696.38	735.37	776.55	820.04	865.96	914.46
Cost avoided by self generation	1680	1794.24	1916.19	2046.36	2185.31	2333.62	2491.92	2660.89	2841.23	3033.7
Cumulative Cost avoided by self generation	1680	3474.24	5390.43	7436.79	9622.1	11955.72	14447.64	17108.53	19949.76	22983.46
FIT on generation	2489.6	2551.84	2615.64	2681.03	2748.05	2816.75	2887.17	2959.35	3033.34	3109.17
FIT per kWh	0.1556	0.1595	0.1635	0.1676	0.1718	0.176	0.1804	0.185	0.1896	0.1943
Cumulative FIT	2489.6	5041.44	7657.08	10338.1	13086.16	15902.91	18790.08	21749.43	24782.77	27891.94
Service Costs per annum	500	500	500	500	500	500	500	500	500	500
Net Saving pa	3669.6	3846.08	4031.82	4227.39	4433.36	4650.38	4879.1	5120.24	5374.56	5642.87
Net Cumulative saving	3669.6	7515.68	11547.5	15774.89	20208.25	24858.63	29737.73	34857.97	40232.53	45875.40

The *Spice2e* has been developed to work independently or to sit alongside existing heating systems so no control integration is required. In order to fully utilise the *Spice2e* the unit operates as the primary heat source for the hot water/heating system via a supplementary buffer tank. The *Spice2e* can deliver over **3,000** litres of hot water @60 degrees and up to 48KWe on a daily basis to the site holder and in doing so can generate average savings of **£4,200** pa plus up to a further 15% in overall efficiencies.

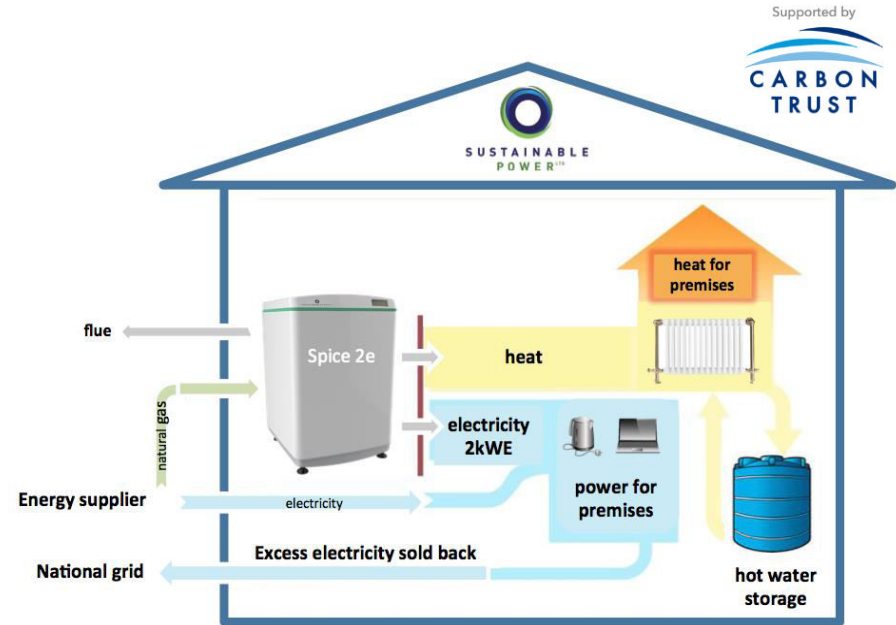
Microgeneration & Benefits of mCHP

Spice2e, mCHP

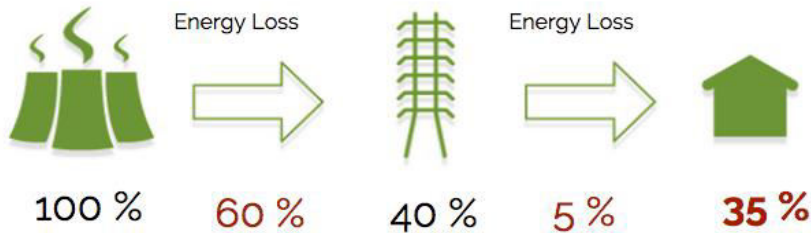
Since the process of producing electricity with the **Spice2e** via self-generation is 97% efficient and uses clean mains natural gas, the electricity generated is around 3 times cheaper and cleaner than the process used in conventional power generation.

Any electricity generated which is not required by the property automatically finds its way back into the electrical grid where it is used elsewhere. Therefore none of the carbon saving is lost.

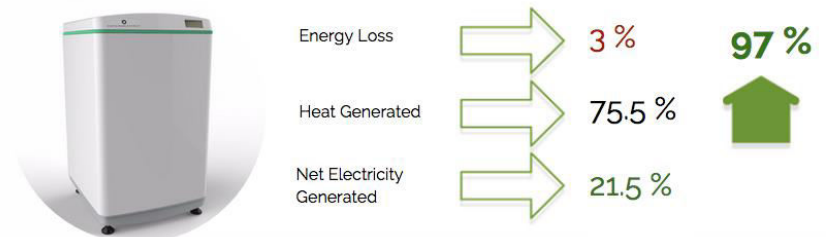
Furthermore, local generation of electricity reduces the loading on the electrical grid network by reducing the total amount of electricity it is required to carry from the centralised power stations. This reduction in grid load frees up capacity to support the roll-out of low carbon electric vehicles and other low carbon electrical technologies.



Gas / Coal – electricity produced via the national grid



Distributed Power Generation with the **Spice2e**



Floor Standing micro-CHP Unit Specification

The **Spice2e** includes a fully remote monitoring and operation system and is designed to work alongside existing heating systems in the plant room of a building, with minimal changes to the existing hot water system. The total installation process takes less than a day.

Spice2e was designed and developed in-house by our team of expert engineers based in Oxford, UK. The appliance is packaged within an impressive 495x490mm floor footprint ensuring the appliance can be accommodated in an existing plant room where floor space is always at a premium. A height of only 725mm means the appliance can be discretely located along side existing heating plant with minimal disruption allowing the installation process to take less than a day.

The technology adopted enables the appliance to start generating both heat and electrical output in a little as 10 seconds from demand. This ability to switch on and off rapidly mirrors that of a standard gas boiler and avoids the complexity of controls required with alternative generating technologies which have extended warm up and cool down periods.

Spice 2e mCHP unit

Height	725mm	Gas Input	9.65 kW
Width	495mm	Electrical Output	2.0 kW
Depth	490mm	Max Heat Output	7.5kW
Weight	c.120kg	Flue System	100/60mm

The power plant in the **Spice2e** is a gas combustion engine with > 97% output efficiency. The appliance has undergone rigorous testing and trials over the last two years and has been BSI certified for installation into the SME market.

The application of internal combustion engine applied with the latest technology developed by Sustainable Power returns exceptionally high electrical efficiencies of over 22%, which is far in excess of those provided by most other generation technologies. A high electrical efficiency combined with a low thermal output, allows the unit to run for longer when satisfying any heating demand. High run hours equates to higher electrical yield from the appliance.

Specifically engineered with optimised control the appliance includes a fully remote monitoring and operating system. Innovative vibration isolation technology and acoustically engineered enclosure provide an exceptionally smooth and quiet appliance.

In addition to outstanding electrical efficiency levels the Sustainable Power team have also achieved market leading thermal efficiencies from the appliance using patented heat recovery technology developed in-house. As a result the application of the Spice2e appliance ensures the total appliance efficiency exceeds that of the very best state of the art gas condensing boiler technology. Therefore there is no downside, in terms of fuel utilisation compared to other high efficiency heating appliances, just benefits through the production of low carbon and low cost electricity.

Active demonstration units

Sustainable Power installed its first **Spice2e** demonstration unit into the SME sector in May 2014. The unit was installed in Tom Urwin House, a care home in Sunderland owned and managed by Gentoo, one of the UK's largest Property Management groups. Subsequently, SP has installed several more demonstration units into Gentoo sites as well as other areas of the SME & larger residential market across the country.

With the installation of 7 active **Spice2e** demonstration units all working effectively to reduce both the carbon footprint and energy costs of the respective site holders, SP is now currently installing a further 7 **Spice2e** demonstration units into the SME and larger residential market including:

- Low cost housing & housing associations
- LPG installations off-grid
- Hospitals
- Hotel chains
- Government Buildings
- Leisure complexes

[Sustainable Power Ltd.](#) intends to make the **Spice2e** commercially available to SME customers starting from Q1 2016 with demonstration units available from Q1 2015.

Tom Urwin House

Silksworth, Sunderland – Built in 1989 and renovated in 2009.
Properties: 35 flats and 11 bungalows.



Spice2e installed in May 2014

Average running time: 22hrs a day

Generating 44kwe and 3400 liters of hot water @65 degrees C per day

Annually this:

- Saves 4.6 tones of carbon
- Delivers electrical savings on energy bills of over £4,000 pa plus efficiency savings of £1000+ pa

Plumbing schematic for Oxford Beaumont

