Berliner Energietage

MicroCHP – International Strategien in den Niederlanden und in Großbritannien

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Overview

- Who is Microgen
- What is MicroCHP
- Cooperation
- Potential
- Changes needed
- Conclusion

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- Who is Microgen ? -

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- Microgen is a company that develops and markets combined heat and power systems for the domestic & light industrial market
- Microgen's HQ is in the UK
- Microgen is 100% subsidiary of BG Group

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Microgen Team

Thames Valley Park
Reading

Microgen Technology Centre
Peterborough

Commercial Team

Building Business Models
Developing Int'l Partnerships
Contracts for Manufacturing

Engineering Team

Test Centre for 50 appliances
Development of engine & controls
Running field trials

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Enabling Technology
Linear Free Piston Stirling Engine

- Simplicity
  - low cost
  - long, maintenance-free life
- High efficiency
- Low noise
- Single phase a.c. power
- Fixed frequency [50 Hz]
- Voltage 230 V

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Microgen Home Energy Appliance
Suitable for the replacement market

- Dimensions (open vented):
  - Height 900mm
  - Width 450mm
  - Depth 420mm
- Combi / system variant 150mm wider.

Type	Max Thermal Output	Electrical Output	Floor or wall mount	Fuel
Regular	15kW	1.1kW	Wall mount	Natual gas or LPG
	24kW			
	36kW			
Combination	24kW			
	36kW			

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Microgen prototype appliance © Microgen Energy

- What is microCHP ? -

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What is microCHP

- MicroCHP = small Combined Heat & Power
- CHP = the simultaneous production of electricity & heat for useful application
- This dual use gives a much higher overall efficiency

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Micro-generation

European Cogen Directive:

- Article 3(m):
- "micro cogeneration unit" shall mean cogeneration unit with a maximum capacity below 50kWe”

  [Ref: 2004/8/EC, 11 Feb 2004]

- For practical reasons, < 15 kWe in the household environment is a more useful definition for microCHP and micro-generation.

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Micro-generation

Widely accepted definition:

- Up to 16A per phase (230/400V)
- Single phase 3.7kWe-5.5kWe
- Three Phase 11kW-15kWe
- [maximum size is country dependent]

Technologies:

- microCHP
- Solar PV
- micro-wind/micro-hydro
- fuel cells

Applications:

- Domestic and small commercial

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What is microCHP

- Replaces the existing boiler
- Usually in household environment
- Also produces electricity
  - Mostly for direct consumption
- The home-owner becomes a producer
  - Tax implications?
  - What to do with extra kWh?
- Decentralised power production

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What does microCHP consist of ?

- A [condensing] boiler
- An integrated generator
  - Stirling engine, fuel cell, gas turbine, steamcell, etc
- Controls
- Peripherals
  - Wiring
  - Meter
  - [Flue]

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- Cooperation -

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Members of Dutch microCHP group - under Cogen Netherlands

BG-group
Delta
ECN
EnAtEc
Eneco
Essent
Gastec

Gasunie
MTT
NOVEM
NUON
Vaillant
Whispertech
Wonen Breburg

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- Market Potential -

Market Size [1]

- From 2007 there is an increasing shortage of electricity in the European Union
  - This is due to increasing demand growth of electricity
- The European Commission is looking to
  - Build 200 GW of new generating capacity
  - Renew 300 GW of existing capacity
- But who is going to invest in a liberalised market?

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Market Size [4] – the Netherlands

- The Netherlands has 6 mln homes
  - Up to ¾ are potential microCHP homes
- The boiler market is well established
  - Saturated market
  - 400,000 boilers sold per year
  - 90% of boilers sold are condensing
- MicroCHP could replace existing boilers directly
  - Installers already know condensing boiler technology
  - There is wide experience with solar PV electrical connections

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How to get there?

- Compare to historical curve of similar technology

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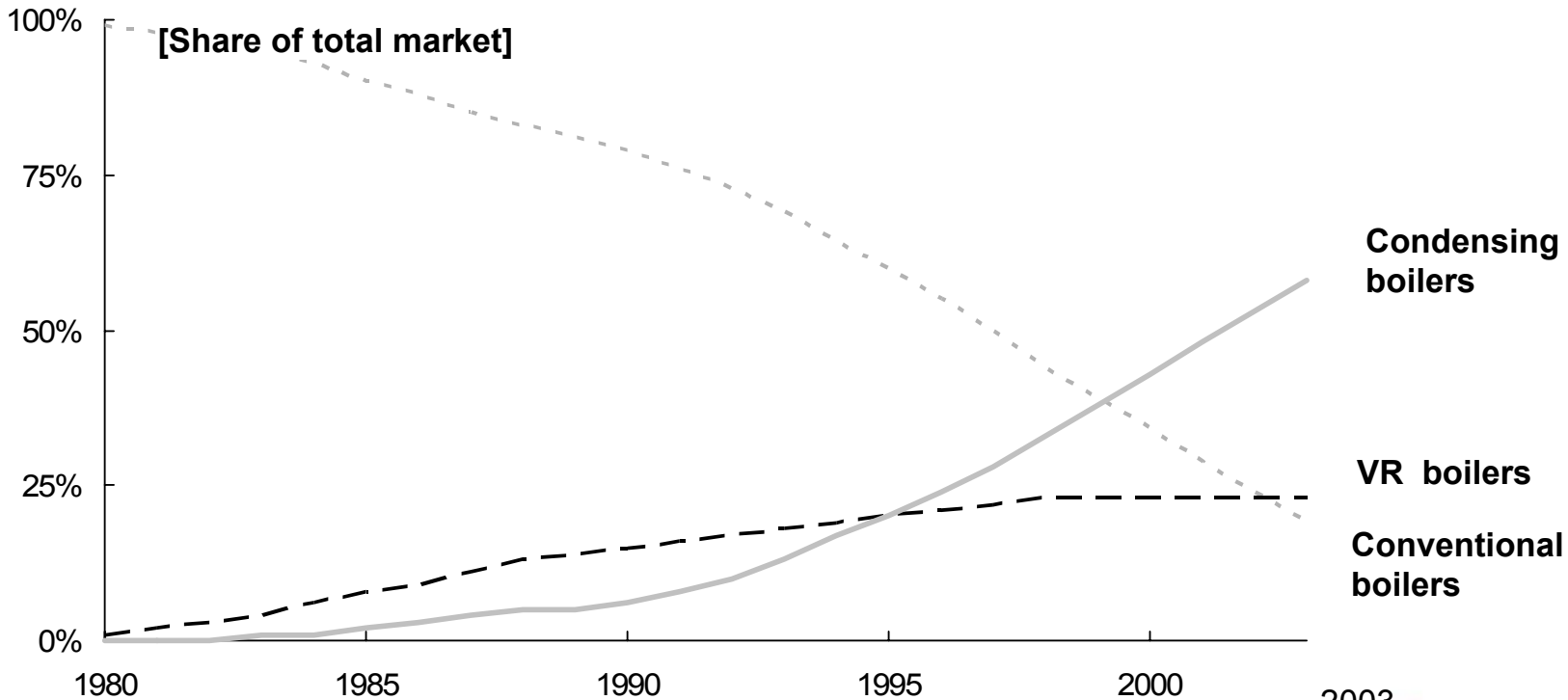
The condensing boiler in the Netherlands has highest penetration in the world at 60%, and is still growing rapidly

Boiler market evolution in the Netherlands

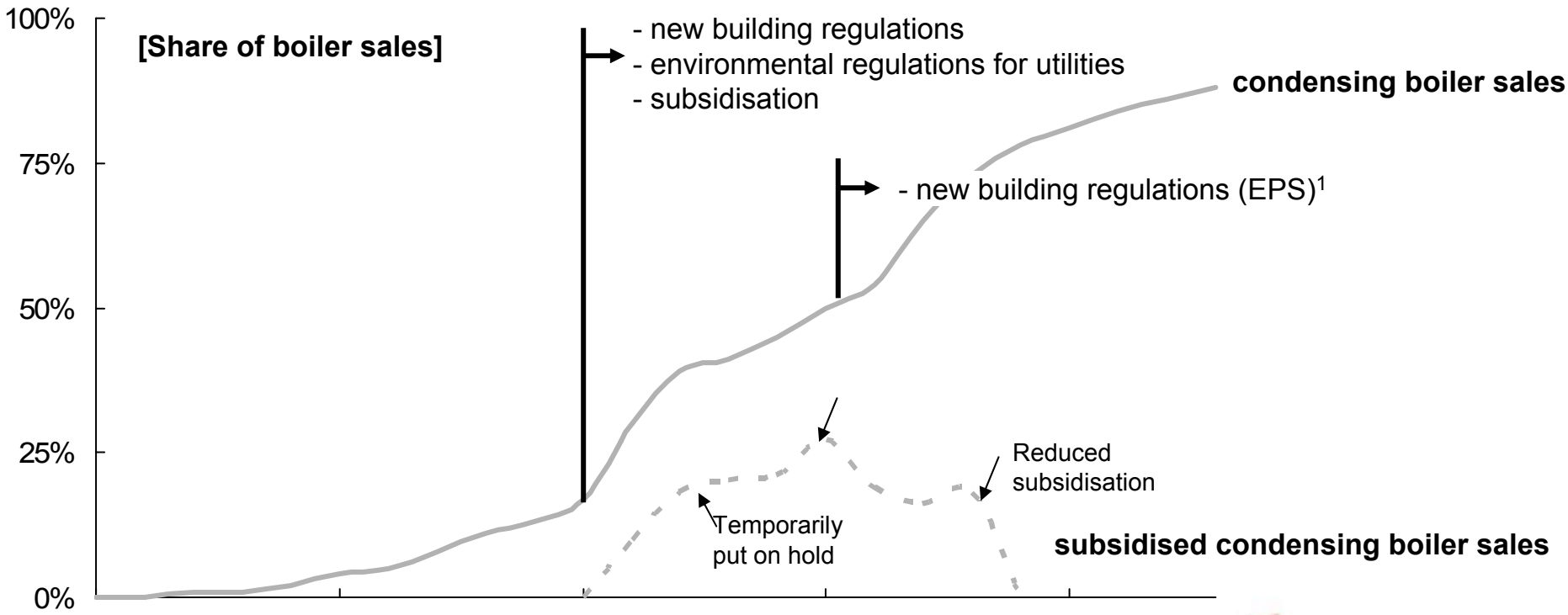


0%	2%	6%	20%	43%	57%	Condensing boiler market shares

Source: ECN, EnergieNed, Roland Berger analysis

The condensing boilers' share of sales rapidly grew from <20% in 1990 to 80+% in 1990

Condensing boiler uptake in the Netherlands



1 Energie prestatie standaard

Source: ECN, EnergieNed, Roland Berger analysis

- Improvements for microCHP -

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Home-Owner's Needs

- Grid Connection
- Meter Installation & Metering
- Upfront Support
- kWh feed-in fee

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Case Situation

- 31st December, evening
- Boiler Breaks Down
- Replacement is needed within 24 hrs

- What happens here if the customer wants to buy a microCHP to replace the boiler?

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Solution

- Home Owner cannot replace boiler with a microCHP within 24 hrs = unfair disadvantage
- Goes against European policy goals to rapidly develop microCHP market
- Root cause is in regulatory framework

- Needed change is:
- [1] “Fit & Inform” system
- [2] Type approval of microCHP’s
- [3] Harmonised acceptance by network co’s

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Meter Installation

- When fitting the microCHP, costs need to be kept as close to boiler costs as possible to be competitive
- This means all installation work to be done in one day - No separate call-out for meter installation and final OK for appliance activation.
- This improves convenience for home-owner

- However, current meter regulations generally don’t allow easy installation

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Meter Installation:

Current situation

- Meter installed on separate day
- By separate team
- Timelines unclear
- Costly situation

- Need further opening of the meter market:
- [1] Certify and use meter of choice [cheaper]
- [2] “Fit & Inform” rule with network company
- [3] Delegated authority to accredited installers

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Upfront Support

- Early Adopter market, no price issue
- Mass Market requires a kick-start and reduction of price differential with boiler market
- Current policy goals send conflicting messages

- Change needed:
- [1] End users need certainty of structural support for energy efficient technology
- [2] A level playing field for all energy

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Upfront Support:

The Tax System

19% VAT

CO2

Energy Efficiency

Unfair Competition

Lower % VAT

CORRECTIVE MEASURE:

Lower VAT for microCHP

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kWh pricing

- Structural arrangement for buy-back of kWh generally not arranged
- Government registration fee out of proportion
- Home-owner does not want hassle of negotiations with energy company; Home-owner does not know where to begin

- Needs:
- [1] A simple, automatic kWh buy-back system
- [2] Low cost / No cost registration system

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QUESTION TIME !

Further information:

www.microgen.com

www.BG-Group.com

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Government

- Primary Energy Saving
  - Lower primary energy consumption
  - Lower transmission losses
- Emissions Reductions
  - Gas consumption has low carbon value
  - Waste heat used more efficiently
  - Around 1.5 Ton CO_2 avoided per system/year
- Infrastructure
  - Diversity of supply: better security & reliability
  - Helps defer investment costs

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Lower Transmission Losses [1]

- Electricity cannot be stored
  - It has to be used as soon as it is produced
  - Unless you convert it –costs energy [2x]
- Transporting electricity costs energy
  - About 3% of electricity is lost in transport
  - Up to another 5% is lost in transformers
- These losses have to be accounted for:
  - Makes central production less attractive
  - Costs due to losses in The Netherlands are some Euro 18 mln /year

Lower Transmission Losses [2]

- The Netherlands loses some Euro 18 mln /year
- However, already >50% of electricity is produced by large CHP /decentral power
  - This has reduced losses by 1/3 [i.e. actual losses would have been Euro 27 mln /year]
- One reason for benefit is that electricity is produced at *Point of Use*
  - Close to where you need it, no transport
- Second reason is that CHP is *Predictable*
  - You produce power when you also need heat

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Benefits:

Home-Owner

- Own Power Station
  - Sense of independence
  - Potential to run even during power cut
- Reduced Energy Bill
  - Annual reduction about €225
  - Mostly through avoided kWh-purchase
- Environment
  - Contributes to efficient energy use
  - Without reduction in quality of life
  - Sensible, economic investment

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Reduced Energy Bill [1]

- Normal buy-in price / kWh = ~Euro 0.13
- Transport costs / kWh ~Euro 0.03

- Let's assume Euro 0.16 / kWh
- Of 2200 kWh per year produced,
  - 440 exported
  - 1760 used [and not bought from Grid]
- 1760 kWh x Euro 0.16 = Euro 282
- 440 kWh x Euro 0.04 = Euro 17.60
  - [wholesale price refunded to home-owner]

- **Electrical saving: Euro 300 /year**

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Reduced Energy Bill [2]

- But, slight increase in gas use [~ 10%]
- Average house uses 3000 m3 / yr
- So now, 3300 m3 / yr
- Price / m3 = ~Euro 0.25
- Additional gas costs
  - 300 m3 x Euro 0.25 = Euro 75 / yr
  - This has to be subtracted from the electricity gain
- Gain Euro 300
- Cost Euro -75
- **Saving Euro 225 / year**

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Market Size [2]

- Within the EU [15] the total market for microCHP is estimated at some 50 million appliances.
  - Main markets are Germany, Netherlands, UK and [northern] Italy. These account for >50% of total
  - Other countries include Belgium, Austria, Switzerland, Denmark and France
- Countries need a significant winter period with cool winter days for microCHP to be economic
  - >5 months per year heating season

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Market Size [3]

- If the full potential of microCHP were installed in the EU,
  - Each the smallest generator of 1.1 kWe
  - That makes 55 GW of production capacity
  - That is >25% of the 200 GW EC target
    - [but what do you do with the heat in summer?]
- If each generator saved 1.5 ton CO_2 / year
  - Equals 75 mln ton CO_2 / year
  - Significant addition towards achieving Kyoto
- Investment made by home-owner

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Rapid growth in the 90's was realised on basis of strong installer support & incentives, regulations and subsidisation (1/2)

Regulatory key success factors

Key success factor	Explanation	Period	Impact
Building regulations	▪ Regulations to decrease energy consumption in new construction increased uptake of condensing boiler (cheaper alternative to installing additional wall/ceiling/floor insulation)	▪ Begin 1990's	▪ Fast adoption of condensing boilers by architects and project developers
Environmental regulations	▪ Introduction of MAP[1] agreement: Utility companies committed to efficiency improvements and CO_2 reductions: push effect for condensing boiler by utilities to meet targets ▪ High involvement and support from Novem and GasUnie	▪ 1991 - ongoing	▪ Energy distributors stimulated to promote condensing boilers
Subsidisation	▪ Utility companies offered consumer subsidies (financed for 50% by government and through 2% levy on end-user electricity and gas prices)	▪ 1991-1996	▪ Sales push from utilities led to increasing sales (yet only 38% of boiler sales subsidised)

1: Environmental Action Plan
Source: ECN 2002; Roland Berger analysis

Rapid growth in the 90's was realised on basis of strong installer support & incentives, regulations and subsidisation (2/2)

Distribution key success factors

Key success factor	Explanation	Period	Impact
Installer support	▪ Utility companies invested heavily in product promotion and training among installers and consumers ▪ Manufacturers investing in new product lines strongly promoted and advertised product and offered incentives to installers	▪1990 +	▪ Installers felt comfortable to install condensing boilers
Installer incentives	▪ Installers received higher compensation for condensing boilers (estimation EUR 50-100) ▪ Secondary benefits for installers from manufacturers e.g. trips	▪1990-1996	▪ Installers promoted condensing boilers strongly
Product standard-isation	▪ Manufacturers standardised products and installation requirements ▪ The GasUnie was responsible for ensuring constant high national gas quality (prerequisite) ▪ High level of Gastec certification for boiler producers (Gastec: independent international organisation for testing and certifying gas related products for manufacturers and distributors)	▪1990 -	▪ Condensing boilers high level of standardisation – simplified installation

Source: ECN 2002; Gastec; Roland Berger analysis