

Micro CHP in The Netherlands

Virtual Storage of Electricity
ESSENTial for Micro CHP Feasibility

Profile of Essent

- a Dutch energy company
- gas/electricity: generation, network, trade & sales
- 2,3 resp. 1,9 mio electricity & gas customers
- invented "Green" Electricity: appr. 800 K clients
- independent, North-Western European ambitions
- over 12.000 employees in The Netherlands, Germany and Belgium

Essent's interest in central heating: Inhome

- Inhome franchise organisation
- serving appr. 1.100.000 households
- sales and rent of central heating equipment
- central heating service contracts
- sales of sustainable energy equipment

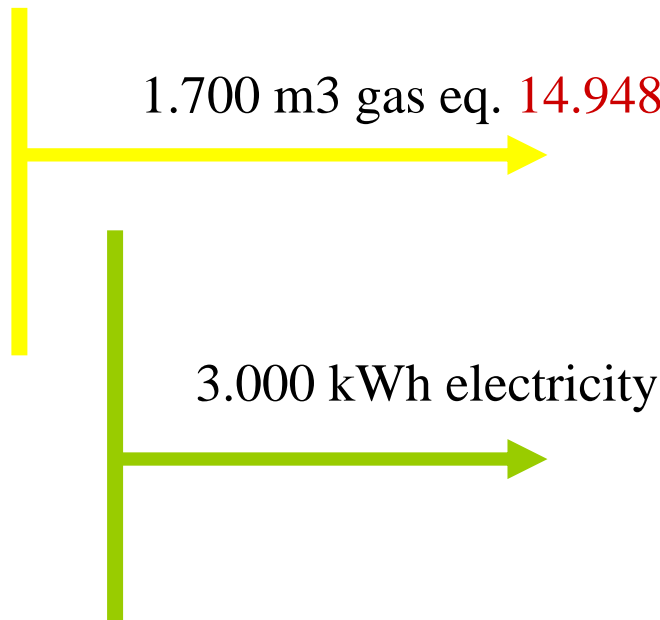
Inhome Vision & Mission

- CO₂ neutral in-house climate control, Green Energy at central level
- Micro CHP possible successor of condensing boiler
- contributions to R&D projects and field tests
- cooperation with government, institutions, consultants, energy, industry & service companies

Micro CHP Field Test - Scope

- goal: accelerate Micro CHP development
- method: install, operate & measure performance of 50 units
- expected results: performance, awareness & cooperation
- cooperation with third parties
- planning: 2006-2007

Average Annual Energy Consumption Dutch Households



Expected Average Annual Energy Consumption Dutch Households with Micro CHP



14.948 kWh Heat

2.500 kWh electricity

1.984 m³ gas

500 kWh electricity



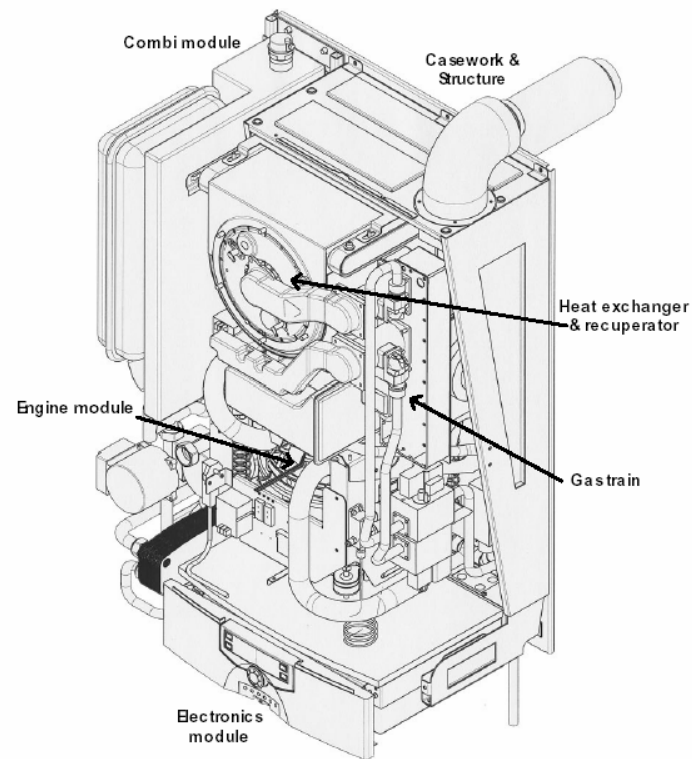
Conclusions:

decreased electricity supply of 2.500 kWh

increased gas supply of 284 m³ gas, to produce 2.500 kWh electricity

electricity generation efficiency of 90%

The Magical Boiler



The gas fueled house hold power plant

The Founding Fathers: Gasunie, ES&T, Inhome





Tolbert





Triemen



The Results Feasibility to be Measured



First Observations

- the tested Micro CHP has a weight of 132 kilos
This exceeds limits set by Dutch labour regulations
- the thermal capacity is about 8 kW
Appr. 14 kW is needed in extreme cold situations

Micro CHP Economics

Energy Efficiency

- additional 284 m³ (eq. 2.775 kWh) gas is needed
- for the production of 2.500 kWh electricity
- resulting in 90% efficiency

Micro CHP Economics

Dutch Electricity Pricing (euro's)

- commodity 0,0771
- grid cost 0,0389
- energy tax 0,0839
- total 0,1999

Micro CHP Economics

Micro CHP electricity pricing (euro's)

- 1 m³ gas contains 9,8 kWh
- 90% efficiency results in 8,8 kWh electricity
- 1 m³ gas costs 0,5941 euro
- Micro CHP generated electricity costs 0,0675 euro

Micro CHP generated electricity is 0,13 euro per kWh cheaper than regular electricity

Micro CHP Economics

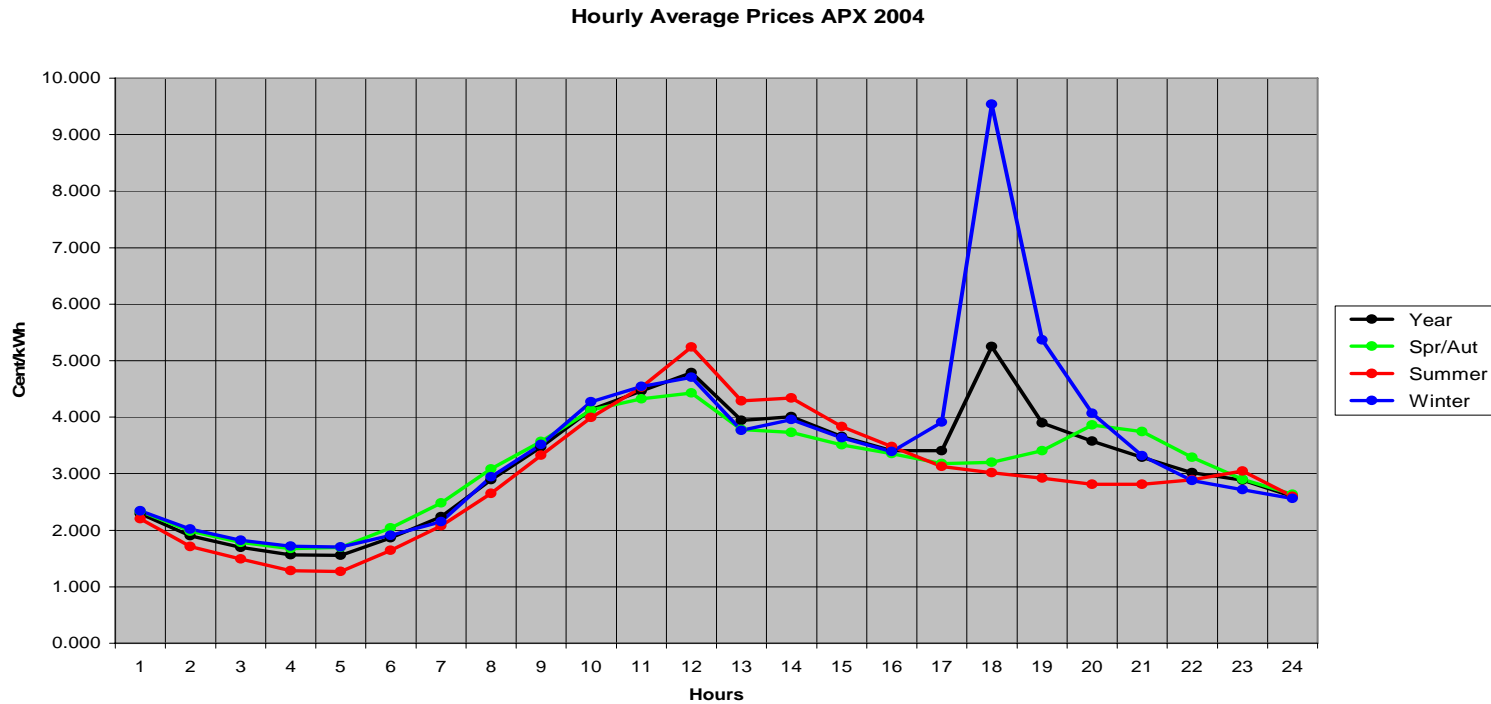
Electricity: usage and finance

- 50% can be directly, domestically used
- resulting in annual cost savings of euro 162
- remainder is turned over to the grid
- Storage of Electricity needed to obtain the other euro 162 cost savings

Storage & later use of electricity is necessary

Sales of excess electricity

- electricity market: volatile & unpredictable
- average market price excess electricity euro 0,035



Sales of excess electricity unattractive

Virtual Storage

Sales Unattractive, Preference for Storage

- physical storage unattractive
- Virtual Storage the better alternative



Virtual Storage

How does it work

Micro CHP generated electricity is

- put on the network when generated and not directly used
- taken off when needed

Virtual Storage

Costs of virtually stored electricity (euro's)

- operation service cost of 0,02/kWh
- normal grid fee (0,0389/kWh) applies
- tax exemption (0,0839/kWh) on "stored" electricity
- Micro CHP electricity direct costs 0,0675/kWh
- total cost of virtually stored electricity 0,1264/kWh

Tax exemption and cooperation with energy company crucial

Virtual Storage

Cost Savings (euro's)

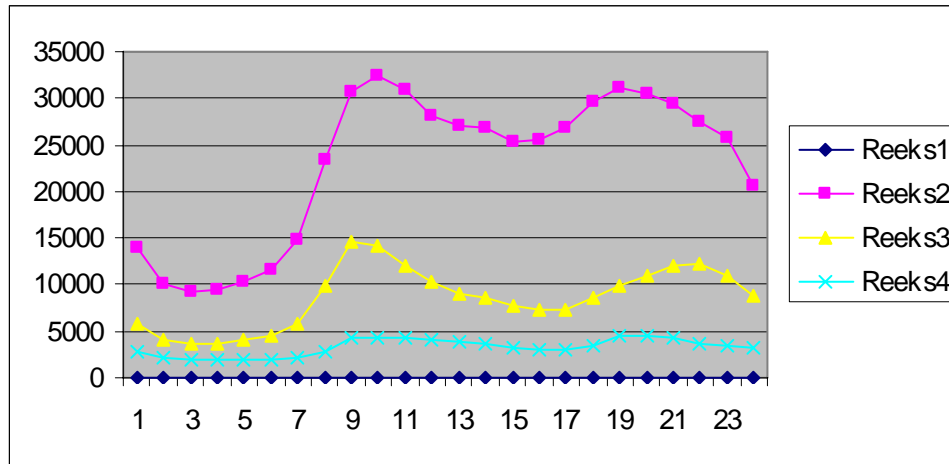
- regular electricity price 0,199/kWh
- Micro CHP virtually stored electricity price 0,1264/kWh
- cost reduction of euro 0,0726/kWh or euro 90 p.a.

Tax exemption and cooperation with energy company crucial

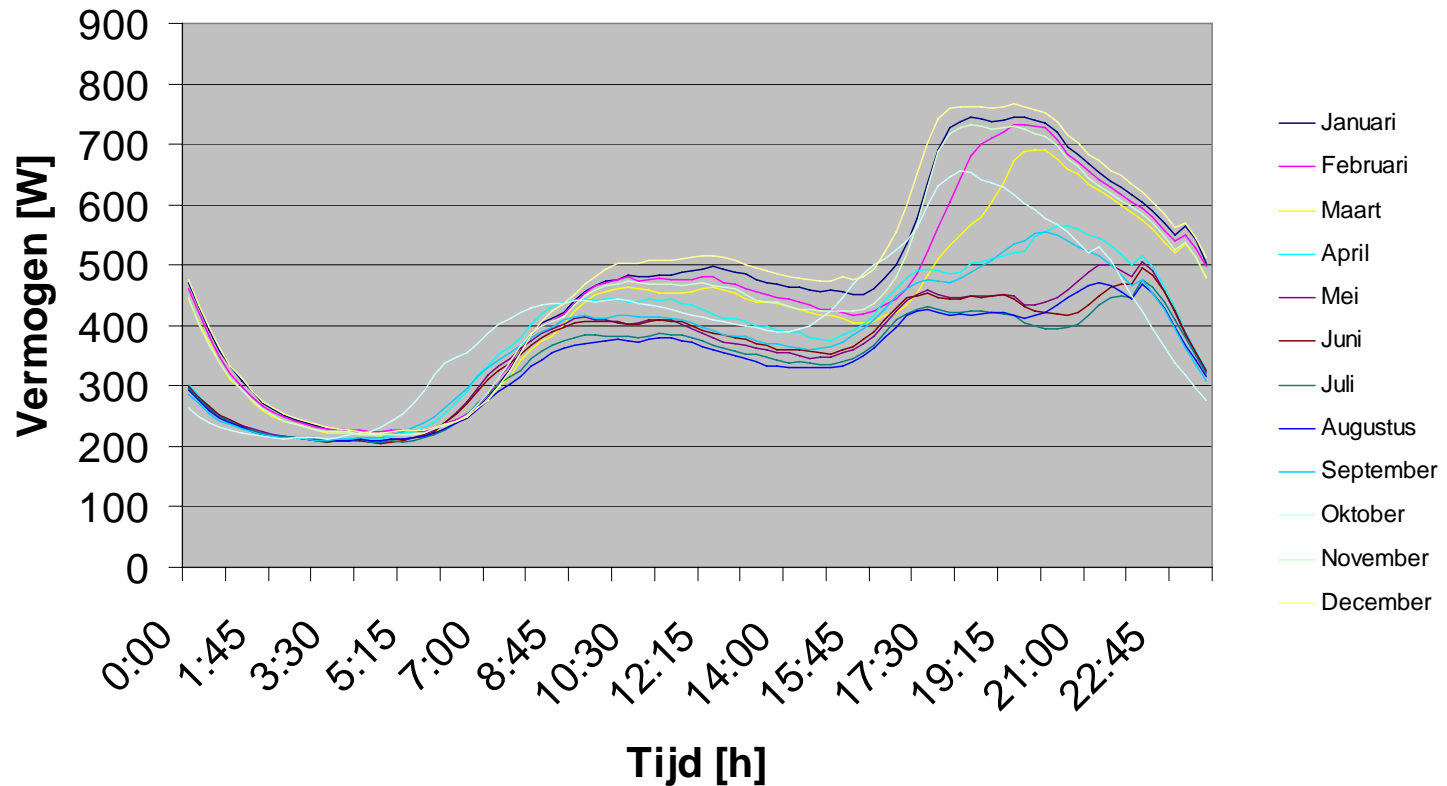
Conclusions

- cost reduction of appr. 250 p.a.
- tax exemption & pay back period of max. 5 years
- Micro CHP price should not exceed current condensing boiler prices with more than euro 1.250

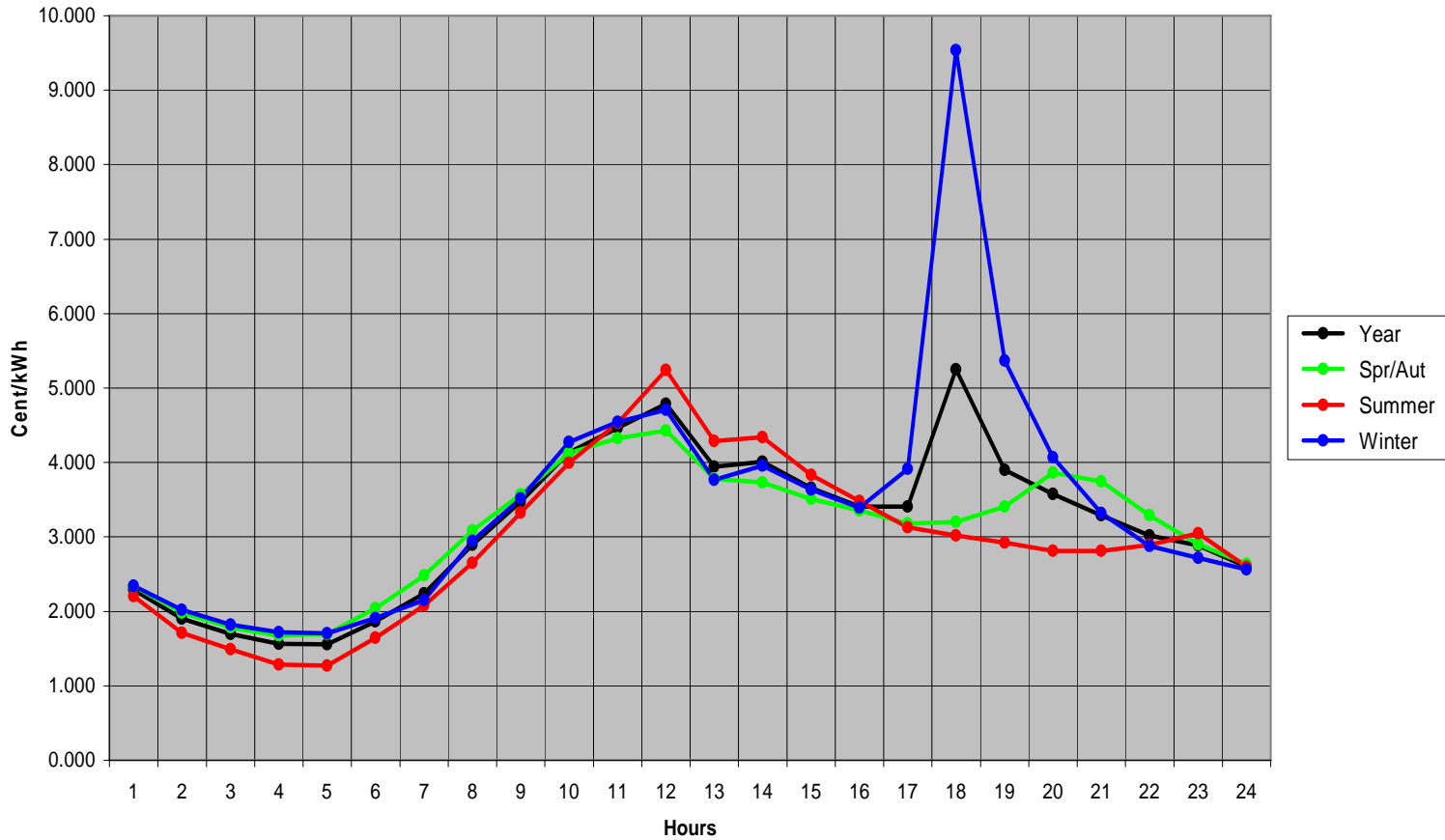
Government must clarify position on tax exemption



Momenteaan E-verbruik bij 3.500 kWh/jaar



Hourly Average Prices APX 2004



[jan 2006\operation profile optimisation.xls](#)

