



COGENERATION OBSERVATORY  
AND DISSEMINATION EUROPE



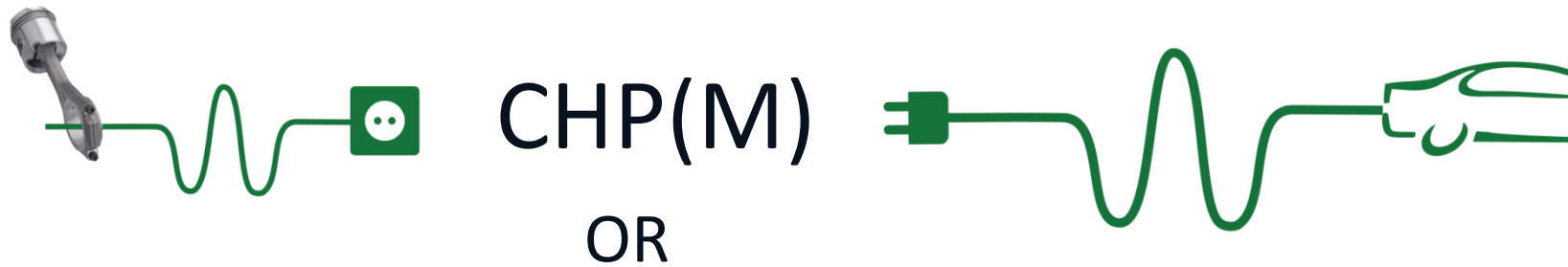
# CODE

## Cogeneration Observatory and Dissemination Europe

*CODE Final Dissemination Workshop*

*25 March 2011, Brussels*





how Combined Heat Power & Mobility  
really heralds the **greening** of the energy landscape

Jean-Pierre Van Wingen  
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## ► EVW and green energy : a long history

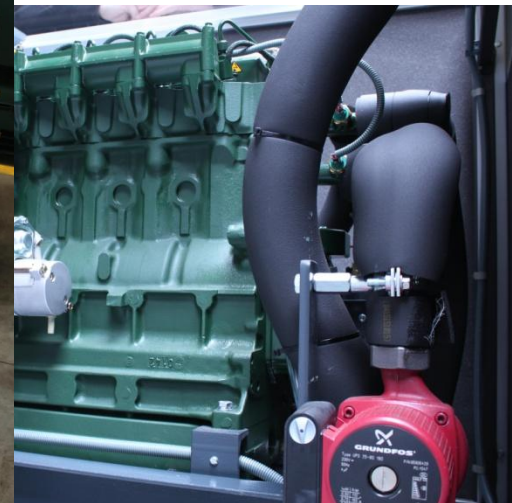
- 1993 : First CHP installation
- 1996 : First biogas engines
- 2004 : First experiments with biological oils
- 2007 : 30 MWe production of green power in Belgium through EVW units
- 2007 : ECOPOWER, first CHP on pure plant oil (rapeseed)
- 2008 : 7 MWe new bio-projects (gas and ppo),  
the bio-breakthrough (such as Shanks, OWS, ADPO, etc.)
- 2010 : 50 MWe production of green power in Belgium through EVW units.
- 2010 : Introduction of Mini-Cogen on the Belgian market

► **Today**

- 2010 : > 50 MW EVW/CHP-installations in Belgium with 60 engines (853 kWe average per installation)
- EVW is a leading player in the market of midrange cogeneration (<1MWe)

▶ New development

# Mini-Cogen



## ► Mini-Cogen

5 kWe < Mini-Cogen < 50 kWe

(≠ Micro-Cogen, < 5kWe)

Why?

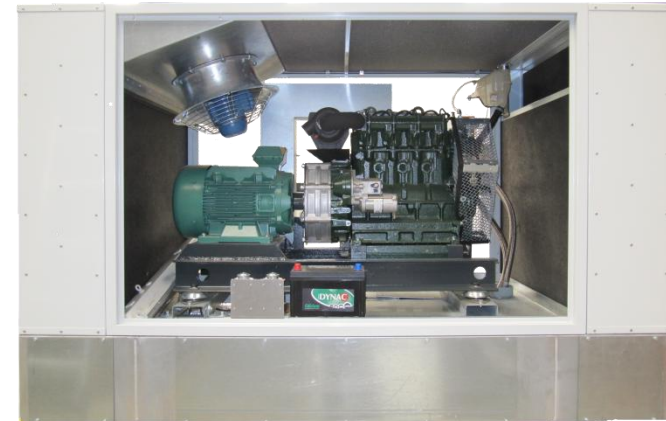
Same aim and result as with large cogen units, but bigger market.

So :

More opportunity to really turn the energy landscape green, i.e.  
**Many small Cogen units > limited number of large Cogen units**

Result :

Less use of energy, less CO<sub>2</sub>, more jobs



## ► Mini-Cogen

Demo project :  
12 kW<sub>e</sub> natural gas cogen unit in Evergem

Specifications :

$P_{in\ th}$	:	40 kW <sub>th</sub>
$P_e$	:	12 kW
$P_{th}$	:	22 kW <sub>th</sub> (24 kW <sub>th</sub> (*) )
efficiency $e$	:	30 %
efficiency $th$	:	55 % (60 % (*) )
efficiency tot	:	85 % (90 % (*) )
temp. Range	:	70-90°C
Smoke gas cooling	:	+ 120°C

Deviations :

thermal output : +/- 5 %

electric output : +/- 2 %

(\* ) installation at EVW premises



## ► Mini-Cogen

The breakthrough?

VW has high expectations. Volkswagen's Bernd Osterloh:  
*'We expect to install mini-cogen units in tenths of thousands of homes. This could make at least two nuclear or large coal fired power plants superfluous. The small power stations are easy to install in the cellar of your house.'*

*At the present time the automobile is unthinkable without a highly efficient diesel or gasoline engine. The future however, and that is certain, will belong to the electric motors fueled by the wall power plug.*

Prof. Martin Winterkorn, CEO Volkswagen AG

► **Mini-Cogen**

Save energy by combining the electric vehicle with a Mini-Cogen!



## ► Mini-Cogen

A calculation:

Well to Wheel ratio (km/MJ) [www.teslamotors.com](http://www.teslamotors.com)

### **Tesla**

90% electric motor efficiency (0,22kWh e/km)

90% battery charger efficiency

vs

**Small diesel car** (5L/100km = 0,5kWh th/km)

35% combustion engine efficiency

**Well to Wheel ratio (km/MJ) :  $0,9 \times 0,9 / 0,35 = 2,3$**

► **Mini-Cogen**

**Electric car vs. conventional car**

Electric car  
68000kWh th / 2,3 / 50 %\*  
= **59000kWh th**

136000km



Diesel car (5L/100 km)

**68000 kWh th**  
(6800 L)

boiler 90 %  
**61000kWh th**

55.000kWth



boiler 90 %  
**61000 kWh th**

\*efficiency of electric power station + transmission losses

► **Mini-Cogen**

**Electric car/Mini-Cogen vs. conventional car**

Electric car and **mini-Cogen**  
with **2500** running hours

30000 kWh e

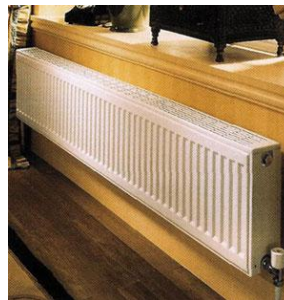
**100000kWh th**

55000 kWh th

136000km



55000kWth



Diesel car (5L/100 km)

**68000 kWh th**  
(6800L)

boiler 90 %

**61000 kWh th**

## ► Mini-Cogen

CHP(M)

# Combined Heat-Power-Mobility

Electricity is a byproduct of the heating :

- Extra use of natural gas =  
 $100000 \text{ kWh} - 61000 \text{ kWh} = 39000 \text{ kWh}$
- Extra **39000 kWh th** has yielded **136000 km**
- For which traditionally **68000 kWh th** had been needed

$$\text{➤ } PES_{\text{mob}} = 100 \% - (39000/68000) = 42 \%$$

## ► Mini-Cogen

Better still?

- CO<sub>2</sub> neutral power generated by a cogen unit running on rapeseed oil.

Purchased from local farmers.

Biomass = CO<sub>2</sub> neutral cycle.

Rapeseed oil production is limited ! So :

- Not suitable for power wasters like cars with combustion engines (20% efficiency)
- A shame to add millions of litres of rapeseed oil to obtain biodiesel as it is done today (see only 20 % efficiency)
- MUST DO: use it in CHP (80 % efficiency)

- Application : rural

## ► Mini-Cogen

Our plans :

- Before the Summer holidays : 6 preseries models **(SOLD)**
- End 2010 : start of serial production : first batch for 2011 (25 units)  
**(Collecting orders)**
- 2011 : increased serial production
- And then : Turn our region into a green environment ! Energy Managers also become Fleet Managers or vice versa.

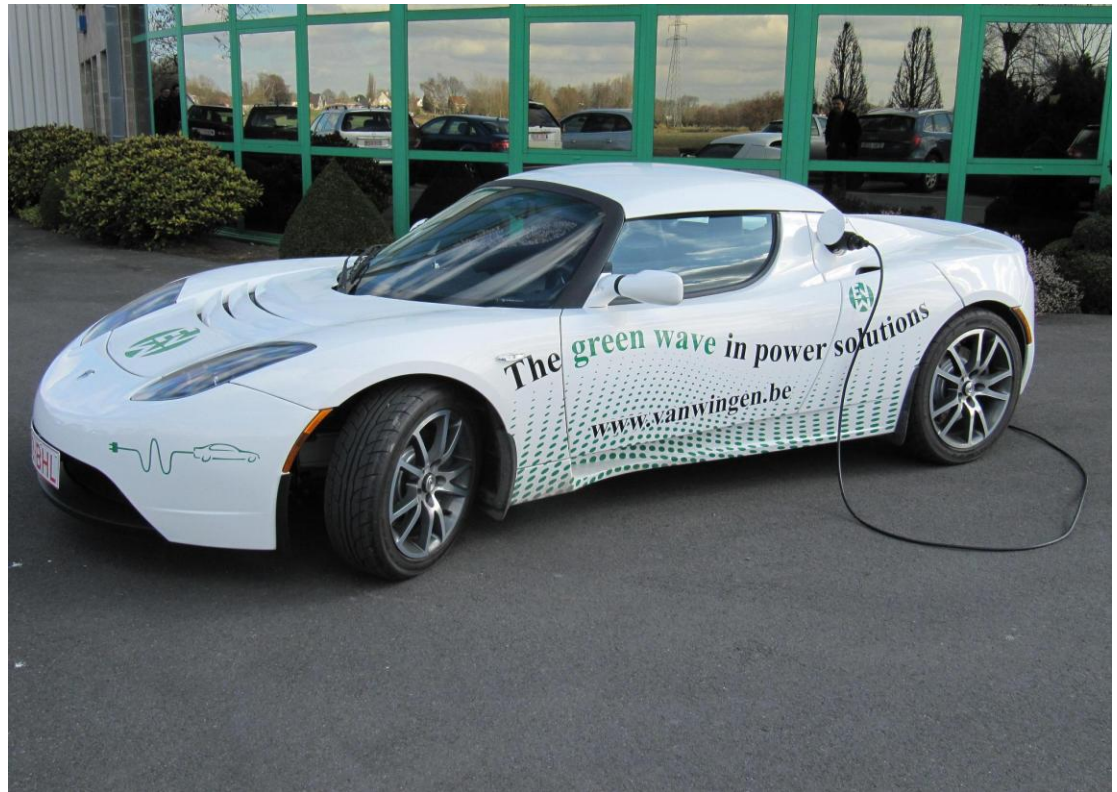
## CONCLUSION :

The electric power generated while heating the premises can be injected into the grid or used locally.

Instead of driving with highly polluting cars with combustion engines the in-house generated electric power will be used to charge the e-car battery.

As such the distance annually driven at zero emissions becomes a by product of the building's central heating.

The revolution in our energy and mobility landscape is inevitable!



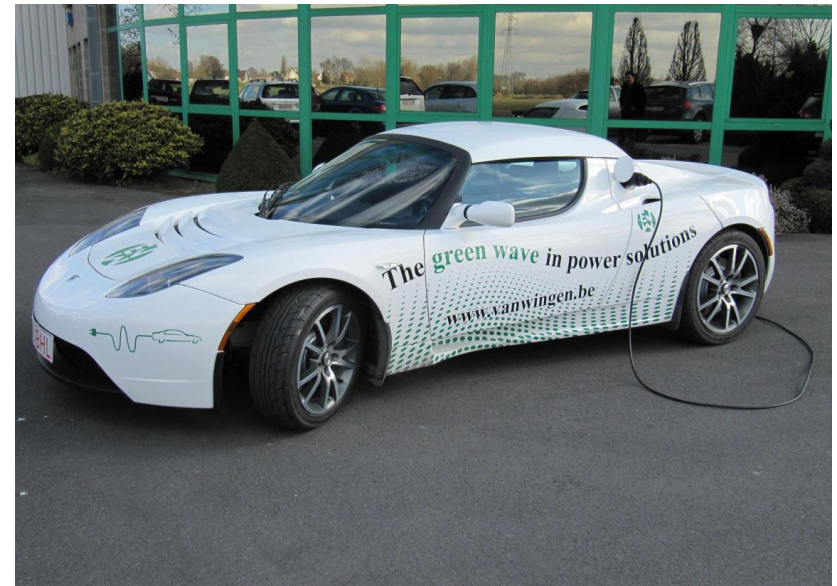
Electric mobility is the perfect stepping stone to unseen energy savings if it is linked with energy efficient decentralized production. Without this link the opposite situation might arise.

The image of the E-vehicle driving on solar power stirs the imagination.

However, bear in mind that 33 m<sup>2</sup> of solar panels only allow 15000 km of E-drive a year.

Investment in solar panels that generate as much electricity (km) as the Mini-Cogen will take 3 or 4 times the investment of a Mini-Cogen !

A Mini-Cogen hardly requires a surface of 3m<sup>2</sup>, whereas the area covered by solar panels that produce the same amount of electric power is 300 m<sup>2</sup> !



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