

6TH SOUTH EAST EUROPE ENERGY DIALOGUE
THESSALONIKI, GREECE 30-31 MAY 2012

Cogeneration

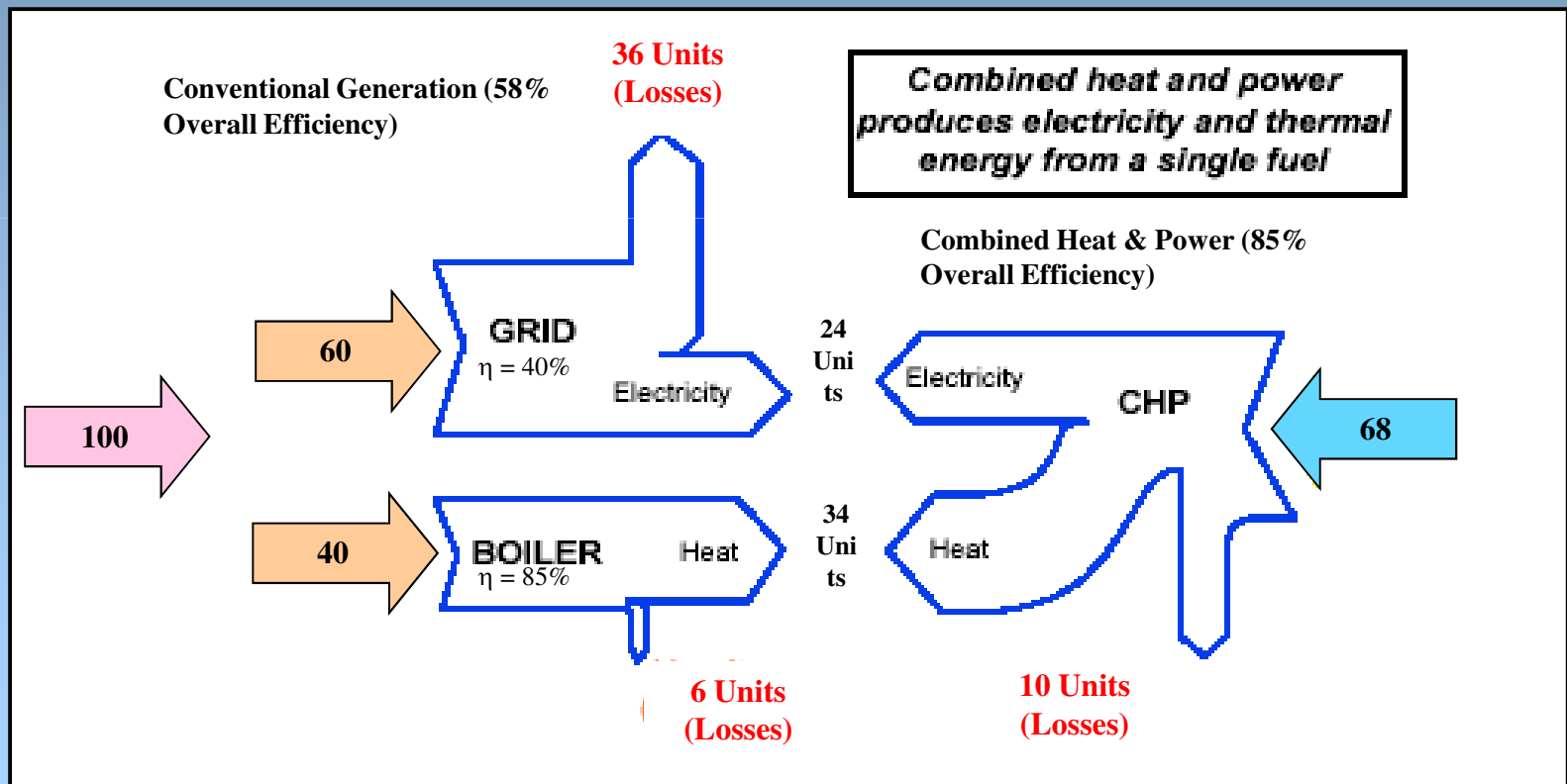
The crucial role of CHP towards the enhancement of EnEffy and PES

Costas G. Theofylaktos
President HACHP - Member Exec. Comm COGEN EUROPE
hachp@hachp.gr

Introduction

Efficiency Advantage of CHP

Cogeneration



(UNESCAP, 2004)

Introduction

Cogeneration

Benefits of Cogeneration

- Increased efficiency of energy conversion and use
- Lower emissions, especially CO₂
- Ability to use waste materials
- Large cost savings
- Opportunity to decentralize the electricity generation
- Promoting liberalization in energy markets

The critical role of Microturbines

Cogeneration

- Small Turbines with Recuperation
- Capacity Range: 5 kW to 400 kW
- Efficiency Range: 25% to 30% LHV
- Recoverable Heat: Gas Exhaust approx. 260 °C

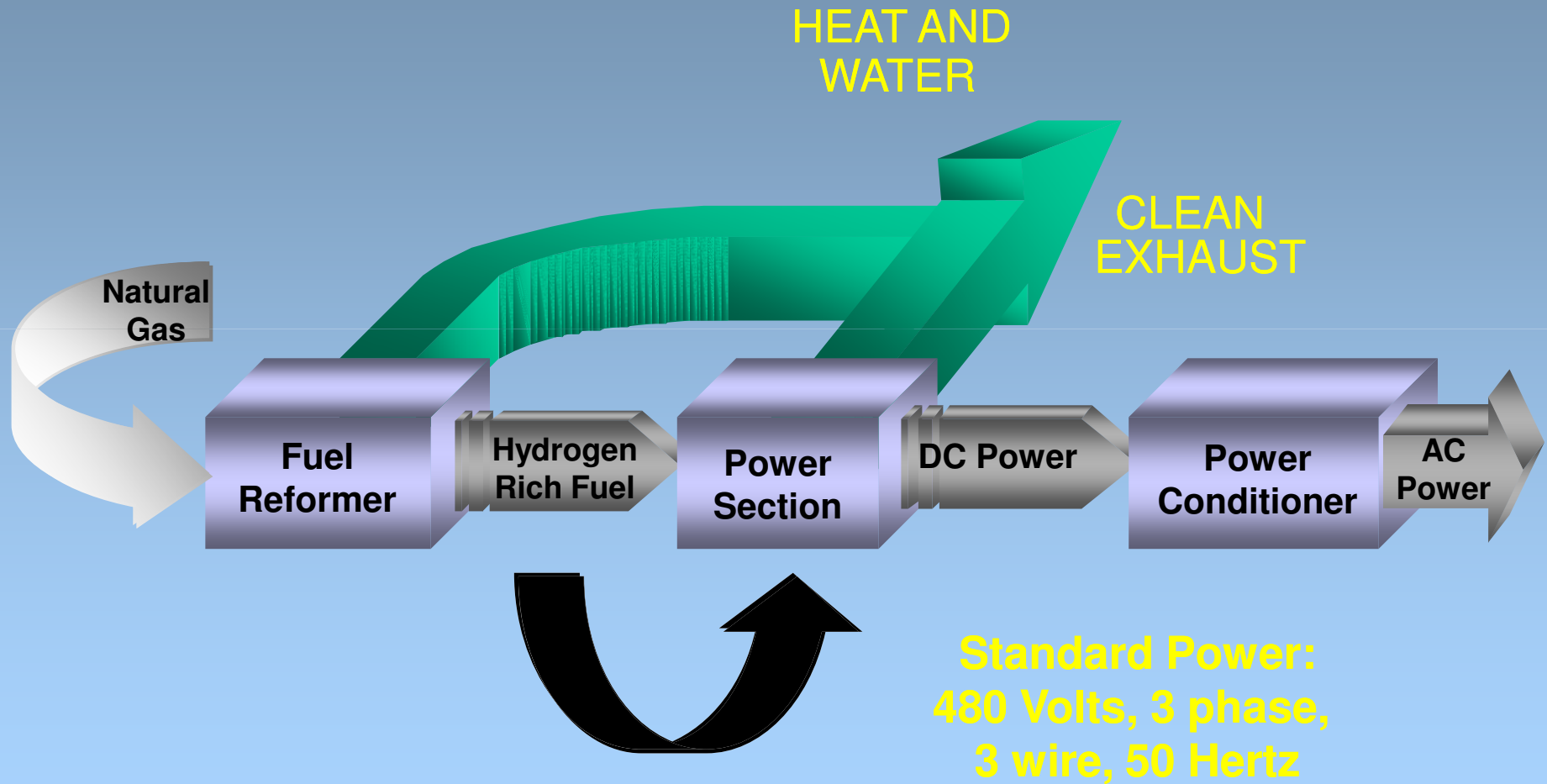


Microturbines

Cogeneration

- Advantages:
 - Compact Size
 - Low Emissions (< 0.30 kg/MWh or 9 ppm)
 - Fuel Flexibility
 - Modular
 - Lower Maintenance
 - No Oil Change (***Applicable to Some Units***)
 - No Spark Plug Change
 - No Valves
 - Small quantities of Moving Parts
 - Quicker Start

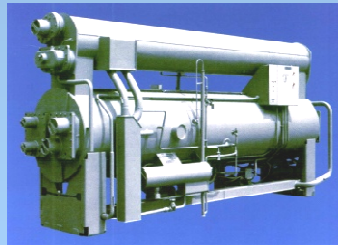
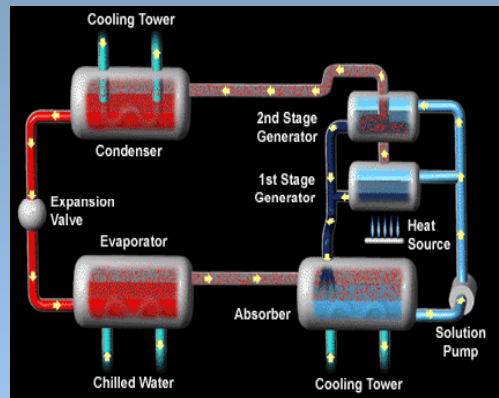
Fuel Cell System Scheme



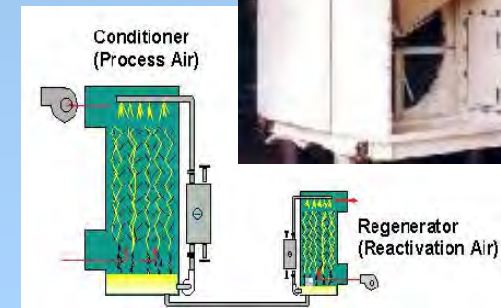
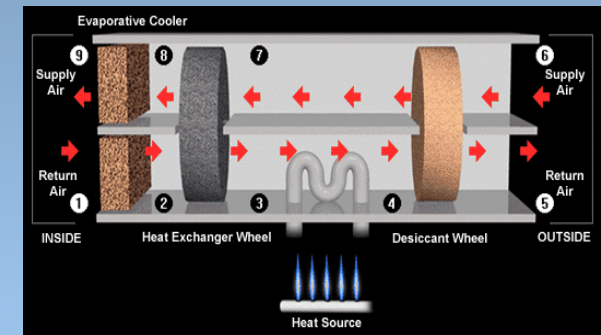
Thermally Activated Technologies- The Role of Trigeneration

Cogeneration

Absorption Chillers



Desiccant Dehumidification



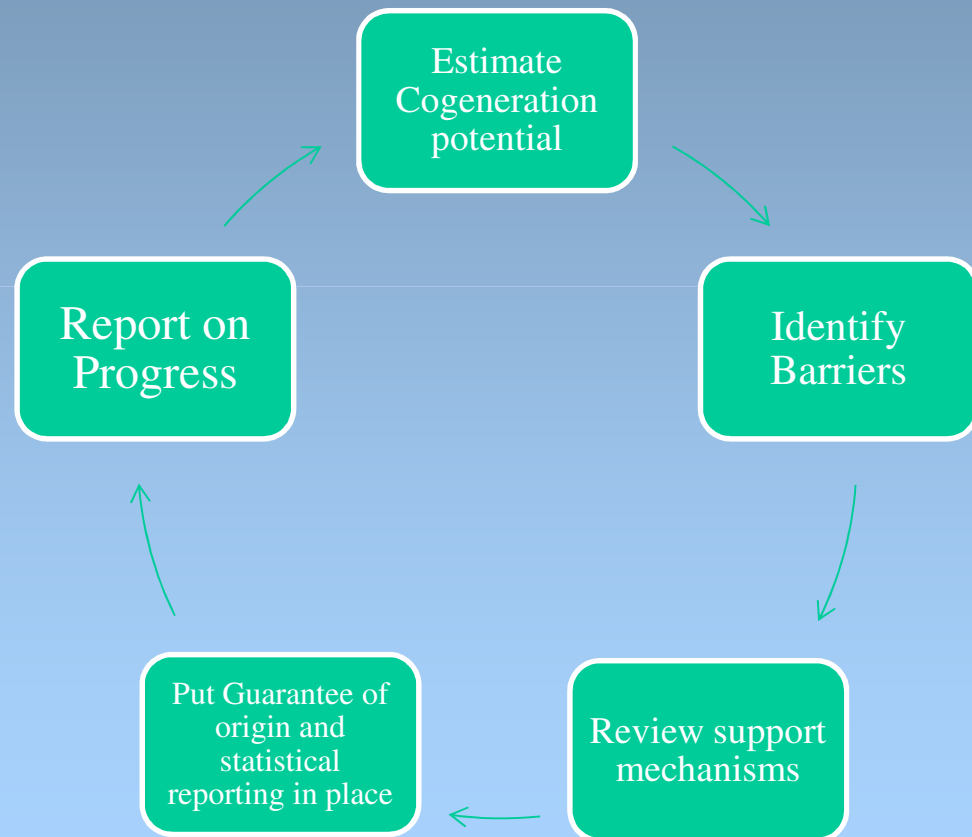
EU Policies about CHP

Directive 2004/8/EC and the role of the new EED

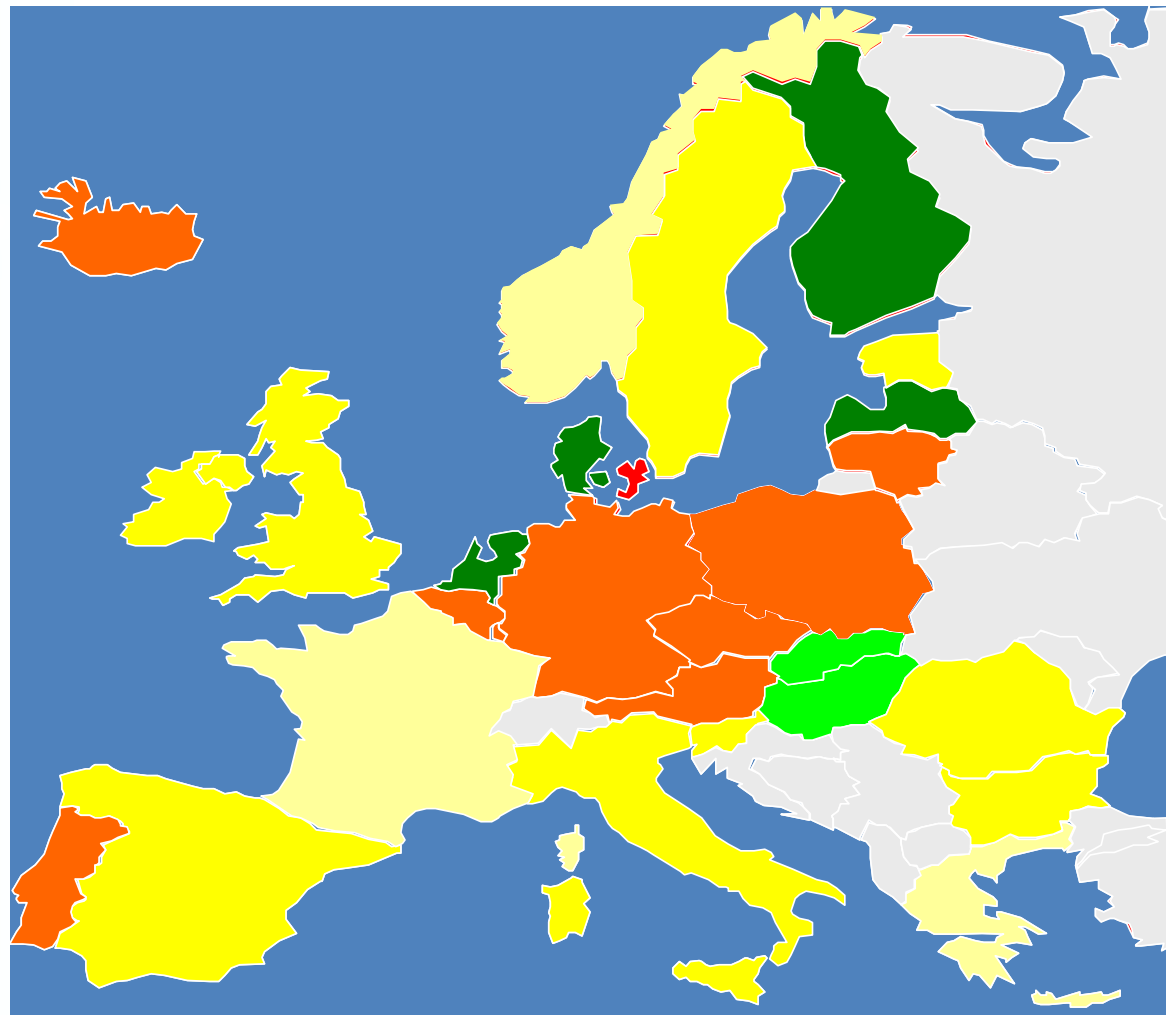
**Changing the way
Europe provides
heat and electricity
for a sustainable future...**

Cogeneration Directive requirements

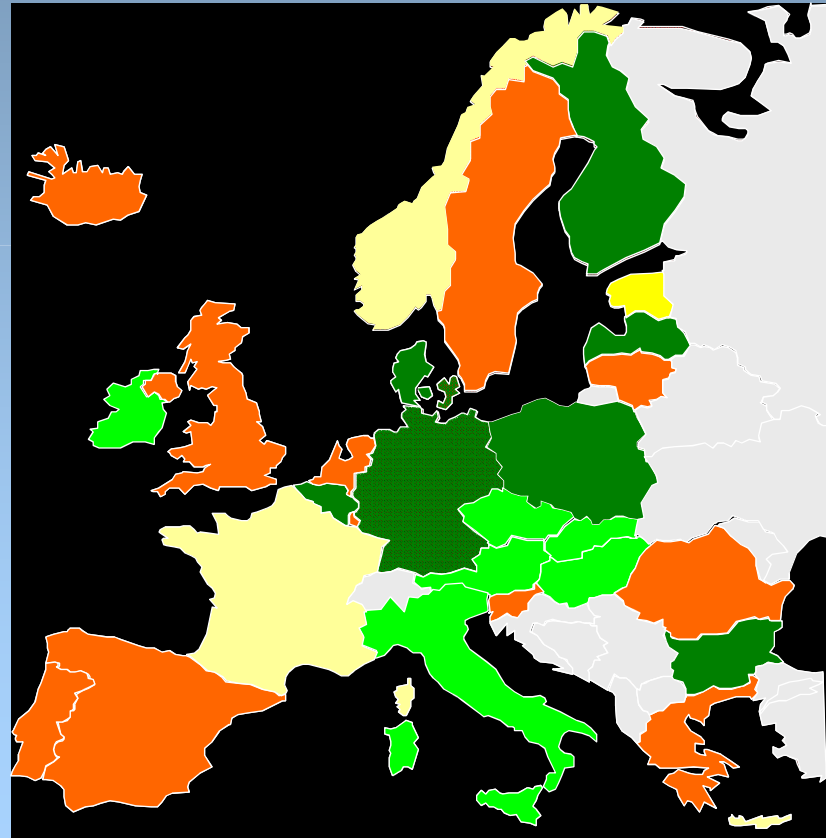
- Cogeneration Directive 2004/08/EC completed in Brussels end of 2008
- European Directive developed under the energy strategy to promote cogeneration for its contribution to security of supply and energy efficiency
- Sets up a policy framework for the promotion of cogeneration
- The Directive requires Member States to report on several aspects their cogeneration use and promotion



Share (%) of CHP in total generation 2008

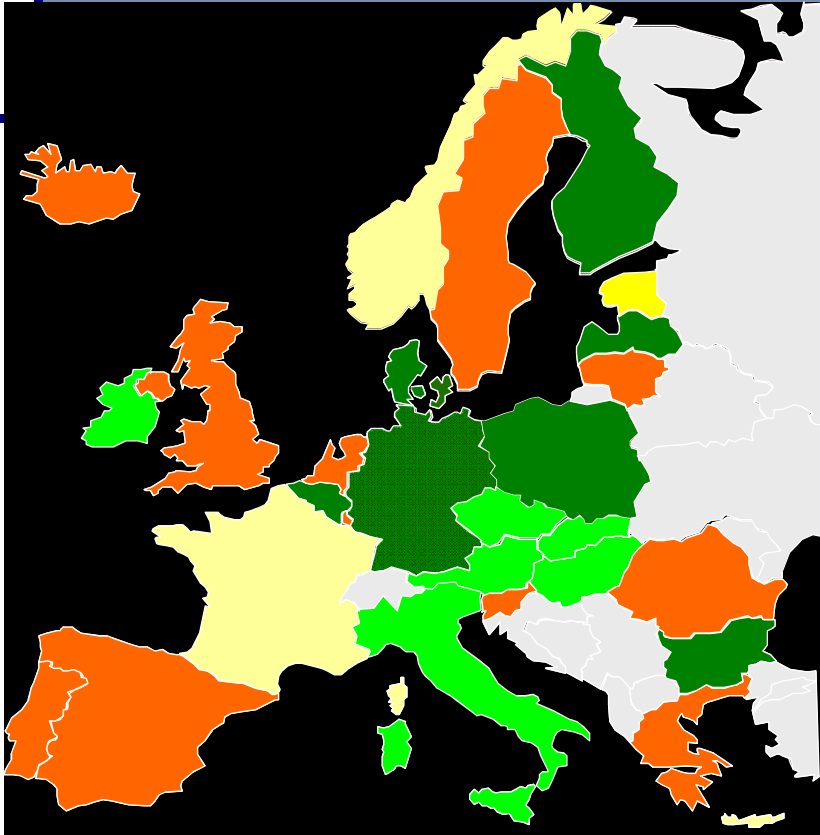


Cogeneration

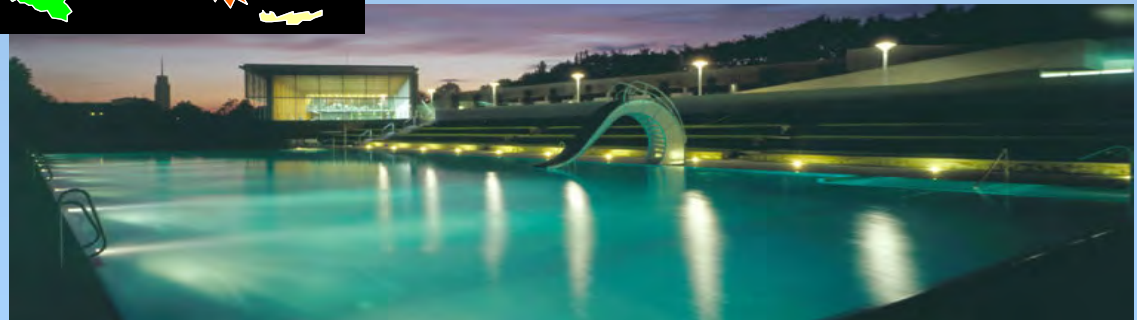


There is significant industrial potential for CHP in Europe. In the larger economies this makes up around 50% of the potential.

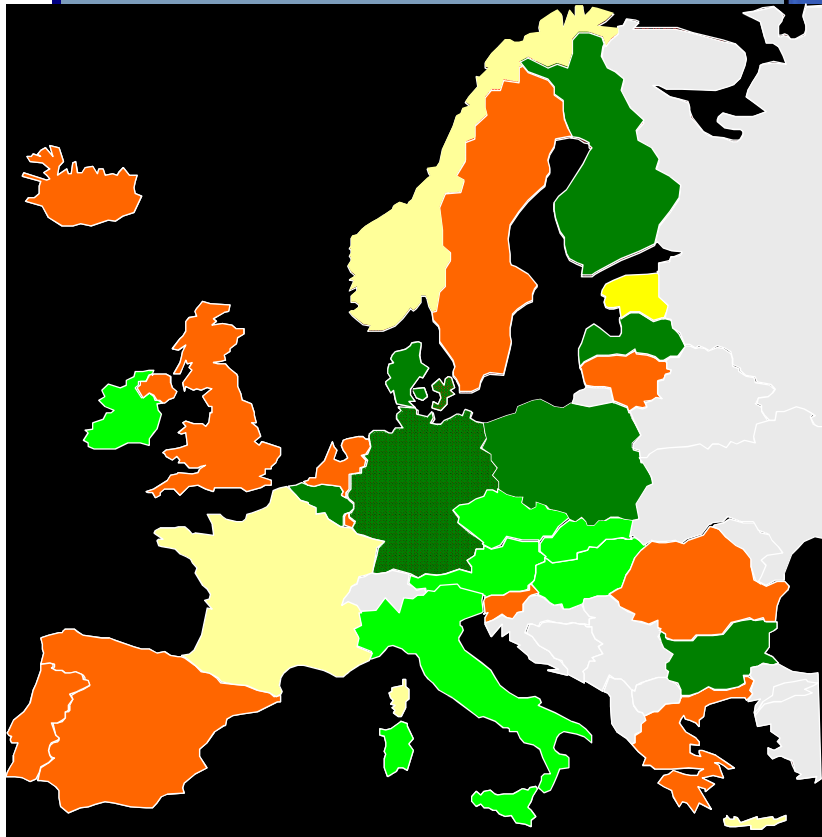
Cogeneration



In southern parts of Europe, the industrial potential and tertiary sector are the opportunity.

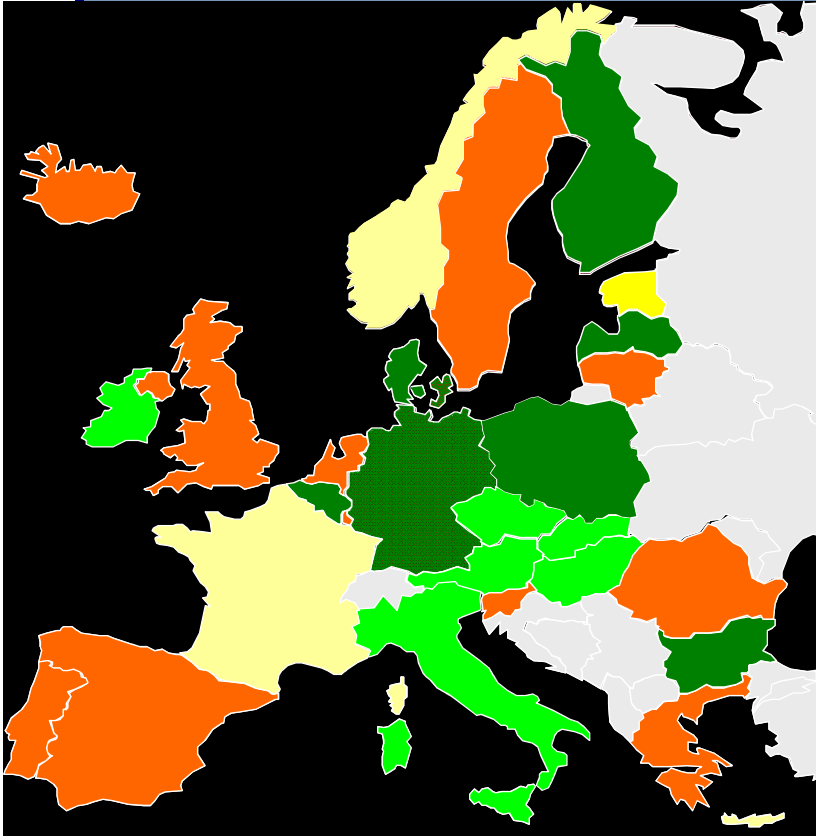


Cogeneration



Significant potential exists in new Member States particularly for refurbishment of district heating schemes and their upgrade

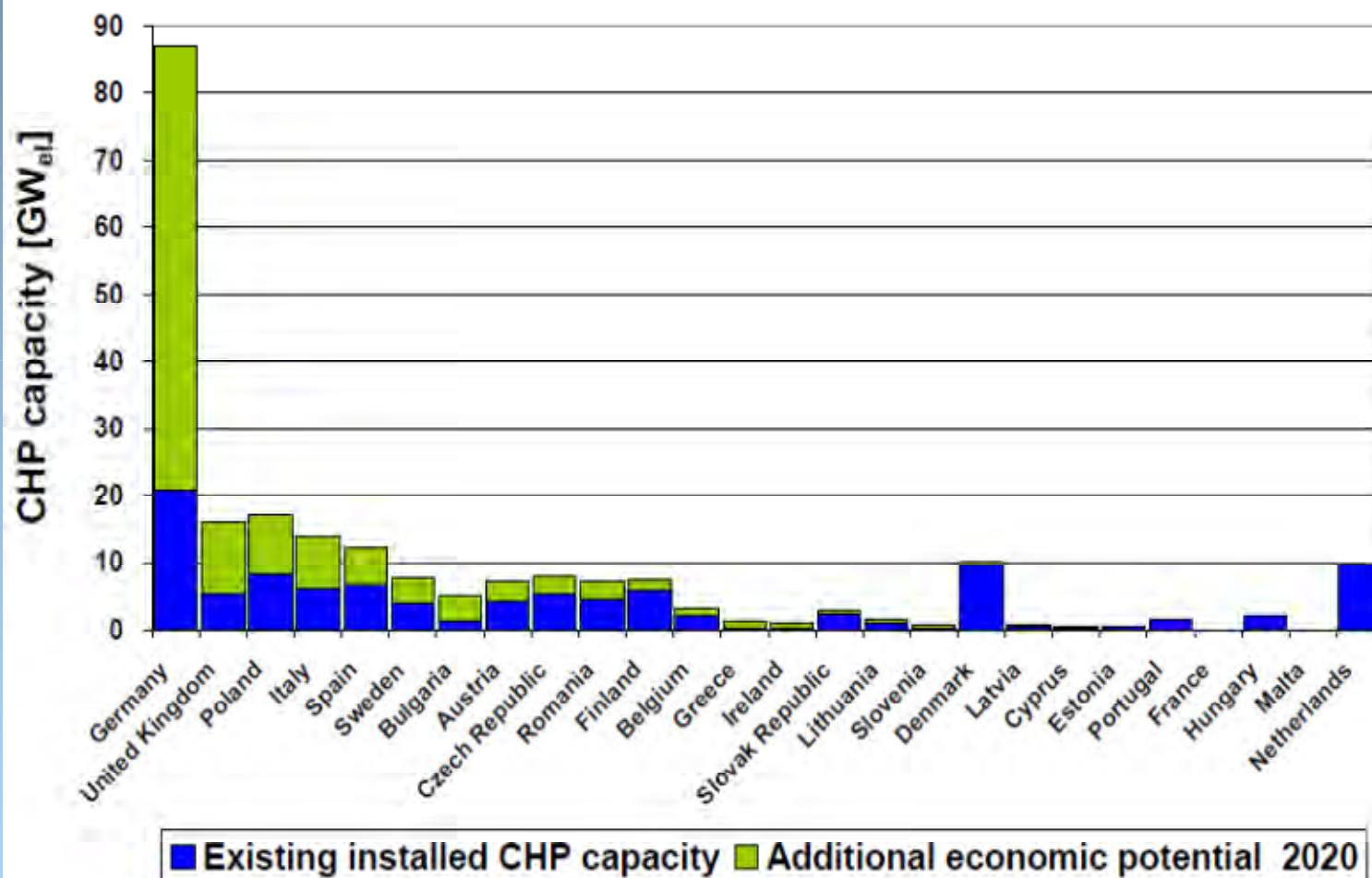
Cogeneration



There is a large untapped energy saving in unfulfilled cogeneration potential in all 27 M-S of EU.

European economic potential for cogeneration in 2020

Cogeneration



European cogeneration additional economic potential

Cogeneration

The additional economic potential as reported by Member States:

- Total additional Primary Energy Saving expressed as electricity (min) 46 TWh p.a.
- Total additional Electrical Capacity: 122 GWe
- Total additional Electricity Generation: 455 TWh p.a.
- Total additional CO₂ avoided (min): 20 mton p.a.
- Value of CO₂ avoided: 798 mEuro* p.a.

* Evaluated at carbon price of 39 E/ton CO₂ (ref. ETS impact study)

Cogeneration

- There is no uniform growth in CHP across Europe
- At 2010, all Member States were at the point of completing implementation of the Directive which include new support mechanisms.
- The following have strong support mechanisms (although barriers remain)
 - Flanders achieved its 2010 CHP target in 2008
 - Small CHP growing in Germany but large CHP is not moving
 - Bio-based CHP is being driven by renewables incentives

CHP Support Mechanisms

Cogeneration

Country	Tax support	Feed in tariff	Certificate scheme	Capital grant	Other
Austria		✓			✓
BE - Flanders	✓		✓		✓
Bulgaria		✓			✓
Cyprus					✓
Czech Republic		✓			✓
Denmark					
Estonia					✓
Finland				✓	✓
France		✓			✓
Germany		✓			✓
Greece	✓	✓			✓
Hungary		✓			✓
Ireland				.	✓
Italy	✓	✓		✓	
Latvia		✓			✓
Lithuania		✓			✓
Luxembourg	✓				✓
Malta	✓				✓
Netherlands	✓	✓		✓	✓
Poland			✓		
Portugal				✓	✓
Romania		✓		✓	
Slovakia		✓			
Slovenia		✓			✓
Spain	✓	✓			✓
Sweden				✓	✓
United Kingdom	✓	✓		✓	

Characteristics of successful mechanisms

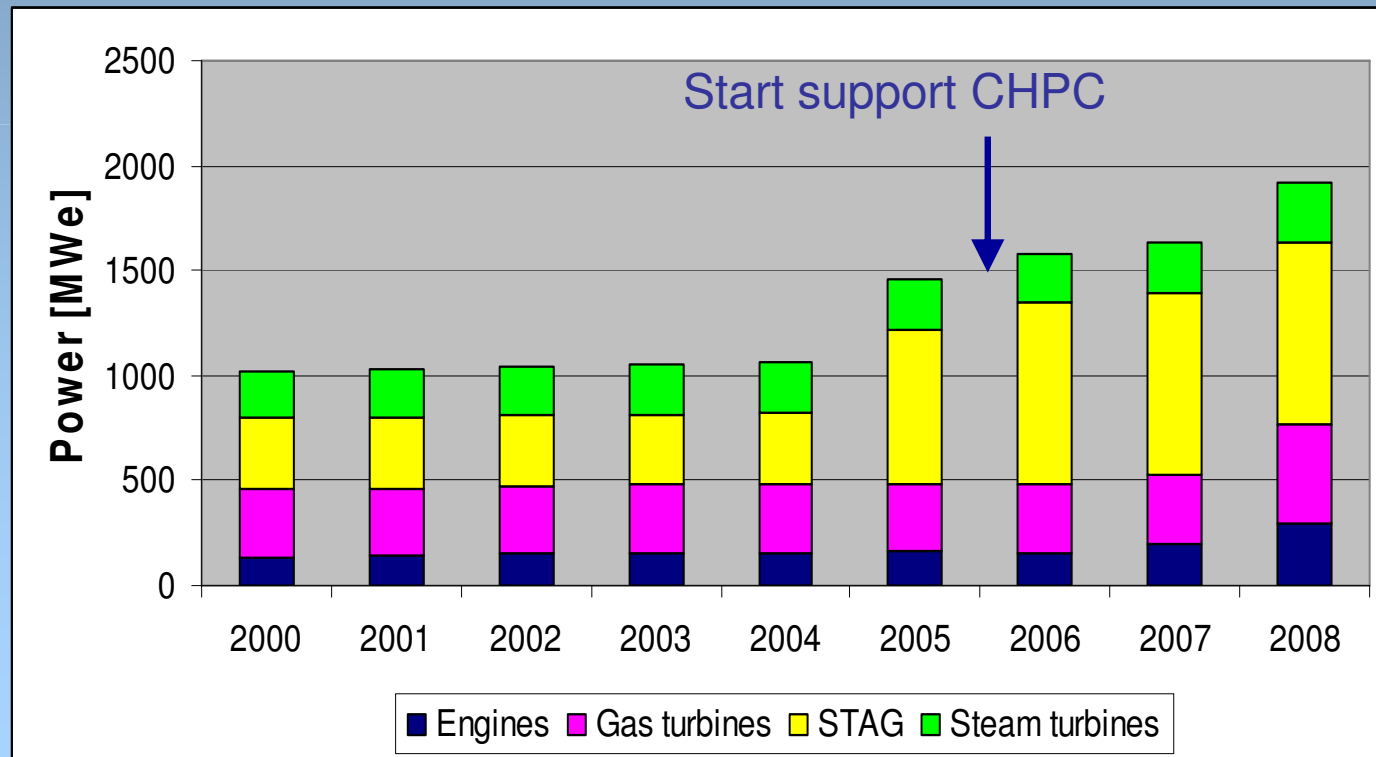
Cogeneration

- Local conditions : key to power of support
- Small units rarely attractive investment even with support
- Capital cost support can have disproportionate impact
- Some Member States have complex multiple support schemes
- Support may increase investment costs – price inflation
- Appropriate support mechanisms are generating growth in key sectors
- Awareness of best practise is limited.

Flanders CHP Certificates – Effects

Cogeneration

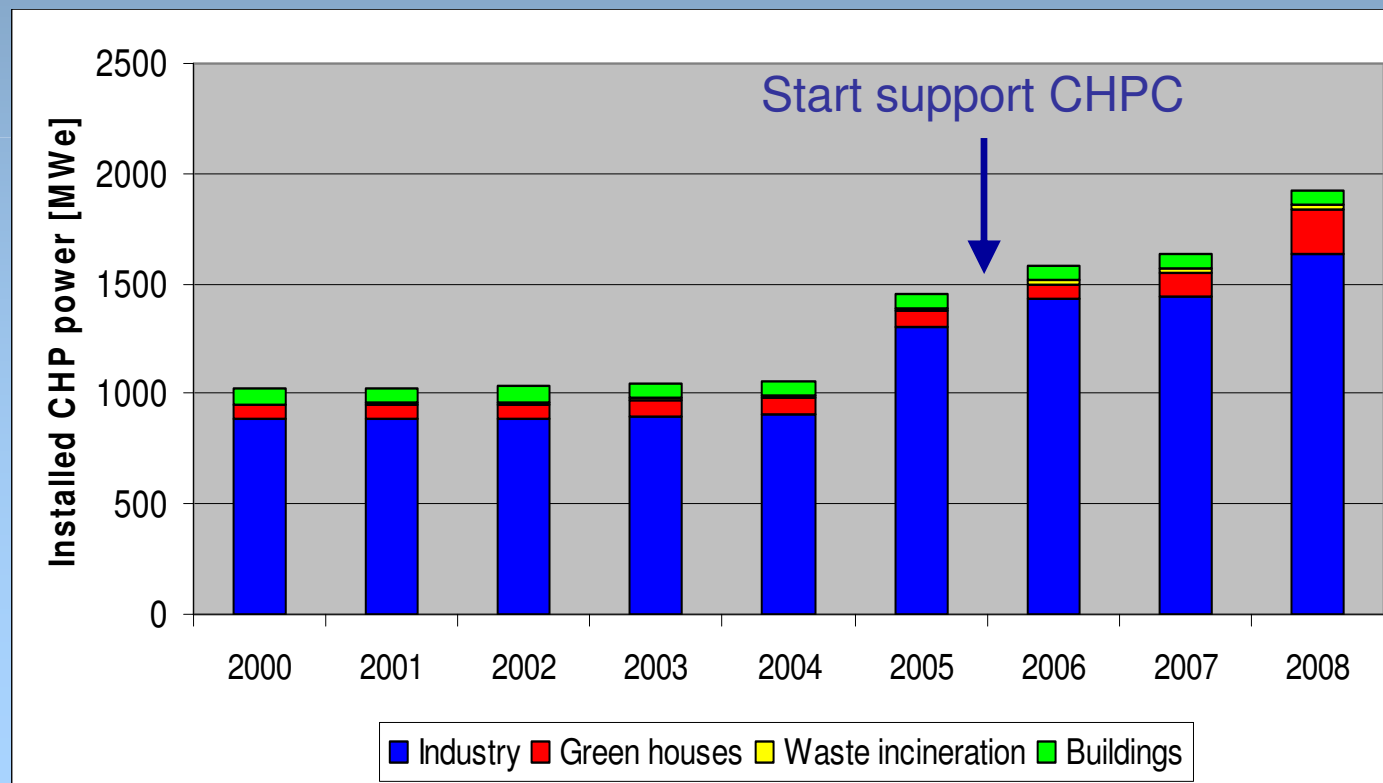
- Installed electrical power of CHP [MWe]
 - **Great success** since 2005! (engines and GT)



Flanders CHP Certificates – Effects

Cogeneration

- Installed electrical power of CHP [MWe]
 - Big increase in industry and greenhouses



CHP projects under the new German CHP law

Cogeneration

- 4546 projects over time period 01/01/09 – 01/05/10 alone under the new law.
- Total Support to CHP 525 MEUR (in 2008); 634 m EUR (2009)
- CHP charge to end user 0.231 cE/kWh

Capacity	Contracts	Total support
>2MWe	32	244 MEUR
50kWe to 2MWe	279	86 MEUR
Up to 50kWe	4235	101 MEUR

Case Study (2): Belgomilk Langemark (Food and beverage)

Cogeneration

Success factors

The main success factors are:

- Primary energy reduction of 19,35%
- CO2 reduction of 5150 tons/year
- The CHP certificates
- Lower total price of the power because of the local production (no transport costs)

Main barriers

The main barriers are:

- Price of natural gas
- Price of the electric power

Electrical capacity (total)	MW _{el}	7,35
Heat capacity (total)	MW _{th}	13,8
Technology	Gas turbine	
No. of units	1	
Manufacturer	Turbomach	
Type of Fuel	Natural gas / Biogas	
Electricity: yearly generation	GWh	57,3
Heat: yearly generation	PJ	0,43



Case Study (1): “Hypo Alpe Adria” Trigeneration Plant

(District heating and cooling)

Success factors

Unmanned operation

Remote control through the internet network allows monitoring and modifying of operating parameters in real time.

Main barriers

Too many laws and regulations in force in Italy.

Electrical capacity (total)	MW _{el}	1,065
Heat capacity (total)	MW _{th}	1,268
Technology	Motor engine	
No. of units	1	
Manufacturer	Jenbacher	
Type of Fuel	Natural gas	
Electricity: yearly generation	GWh	2,366
Heat: yearly generation	GWh	2,572



Case Study (3): Mini CHP for e-mobility

(EVW Belgium)

Success factors

The concept of combined heat (mobility) and power has received very positive acclaim from the champions of cogeneration, academics, engineering consultants and business managers alike.

Main barriers

The main barrier is the price of the obligatory mains coupling protection equipment from 10 kW_{el} onwards. This limit should be raised.

Electrical capacity (total)	kW _{el}	12
Heat capacity (total)	kW _{th}	24
Technology	Motor engine	
No. of units	1	
Manufacturer	E. VAN WINGEN NV	
Type of Fuel	Natural gas	
Electricity: yearly generation	MWh	30
Heat: yearly generation	MWh	60



Current opportunity

Cogeneration

- Europe is failing to achieve its 20% energy saving target for 2020; cogeneration is a fundamental energy efficiency measure in reaching the target.
- Heat is a larger part of end use energy than electricity in the European energy system. It's efficient use and provision are vital.
- The additional potential for cogeneration identified as economic by the Member States identifies opportunities to combine the production of heat and electricity, saving a minimum additional 35mtoe a year of primary energy by 2020

What does it take to grow CHP?

Cogeneration

Breweries, hospitals, schools and industrial plants to find it advantageous to make their own electricity as well as heat (or let someone else provide the service - i.e. ESCOs)

A large number of district heating schemes need to upgrade and renovate their infrastructure and the buildings they serve

Traditional electricity companies need to find it attractive to develop a business model for heat customers

Energy service companies need to create new CHP offerings

New Energy Efficiency Directive...

Cogeneration

- EU institutions (Commission, European Parliament, Council of the 27 M-S Energy Ministers) are currently engaged in the final stages of a triilogue for the approval of a new Directive, called “Energy Efficiency Directive”
- CHP and EE are the two key issues, so the new Directive is going to enforce the Directives for CHP and for Energy Savings
- Why? In order to reach the target 20% of Energy Efficiency by 2020...as EU is lagging to its original target.

Greek situation in the Energy Sector

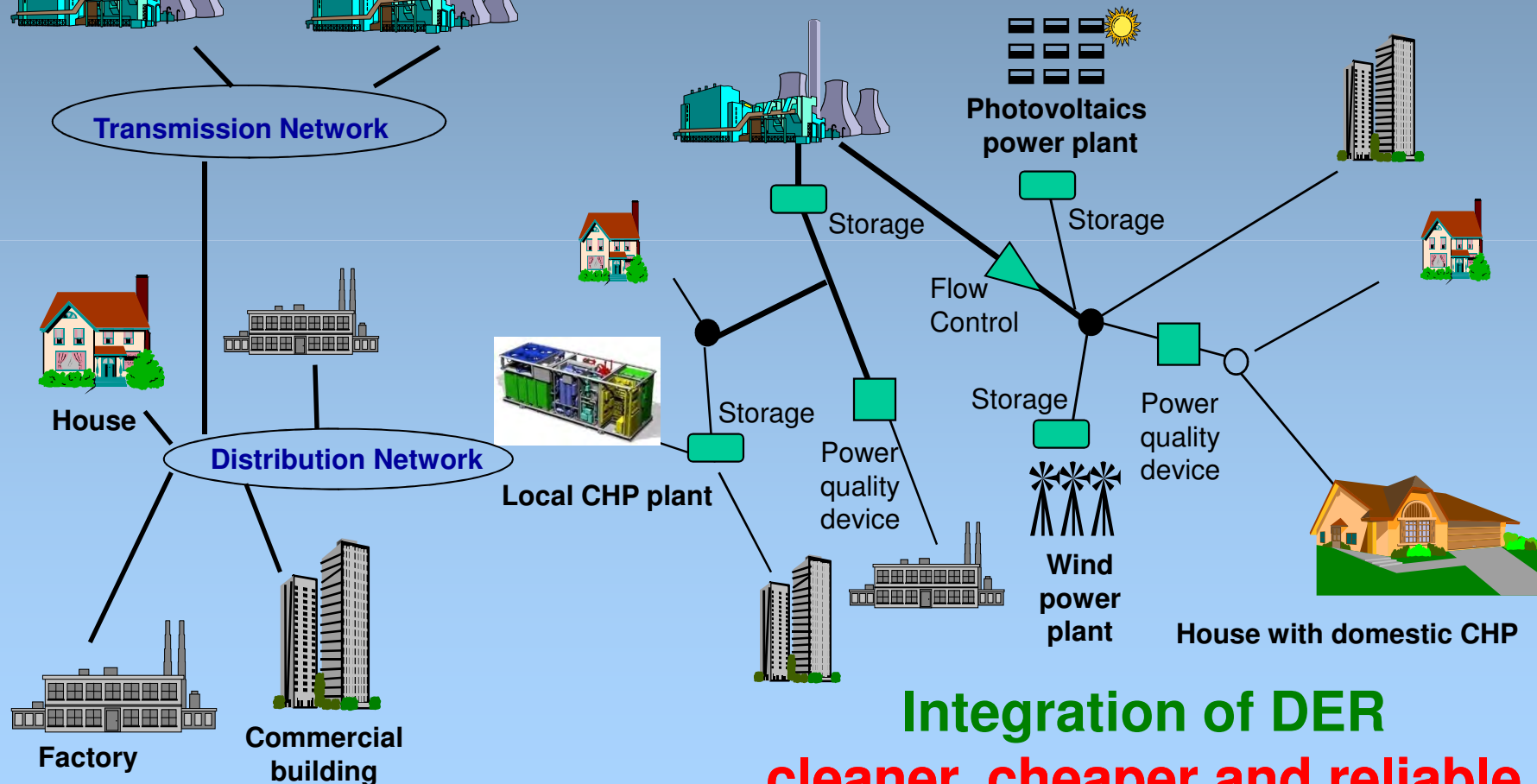
Cogeneration

- Economy in recession during the past 3 yrs
- Political instability
- Not fully liberalized energy market, yet
- Not reliable Energy Strategic Plan for the next yrs
- Promotion of RES, with FiTs – remarkable high for PV – not based on “real” energy market terms
- HECHP is currently accepted as the primary energy efficient player—many barriers are removed—favorable FiT is given, specially for NG users.
- Many energy players, mostly from the area of RES, are operating with an opportunistic attitude, confronting energy efficient players, for their FiTs.

Breaking the Rules



Tomorrow: distributed/ on-site generation with fully integrated network management



Integration of DER
cleaner, cheaper and reliable

**Thank you
for your attention**

Any questions?