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June, 2nd 2010

CO2 Emission Trading

Friend or Foe for Combined Heat and Power ?

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Agenda

- AkzoNobel and Cogeneration
- Emission trading Phase III in headlines
- Investment in Industrial Cogeneration
- Conclusions

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At a glance

- Serving customers throughout the world with **decorative paints**, **performance coatings** and **specialty chemicals**
- Revenue € 13.9 billion
- 57,000 employees in more than 80 countries
- Committed to delivering Tomorrow's Answers Today
- Headquartered in Amsterdam, the Netherlands
- Global Fortune 500 company
- Listed on the Euronext Amsterdam stock exchange
- For five consecutive years listed as one of the leaders of the Dow Jones Sustainability Indexes (Chemical sector)

Industrial Chemicals

Part of business area Specialty Chemicals

Total revenues € 1 bln, excluding JVs

Business areas: Salt, **Energy**, Chlor-Alkali and MCA

Main products: Salt, Chlorine, Caustic Lye and MCA

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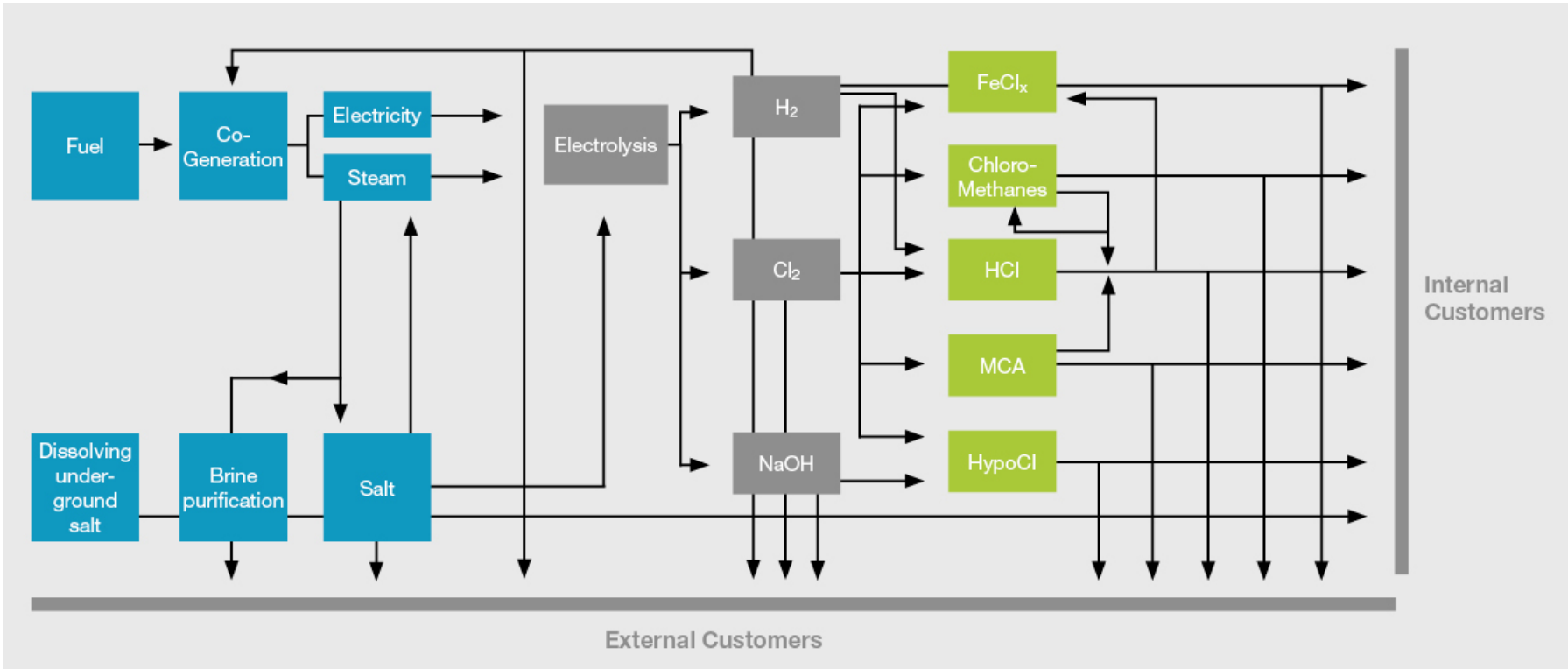
Integrated Business Model Industrial Chemicals



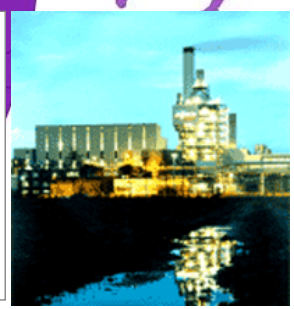
Industrial Chemicals main focus on Europe Cogeneration in the Netherlands and Denmark

Delesto
Delfzijl,NL
JV AkzoNobel/Essent
540 MW
500 tons/hr

Maricogen
Mariager DK
25 MW
50 tons/hr

EVB
Rotterdam,NL
22 MW
70 tons/hr

Salinco
Hengelo NL
70 MW
200 tons/hr



Our 1st cogen ~1900

04

EU CO2 emission trading
Phase III: 2013-2020

EU ETS

	Kyoto period		Post - Kyoto
	Phase I	Phase II	Phase III
	2005-2007	**2008-2012**	**2013-2020** +process + aviation
Free allocation Emission	2.3 billion ton 2 billion ton	1.9 billion ton 2.1 (2008) 1.9 (2009)	<1.9 (2013)/<1.7 (2020) *Cap declining* *(-1.74%/yr)*

Third phase EU ETS (2013 – 2020)
key issues

Reduction of cap with -1.74%/year (-21% from 2005)

Basic mechanism: full auctioning of allowances

- Fully applicable for power generation

Transitional free allocation to industry:

- Based on benchmarks (‘ton CO2/ton product’)
- Historic activity level (ex ante) (‘ton product/year’)
- Free allocation: 2013 80%
  2020 30%
  2027 0%
  Leakage factor

  except….

Carbon leakage sectors

- To prevent out of EU migration of (in EU more efficient) carbon intensive production (steel, paper, sugar, oil,…)
- Criteria and list with sectors determined
- 100% free allocation according to the benchmark

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Third phase EU ETS (2013-2020) Allocation mechanism for free allowances

Basic formula:

Allocation = Historic Activity Level (ton product or GJ/year)

* Benchmark (ton CO2/ton product or GJ)

* Leakage factor (80%-30% or 100%)

** Linear reduction factor (-1.74%/yr)*

** Correction factor*

Descending order of applicable methodologies:

1. Product Benchmark (20 main sectors)
2. Heat Benchmark (measurable heat carrier)
3. Fuel Benchmark (non-measurable heat carrier)
4. Grand fathering (process emissions)

(*) Current interpretation, legislation to be finalized before 2011

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Third phase EU ETS
Allocation of heat

Heat benchmark:

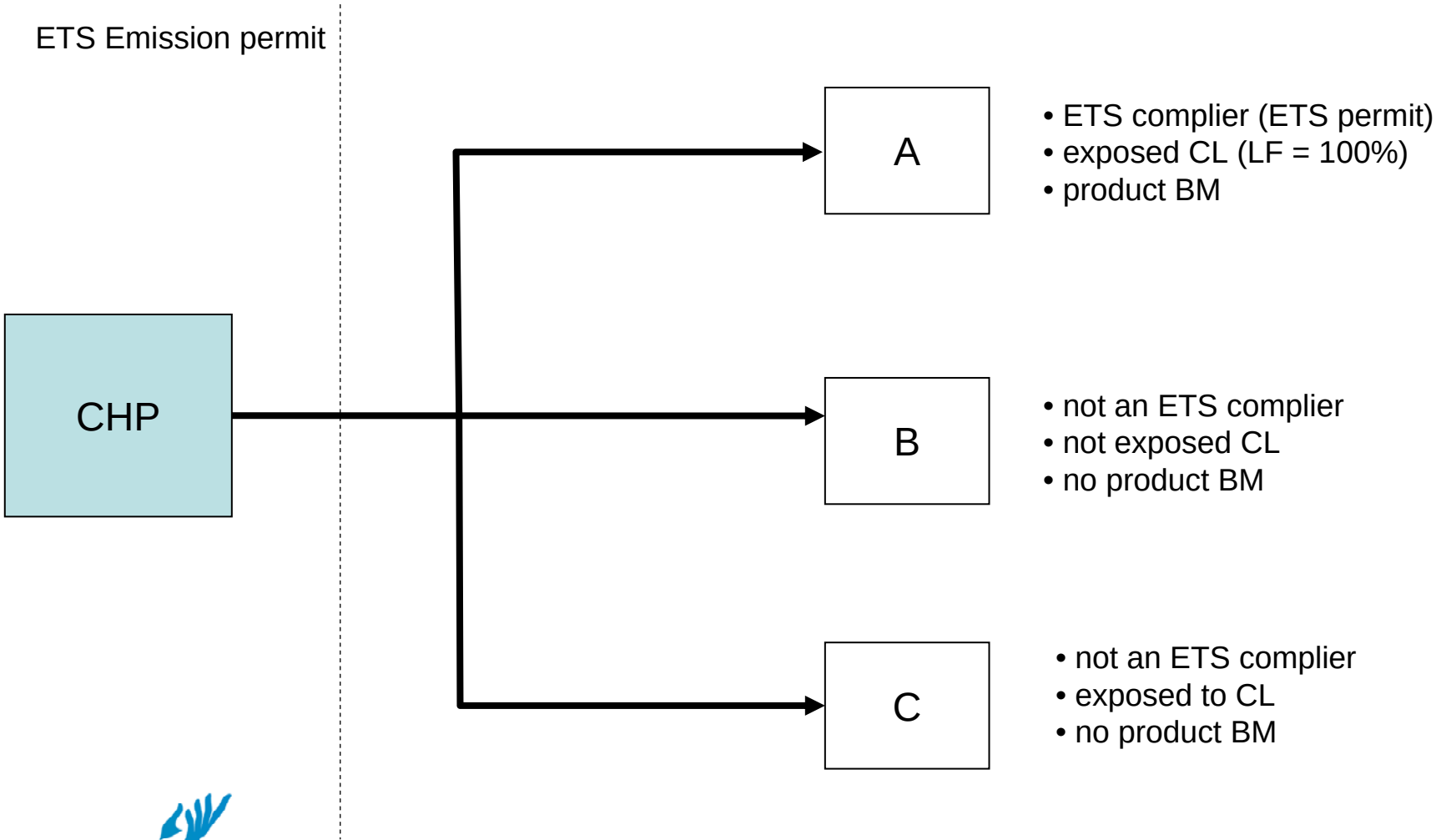
- Ton CO2/GJ heat
  - Natural gas
  - Boiler efficiency of 93%

Cross boundary heat flow

- Heat delivery between installations not within same emission permit
- Status of heat consumer:
  - Own ETS permit?
  - Exposed to carbon leakage

(*) Current interpretation, legislation to be finalized before 2011

EU ETS III Cross Boundary Heat flows
Effects for a central CHP on a (chemical) site



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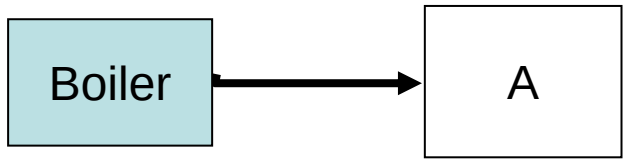
EU ETS III Cross Boundary Heat flows
reference situation at chemical site

A = 100 % * product BM * ton prod (A)

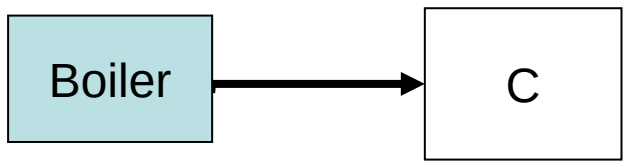


- ETS complier
- exposed CL (LF = 100%)
- product BM

B = 80-30 % * heat BM * GJ heat (B)

- not an ETS complier
- not exposed CL
- no product BM

C = 100 % * heat BM * GJ heat (C)



- not an ETS complier
- exposed to CL
- no product BM

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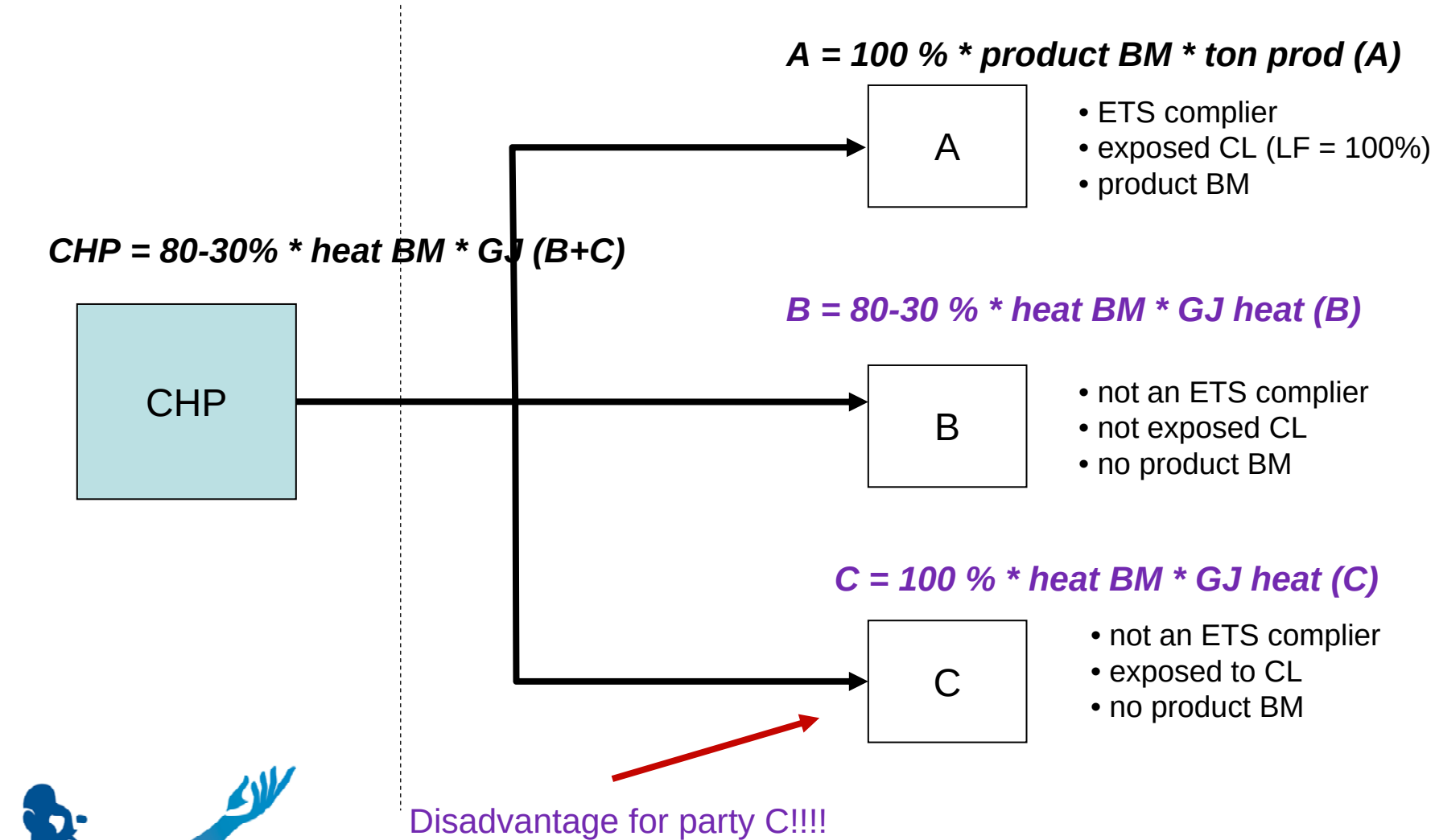
EU ETS III Cross Boundary Heat flows
benchmarks : proposal Commision 2b



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EU ETS III
Cross boundary heat flows

- Estimate: >40% CHP heat in the Netherlands: Cross Boundary Heat Flow
- Investment in new CHP will in many cases be an outsourced ('cross boundary heat flow') CHP
- Fair allocation to CHP installations important to keep existing in operation and to promote investment in new ones.

Investment in cogeneration installations

Investment in Cogeneration
The business case (flows of money)

Capital costs

Income from steam

CO2 costs

Fuel costs

Operation and maintenance costs

Income from power

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CHP: The business case
The local heat market

- Max transport distance high grade heat: ~5 km
- Industry constant baseload heat demand: 24/7
- Heat cannot be stored: operation of CHP must follow heat demand
- Heat price from CHP < generation by a boiler
- All CO2 costs will be transferred to the heat consumer

- Cogeneration competitive versus boiler:
  - Income from power generation should make heat cheaper than generation by boiler
  - At least same CO2 allocation as separate generation

Investment in Cogeneration
The business case (flows of money)

Capital costs

Income from steam

CO2 costs

Fuel costs

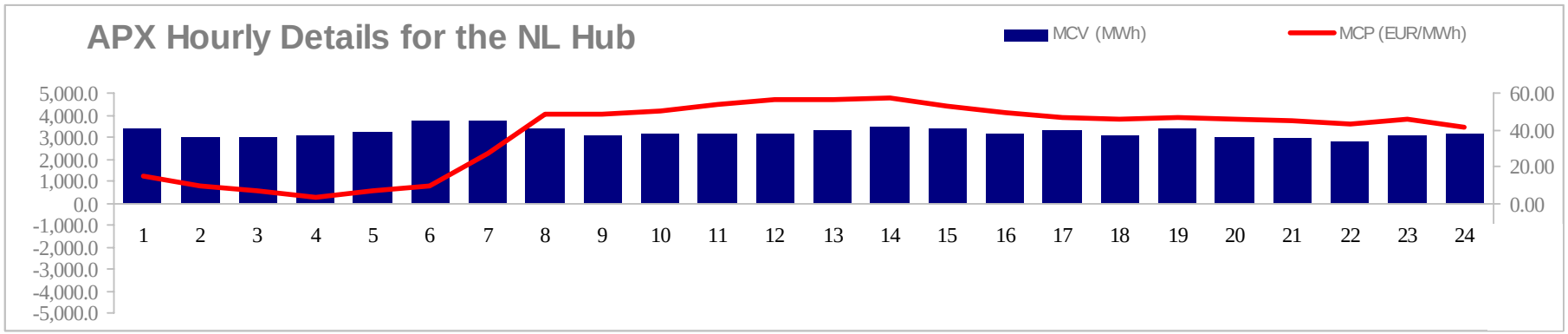
Operation and maintenance costs

Income from power

CHP: The business case
The (inter)national power market

•Very volatile market **(not** baseload)**:**

- Off peak hours: competition on lowest marginal costs:
  - Forward: coal based power



- Peak hours: advantage of high efficiency:
  - Lower gas costs
  - Lower CO2 costs
- Off peak: disadvantage of inflexibility (24 hr steam demand)

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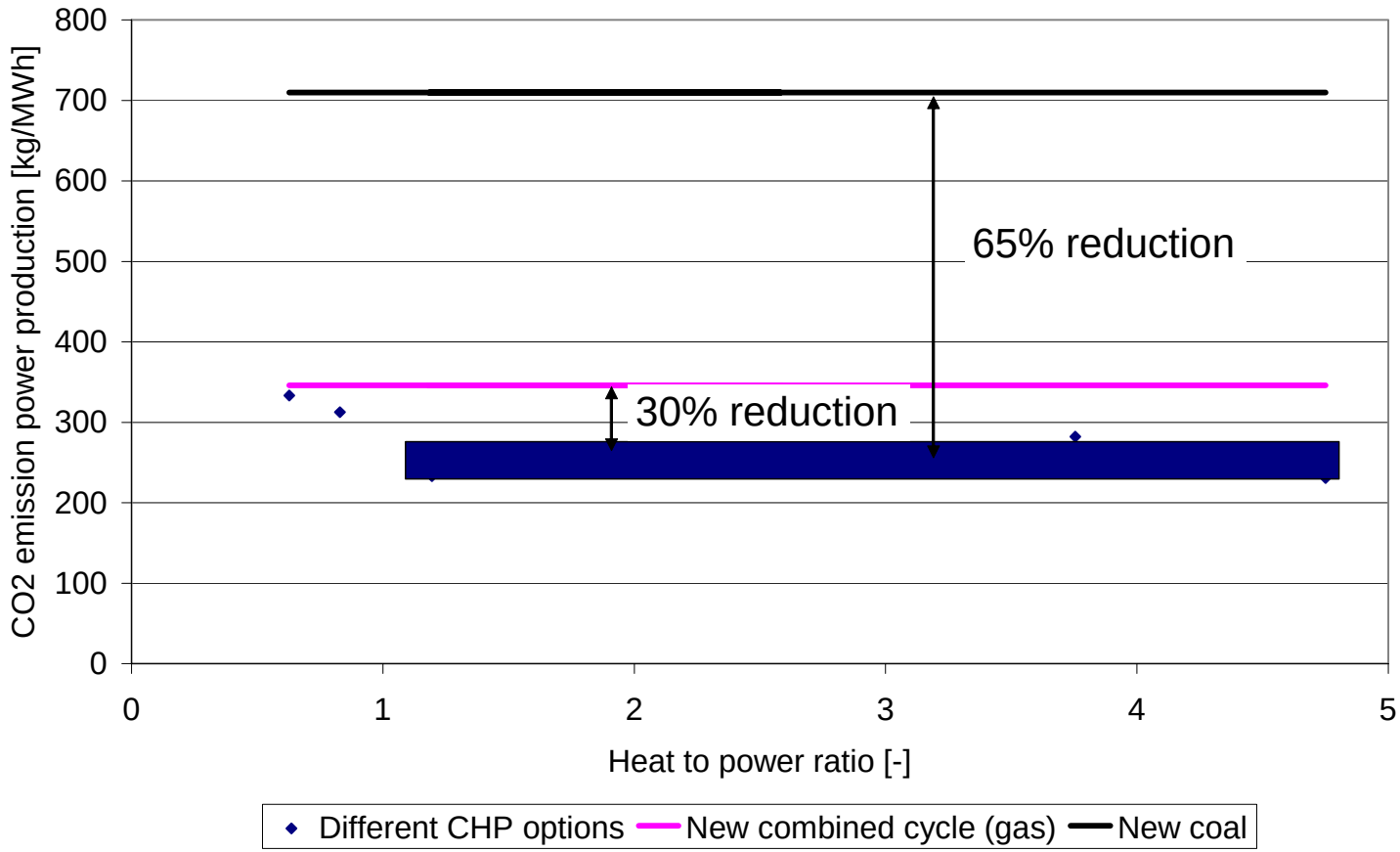
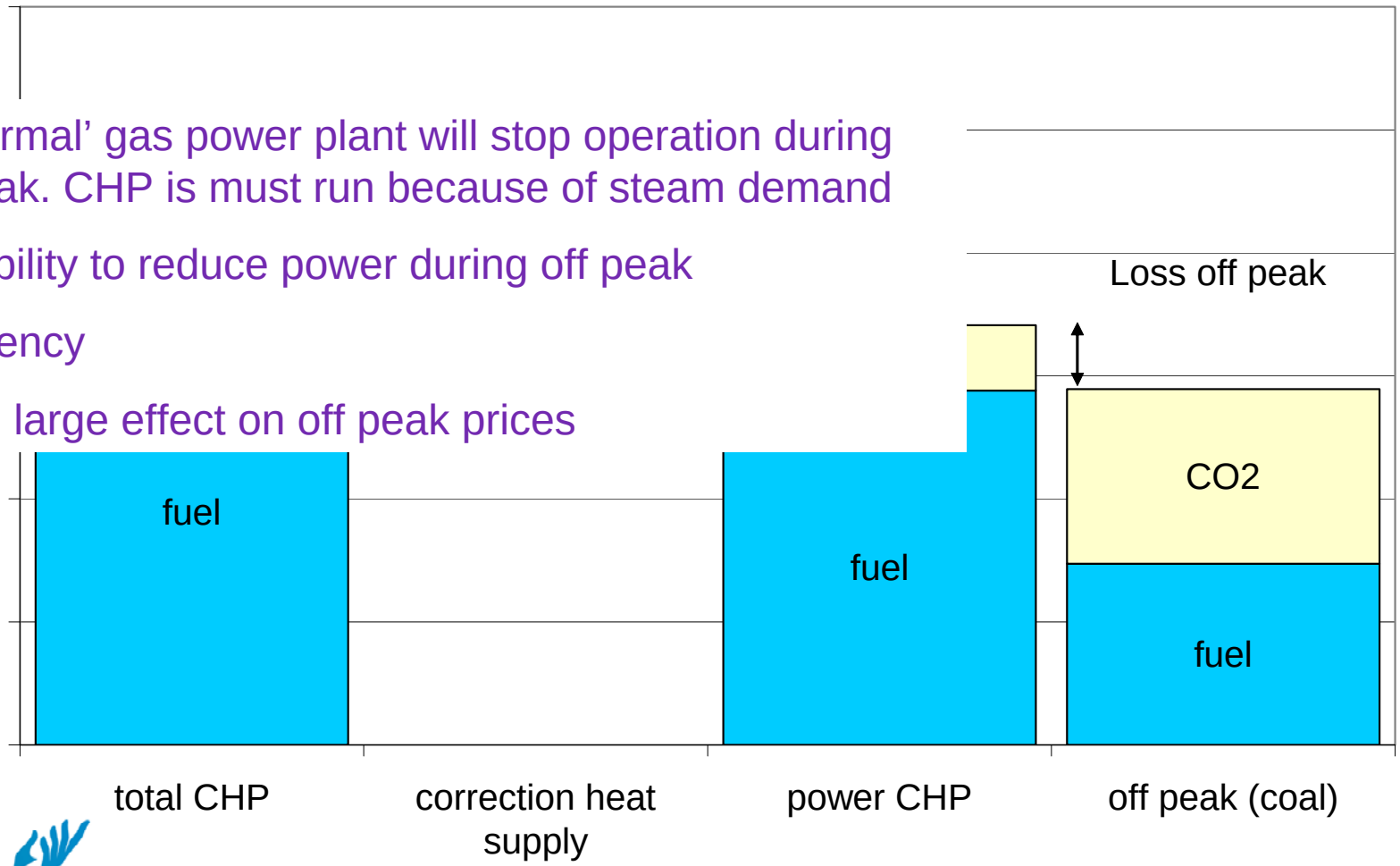
CO2 emission factor power generation

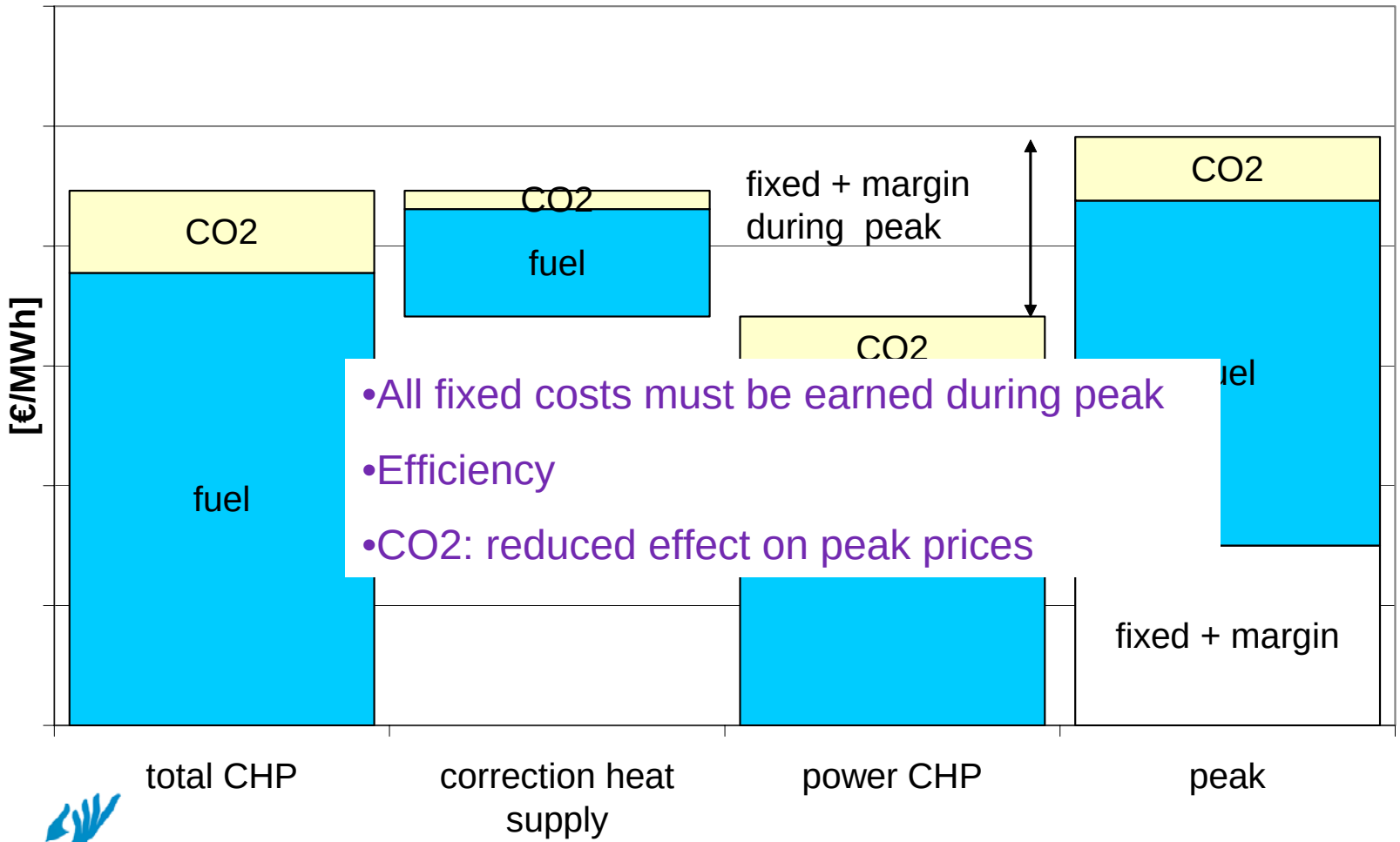


Competition on the forward power market
Typical marginal costs off peak

- A ‘normal’ gas power plant will stop operation during off peak. CHP is must run because of steam demand
- Flexibility to reduce power during off peak
- Efficiency
- CO2: large effect on off peak prices



Competition on the forward power market
Typical peak prices



- All fixed costs must be earned during peak
- Efficiency
- CO2: reduced effect on peak prices

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Feasibility of investment in cogeneration

- Significant CO2 reductions (30%-70%) BUT
- Feasible operation and investment:
  - Minimize off peak losses (**Flexibility)**
  - Maximize peak earnings (**Efficiency, Heat to Power ratio)**

Conclusions

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Conclusions
ETS: friend or foe?

Heat

Fair CO2 allocation for heat generation to be competitive in local heat supply market:

- Carbon leakage status of heat consumer
- No application of linear reduction factor

Power

•CHP gives significant CO2 savings for the generated power

•CO2 price helps competition on forward off peak power prices

•Feasibility CHP needs much more than only it's better CO2 performance