

Vattenfall Capital Markets Day

Emissions Trading

Presentation by

Erik Saether,
Head of Vattenfall Trading Services

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- Vattenfall Trading Services: Roles and Responsibilities
- The Emission Trading Scheme
- Market Assessment
 - Participants
 - Volumes
 - Price drivers
- CO2 Impact on the Merit Order
- Future Price Effects

- *Appendix*

Vattenfall Trading Services

Vattenfall's central trading platform

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Service Provider

- portfolio management and trading related services for Vattenfall
- hedging strategies for the Vattenfall portfolio's

Market Access and Trading

- Market Access for
 - European and Nordic power markets
 - financial coal, CO2, green certificates, weather
- Trading on own behalf
 - cross border
 - interconnectors

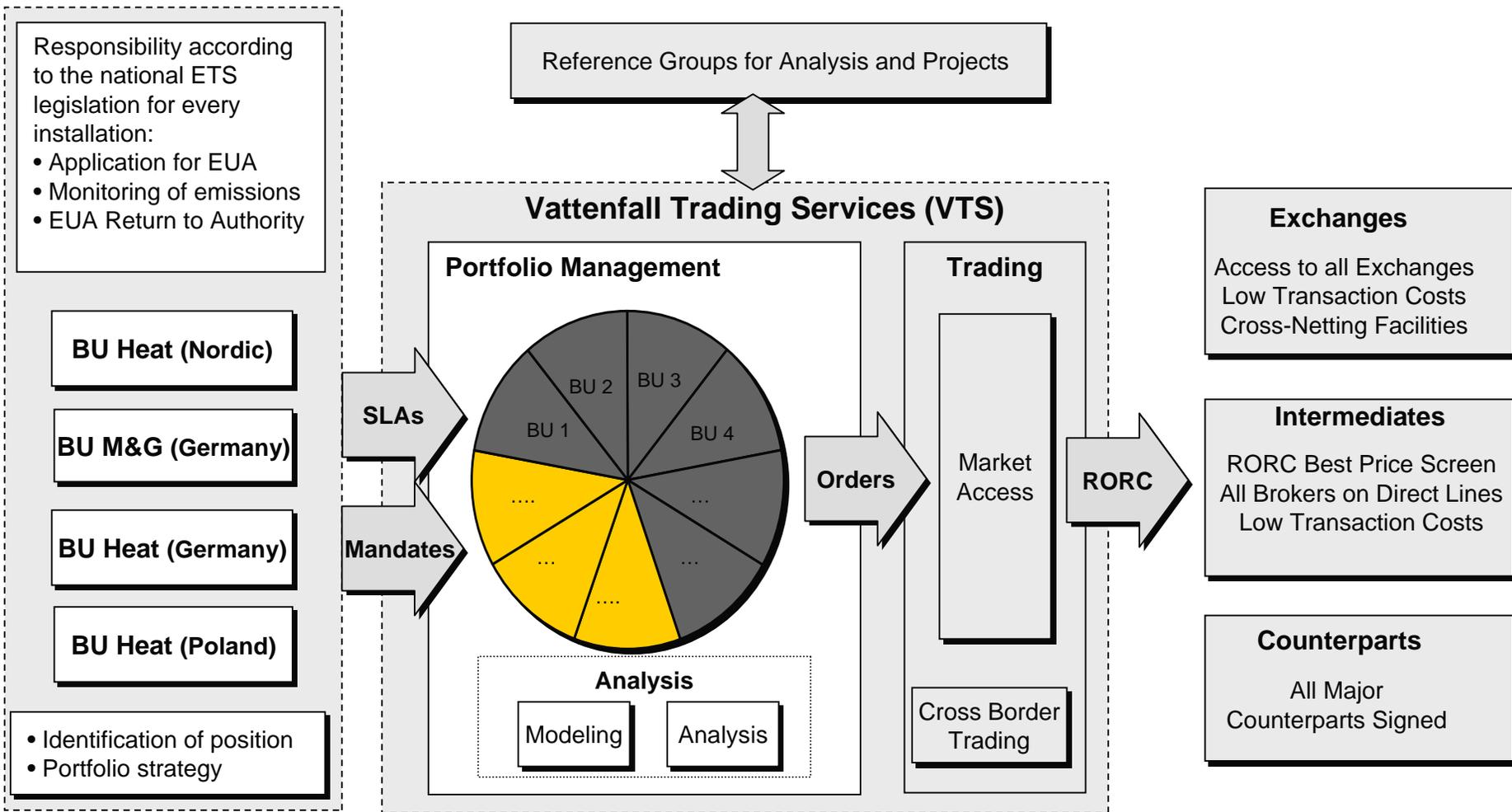
Key Markets

- Nordic, Germany, Poland, France and the Netherlands

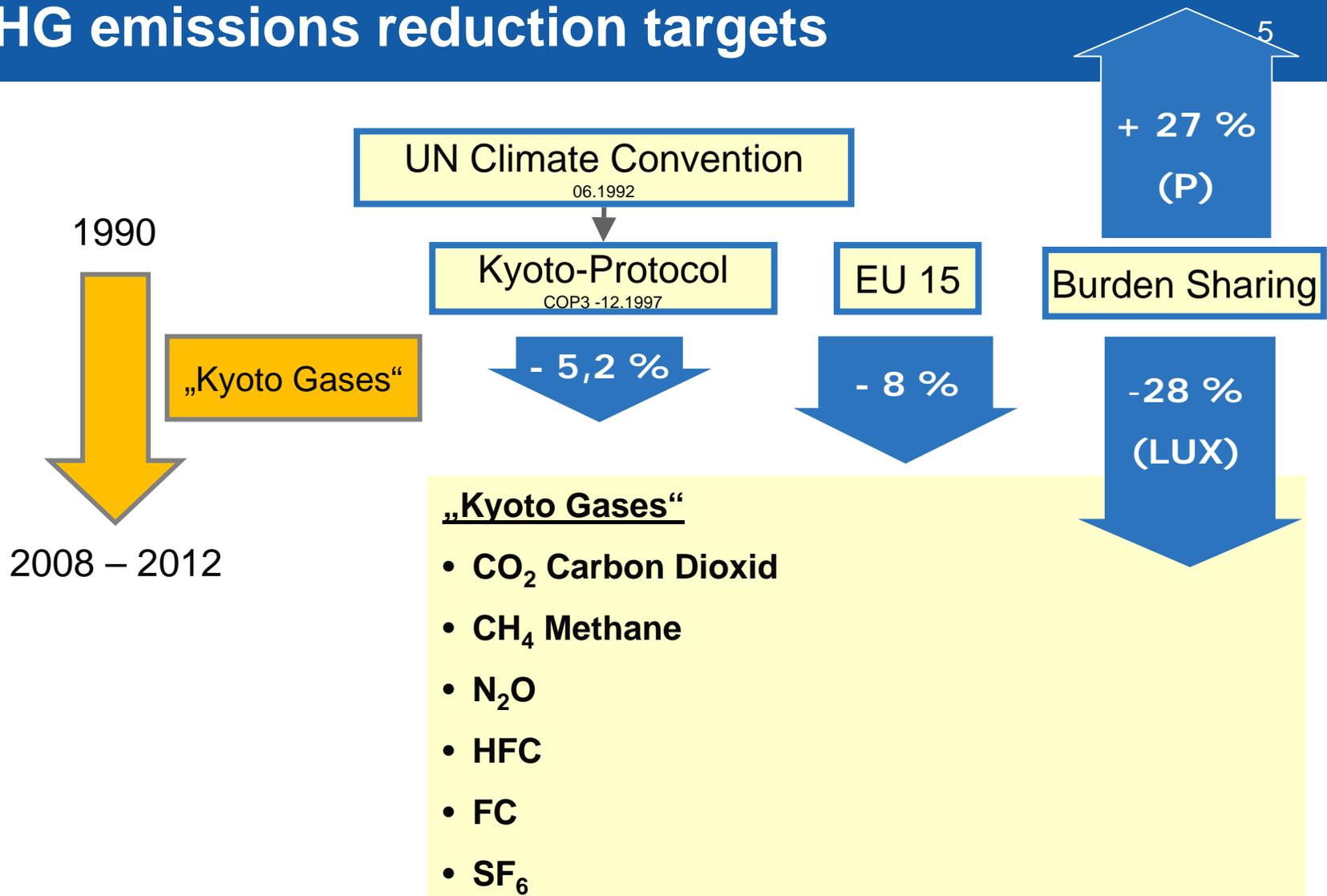


- Countries, where VTS has offices
- ★ Exchanges, where VTS trades (Nordpool, EEX, APX, Powernext)

CO2 activities of Vattenfall



GHG emissions reduction targets

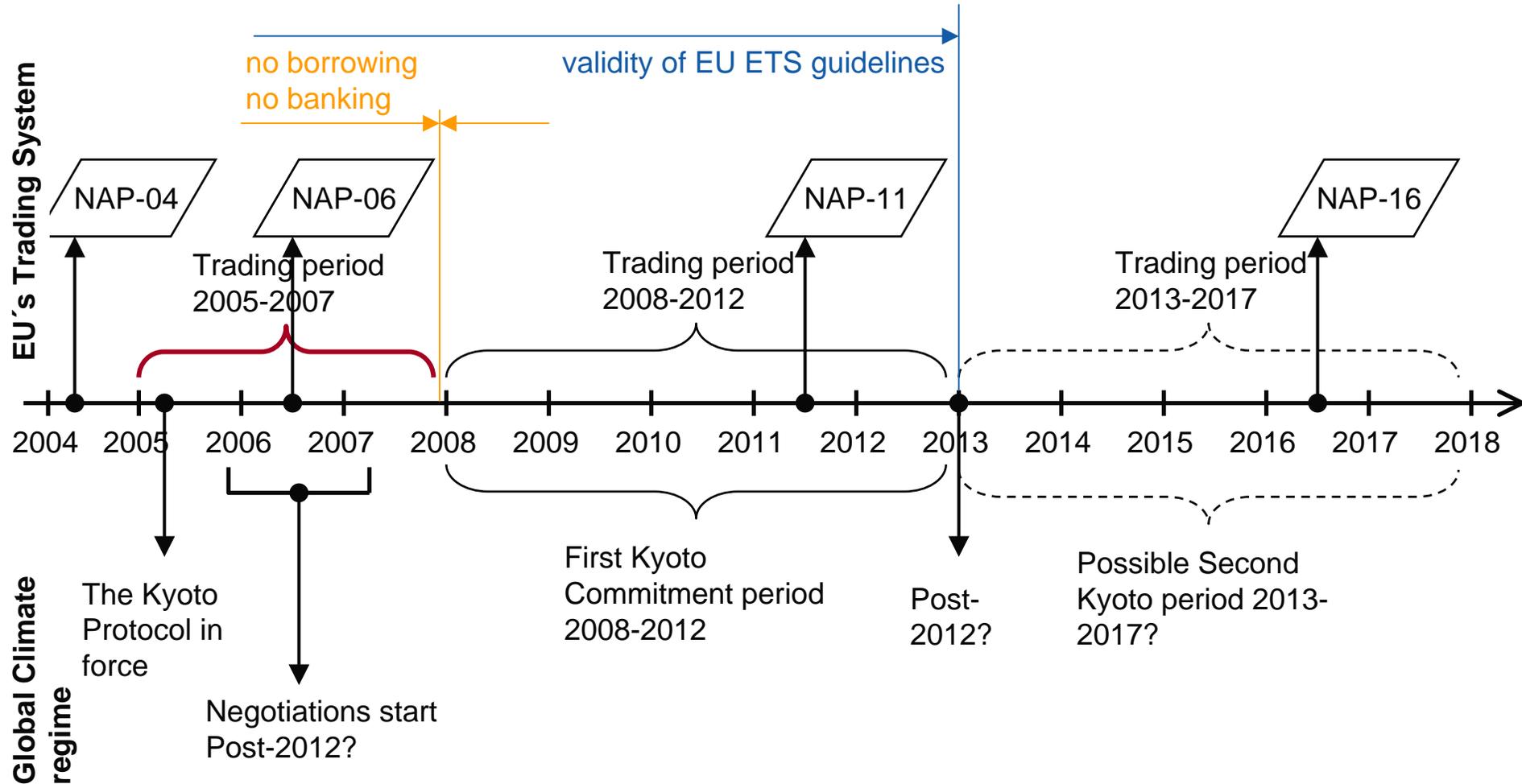


The EU emission trading scheme (EU ETS)

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- One of the tools for greenhouse gas (GHG) emissions is a cap-and-trade system - the new EU ETS
 - Included sectors:
power and heat production, pulp and paper production, oil refineries, cement, lime and glass production
 - Included GHG: only CO₂
 - ETS sectors represent roughly 45 % of the GHG emissions in the EU
- Objective of EU ETS:
Emission reductions shall take place where it is most cost efficient
- First phase (2005-2007) NAPs represent a reduction of approx. 2.7% from “business as usual” emission levels (12,000 installations affected)
- Second Phase (2008-2012) should lead to a reduction in EU emissions to a level 8% below the 1990 rate and may include other sectors and other GHG’s

Timeframe – EU and the global climate policy



Allocation 2005-07 to the installations of Vattenfall 8

Sweden

- Negligible impact due to the hydro/nuclear generation mix.

Germany

- Nearly all necessary allowances received for the 1st trading period 2005-2007
- Vattenfall's "early actions" have been recognised in the German national allocation plan
- Large CHP portion with a reasonable allocation level

Poland

- Necessary allowances received for the 1st trading period 2005 - 2007

Participants:

- Utilities, Gas/Oil Companies and a growing number of Banks
- 7 Brokers and 5 Exchanges offering Spot, Futures and Forwards.

Volumes:

- Traded volume 145 Mt in 2005.
- OTC Market represents 50 % of volume traded up until August 2005.
- Exchange traded volume is rising as market develops.
- Spot Market expected to expand substantially once Registries/Accounts are in place

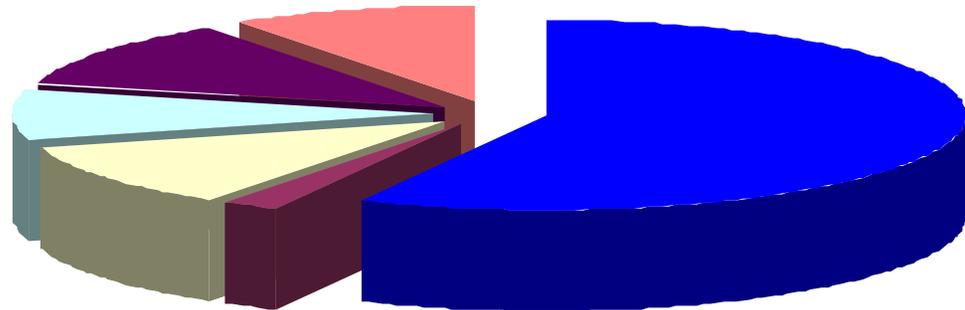
First and Second Phase:

- First Phase - Trading has transformed from policy driven into Trading based on fundamentals
- Second Phase - Trading is still pending - Policy and regulatory framework to be decided

Countries:

- UK
- Germany
- Denmark
- Austria
- France
- Finland
- the Netherlands

National Allocation Plans (EU 25) by Sector:



■ Power and Heat

■ Oil and Gas

■ Pulp and Paper

■ Cement, lime, glass

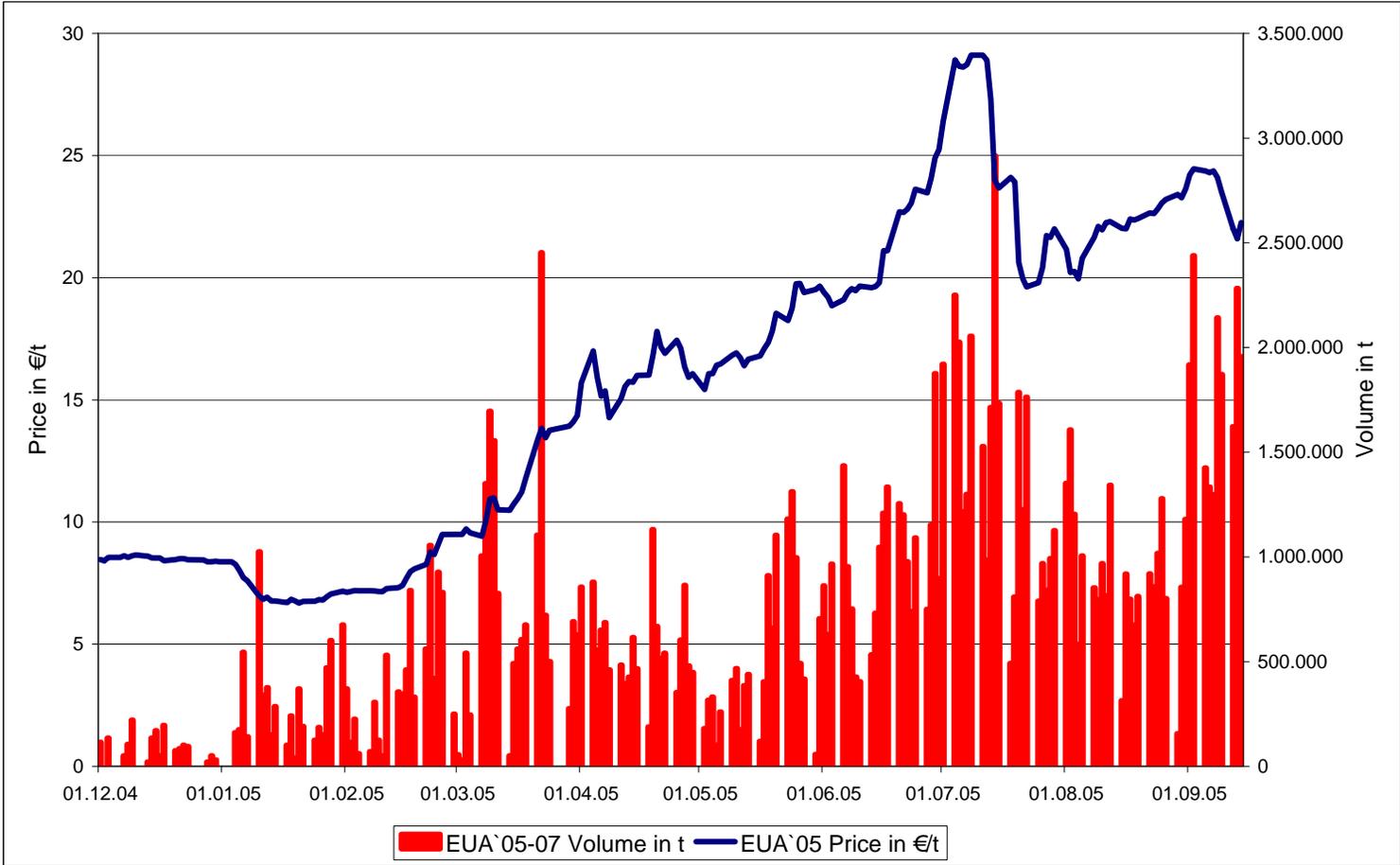
■ Metals

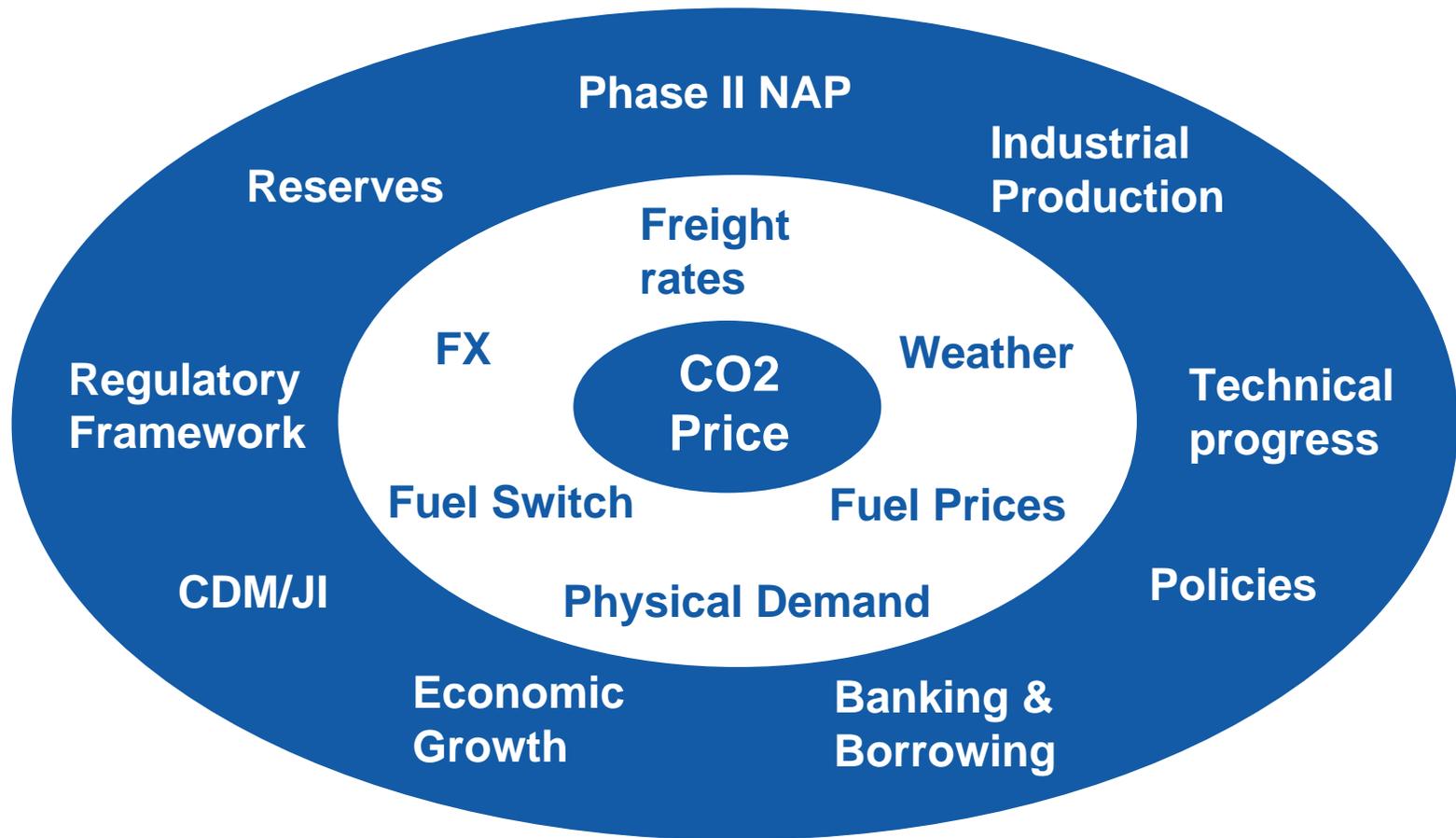
■ Others

Approx. 50 participants are trading daily, mainly energy companies, banks and hedge funds

Average trading volume: 1 million tons per day

Price and volume development





The price of CO2 allowances higher than anticipated 13

Possible reasons:

- Price is in principle set by marginal cost for abatement
- Short term reductions achieved as a consequence of gas substituting coal. High gas prices result in increased costs for reductions.
- The trading period is very brief 2005 – 2007, which means no long term investments
- Uncertainties regarding EUA demands (no reliable statistics available)
- Indicators of a larger allowances deficit than expected – NAP's and draught
- Some countries like Poland and Italy are still outside (still no valid NAPs), only 10 countries have functioning registers
- Players with a surplus are not yet active in the market
- Lack of knowledge relating to the trading system among many players
- CDM/JI not yet available, limited supply in the first period

HARDCOAL

Average Plant efficiency: 38%

CO2 emissions per MWh: 0,89 t

Cost of CO2:

1 €/t equivalent to 0,89 €/MWh

20 €/t equivalent to 17,80 €/MWh

GAS

Average Plant efficiency: 50%

CO2 emissions per MWh: 0,40 t

Cost of CO2:

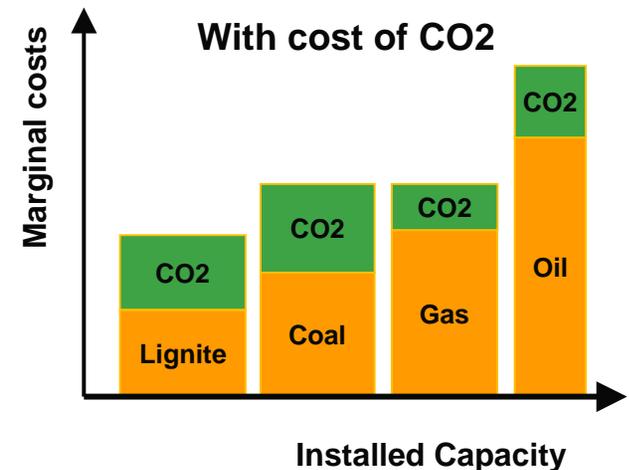
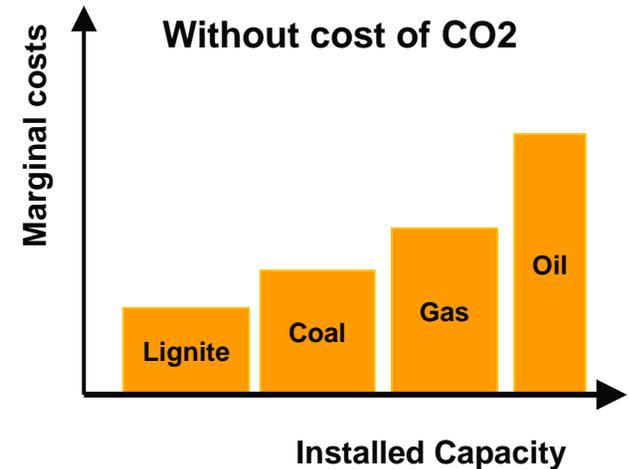
1 €/t equivalent to 0,40 €/MWh

20 €/t equivalent to 8,00 €/MWh

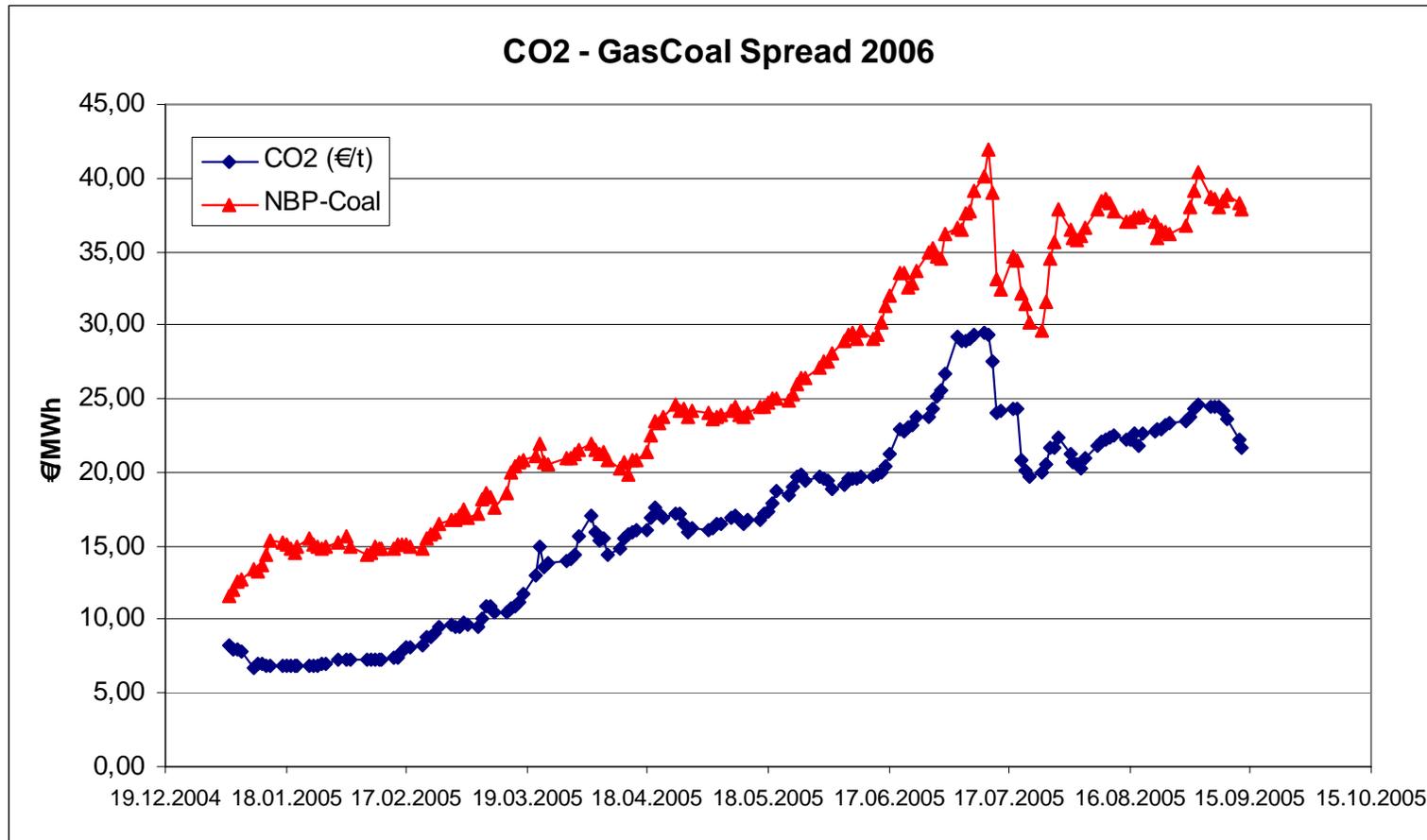
Impact of CO2 prices on merit order

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- The need for allowances is dependent upon the amount of production
- The market value of allowances is part of the marginal costs of power plants
- The power plant production is offered with the higher marginal costs at the spot market
- If the marginal costs are higher than the spot price, the power plant reduces its production and sells the allowance instead.



Gas to coal spread



Marginal abatement cost

Price is in principle set by marginal cost for abatement

EUA Reserves

The rules governing new entrant reserves are far from clear. A potential 60-180 Mt could potentially be allocated/deleted. Will allowance auction disrupt continuous trading in EU ETS?

Clean Development Mechanism Projects (CDM)

Investment in mitigation projects and delivery of Carbon Credits will affect pricing. Current Status of projects suggest max. 25Mt supply of CERs into Phase I.

Joint Implementation (JI)

Potential for Emission Reduction Projects is huge. Uncertainty of regulatory frameworks in big JI countries like Russia and Ukraine. No effect on Phase I pricing.

Actual CO2 Position

Emissions subject to weather during Phase 1. First reliable position estimate in April 2006. CO2 price is sensitive to position adjustments.

Phase II (2008-2012)

Uncertainty of NAP, Inclusion of other Green House Gases and Industries(?)

Appendices

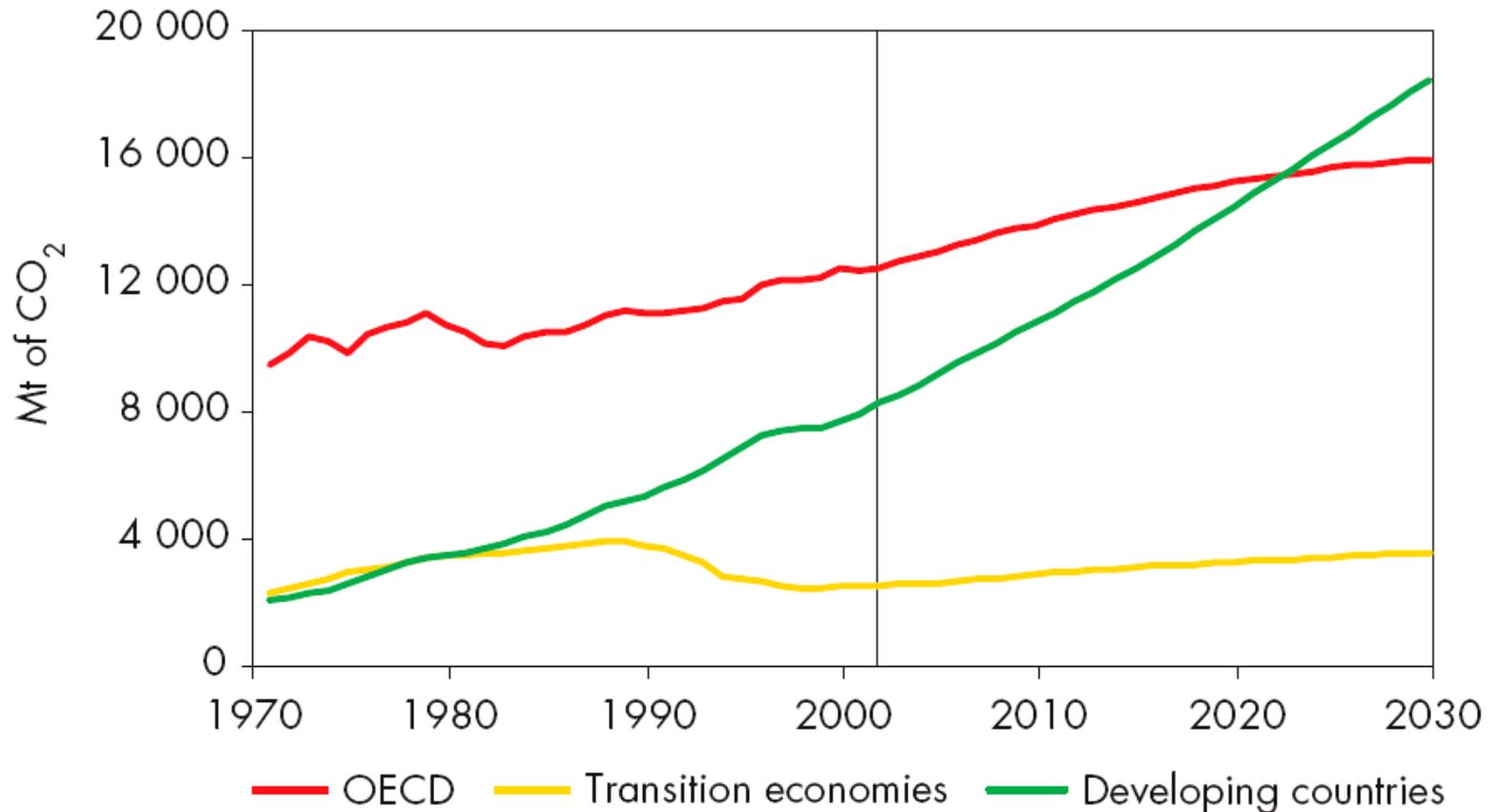
- CO2 emission reducing projects in Annex I Countries (industrialized or in transition with a CO2 emission reduction target)
- Applied methodologies include efficiency improvement, fuel switch, reduction of agriculture-related emissions
- Project transforms AAUs into ERUs (Assigned Amount Units into Emission Reduction Units)
- ERUs have same value as EUAs (EU-Allowances)
- ERUs can only be used for compliance from 2008 to 2012

- CO2 emission reducing projects in Non-Annex I countries (no CO2 emission reducing target)
- Applied methodologies include destruction of methane, HFC23, N2O, and new biomass and small hydro plants
- Projects generate CERs (Certified Emission Reductions)
- CERs have same value as EUAs (EU-Allowance), but are generated not converted, i.e.no “AAU conversion”.
- ERUs can be used for compliance in both phases and beyond

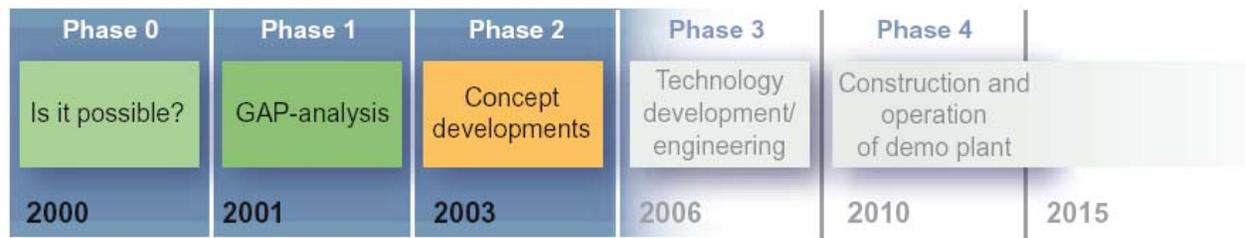
- Received and purchased emission rights are reported as inventories
- In those cases where emission rights are received, or acquired, at a value lower than fair value, the inventory asset is reported at fair value and as deferred income (government grant) in the balance sheet
- The government grant is carried as income over the year and as carbon dioxide is emitted, a cost and a liability for the obligation to provide emission rights are reported
- The liability and inventory asset are valued in a uniform manner

World energy related CO₂ emissions by region

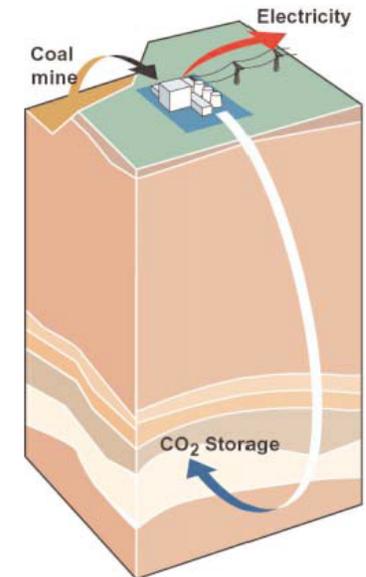
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Vattenfall's R&D effort



CO₂ free power plant



The target is 20€/tons CO₂

Commercially available around 2020

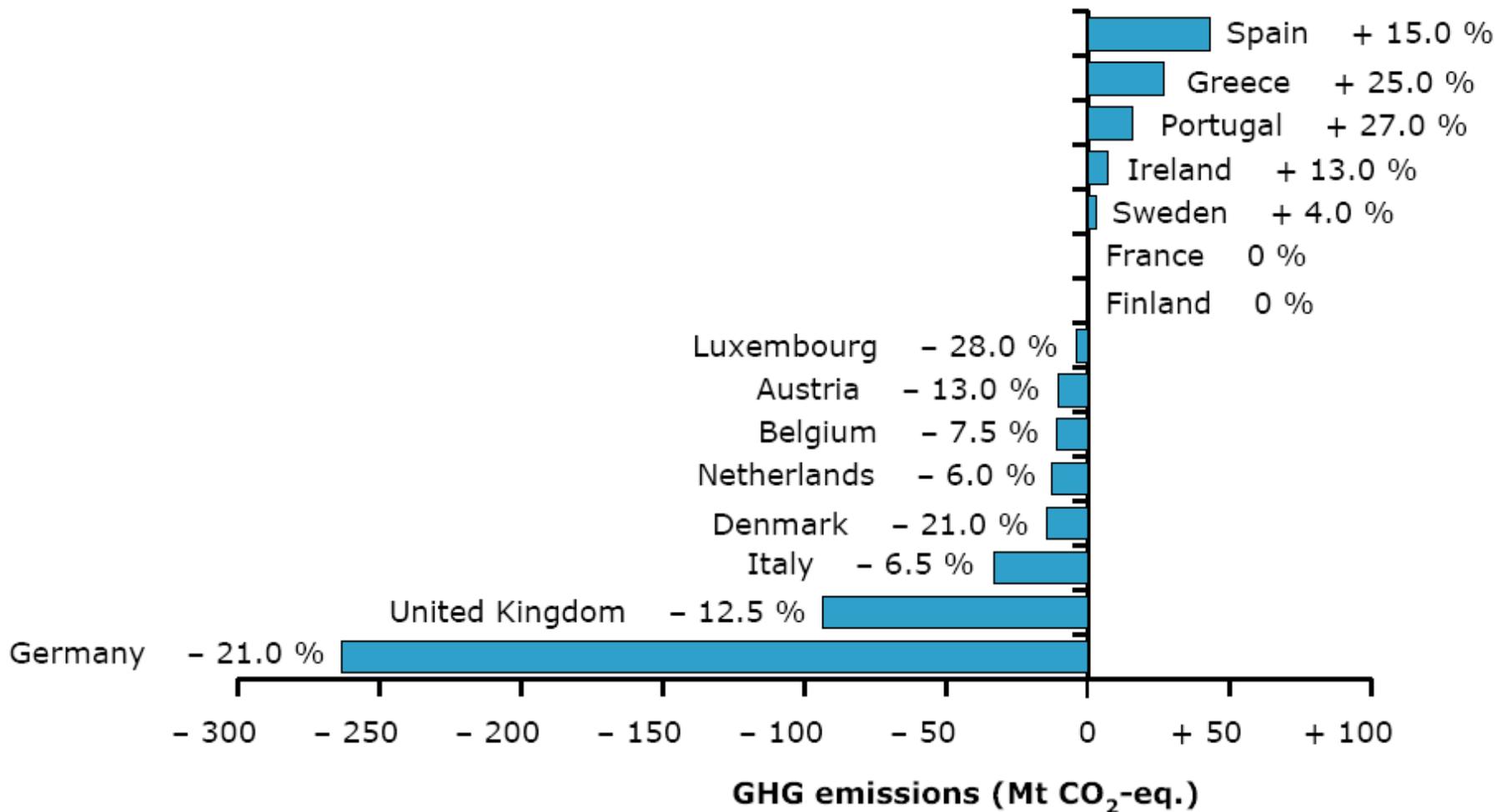
International co-operation

Development phase includes a pilot plant

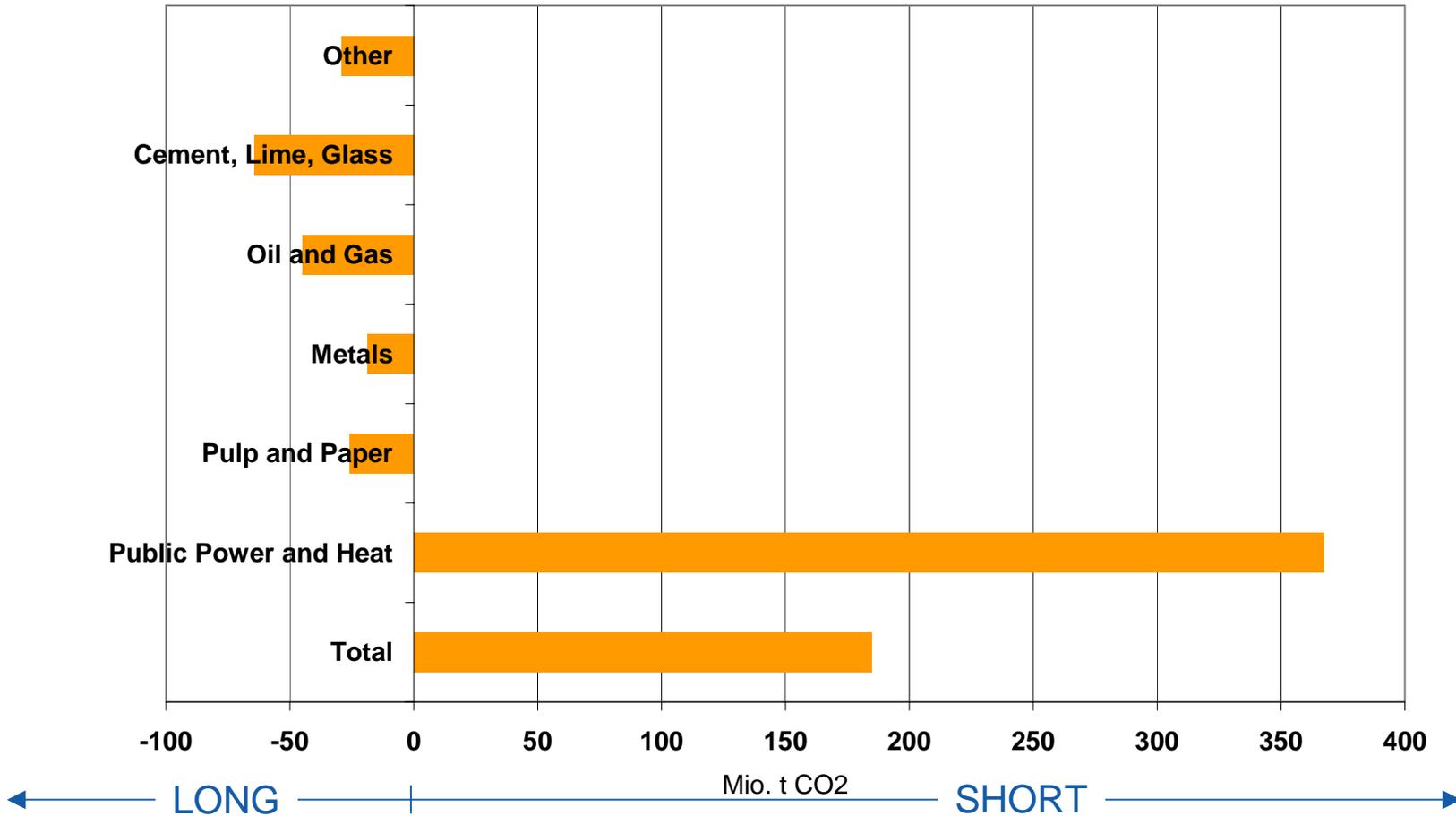
Strong support from the Vattenfall Management

high
expectations

EU burden-sharing agreement

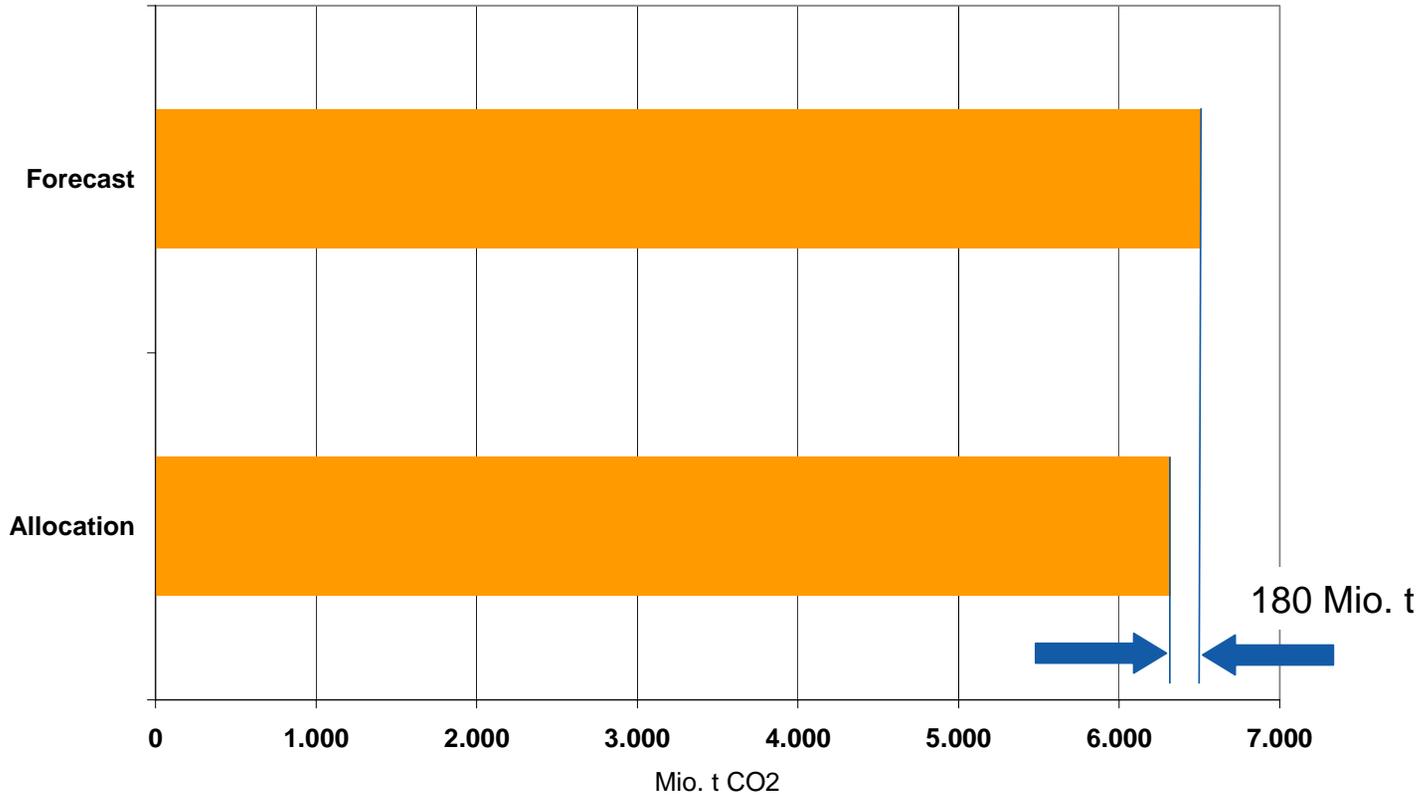


Public power and heat sector is short 2005 - 2007



Source: Carbon Market Trader, 01.08.05; own compilation

3% shortage 2005 - 2007

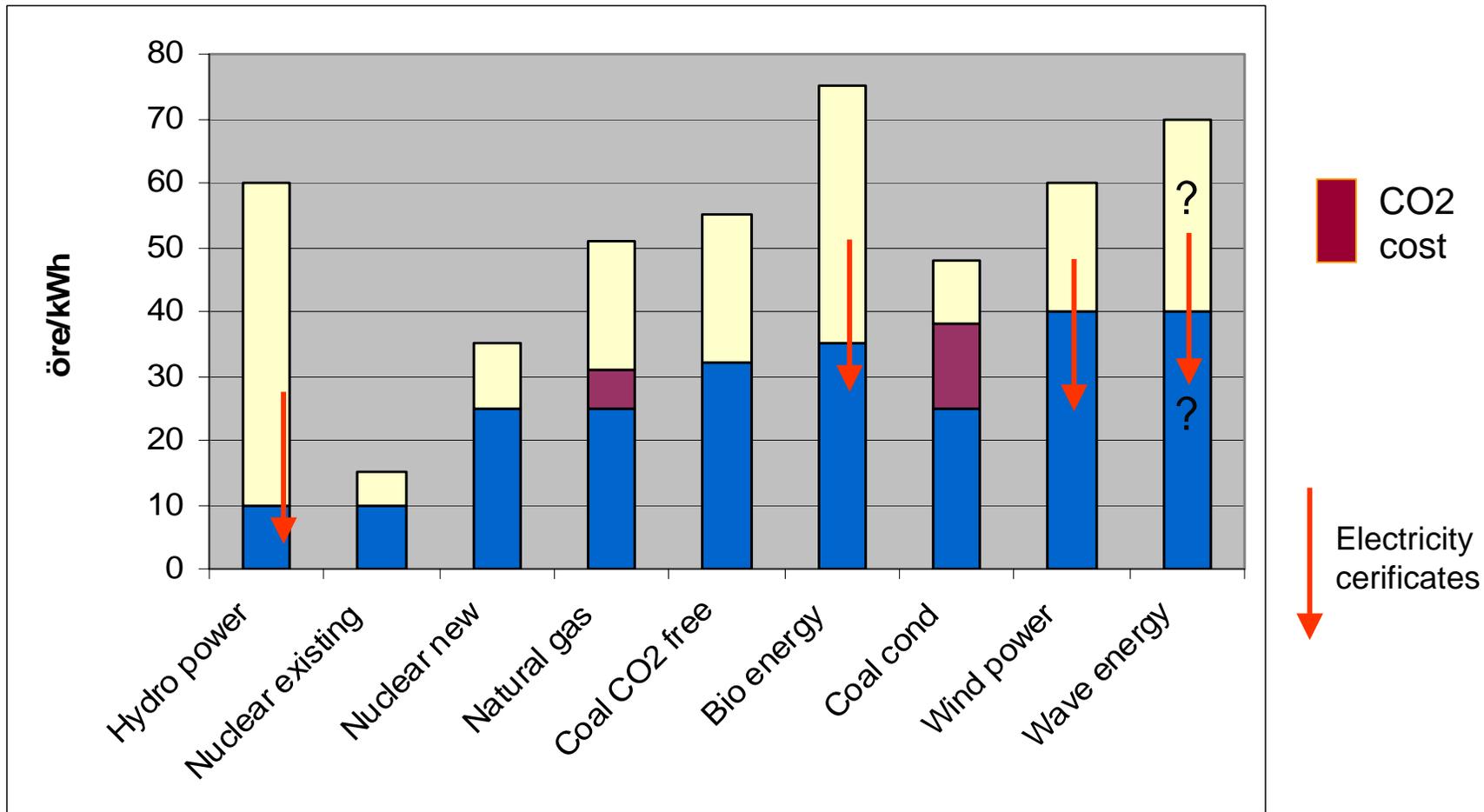


Source: Carbon Market Trader, 01.08.05; own compilation

→ Market is short compared to forecasted emissions

Electricity generation cost - uncertainties

Incl 20 €/ton CO2, excl. taxes, CHP not shown.



The CO2 emissions trading system increases electricity price

Prices on the Nordic Market
- Impact on electricity price from CO2 ETS

Variable cost

öre/kWh

(dry year)

(normal year)

(wet year)

Hydro

Nuclear

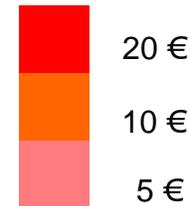
CHP

Coal
condensing

Oil

Gas turbines

Price/ton CO2



0 100 200 300 400

TWh/year

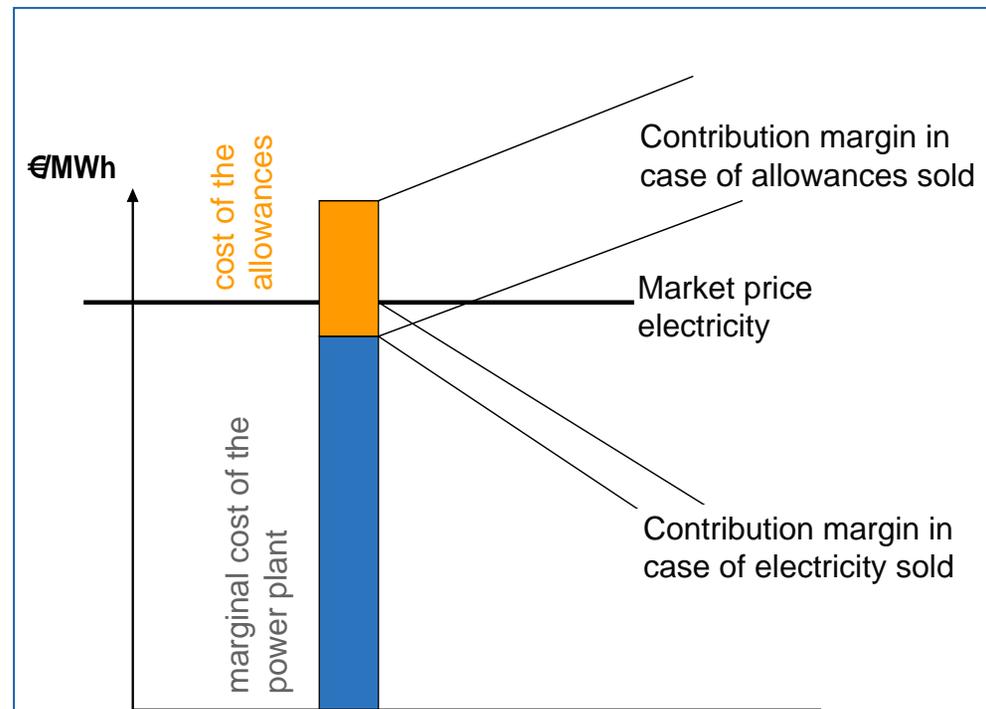
Demand

Theoretical mechanism of dispatch under ETS influence

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Model – taking full (opportunity) cost into account

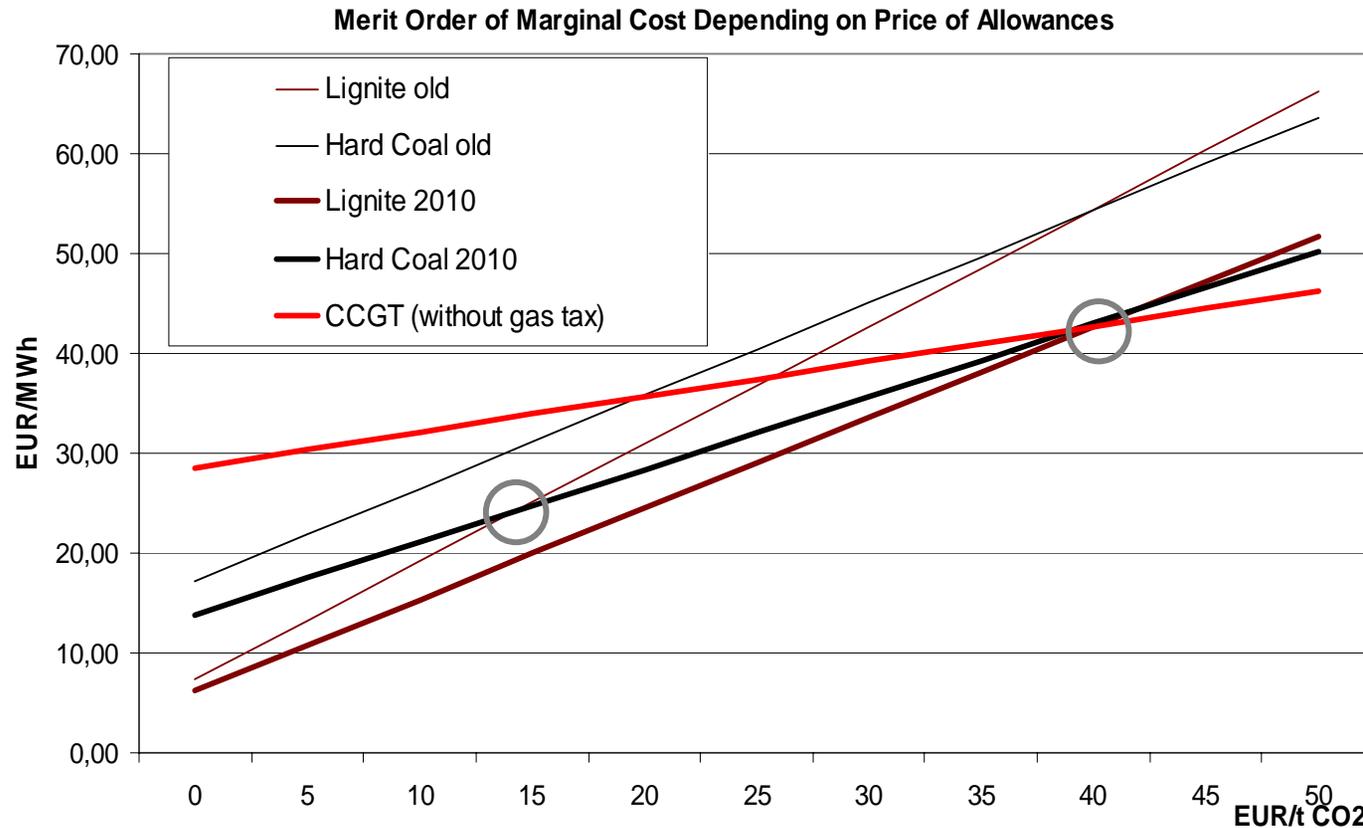
- The allowance-need depends directly on the production amount.
- The Market value of allowances is part of the marginal cost of power plants.
- The power plant production is offered at the spot market with the marginal cost including the market value of certificates
- In case of a switch in the merit order the power plant reduces its production. It gets its contribution margin by selling the allowances.



- ETS will be taken into account irrespective of the allocation mechanism.
- Pricing mechanism is essential for function of the ETS system.

Consequences for power plant operation

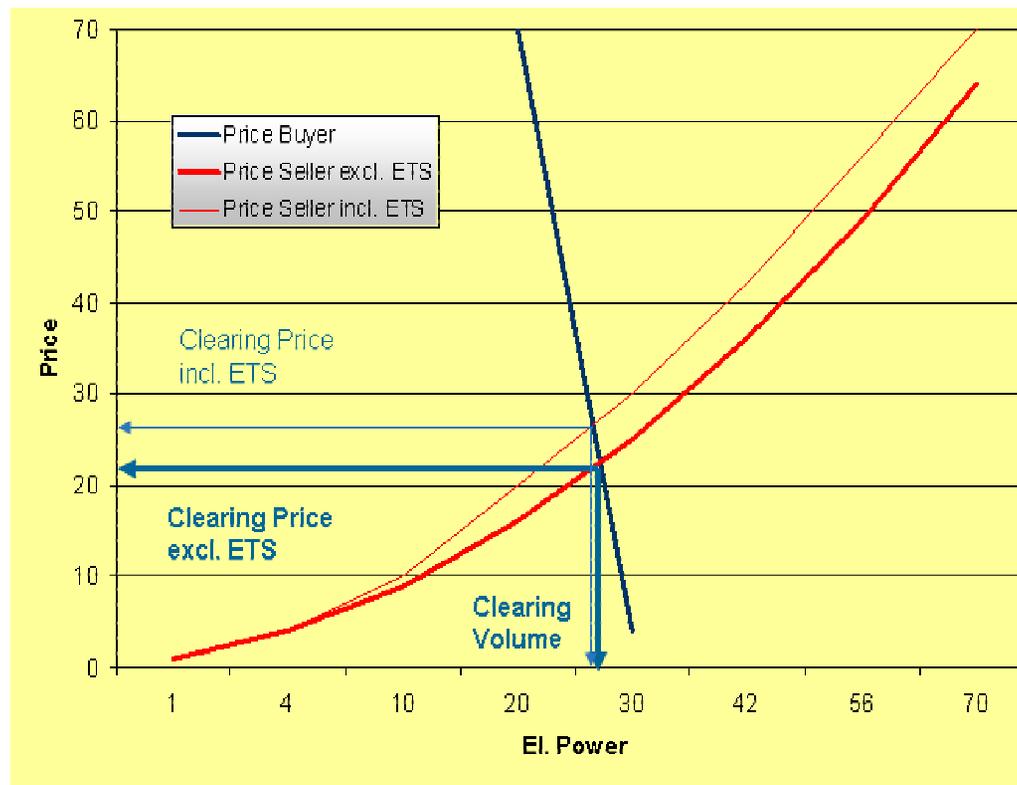
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Every cross point leads to a switch in the merit order and another power plant operation

Pricing at the Power Exchange (EEX, Nordpool)

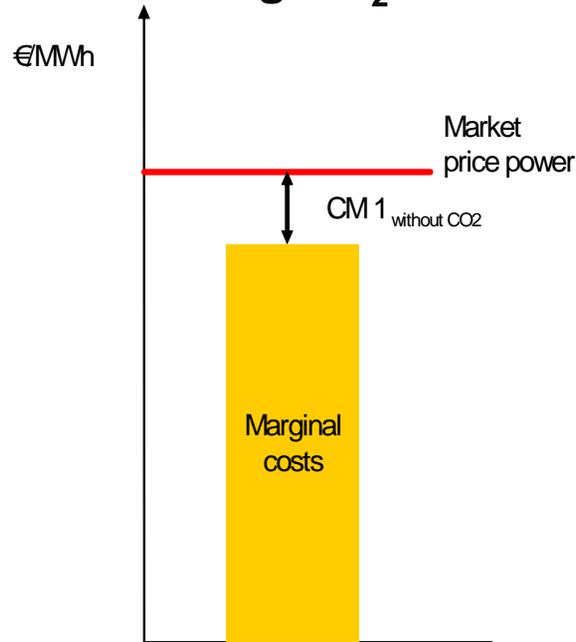
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- An unavoidable price effect is a higher power market price.
- The price influence depends on marginal power plants in the region and other influences (fuel prices, demand ...).

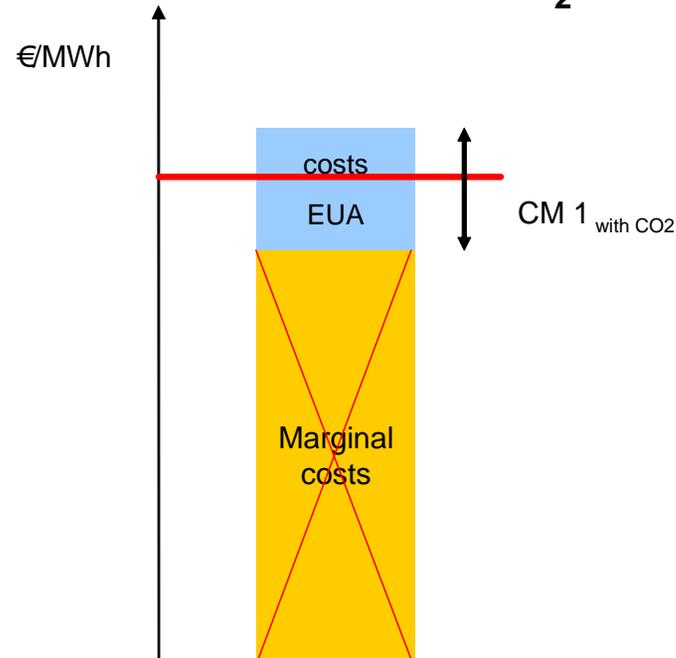
Taking the opportunity cost into account for the purpose of electricity pricing - Case: 100% of allowances allocated for free

Without taking CO₂ into account



Allowances have to be surrendered at full volume. Contribution margin = difference between market price and marginal cost.

With CO₂



Plant has to be switched off. Not used allowances are sold to the market.

Contribution margin_{without CO₂} < Contribution margin_{with CO₂}

→ Taking CO₂ into account for electricity pricing purposes is economically rational.