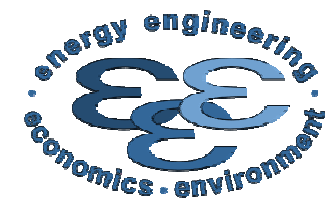




Technische Universität Berlin

Institute for Energy Engineering



**A snapshot of energy policy in Germany :
the EU emissions trading scheme,
the renewable energy feed-in law, and provisions for
combined heat and power plants**

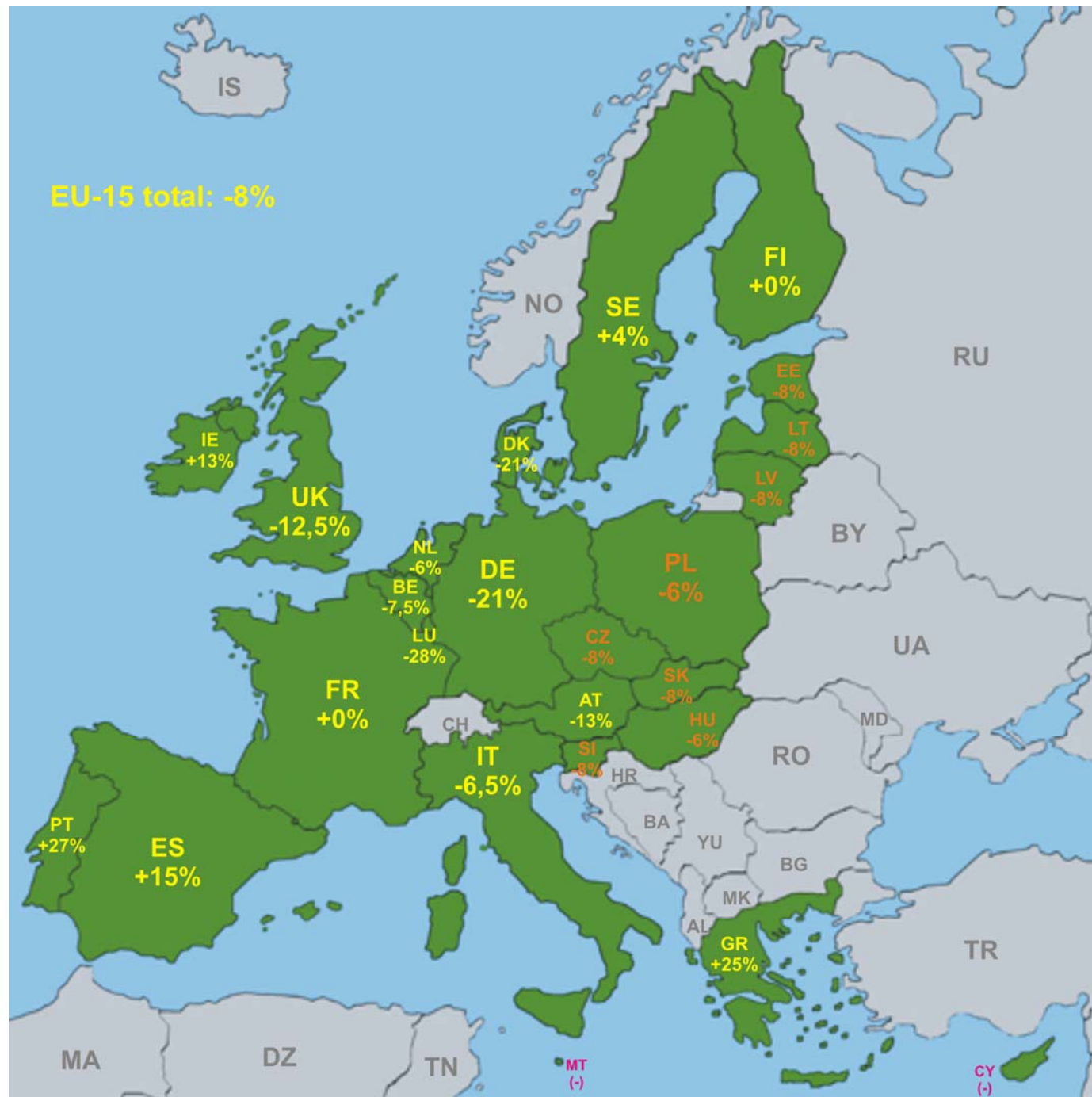
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Background of the European ETS

- ▶ The European Emissions Trade Scheme (ETS) is one of the instruments defined in the Kyoto-Protocol to comply with the emission reduction commitments of 25 European countries
- ▶ European ETS started at 01/01/2005, as constituted by the EU-Directive 2003/87/EC, dated 07/23/2003
- ▶ ETS covers 46% of the CO₂ emissions of the member states and is considered the most important climate protection instrument in Europe



ETS member countries
Kyoto targets and
EU burden sharing
targets for 2008-2012
(in respect to 1990)

EU Directive for establishing the ETS system

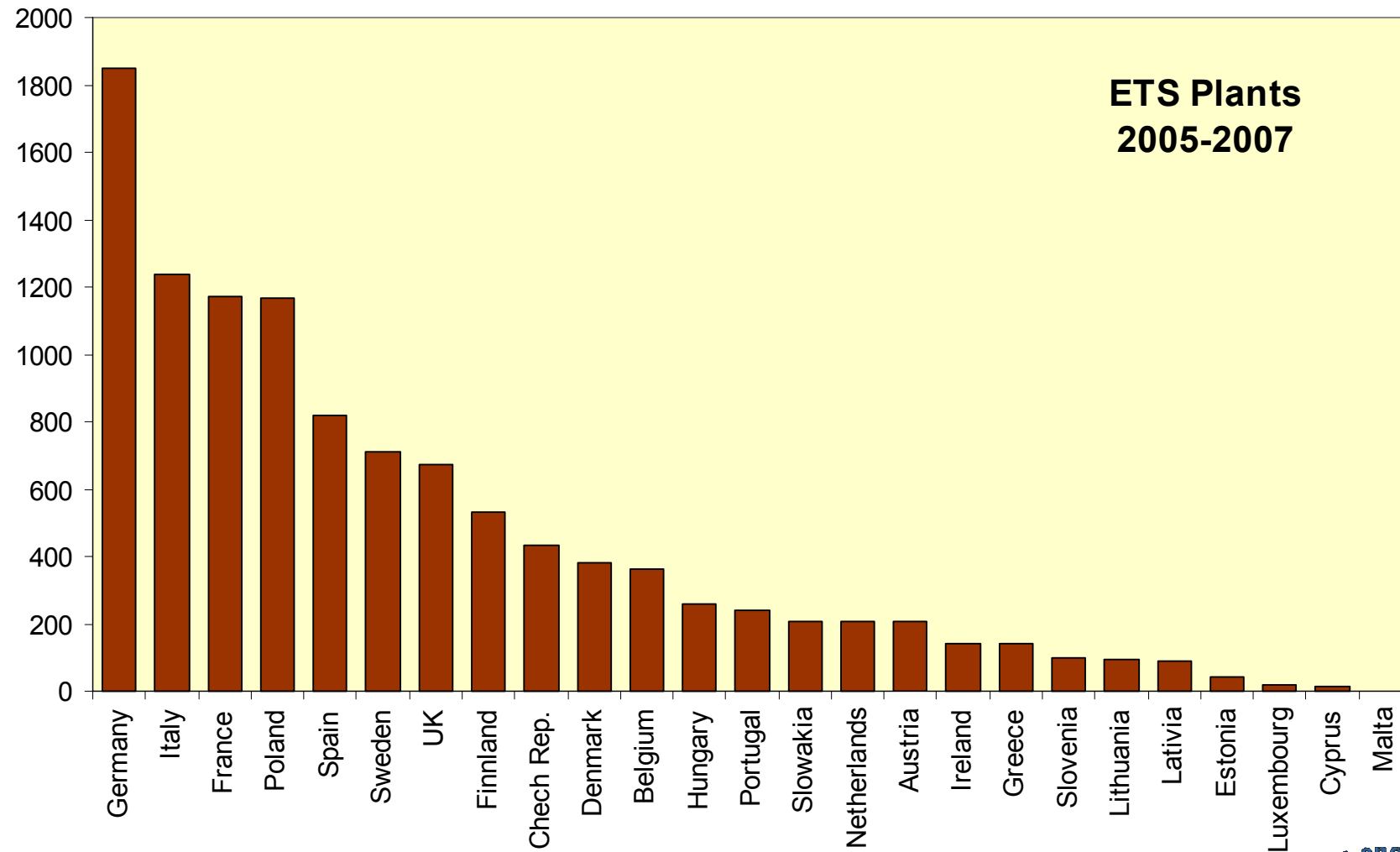
- ▶ plants of the energy and industrial sector need a **permit to emit CO₂**
- ▶ every member state disposes of a certain **budget of allowances**, which are distributed among the plant operators according to the national allocation plan
- ▶ every plant operator holds an account, on which allowances are deposited and allowances equal to the emissions of the plant are cancelled annually
- ▶ **allowances can be traded** internationally by plant operators and any other person
- ▶ ETS begins 01/01/2005
- ▶ ETS periods (2005-2007, 2008-2012, 2013-2018...)
- ▶ penalties for excess emissions: 100 €/t CO₂, „naming-and-shaming“
- ▶ monitoring and reporting rules for plant operators and for countries

Participating installations

- ▶ combustion installations with a rated thermal input exceeding 20 MW
- ▶ mineral oil refineries
- ▶ coke ovens
- ▶ production and processing of ferrous metals
- ▶ mineral industry (cement clinker, glass, ceramic products)
- ▶ production of pulp from timber (exceeding specified capacities)
- ▶ production of paper and board (exceeding 20 t/d)

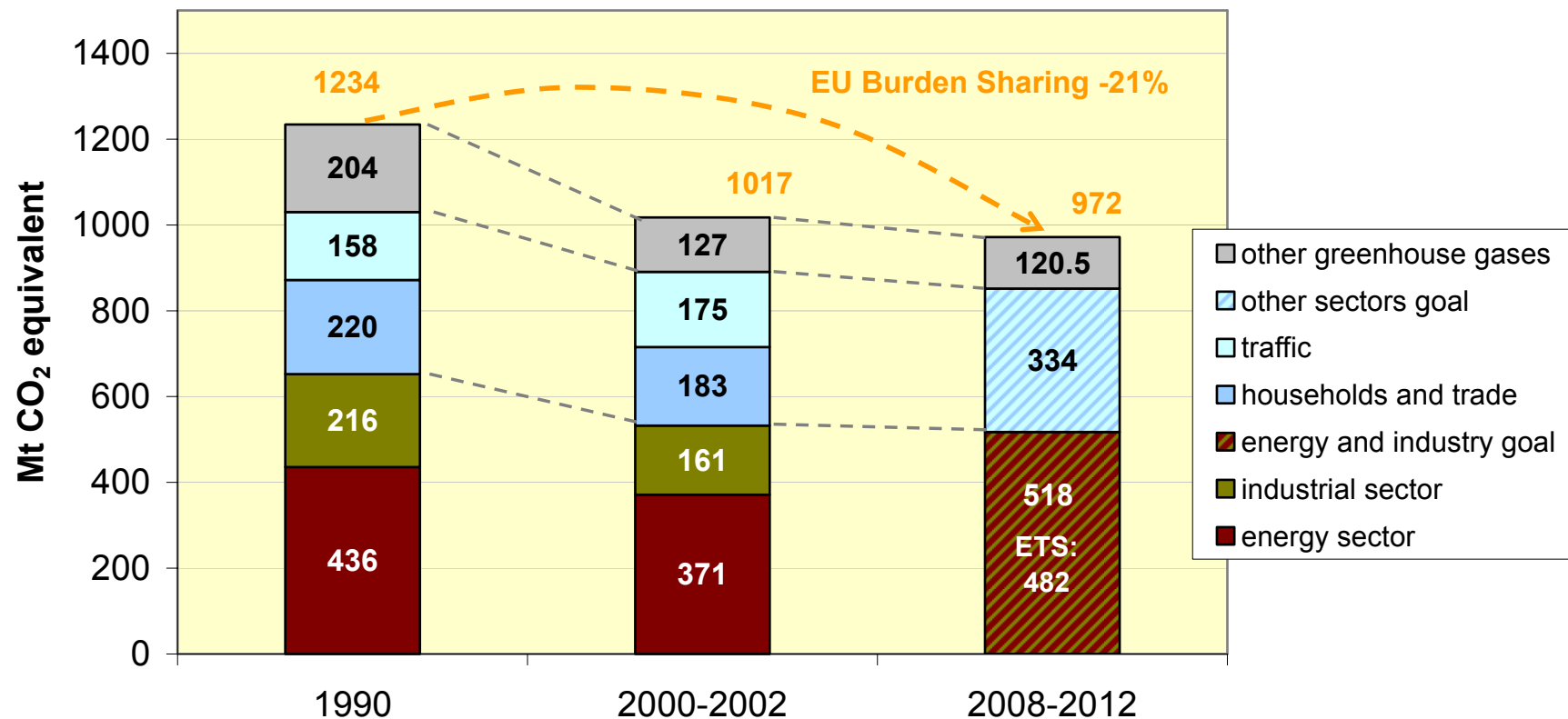
Approx. 11,400 installations EU-wide (46% of total CO₂-emissions)

ETS plants in member countries

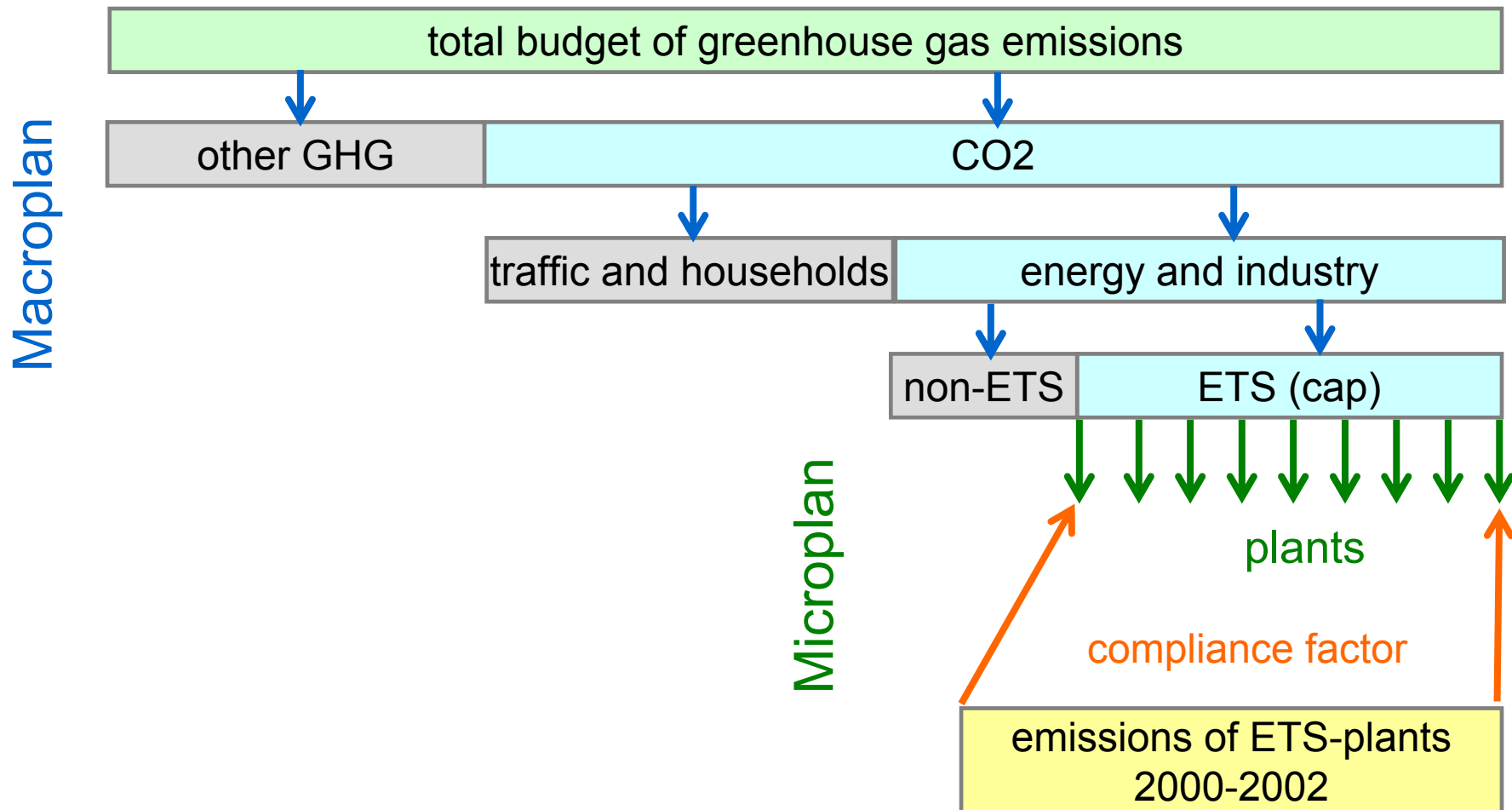


Emissions reduction goals for Germany

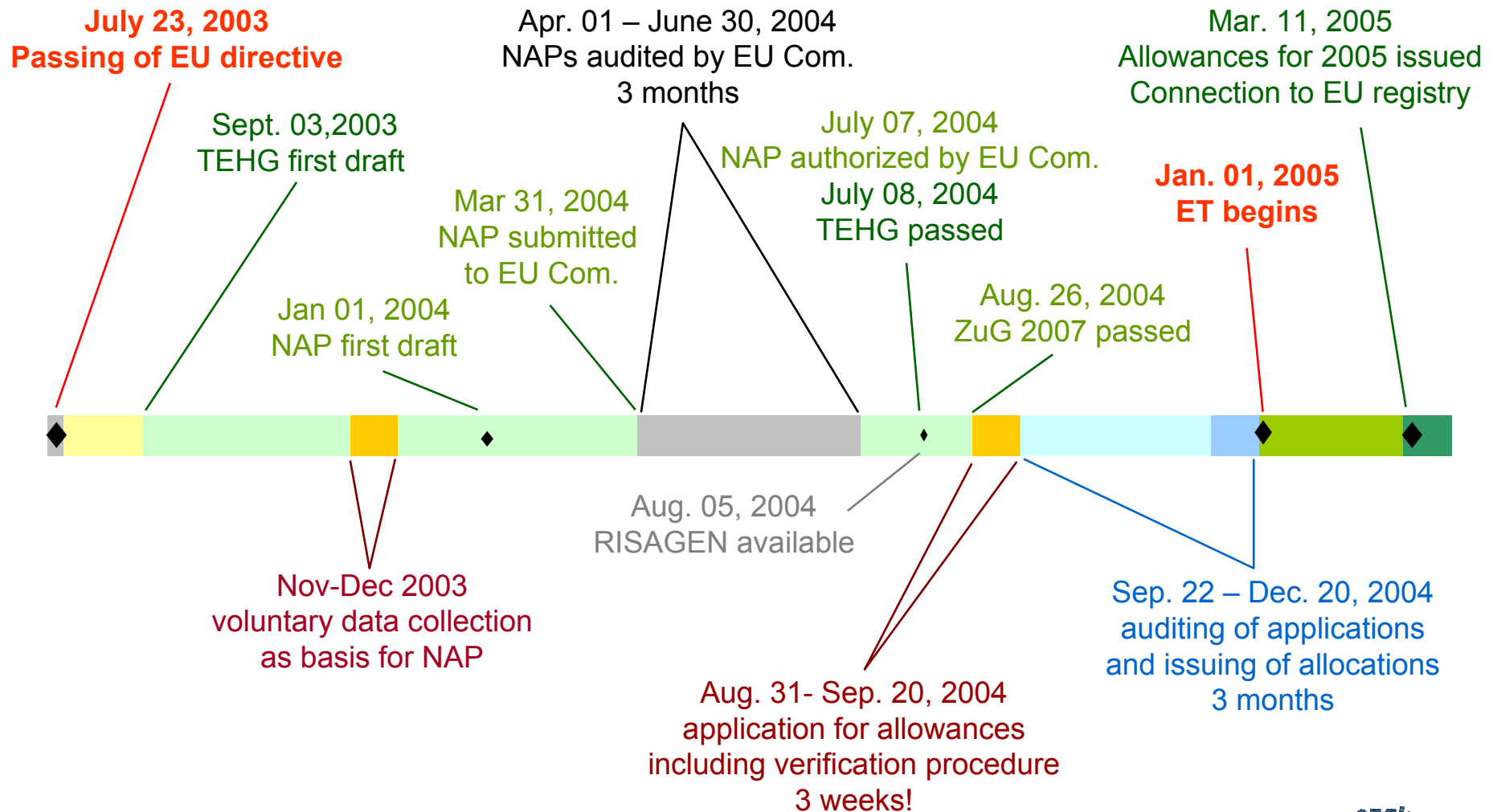
Emission reduction goals for Germany



Macroplan and Microplan



A tight schedule



German Allocation Plan 2005-2007

Allowances are given to plant operators for free

Basic allocation method for existing plants

- ▶ „grandfathering“ on basis of historical emissions in 2000-2002
- ▶ multiplied with compliance factor of 0.9709

Basic allocation method for new plants

- ▶ benchmarks (specific emissions per unit of product)
- ▶ prognosis of utilization factor by plant operator with ex-post adjustment

Option rule

operators of existing plants can get allocation with the benchmark system instead of historical emissions if they wish so

Benchmarks for energy conversion plant

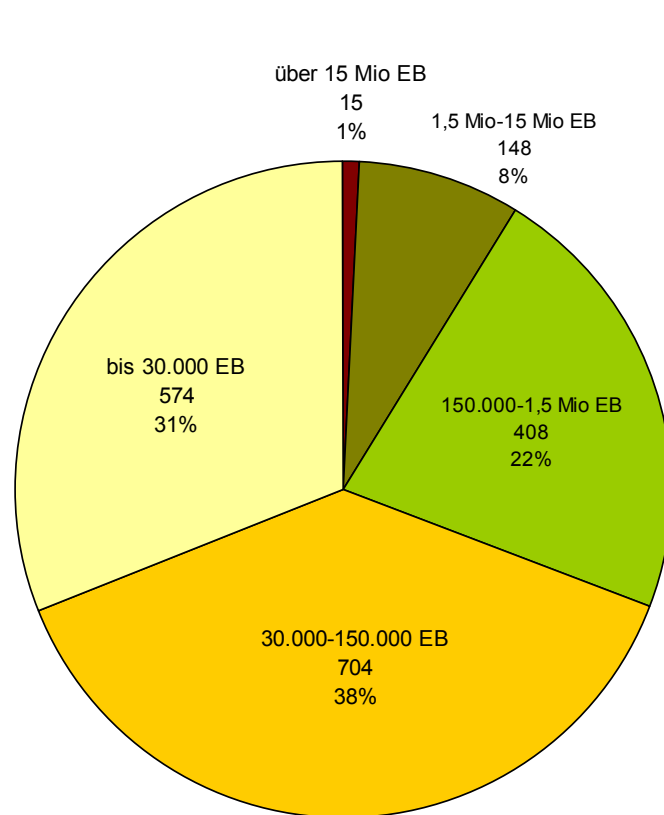
Benchmarks are depending on fuel and product type

Product	Benchmark		Reference plant		efficiency
power	min.	365	g/kWh	gas-fired combined cycle	55%
	max.	750	g/kWh	hard coal fired steam cycle	46%
steam	min.	225	g/kWh	gas-fired boiler	90%
	max.	345	g/kWh	oil-fired boiler	82%
hot water	min.	215	g/kWh	gas-fired boiler	94%
	max.	290	g/kWh	oil-fired boiler	92%

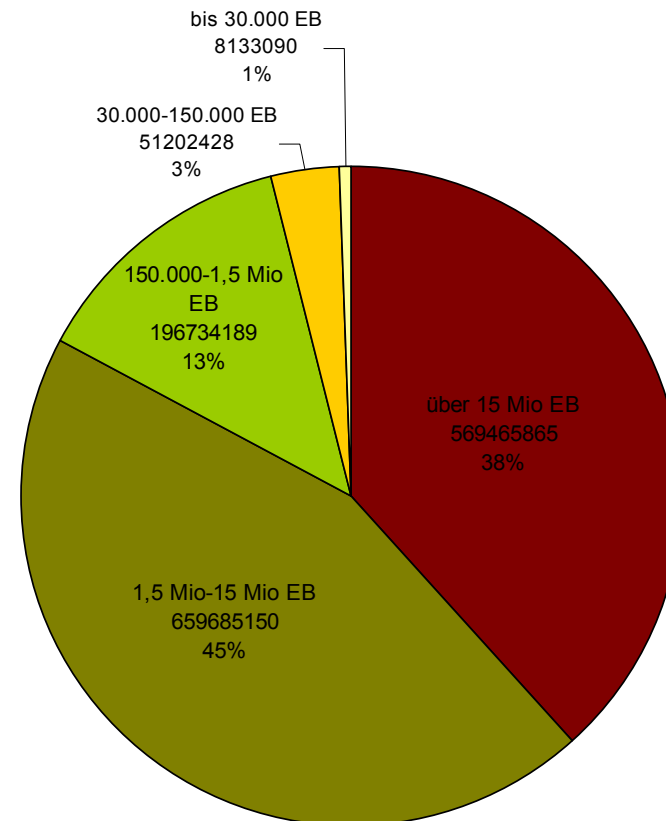
CHP plants:

„double-benchmarks“ for power and heat

Results of the allocation: Many small plants



Verteilung der Anlagen



Verteilung der Emissionsberechtigungen

79% of the plants hold a total share of 4% of the allowances
9% of the plants hold a total share of 83% of the allowances

Transaction costs for small plants

high transaction costs for small plants

transaction costs	
plant with > 3 Mt CO ₂ /a	0.1-0.2 €/t
plant with < 50,000 t CO ₂ /a	0.6-3.5 €/t

→ Solution in NAP II:
simplified procedures for application, monitoring and allocation
for plants with annual CO₂ emissions < 25,000 t

Experience of one year ETS: windfall profits

Power companies	Industrial companies
1236 plants, hold 67% of allowances	613 plants, hold 33% of allowances
include costs for emission allowances in electricity prices, even though allowances were given to them for free → windfall profits	international competition cannot include costs for allowances in product prices
trade allowances on daily basis → set carbon market price	hold on to allowances to ensure compliance
high emission reduction potential	moderate emission reduction potential
NAP II: reduction obligation of 15%	NAP II: reduction obligation of 1.25%

Experience of one year ETS: conclusions

- ▶ **administrative framework for the ETS has been established:**
All countries except Poland, Malta and Cyprus have working registers and are connected to the EU transaction log
- ▶ **over allocation:**
excess allowances in most countries in 2005, due to generous allocation in first period
- ▶ **NAPs for 2008-2012 must be more ambitious:**
most EU-15 countries are quite far from complying their Kyoto goals for 2008-2012
- ▶ EU accession countries will have a surplus of allowances

EEG - Renewable Energy Sources Act

- ▶ grid operators are obliged to purchase electricity from renewable energy plants at fixed premium prices
- ▶ constant remuneration for a period of 20 years, based on the electricity generation costs of the individual renewable technologies (3.7 ct/kWh for hydro to 62.4 ct/kWh for photovoltaic)
- ▶ degression of the remuneration depending on year of commissioning
- ▶ nationwide equalisation of the electricity purchased and the corresponding remuneration (average levy for consumers in 2005: 0.63 ct/kWh)
- ▶ climate protection target: 12.5% electricity share from renewables by 2010

EEG - remuneration

Technology	Remuneration (ct/kWh)
Hydropower	3.7 – 9.7
Landfill gas, sewage gas, mine gas	6.7 – 9.7
Biomass	3.9 – 17.5
Geothermal energy	7.2 – 15.0
Wind power	5.5 – 9.1
Photovoltaic	45.7 – 62.4

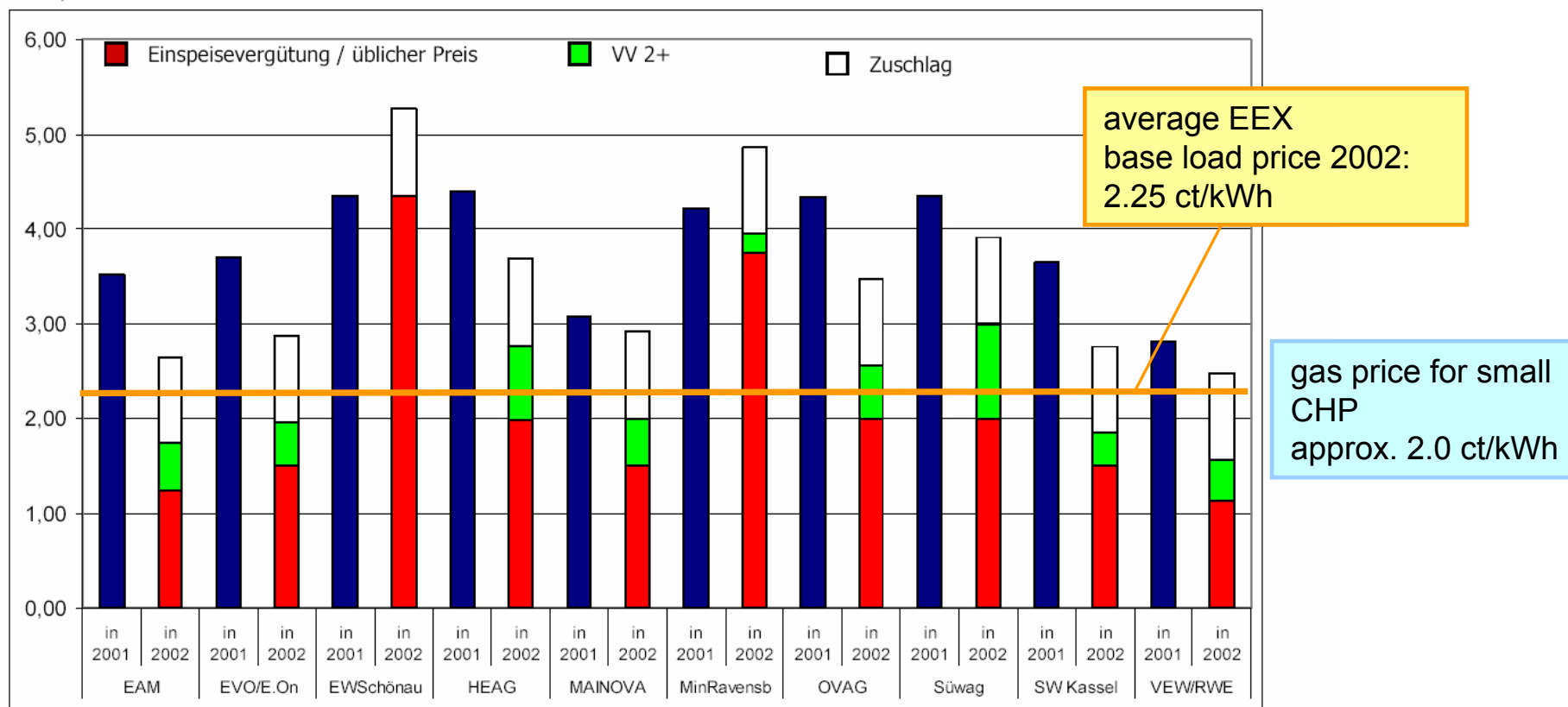
average EEX base load price 2000-2005: 2.9 ct/kWh

KWKmodG – Combined Heat and Power Law

- ▶ feed-in law similar to the EEG (Renewable Energies Law)
- ▶ aims at retention and modernization of existing fossil fired CHP plants and expansion of small decentral CHP
- ▶ remuneration composed of
 - customary price (EEX base load price)
 - avoided grid costs for decentral feed-in
 - CHP premium (0.56 – 5.11 ct/kWh depending on technology and year)
- ▶ remuneration declining and limited until 2010, except for fuel cells and gas- or diesel motor plants with a capacity $< 50 \text{ kW}_{\text{el}}$
- ▶ nationwide equalisation of the paid CHP premium (levy for consumers in 2005: 0.336 ct/kWh)
- ▶ complex definition and calculation rules for the amount of co-generated electricity
- ▶ climate protection target: reduce CO_2 emissions by 23 Mt by 2010

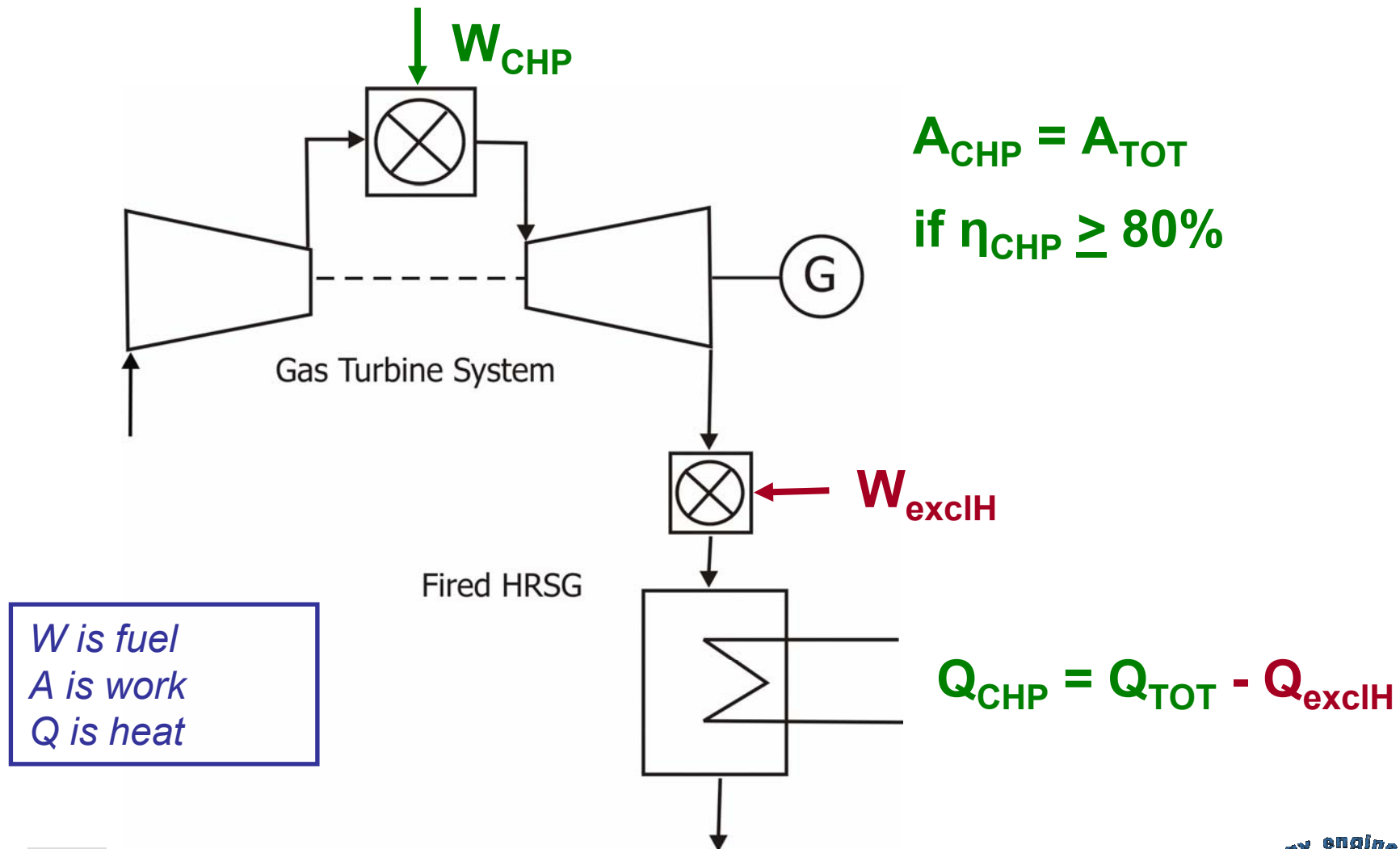
CHP law: "customary prices"

Abbildung 1: Entwicklung der KWK-Einspeisevergütung einer 25 kW_{el} Anlage mit 6.000 Betriebsstunden jährlich und 20% Einspeisung (30.000 kWh), Winter HT 15%, Winter NT 45%, Sommer HT 10%, Sommer NT 30%

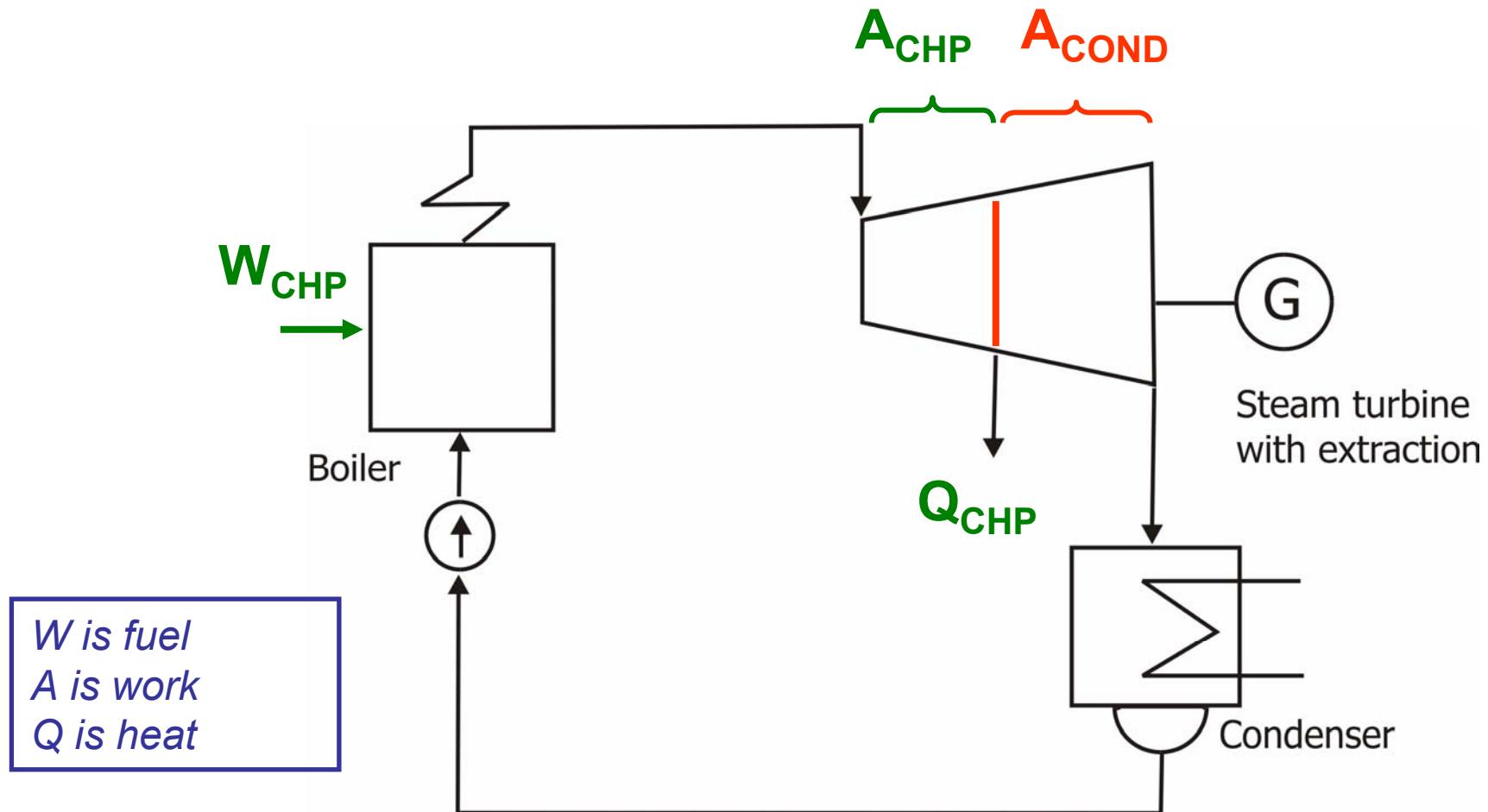


Quelle: Nordsolar e.V. (Dezember 2002)

KWKmodG – definition of combined heat and power (I)



KWKmodG – Definition of combined heat and power (II)

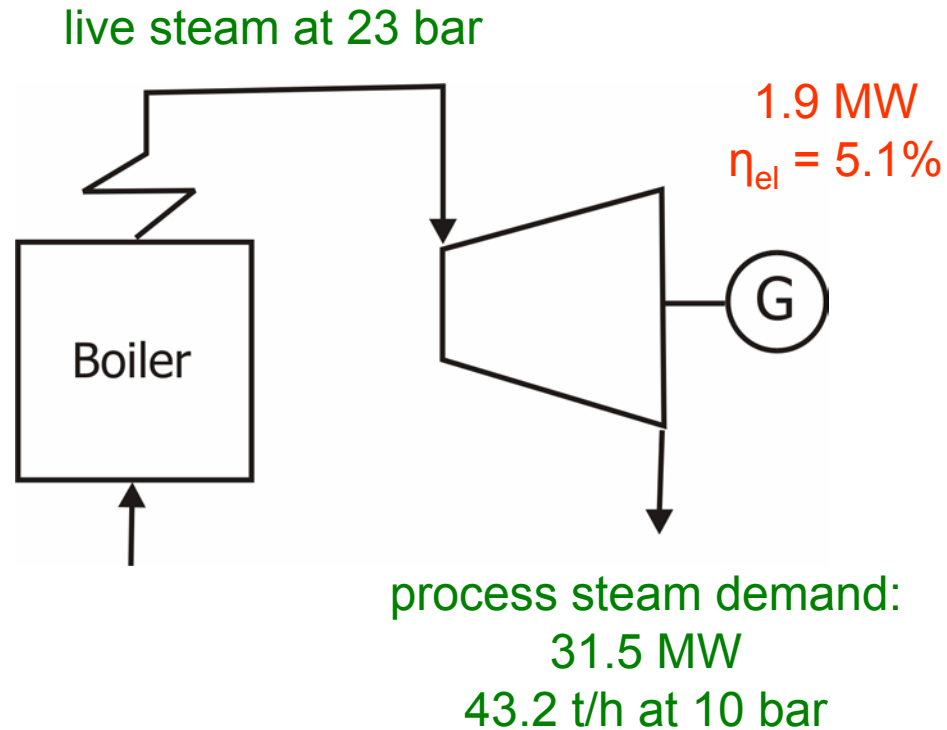


Eco-tax-reform

	Scope	Effect for renewables and CHP
mineral oil tax (was increased as part of the eco-tax reform)	combustion of gasoline, diesel, natural gas and liquid gas	CHP plants: total exemption from the mineral oil tax (natural gas: 0.55 ct/kWh _{LHV})
electricity tax	electricity consumption paid by plant operator, apportioned to consumers	decentral plants < 2 MW which cover autoproducers own use: tax exemption (2.05 ct/kWh)

The eco tax revenues are used to reduce the federal contribution to the statutory pension insurance (socio-ecological tax reform) and for funding of ecological programs

Mineral oil tax: steam turbine example



Mineral oil tax exemption for back pressure			
		CHP	reference boiler
fuel consumption	[MW]	38.0	35.8
full load hours	[h/a]	7,000	7,000
gas price	[ct/kWh]	3.00	3.00
natural gas costs	[10 ³ €/a]	7,971	7,508
mineral oil tax exemption	[10 ³ €/a]	1,461	
total fuel costs	[10 ³ €/a]	6,510	7,508
fuel costs savings	[10 ³ €/a]	998	

Concluding comments

- ▶ The now established emission trade system is a powerful instrument for climate protection, but its effectiveness can be hindered by over-allocation.
- ▶ The effectiveness of political measures for the support of renewable energies and decentral CHP plants is to a high degree dependent on the security granted by fixed remuneration.
- ▶ The existing feed-in laws in Germany focus on electricity production. Similar provisions for heat from renewable energies and CHP plants would be useful.
- ▶ For operators of small plants, like decentral CHP, the costs of providing the required data and expert opinions by authorized assessors is very high.
- ▶ The reactions of the plant operators to political measures are sometimes quite inventive and can undermine the effectiveness of the measures.
To ensure the achievement of the national emission reduction targets, careful analysis and modelling of the overall system is useful.

