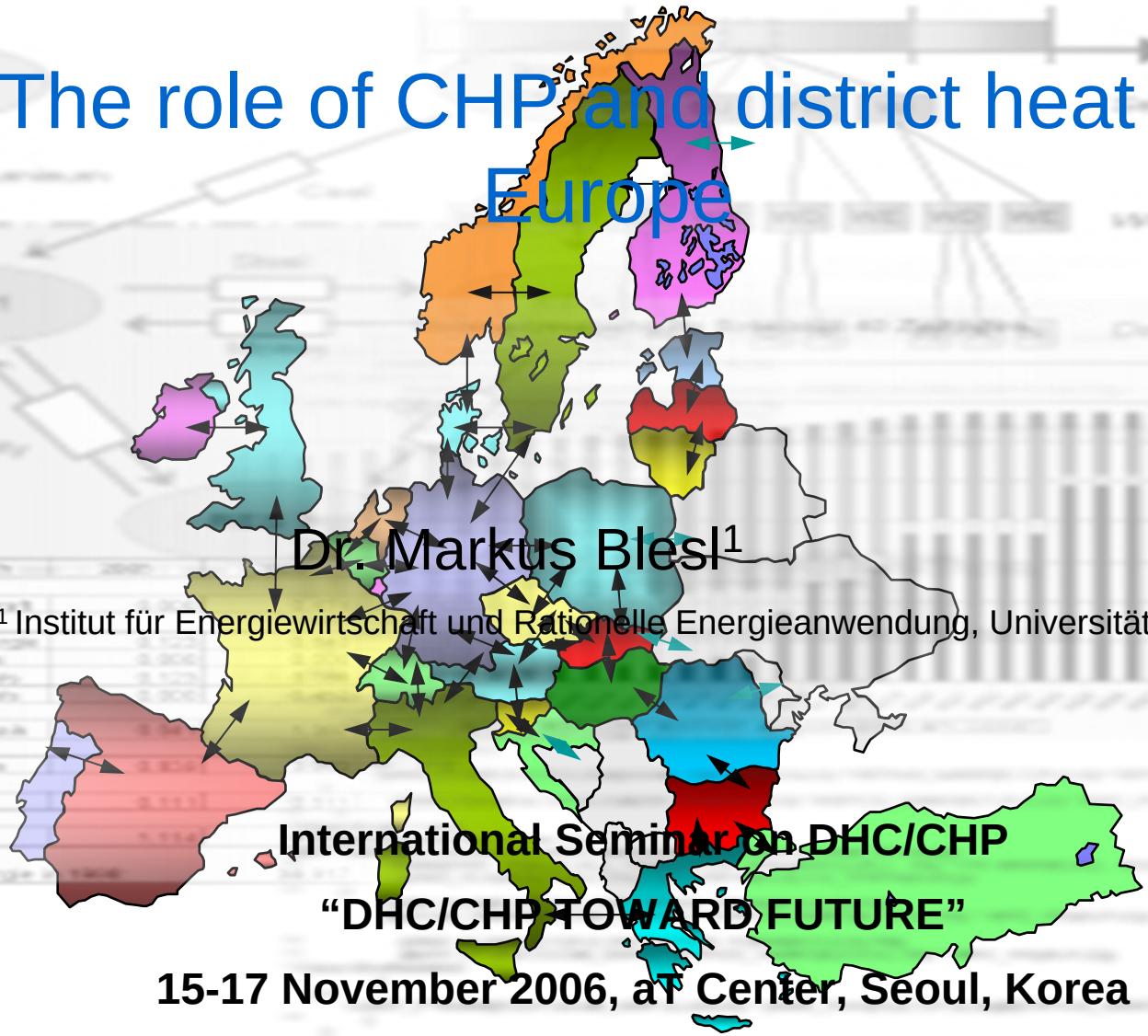
The role of CHP and district heat in Europe



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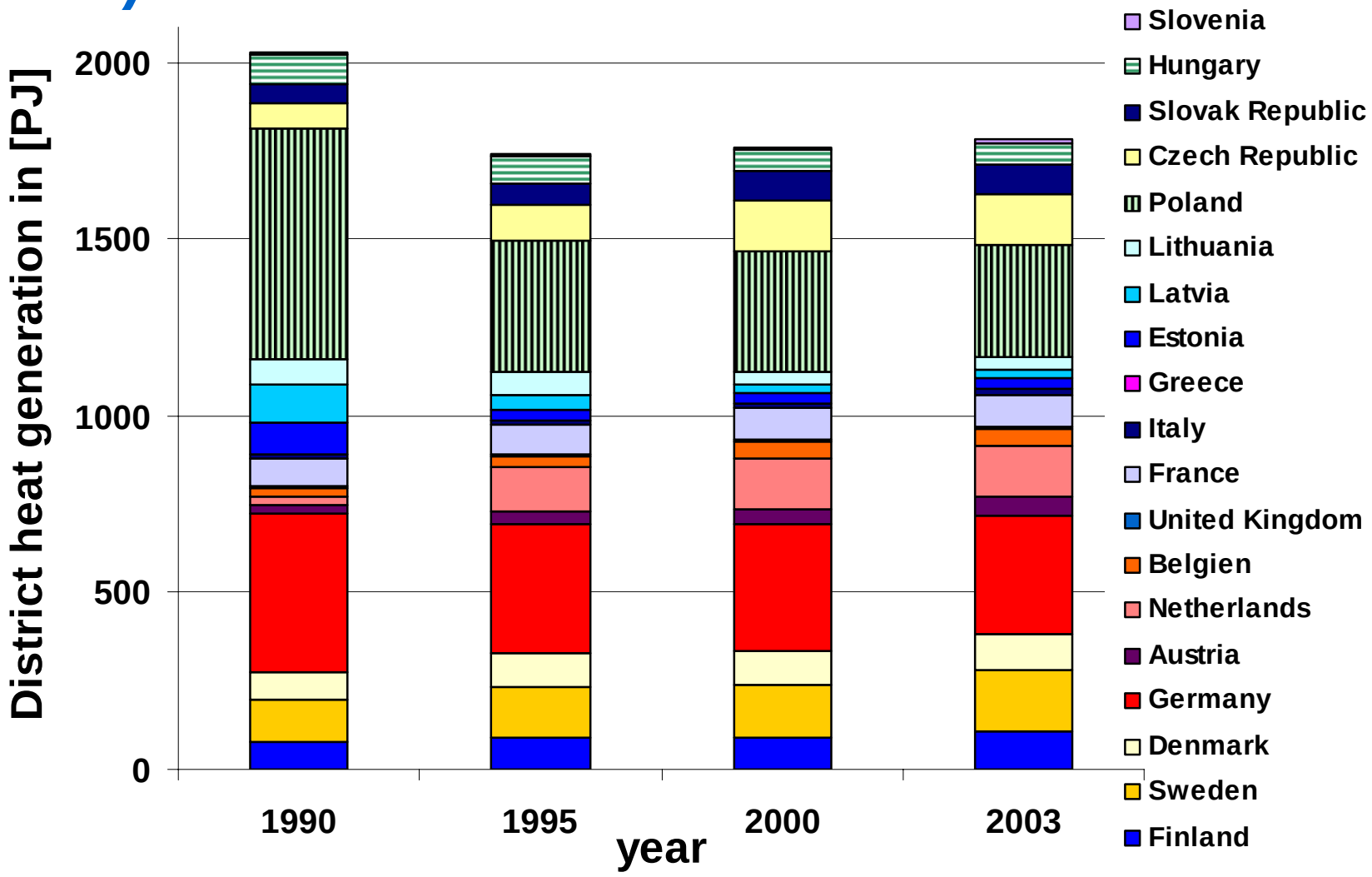
International Seminar on DHC/CHP

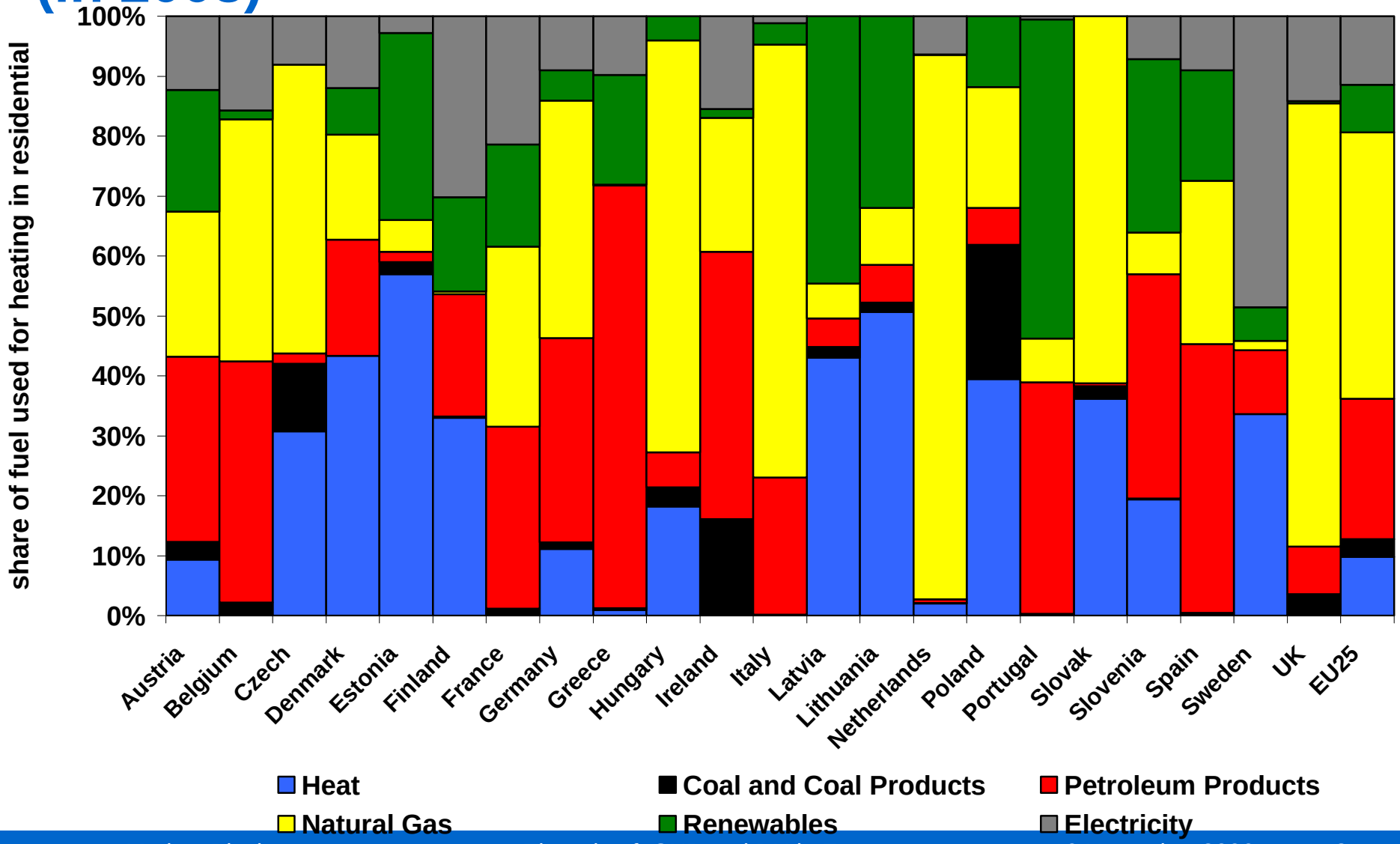
“DHC/CHP TOWARD FUTURE”

15-17 November 2006, aT Center, Seoul, Korea

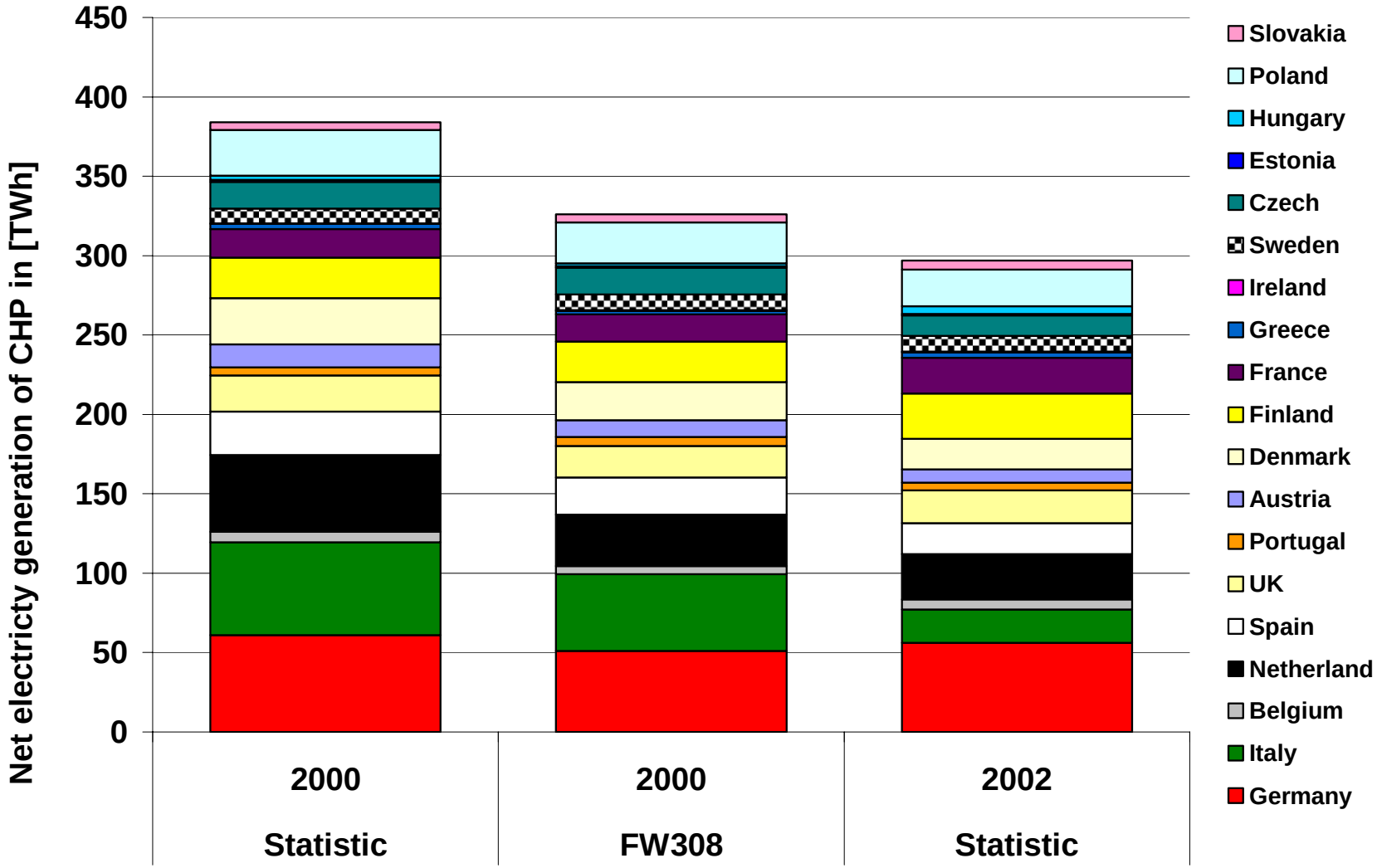
Statistic of District heat generation in Europe (EU25)



Fuel used in residential for heating and hot water (in 2003)



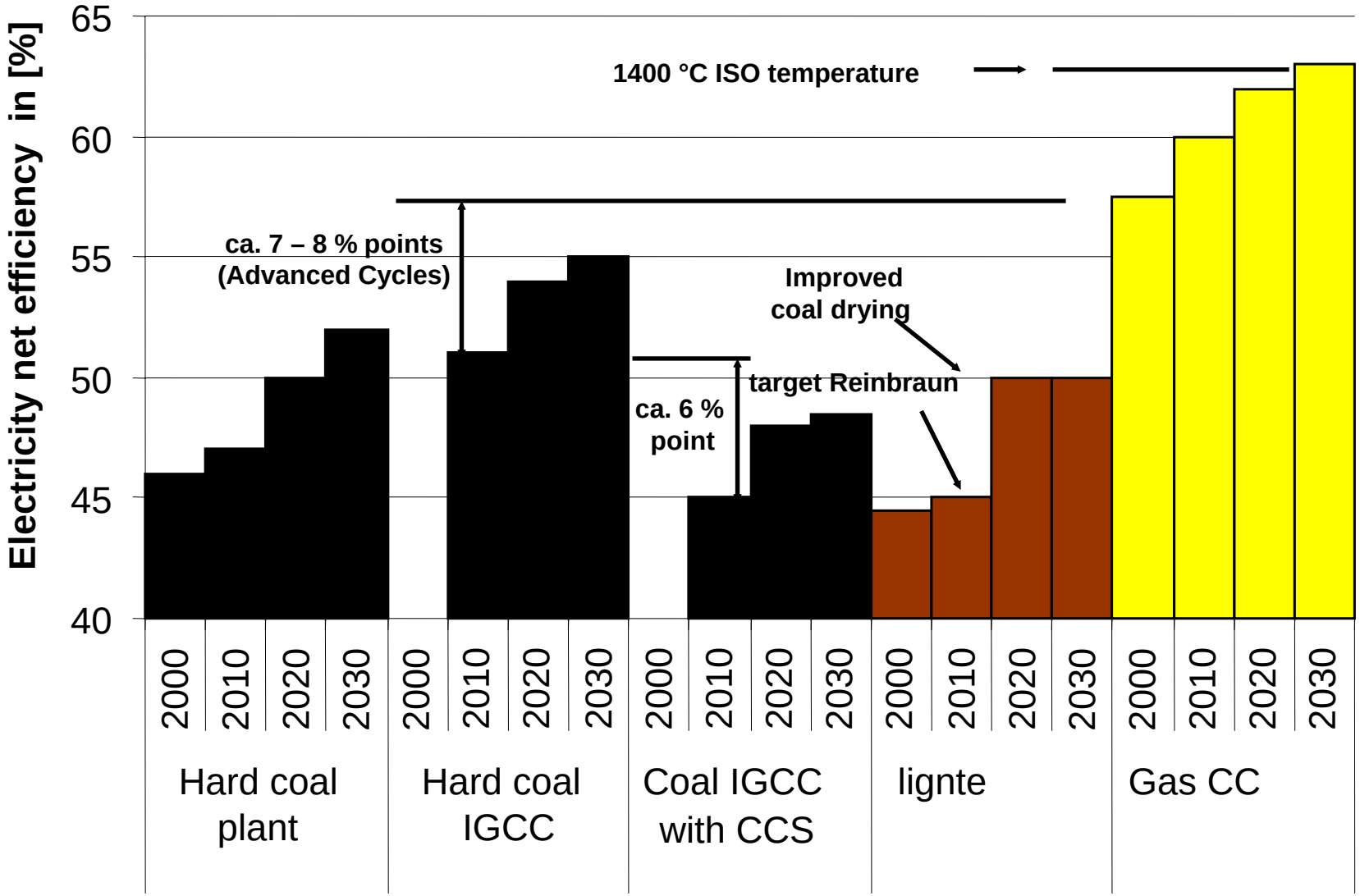
Net electricity generation of CHP in Europe (EU25) – Statistic / Problems



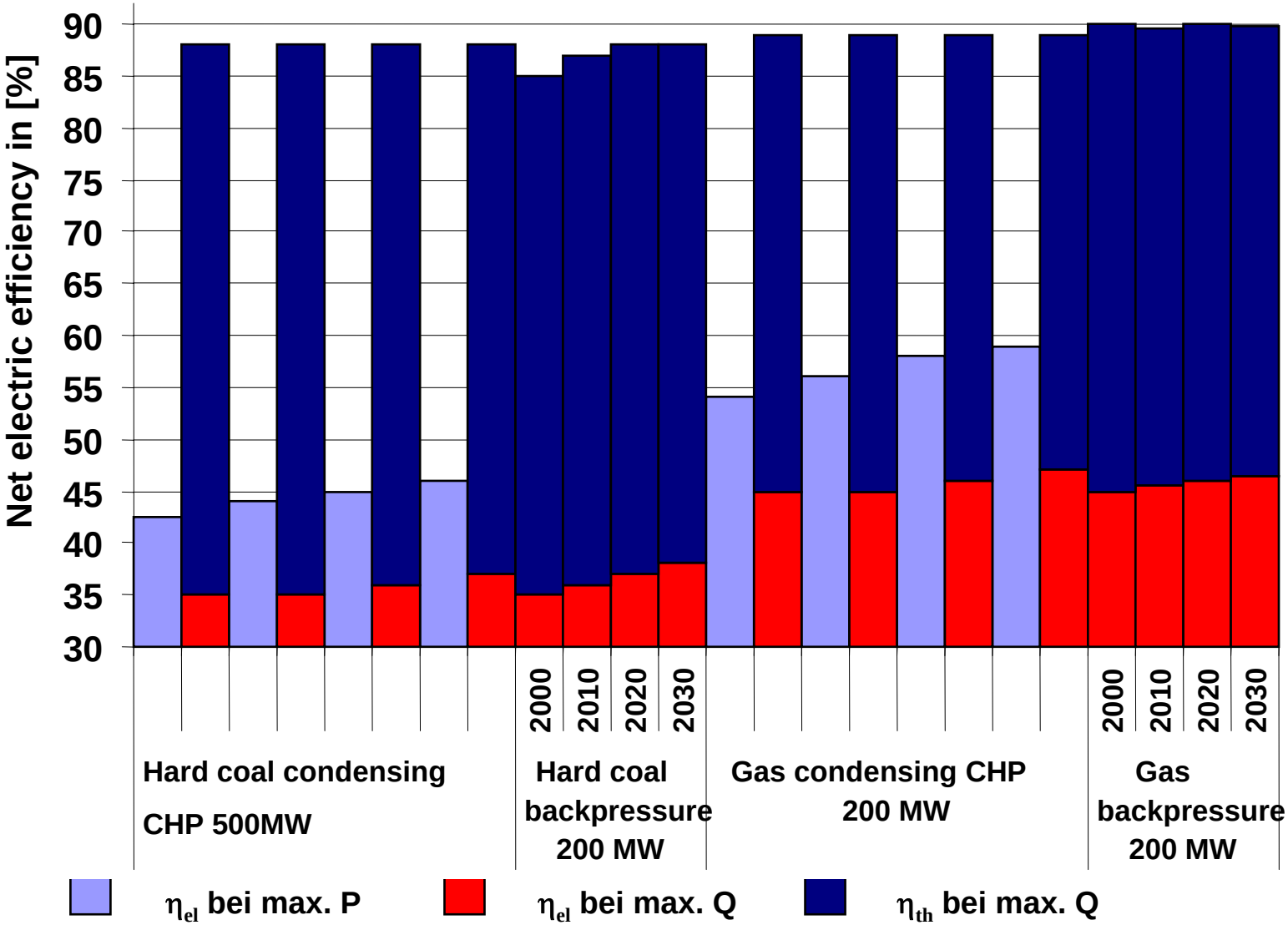
Policy measures in the European electricity market

- **Liberalisation of the electricity market (directive of the EC from 1997 (96/92/EG) and 2003 (2003/54/EG)**
- **Kyoto-Protocol and Emission trading**
- **Renewable Energy Directive (directive of the EC 2003/54/EG)**
- **Promotion of combined heat and power (directive on promotion of cogeneration based on a useful heat demand in the internal energy market (2004/8/EC))**
- **Energy infrastructure and security of supply**
- **Harmonization of the European energy taxation**

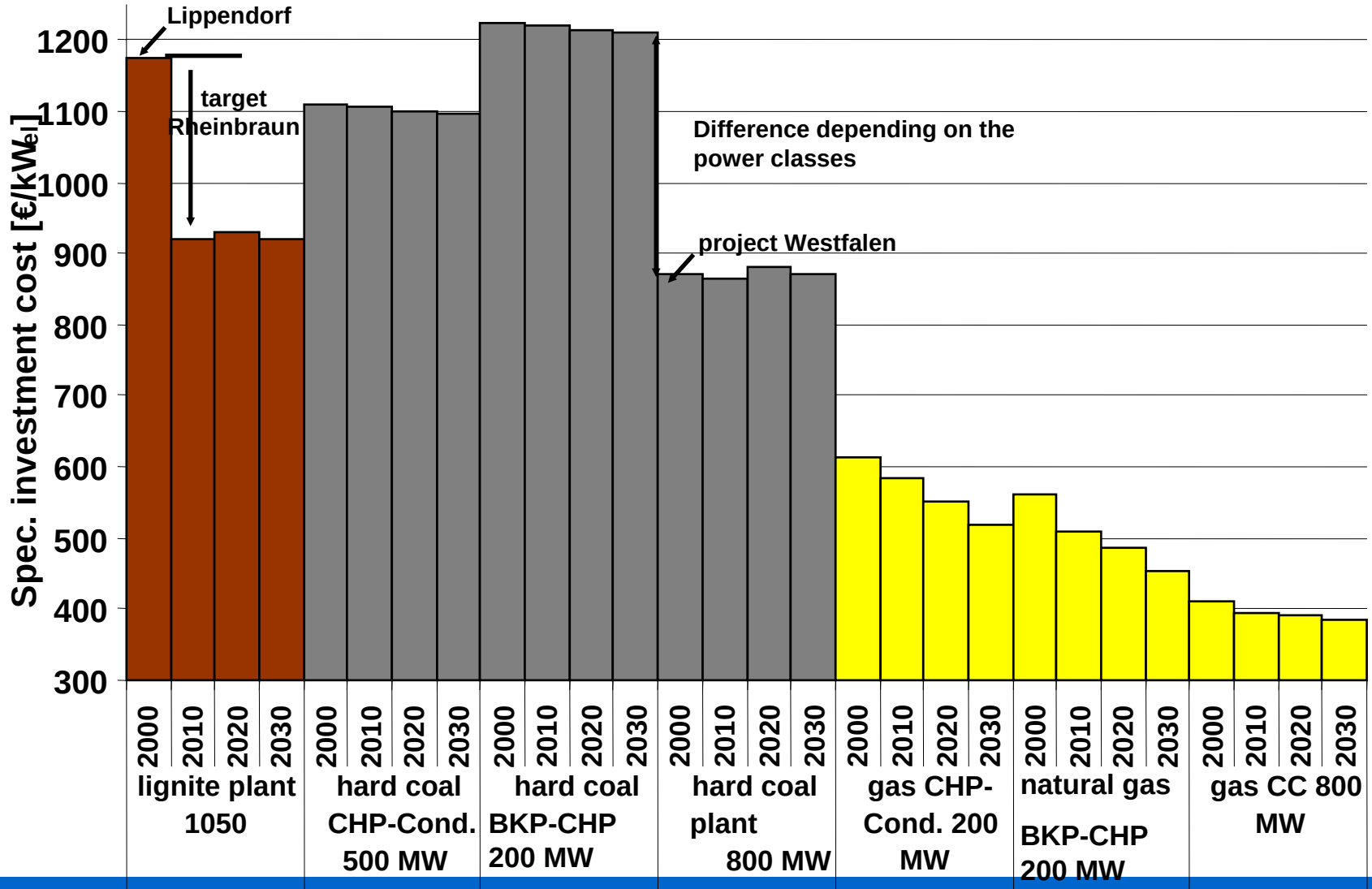
Electric efficiency of power plant in the future



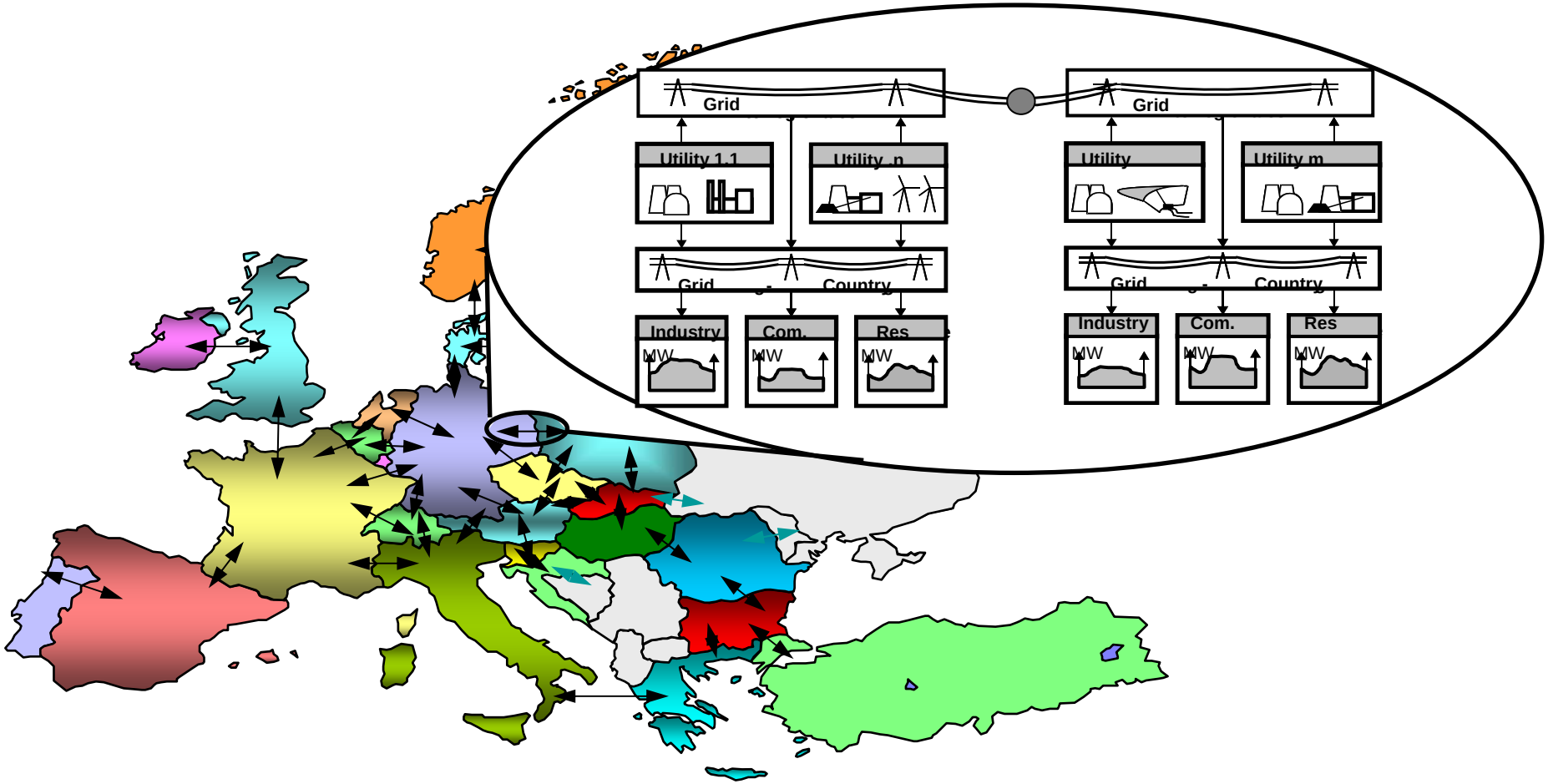
Electrical efficiency of CHP in the future



Specific investment cost of different power plants and CHP-plants



Model of the Electricity and Gas market – TIMES-EG



TIMES – EG (European Electricity and Gas Market)

- Technical, ecological and economical optimisation model based on the model generator TIMES
- Technology oriented bottom-up model with prefect foresight
- 30 region model (EU 25 + Ro, Bu, Tu, N, CH)
- Detailed power generation sector based on a IER power plant database with 25,000 units included
- Country specific differences for characterisation of new power plants and CHP (CO_2 sequestration and capture options included)
- Detailed electricity exchange balances based on ETSO statistics
- Consideration of CHP expansion options
- Renewable potential (onshore wind, offshore wind, geothermal, biomass, biogas, hydro (small, middle, large))
- Country specific availability factors for renewable
- Country specific heat and electricity demand reduction options
- GHG/ Pollutants : CO_2, CH_4, N_2O, NO_X, SO_X, particles included

Scenario definition

Reference case (REF)

- no strict climate policy or additional promotion of any technology or energy carrier

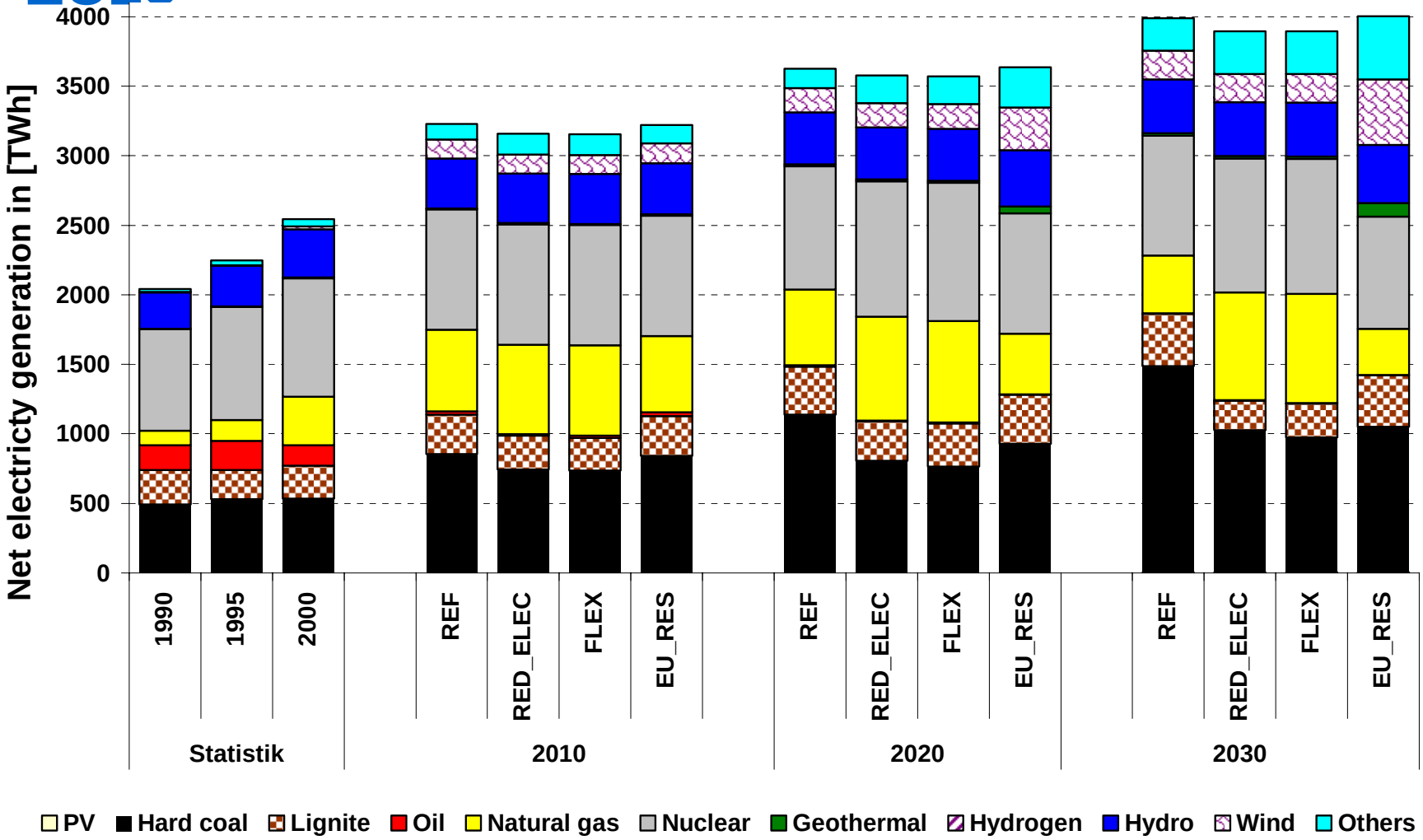
CO_2-reduction scenarios (Kyoto target and beyond - in 2010 8 % and in 2030 15.6 % CO_2-emission reduction compared with 1990):

- CO_2 - Emission target emission targets have to be met without any contribution of the residential sector **(RED_ELEC)**
- CO_2-reductions based on CHP plants in the residential sector are taken into account to fulfil the reduction target target for the EU25 (**FLEX**)

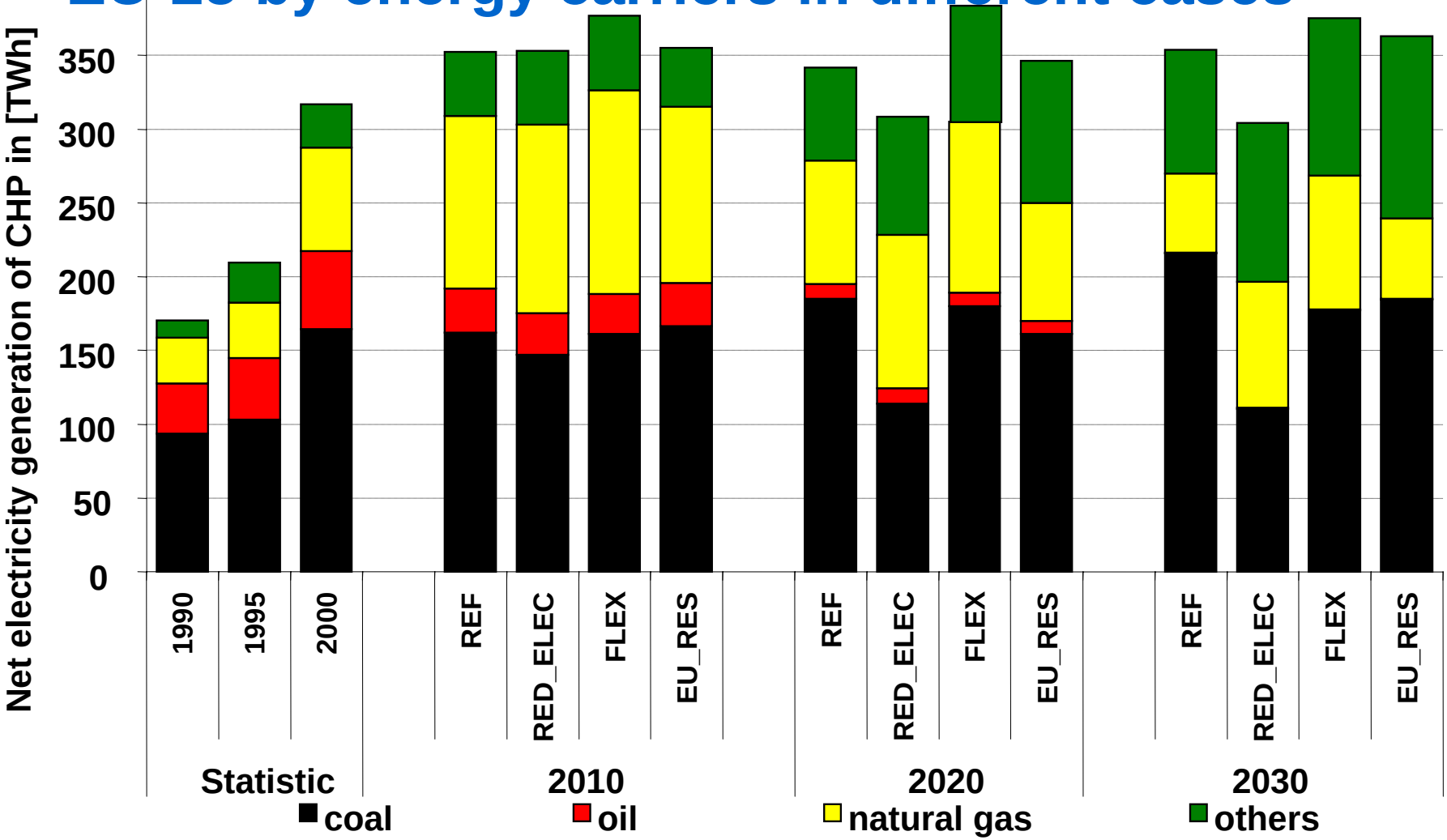
Renewable scenarios:

- Renewable electricity consumption targets for EU25 (**EU_RES**) (21.5 % in 2010 and 40 % in 2030)

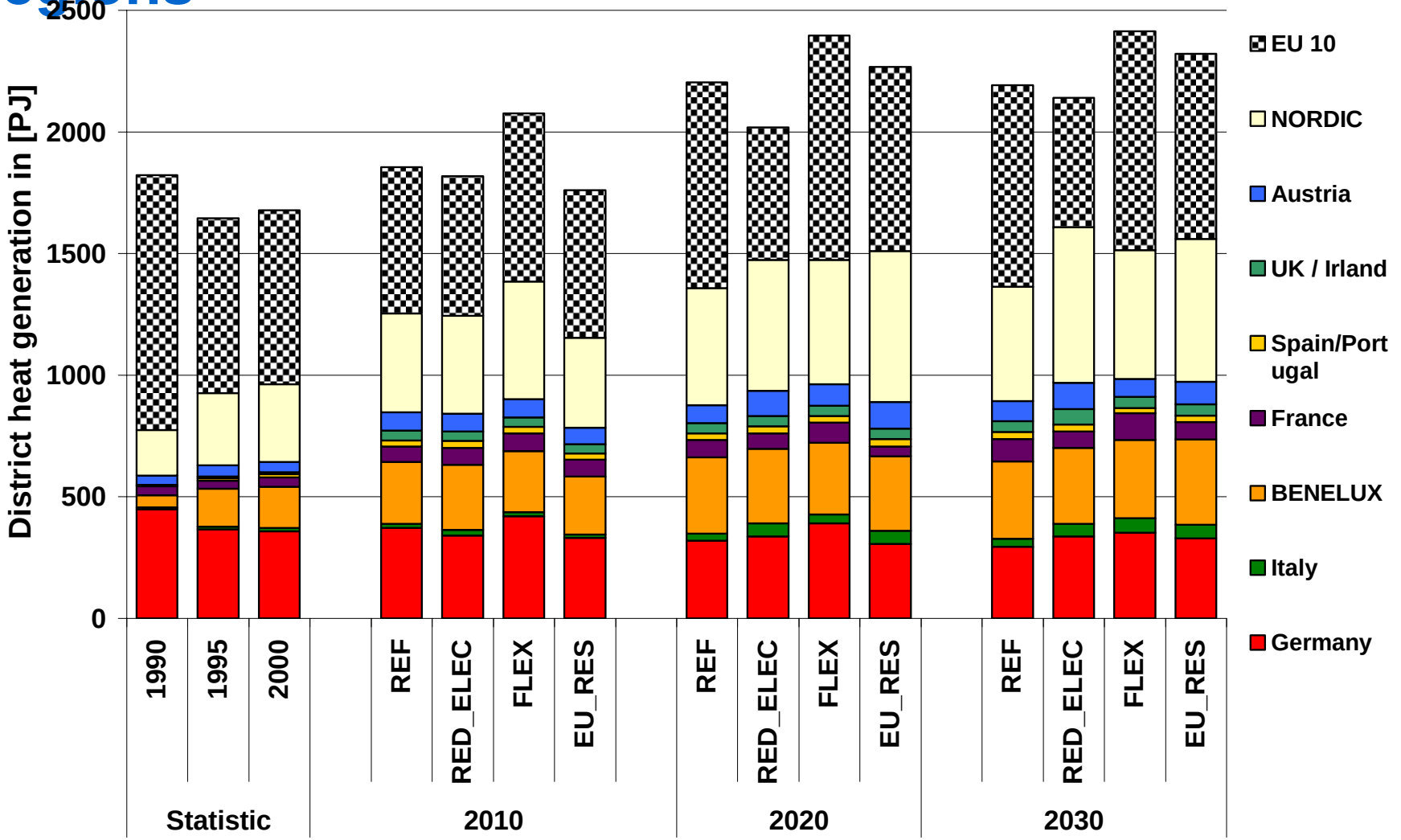
Net electricity generation by energy carriers in EU25



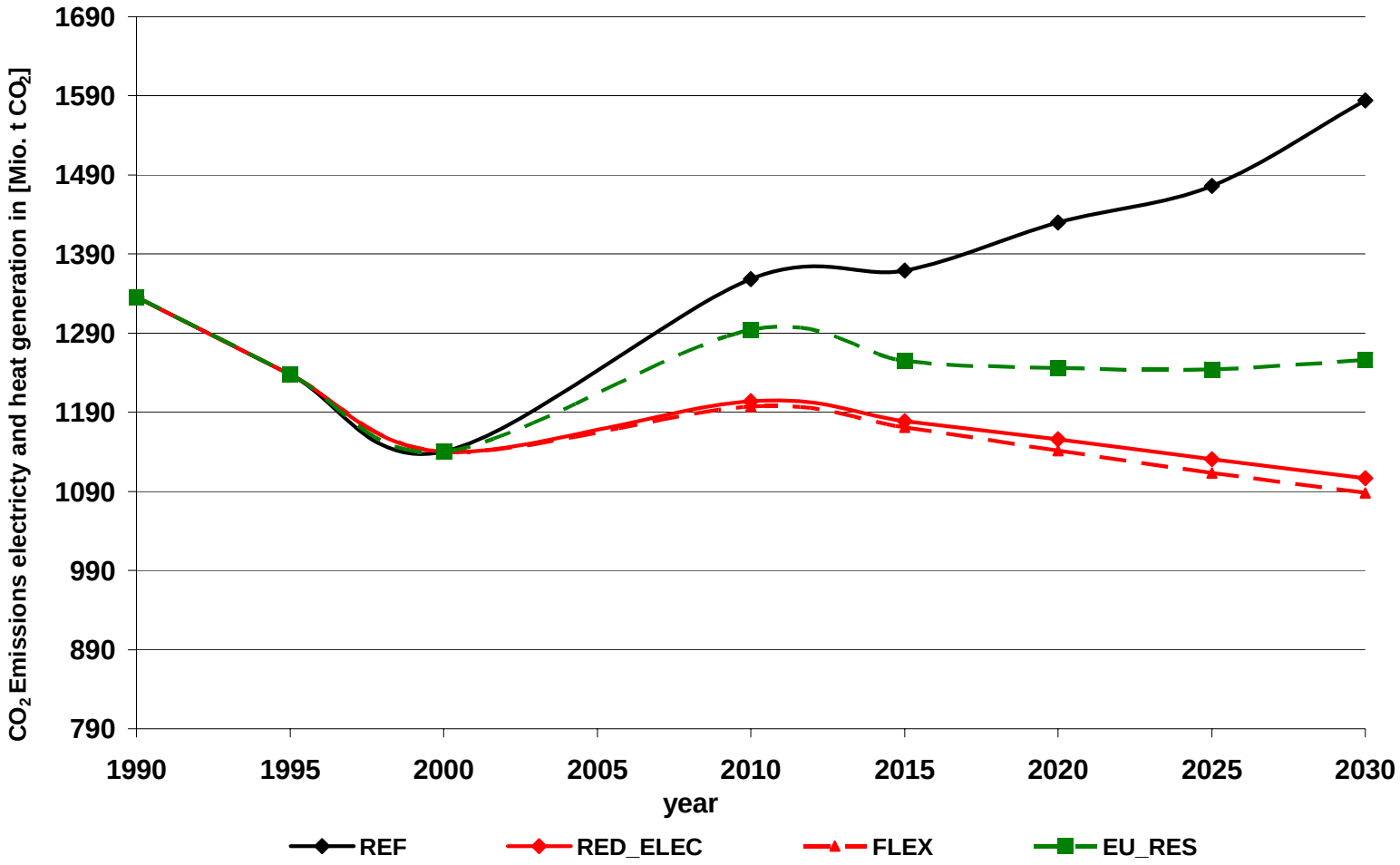
Net electricity generation of CHP plants in the EU-25 by energy carriers in different cases



District heat generation in the EU25 by aggregated regions



Influence of the reduction targets to the total CO2 emissions in the different scenarios for the EU25



Conclusions

- **Depending on the countries in Europe the development of DH will be different because the starting point is of economical growth, national existing laws or cross-subsidies for competitor's energy carriers.**
- **Additional co-generated electric power is produced tendentiously out of natural gas and biomass. The share of district heat from CHP plants gradually rises instead from heating plants.**
- **If all sectors were included efficiently in an emission trading system, the whole system would be improved. DH systems have equal competitive conditions in the heat and electricity market.**
- **The progression of district heat crucially depends on the costs of opening up new district heating supply areas in the future. Only provided that the costs of the extension of supply areas and the costs of starting losses reduce significantly, new district heating supply areas can be opened up economically.**


Thank you for your attention !