EU 20-20 policy implications on the energy system of Germany – an analysis with TIMES PanEU

Markus Blesl, Tom Kober, Ralf Kuder, David Bruchof, Uwe Remme

Institute of Energy Economics and the Rational Use of Energy (IER)
Universität Stuttgart

International Workshop “Carbon and Prospective”
December 16th 2008 in Sophia Antipolis

Current policy in Germany - the integrated energy and climate program of the German government

Target:

- 30 % reduction of the GHG emission by 2020 related to the year 1990

Main elements:

- Doubling of the share of electricity generation by combined heat and power plants (CHP) of the total electricity generation to 25 % by the year 2020
- Increase of the share or renewable energy on the total electricity generation to 25-30 % by 2020, and a continue increase in the future
- Increase of the share of renewable energy related to the heat production to 14 % in the year 2020
- Minimum addition of 10 % bio gas in the natural gas grid by 2030
- *Increase of the share of bio fuels till 2020 to approximately 20 volume percent (corresponds 17 % energetic)*
- Increase the requirements of standards in the building sector (30 % in 2009, after 2012 again a comparable reduction)

The German targets

		2005	2020	2005	2020
GHG	Total	- 11 %		?	
	ETS	- 21 %			
	Non-ETS	- 10 %		- 14 %	
Renew-able energy	Total	8,5 %	20 %	6 %	18 %
	Bio fuels	1 %	10 %	3,8 %	10 %
Energy consumption		- 20 % (related to the Baseline)			

The TIMES Pan-European model (PanEU)

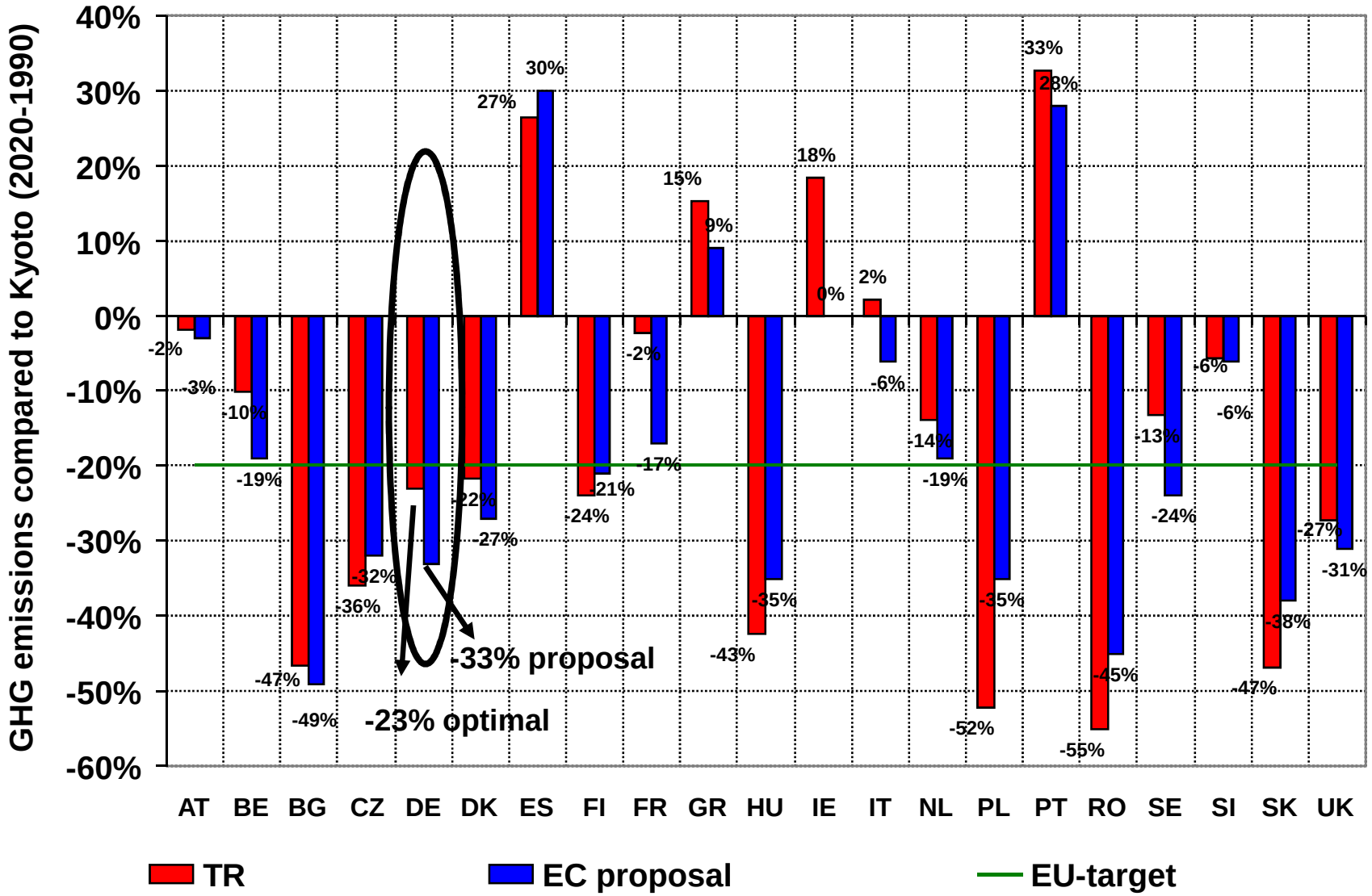
Model description:

- PEM is a 30 region (EU 27 + NO, CH, IS) partial equilibrium energy systems, technology oriented bottom-up model.
- Time horizon: 2000-2050
- 12 time slices (4 seasonal, 3 day level)
- GHG: CO_2, CH_4, N_2O, SF_6
- Others pollutants: SO_2, NO_x, CO, NMVOC, PM2.5, PM10
- The database integrates results of LCI and specific Damages with the aim to integrate the treatment of Externalities in the optimization procedure

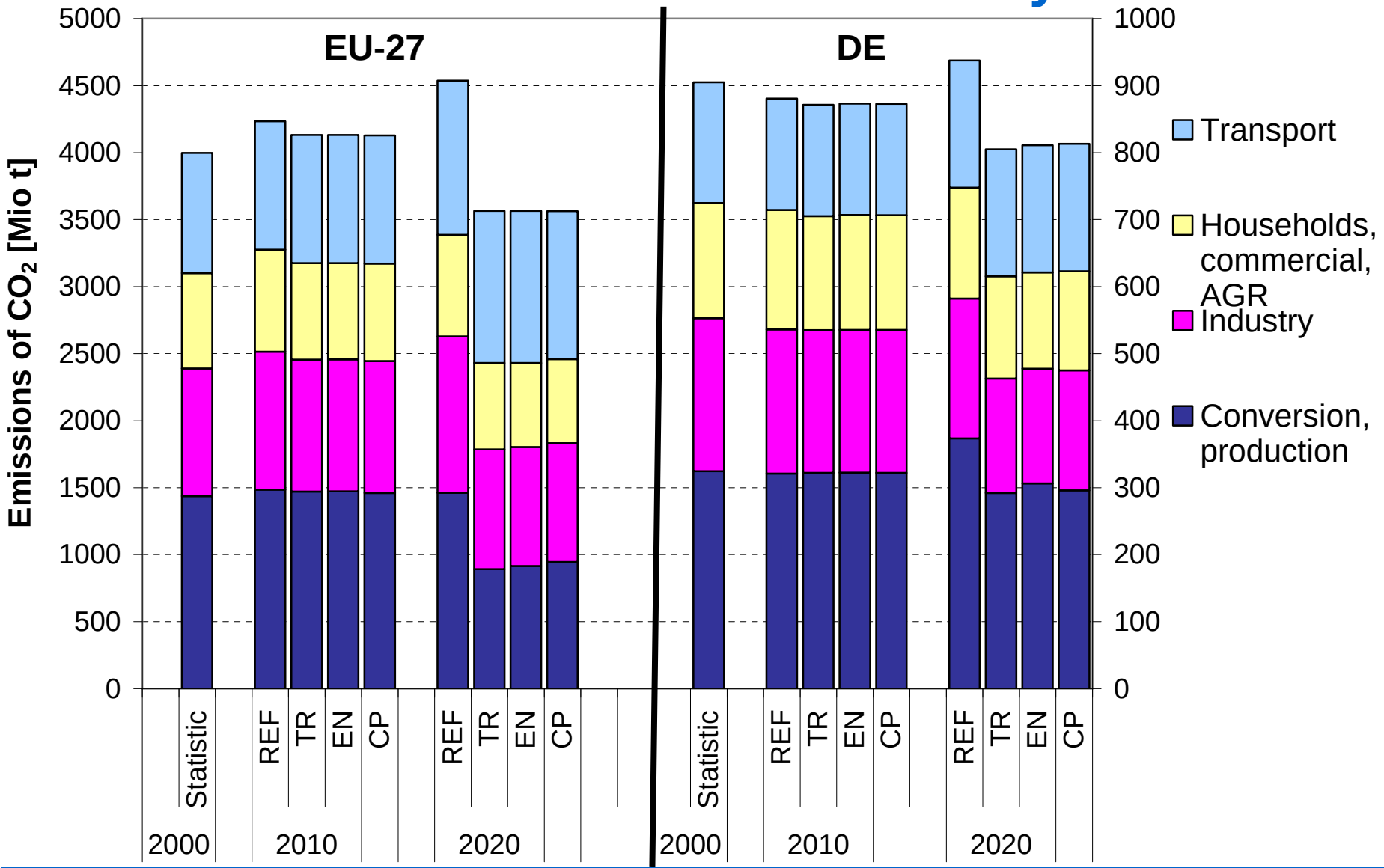
Scenario Definition

Scenario name	Characteristics
REF	- **No emission reduction measures** - **Nuclear phase-out according policy of respective EU countries** - **Minimum renewable energy use according national targets**
Climate policy	**EU GHG emission reduction -71% by 2050** **Minimum 20% renewable energy at FEC in 2020**
CP **C**urrent EU **P**olicy	**- 21% GHG emission reduction ETS sector compared to 2005** - **EC national GHG emission reduction targets for non-ETS sector** - **Nuclear phase-out according policy of respective EU countries**
EN **E**TS and **N**on-ETS Overall Cap	- **21% GHG emission reduction ETS sector compared to 2005** - **10% GHG reduction non-ETS sector EU-27 wide compared to 2005** - **Nuclear phase out according policy of respective EU countries**
TR Emission **Tr**ading	- **Cost optimal burden sharing** - **Nuclear phase-out according policy of respective EU countries**
LC **L**east **C**ost	- **Cost optimal burden sharing** - **Additional use of nuclear (new plants, prolongation of existing plants)**
ES **E**nergy **S**upply Security	- **Cost optimal burden sharing** - **Nuclear phase-out according policy of respective EU countries** - **Reduction of the net import dependency of oil (-30%) and natural gas (-40%) by 2050 compared to 2010**

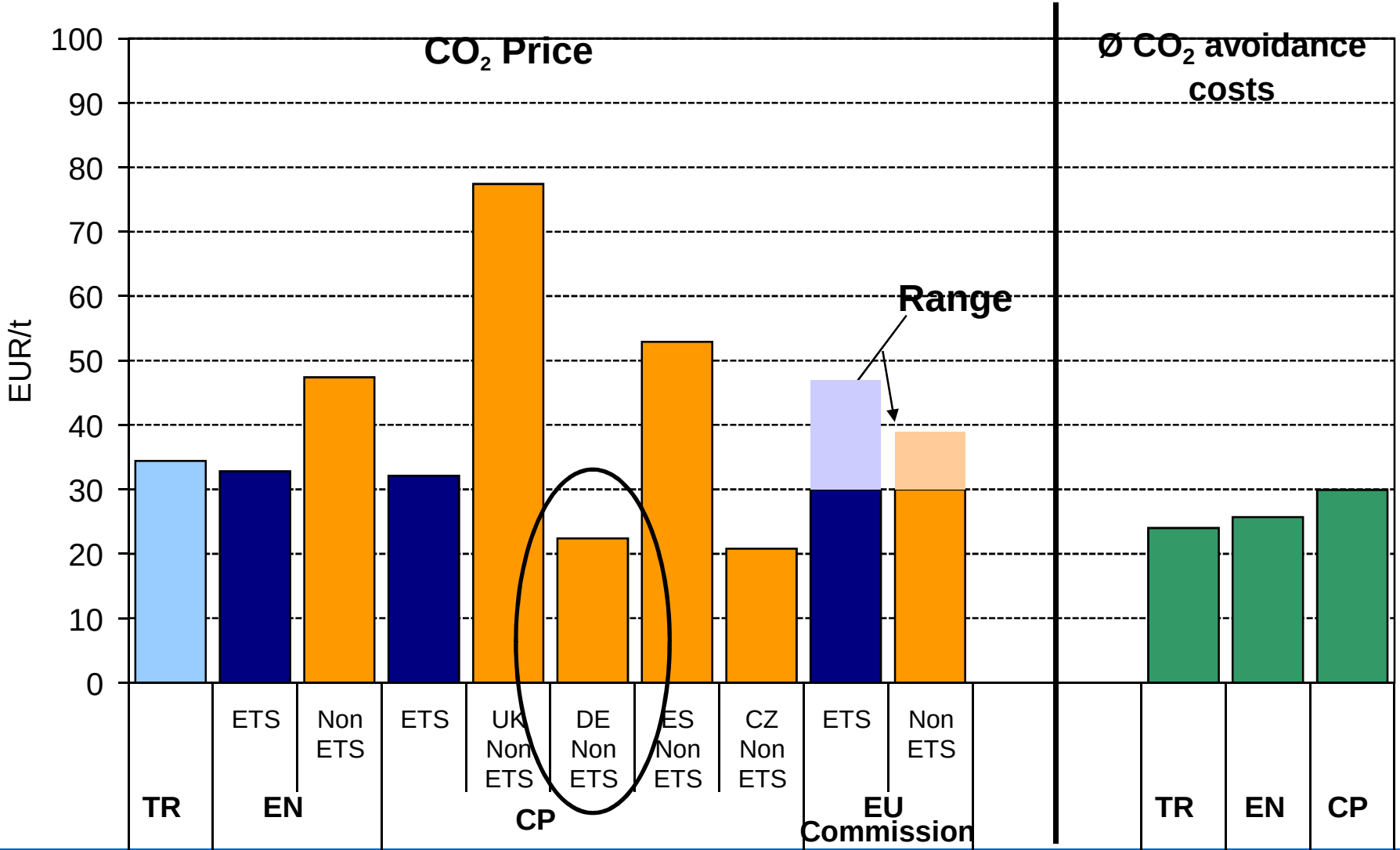
Cost Optimal Burden Sharing of 20% EC 2020 Target



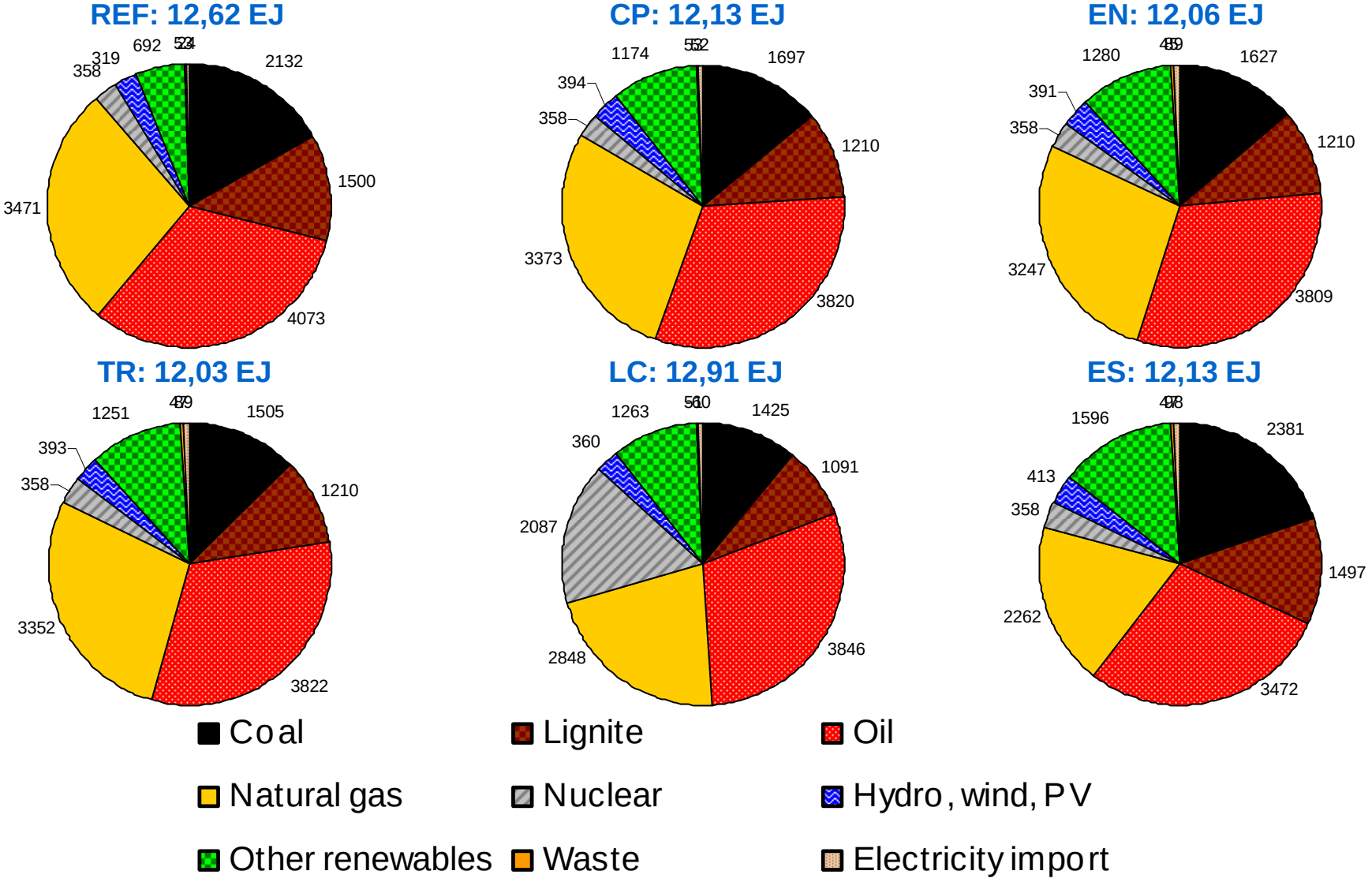
Carbon Emissions EU-27 vs. Germany



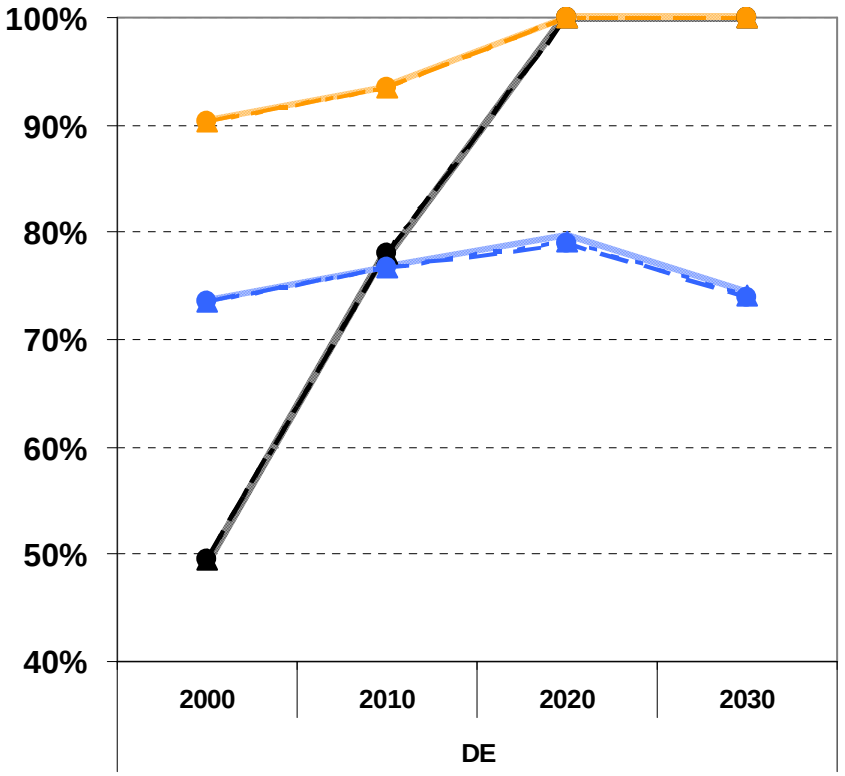
CO_2 Prices and CO_2 Costs in 2020

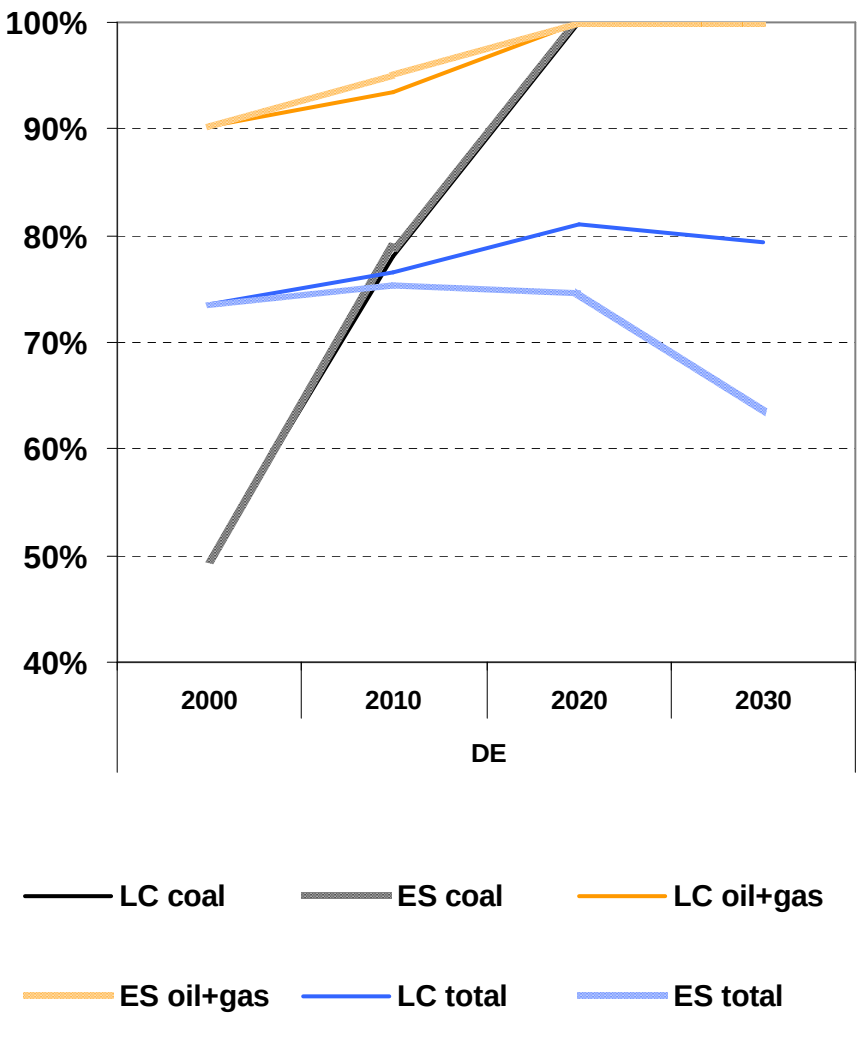


Primary energy consumption Germany in 2020



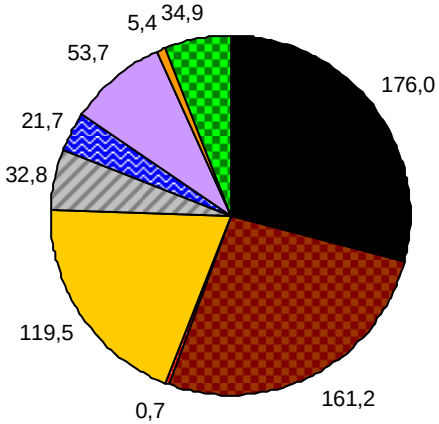
Import dependency of Germany



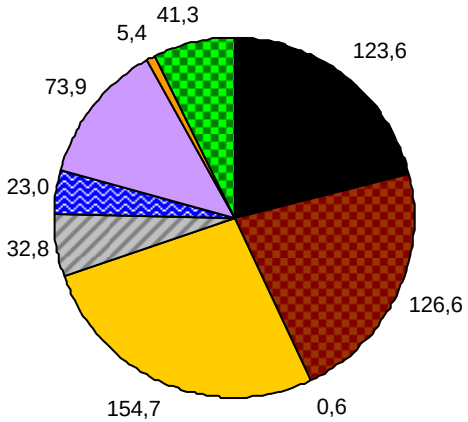


Net electricity generation in Germany in 2020

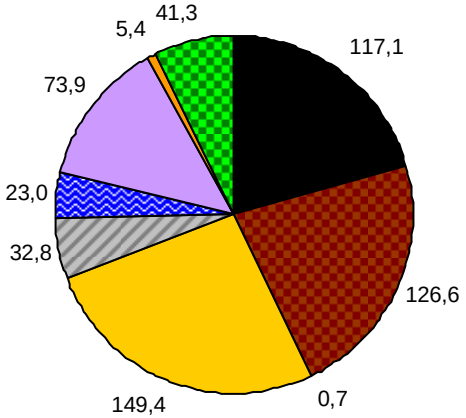
REF: 606,0 TWh (+6,6 Imp)



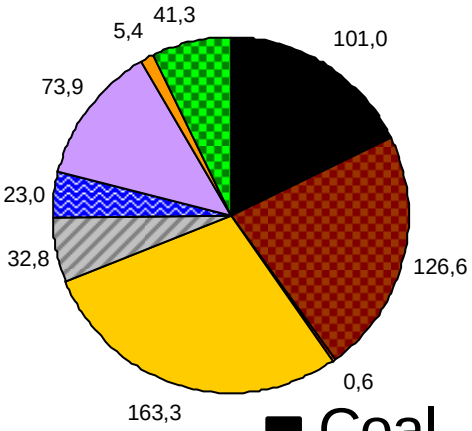
CP: 581,8 TWh (+14,4 Imp)



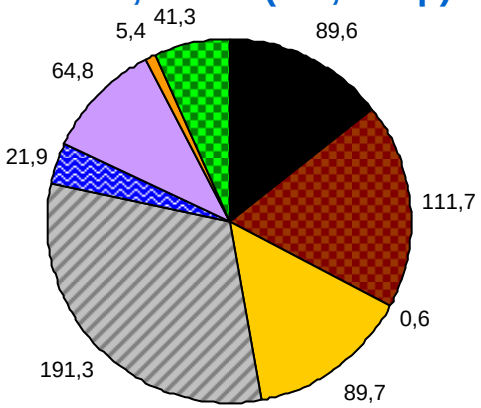
EN: 570,2 TWh (+24,9 Imp)



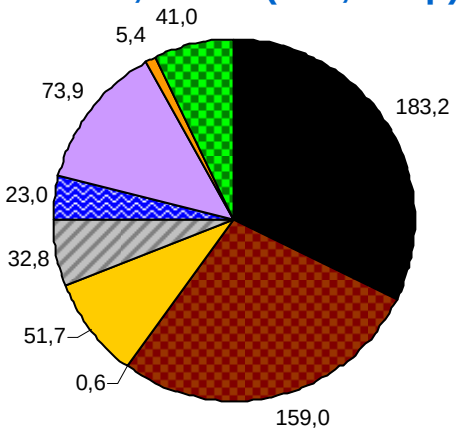
TR: 567,8 TWh (+24,6 Imp)



LC: 616,3 TWh (-16,7 Exp)



ES: 570,7 TWh (+27,2 Imp)



Coal
Lignite
Oil
Natural gas
Nuclear
Hydro
Wind
Solar
Others

Contribution of Germany related to the EU 2020 target

2020 Key figures		DE				
		CP	EN	TR	LC	ES
GHG reduction rel. Kyoto - Basis (DE: 30 %)	[%]	23%	25%	25%	28%	23%
CO2-reduction rel. 2005						
- Total (without International Aviation)	[%]	11,7%	13,4%	13,9%	17,8%	11,6%
- ETS	[%]	10,5%	10,9%	13,1%	20,2%	2,9%
- Non-ETS (DE: 14 %)	[%]	14.0%	16,8%	15,1%	14,5%	23,5%
Share of renewable energy of Final energy consumption (DE: 18 %)	[%]	16%	17%	17%	17%	21%
Share of renewable energy of the Total electricity generation (DE: 30 %)	[%]	25%	25%	25%	22%	25%
Energy efficiency improvement gg. 2006 (DE: 3 %/a)	[%/a]	-2,80%	-2,85%	-2,86%	-2,37%	-2,81%
Share of CHP of the total electricity generation (DE: 25 %)	[%]	25%	28%	25%	19%	15%
Cumulative discounted System cost by 2020 (rel. REF)	[Bio. €]	11,7	12,8	12,0	-1,5	37,8


Thank you for your attention!
www.ier.uni-stuttgart.de