



Clean coal technologies - strengthening coal's contribution to sustainability

Dr. Hans Wolf von Koeller
June 2014

steag

STEAG – Expertise and Fields of Services

Fossils

Coal



Gas



Heavy Oils/Resid.



Renewables

Bioenergy



Solar



Wind



Systems

„Green Island“



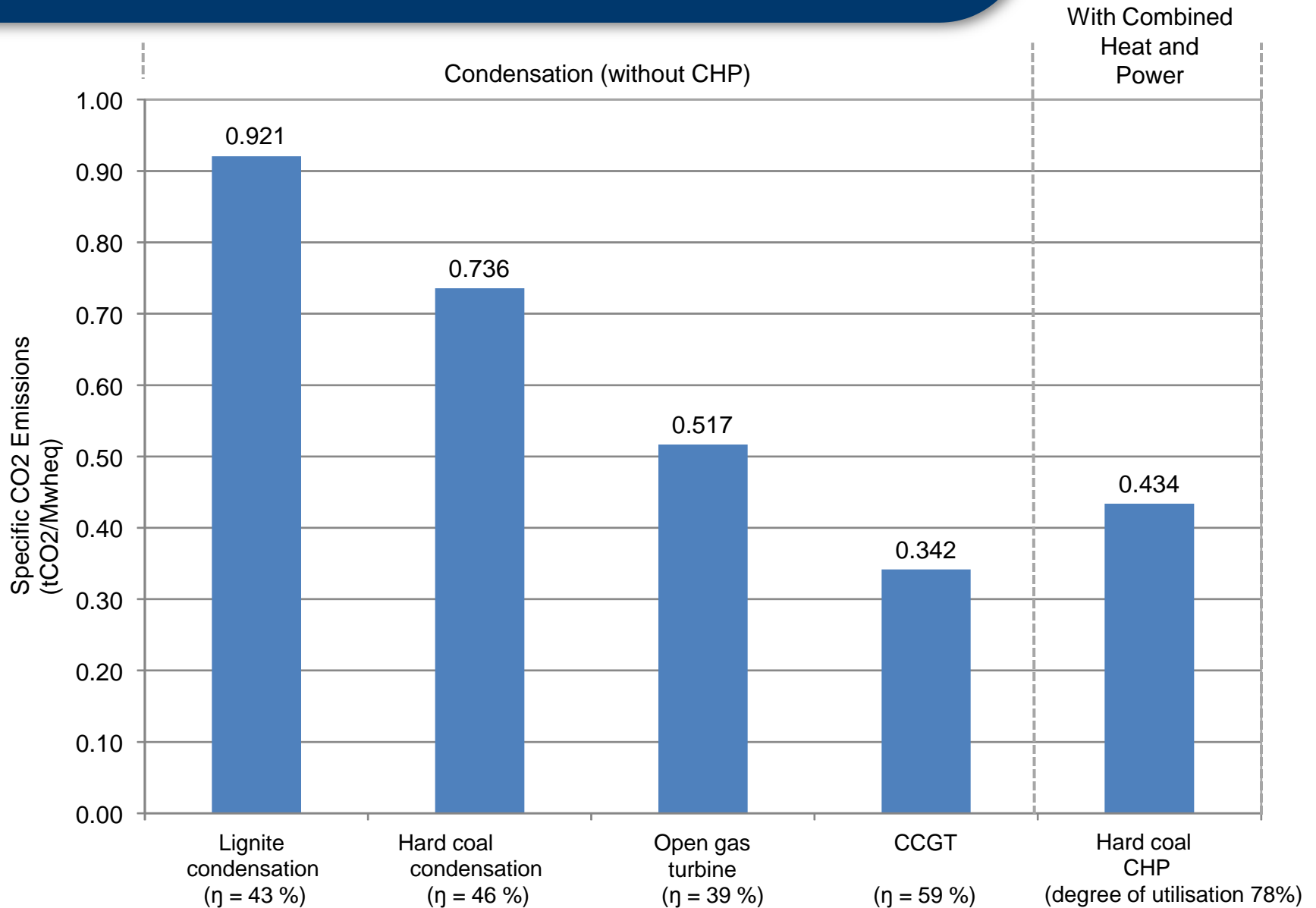
Combined Plants



Storage



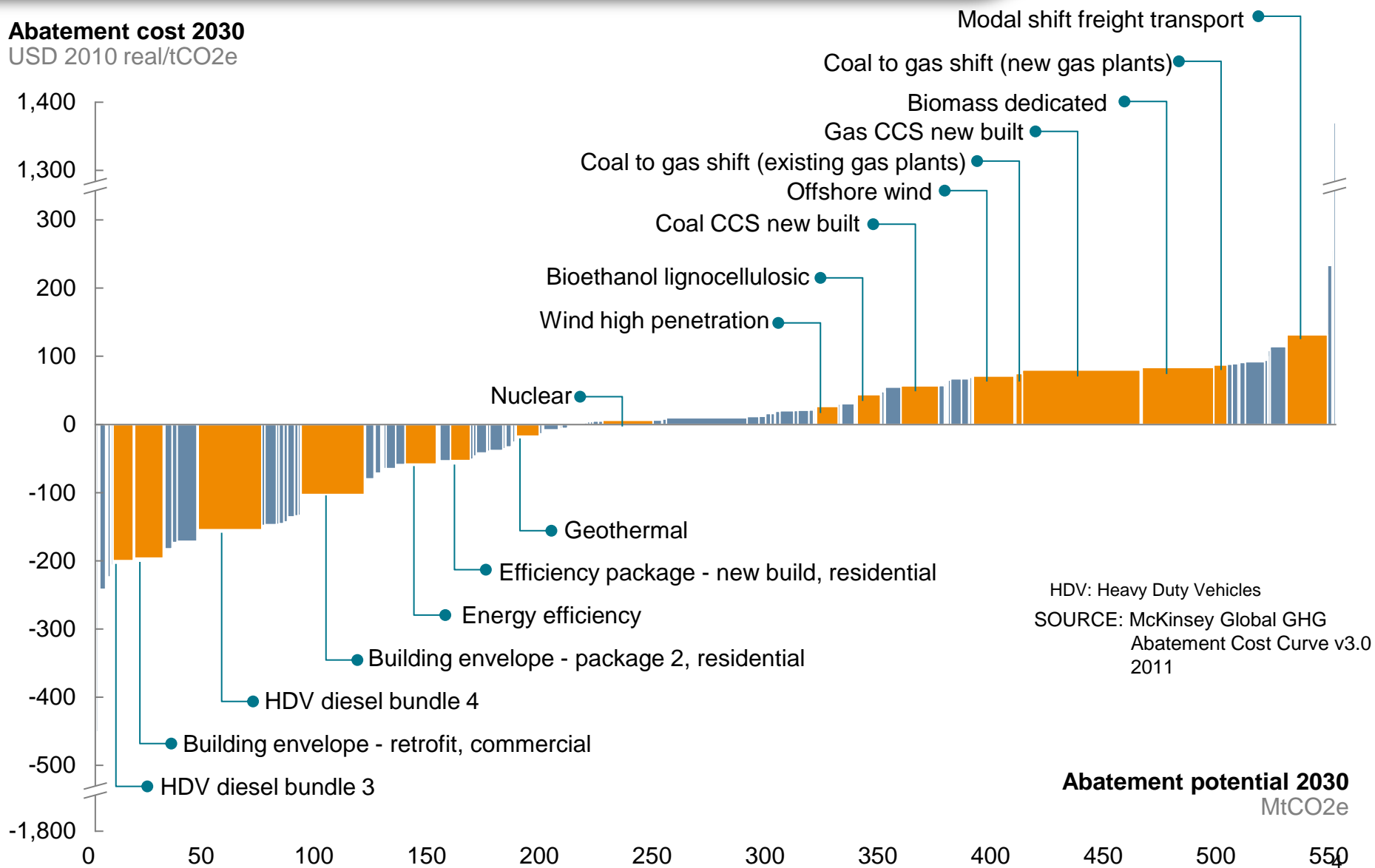
CO₂-Emissions of Different Power Technologies



Greenhouse gas Abatement Cost Curve 2030 - Germany



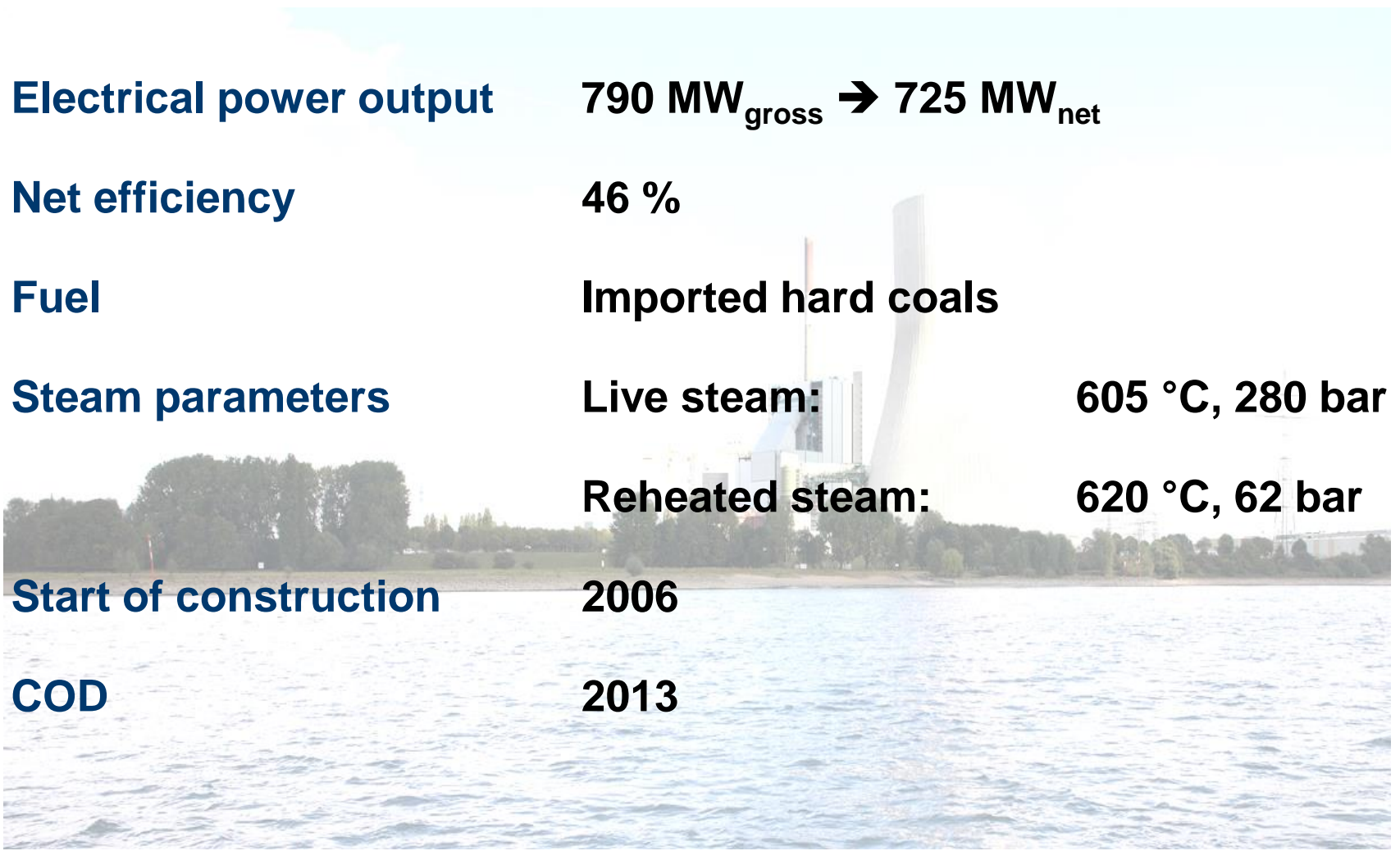
Abatement cost 2030
USD 2010 real/tCO₂e



HDV: Heavy Duty Vehicles
SOURCE: McKinsey Global GHG Abatement Cost Curve v3.0 2011

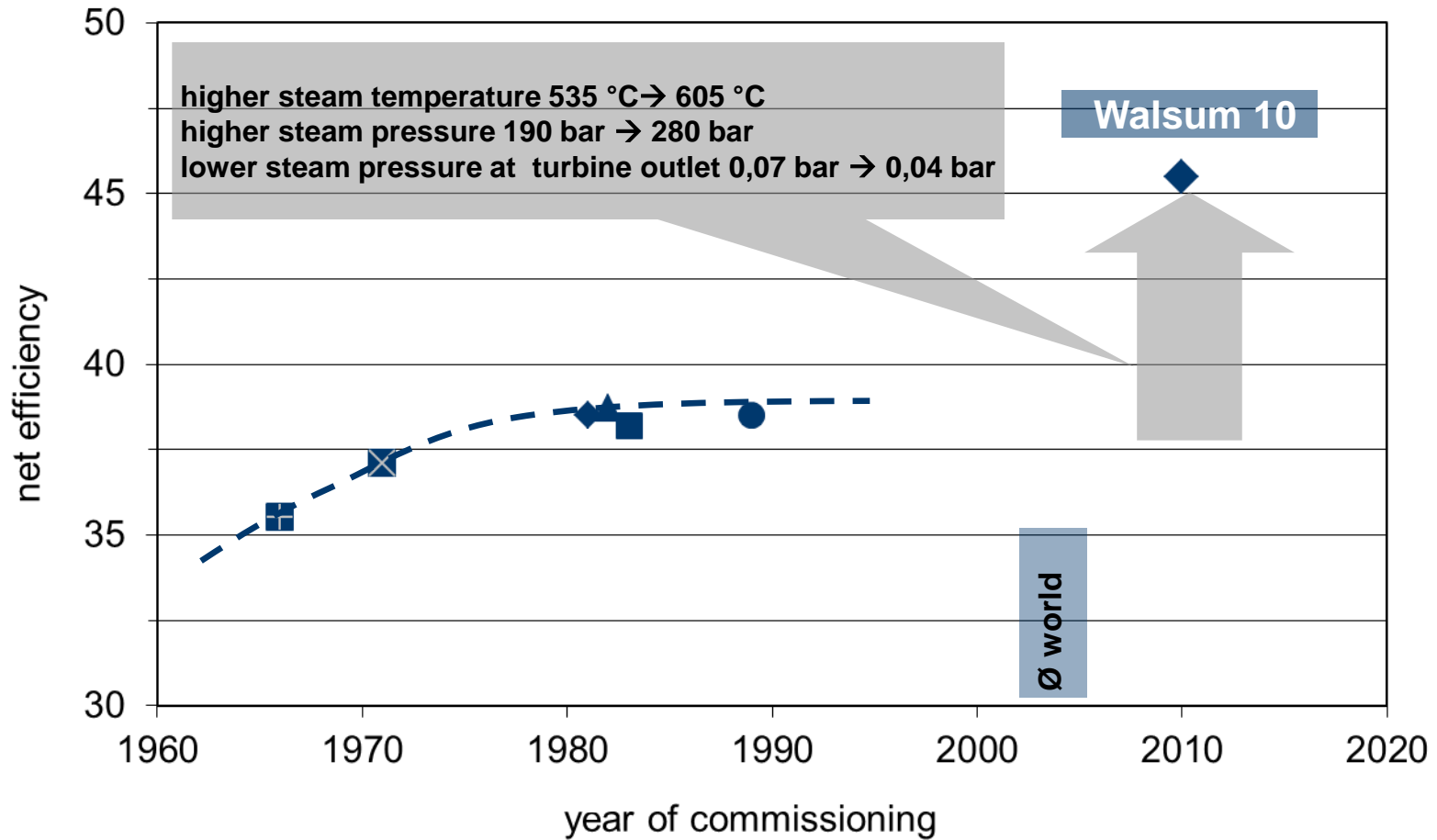
Abatement potential 2030
MtCO₂e

Main Parameters of Walsum 10

A background image showing a large industrial power plant with several tall chimneys, situated on the shore of a large body of water. The sky is overcast.

Electrical power output	790 MW_{gross} → 725 MW_{net}
Net efficiency	46 %
Fuel	Imported hard coals
Steam parameters	Live steam: 605 °C, 280 bar
	Reheated steam: 620 °C, 62 bar
Start of construction	2006
COD	2013

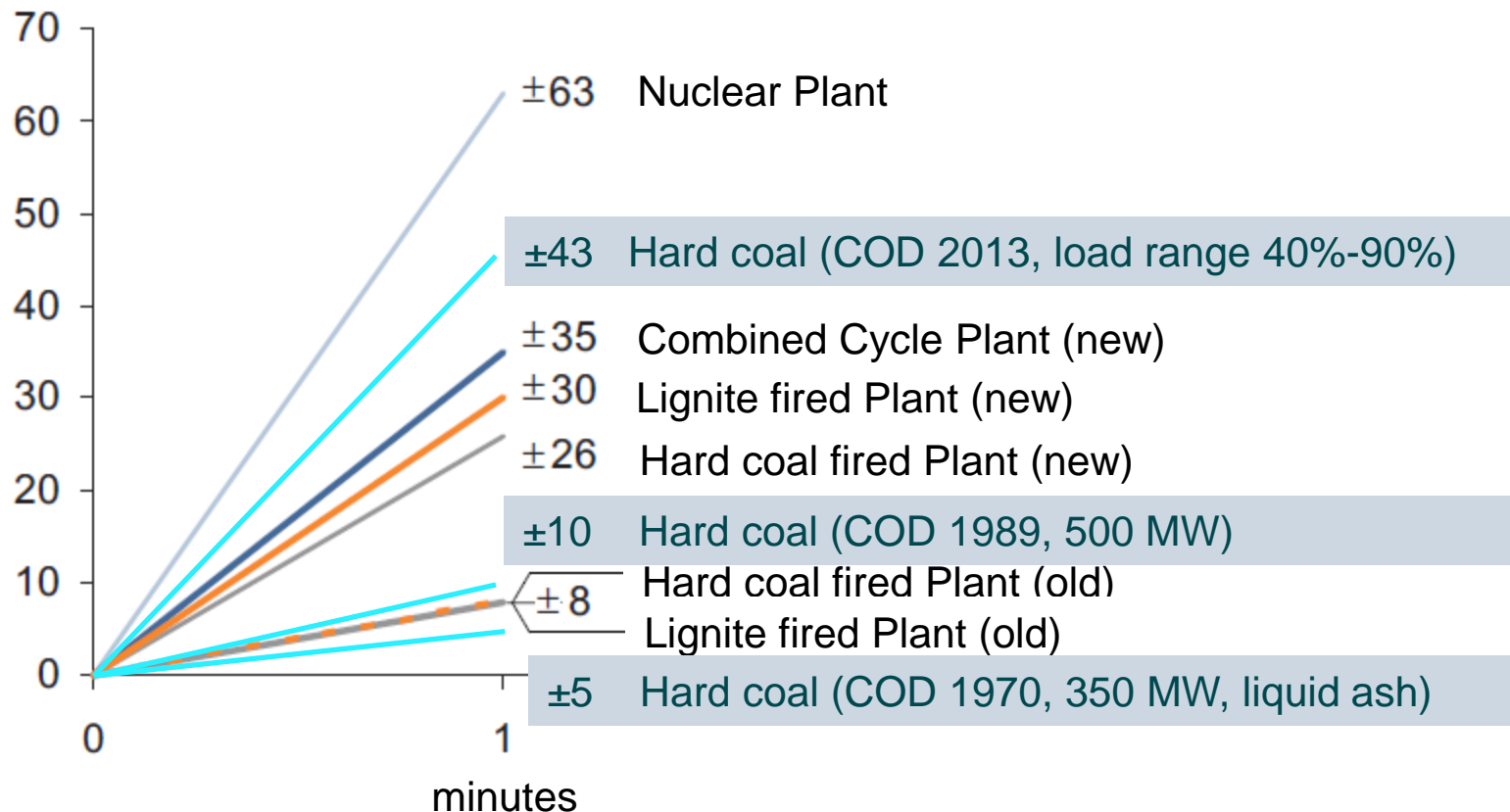
Highest Efficiency



Walsum 10 requires 20% less coal

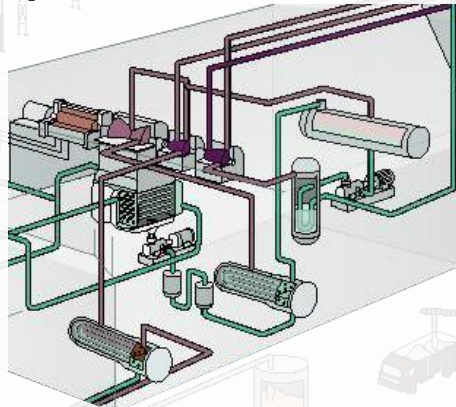
Load Change gradients

max. gradients for
load changes
in MW



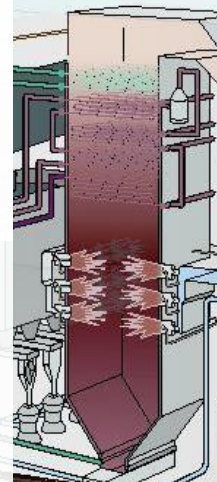
Water Steam Cycle:

- Turbine / Condenser
- Preheating Train
- Feed Water Pumps



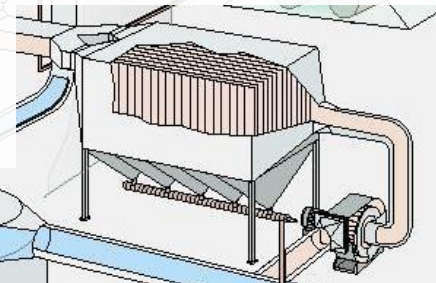
Others:

- Cooling Tower
- Dynamic of Operation
- Frequency Control



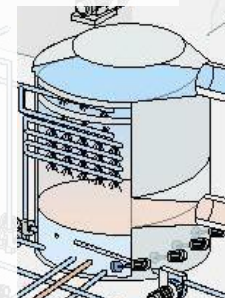
Steam Generator:

- Exchange of Heat Surfaces
- Firing System
- Mills / Classifier
- Fuel Drying Systems



FGD:








- S-Removal
- Pressure Drop
- Demister



ESP:

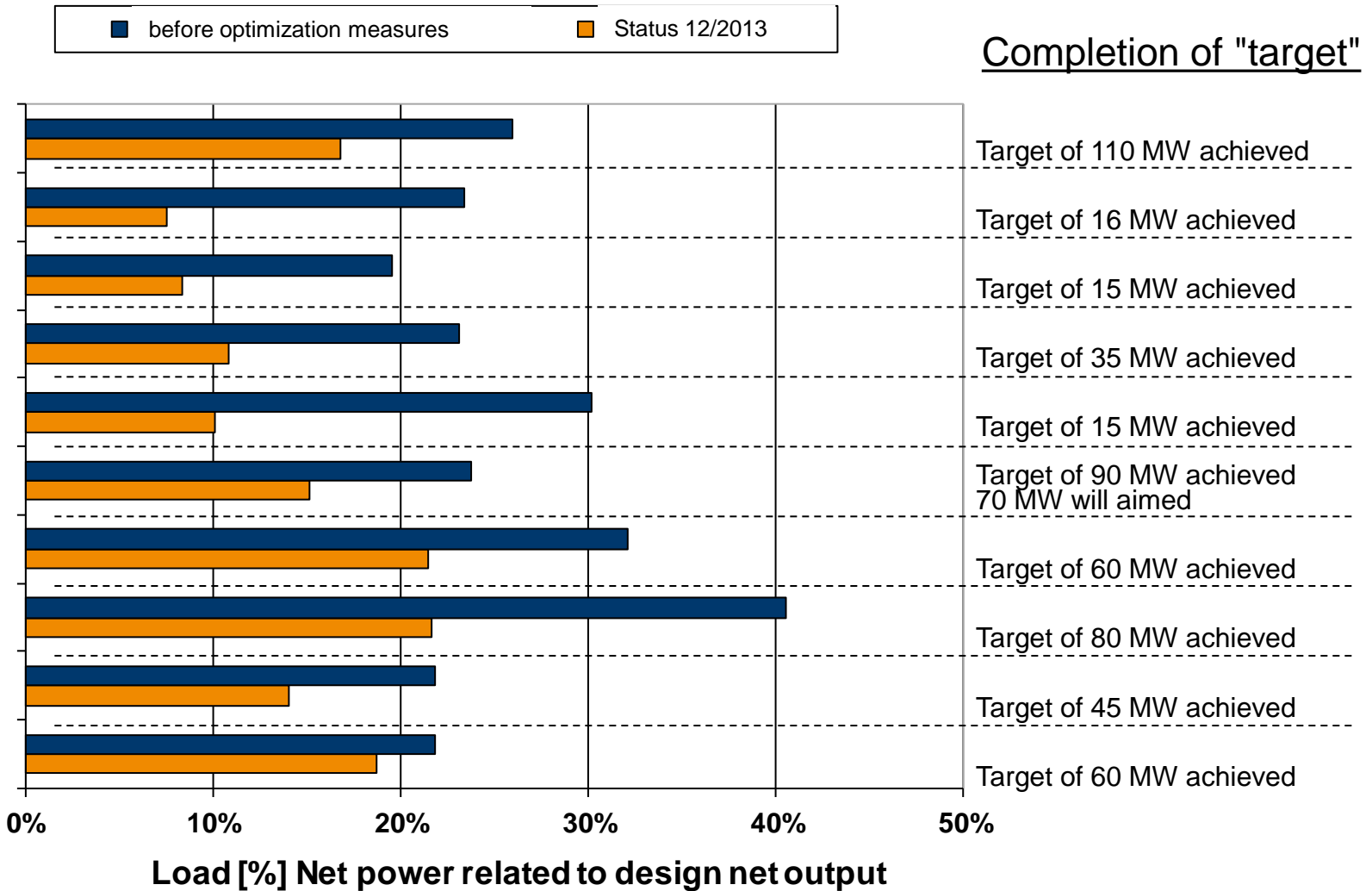
- Dust Removal
- Pressure Drop

Realisation of Steam Turbine Retrofits at STEAG

	Unit	Herne 3	Lünen 150 MW	Lünen 350 MW	West 1+2	Weier 3	Bergkamen	Bexbach
								
- <u>Measures on turbine</u>		HP / IP	HP	HP / IP	HP	LP	HP / LP	LP
- <u>Additional measures</u>		steam cond. (540 / 535 °C)	HP heaters	steam cond. (530 / 540 °C)	boiler- modification Feed water pumps			
- <u>Blading</u> ▪ before retrofit ▪ after retrofit		Impulse (I) Reaction (R)	Impulse (I) Reaction (R)		W1:R / W2:I W1:R / W2:I	Reaction (R) Reaction (R)	Reaction (R) Reaction (R)	Reaction (R) Reaction (R)
- Realisation of retrofit		2007	2007	1998	2006/2007	2006	2008	2010
- Manufacturer		Siemens	Alstom	Alstom	Alstom	Alstom	Siemens	Alstom
- Load increase (at 100 % load)	MW	7	7	15	8 (each)	17	30	7.2

Minimum load of STEAG Power Plants

Change in net load in „Kondbetrieb“



Coal Power Plants take a decisive part in the energy transition

- contribution to **security of the supply**, replacement of nuclear power plants, diversified fuel sources, close to the consumption
- **stabilization of the system** through the efficient balancing of the strong fluctuations of renewable energies
- **containment of expenses** with low variable costs and high flexibility
- **CO2-reducing** by use of combined heat and power systems and modern technologies



... because a comparable technology is not available