Where is the "Dash" for Gas ?

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BY PEOPLE FOR PEOPLE

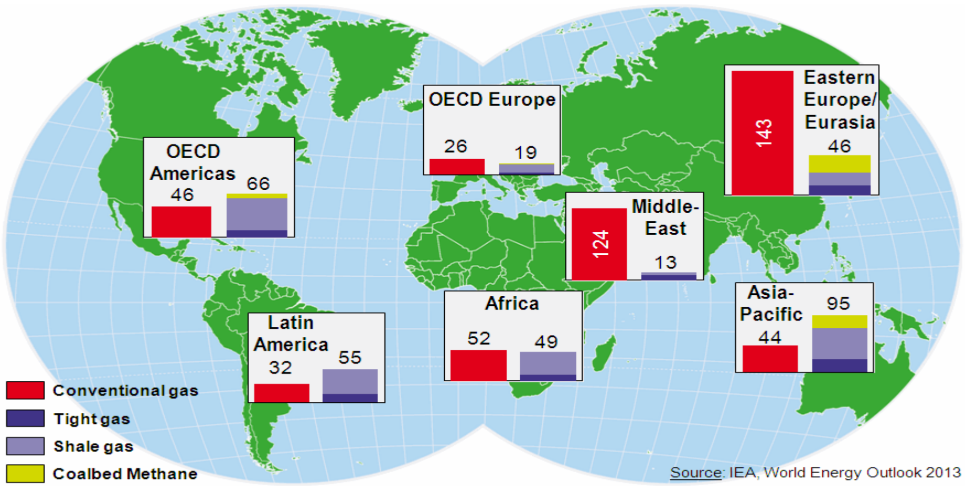
AGENDA

- The Worldwide Gas Bounty
- Where is the Dash for Gas in Europe?
- The Specific German Context
- The “Cannibalization” Effect
- Remedies
- Conclusions

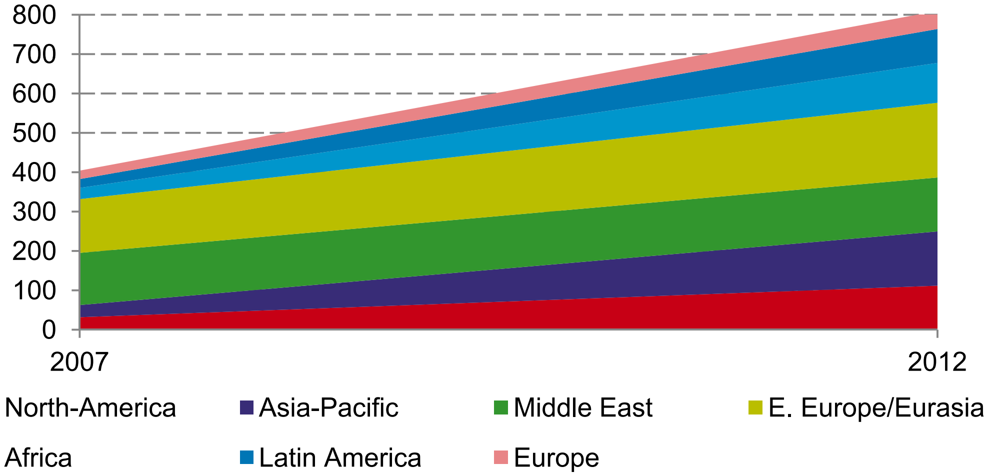
The Worldwide Gas Bounty

The worldwide gas bounty

Technically recoverable resources, end-2012 (tcm)



Technically recoverable resources 2007-2012 (tcm)



Source: IEA World Energy Outlook 2009 and 2013

- Resources have exploded since the discovery of unconventional gas in which the United States is the leading global player
- The worldwide resources have doubled since 2007
- The pace of revaluation resources grows faster for gas than for oil
- Resources are more evenly distributed
- Will Europe miss that gas bonanza?

Internal use only

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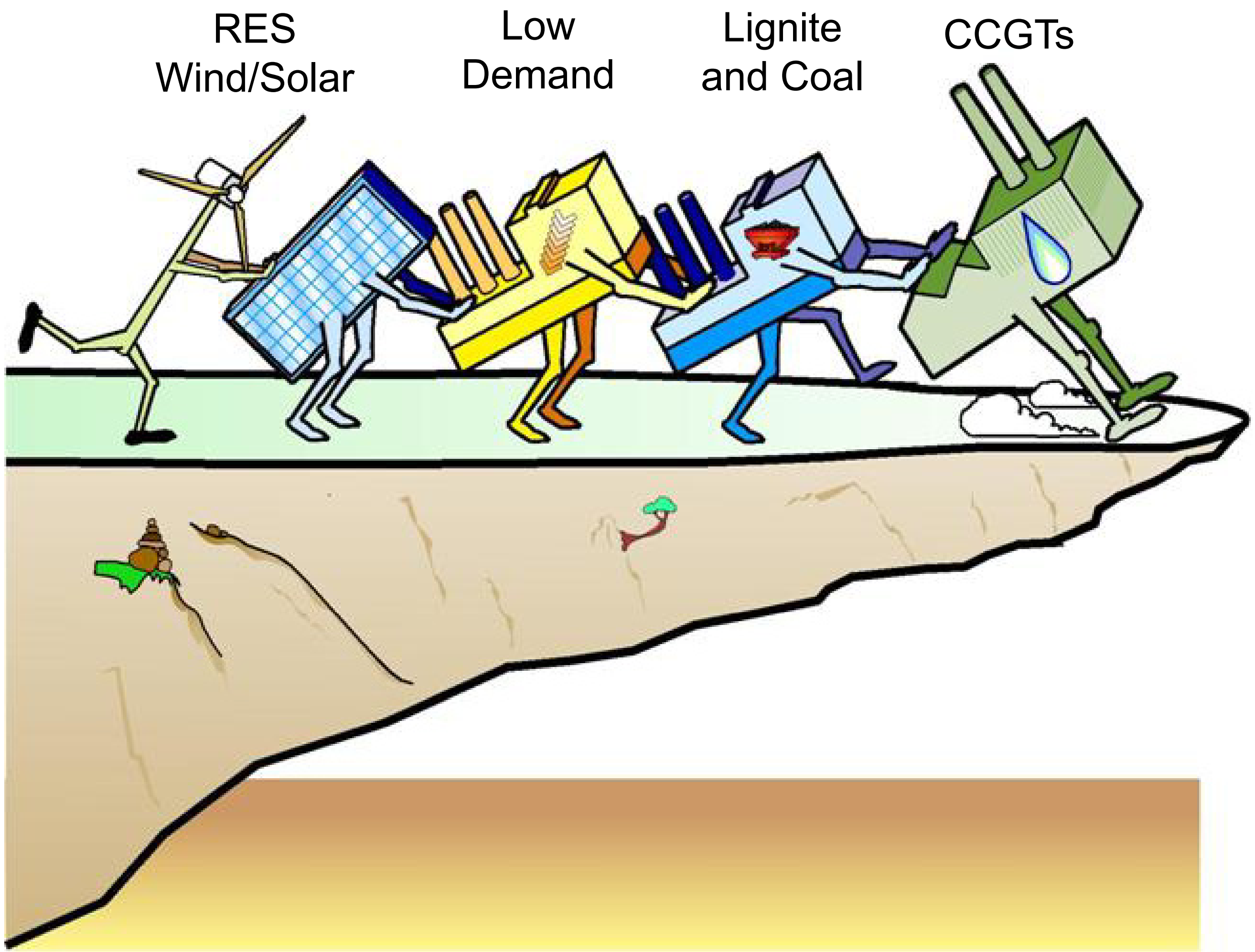
Development of GDP

Real Gross Domestic Products (YtoY)	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*
World	*1.6*	*-1.9*	*3.6*	*3.0*	*2.3*	*2.1**	*2.8**	*3.2**
Advanced Economies	*0.0*	*-3.6*	*2.9*	*1.6*	*1.3*	*1.1**	*2.0**	*2.4 **
Eurozone	*0.3*	*-4.4*	*1.9*	*1.6*	*-0.6*	*-0.5**	*0.9**	*1.4**
United States	*-0.3*	*-2.8*	*2.5*	*1.8*	*2.8*	*1.7**	*2.7**	*3.3**
Japan	*-1.1*	*-5.5*	*4.7*	*-0.4*	*1.4*	*1.7**	*1.7**	*1.4**
China	*9.6*	*9.2*	*10.4*	*9.3*	*7.7*	*7.6**	*7.3**	*7.2**
Emerging Markets	*6.0*	*1.8*	*7.3*	*6.4*	*4.8*	*4.5**	*4.7**	*5.1**

Source : (= Estimated) Oxford Economics – Gross Domestic Product, constant Price & Exchange Rate*

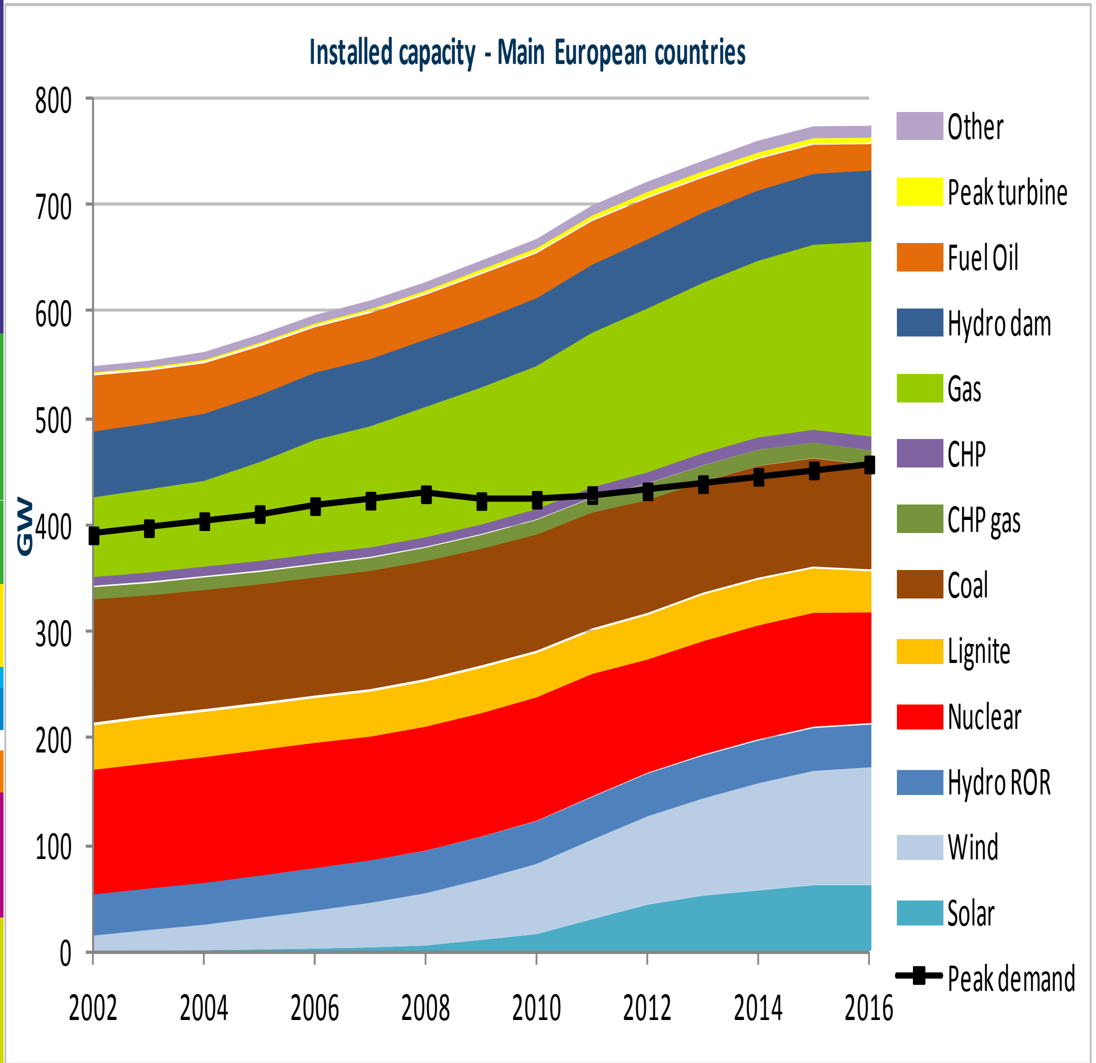
Where is the dash for gas in Europe?

The reality of conventional generation in 2012



Source: CERA

Europe faces a tough gas-to-power context



- **Gas-fired plants have been hit by a triple whammy**
  - **Low electricity demand growth**
  - **Strong push from RES**
  - **Tough competition from coal plants in combination with low CO2 prices**

- **Coal is displacing gas in power generation**
  - **favorable economic environment for old, high emission coal plants**
  - **low emission CCGT plants are out of the money**

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Power Prices and Gas Plant Revenues

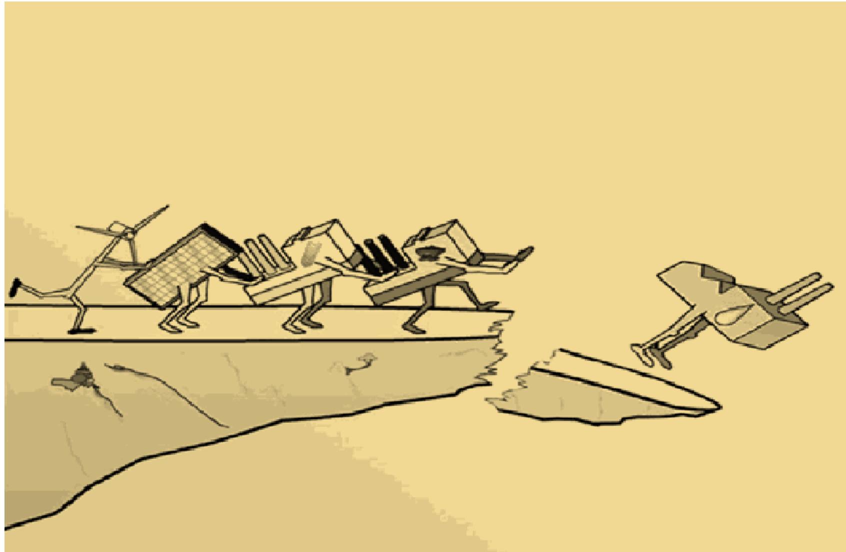
Power prices are further eroding.

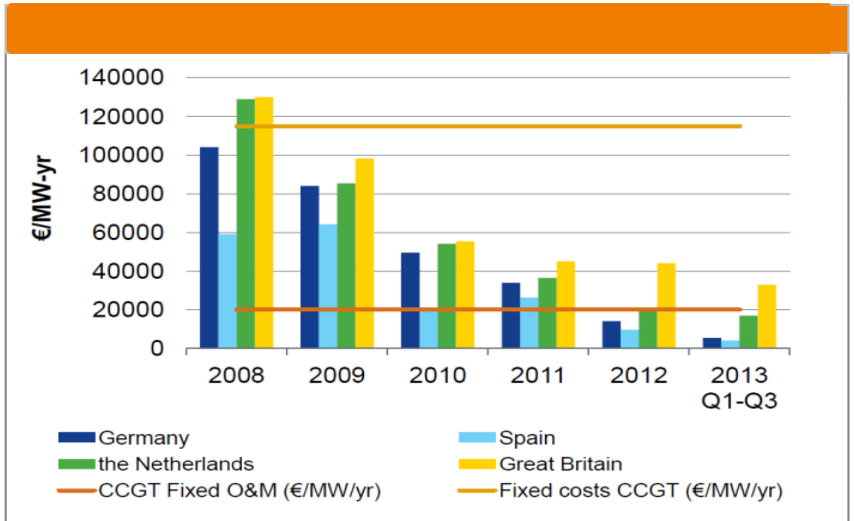
Q1 2014:

<40 €/MWh	**in D**
40 to 50 €/MWh	**in B, F and NL**
ca. 60 €/MWh	**in GB and I**

Gas plants cannot cover fixed costs and actually not even the fuel costs in some countries

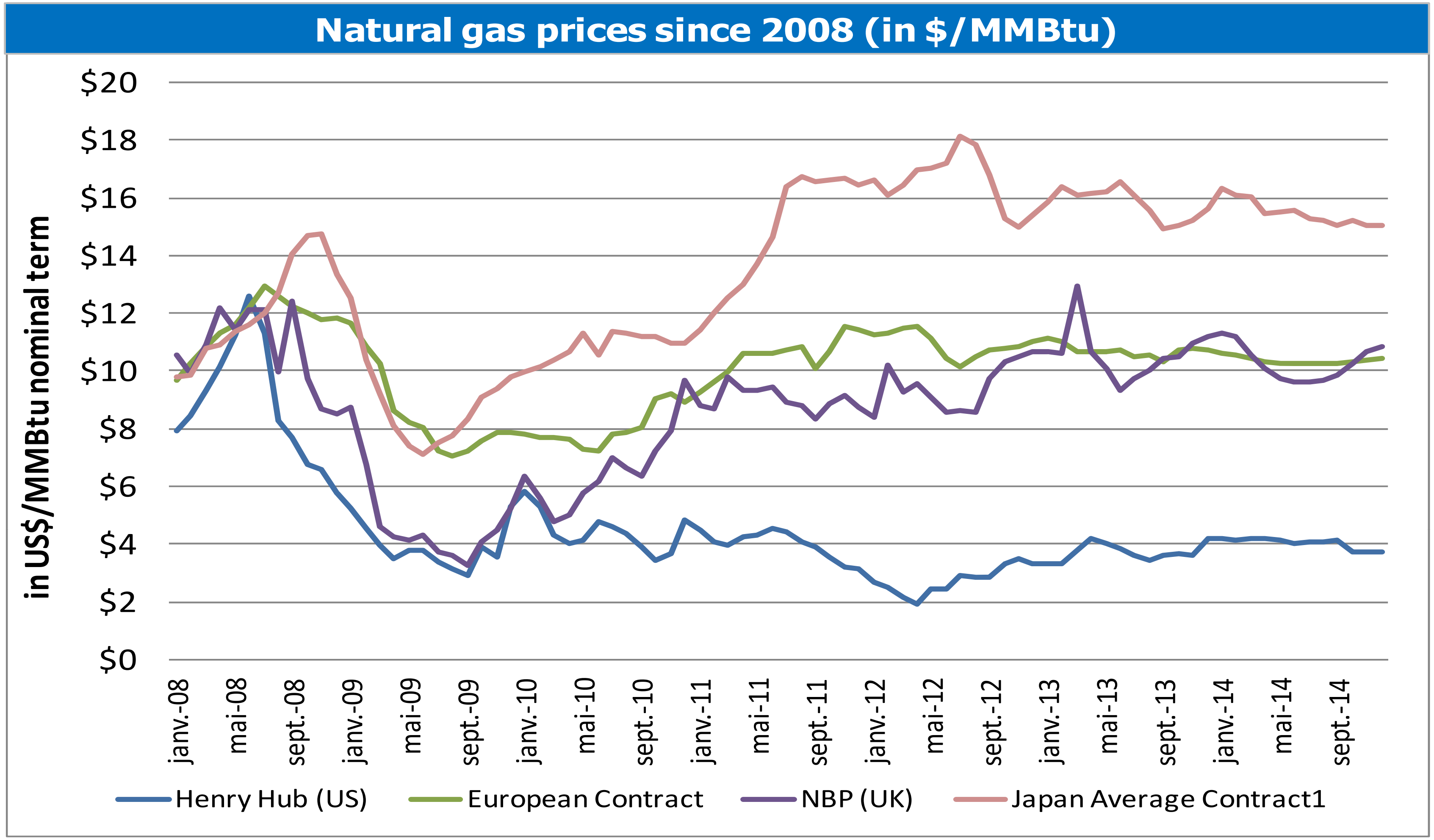
US wholesale prices are at a comparable level but due to the differences in fuel cost gas is in the money whereas coal is squeezed in the US





Source: IHS CERA, Thermal Plant Profitablility 12-2013

Natural Gas Price Development



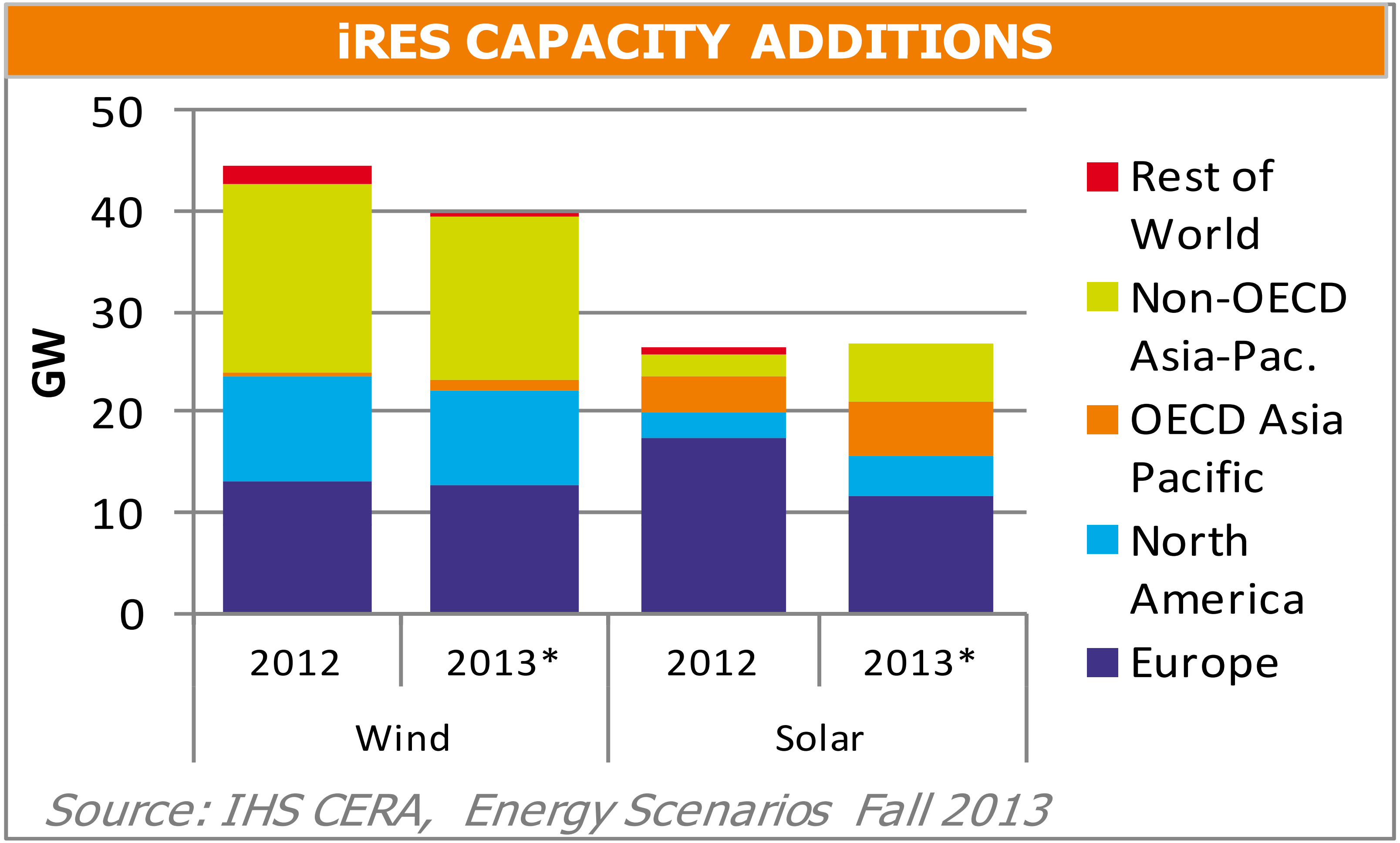
Source : IHS CERA December 2013 Planning Scenario

CO2 –Prices

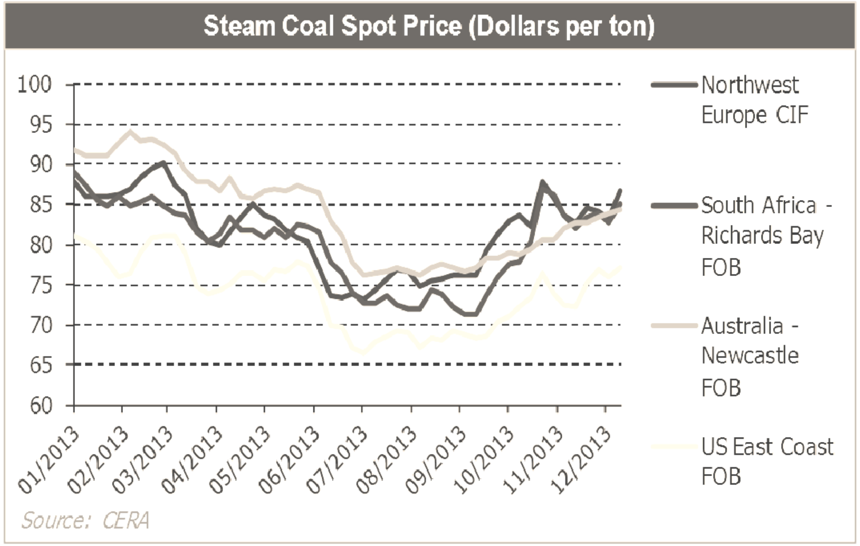
	2008	2009	2010	2011	2012	2013	2014	2015
EU-Allowances Price (€/tCO_2)*	22.2	13.1	14.3	13.0	7.4	4.5	4.8 (FWD)	5.0 (FWD)
EU-ETS Total amount of emissions EU(MtCO_2)	2120	1880	1939	1904	1867			
Total amount of EU-allowances backloading (EUAs) (MtCO_2)	2012	2054	2090	2110	2175	2082*	2044*	2005*

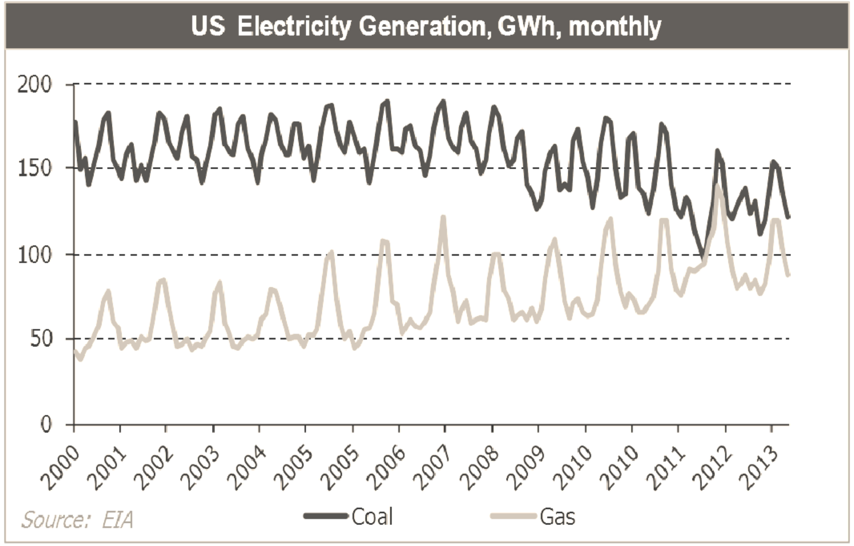
Source : (= Estimated) Prices : MoPub & Forwards on 31/12, Emissions : CITL & Supply : CITL Data Viewer, European Commission (SWD(2012) 234)*

Development of Renewable Capacities



The Coal Market





Steam Coal Prices ($/ton)	***2008***	***2009***	***2010***	***2011***	***2012***	***2013***	***2014***	***2015***
Northwest Europe - CIF	***147.2***	***70.5***	***92.0***	***121.5***	***94.2***	***82.2***	***84.2****	***91.7****
Japan - CIF	***157.9***	***83.6***	***108.5***	***126.1***	***102.1***	***90.9***	***92.6****	***100.8****
Australia - Richards Bay – FOB	***121.2***	***63.9***	***90.5***	***116.1***	***94.6***	***84.8***	***83.4****	***86.0****
South Africa – Newcastle – FOB	***130.9***	***71.6***	***98.0***	***120.8***	***96.2***	***84.9***	***83.4****	***86.0****
Colombia – FOB	***124.8***	***90.4***	***114.8***	***146.5***	***131.4***	***106.3***	***92.6****	***100.8****

Source : CERA (= Estimated)*

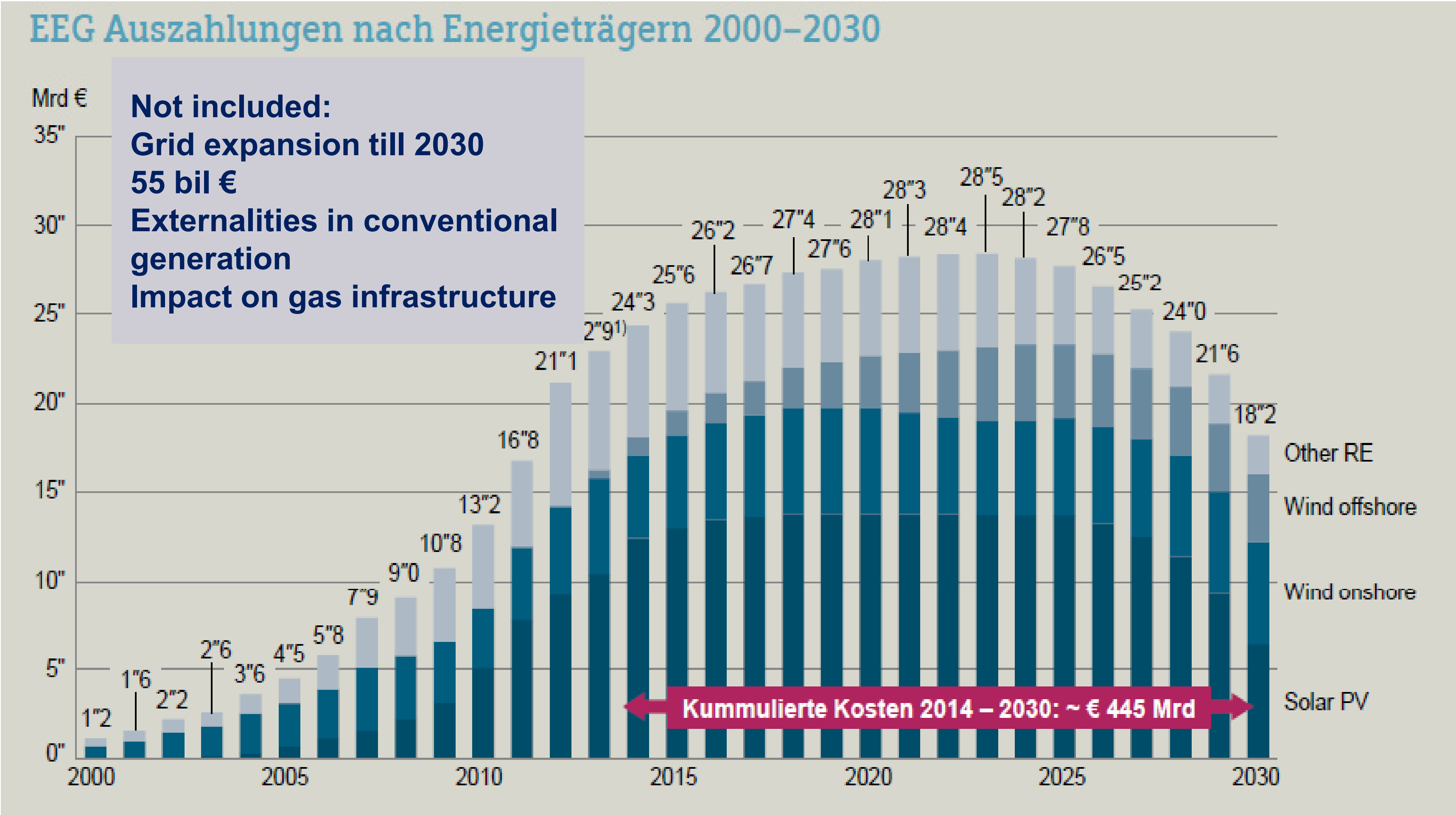
The Specific German Context

The „Energiekonzept“

Germany plans to turn into one of the most energy-efficient and climate-friendly economies in the world

Objectives Energy Concept		Base year	2020	2030	2040	2050
Overall objectives	Reduction of GHG emissions	1990	-40%	-55%	-70%	-80%
	Share of RES in gross final energy consumption	-	18%	30%	45%	60%
	Reduction of primary energy consumption	2008	-20%			-50%
Electricity	Share of RES in gross electricity consumption	-	35%	50%	65%	80%
	Reduction of electricity consumption	2008	-10%			-25%
Buildings	Reduction of heat consumption	Not mentioned	-20%			
	Reduction of primary energy consumption	Not mentioned				-80%
Mobility	Reduction of final energy consumption	2005	-10%			-40%

Direct Costs of RES in Germany

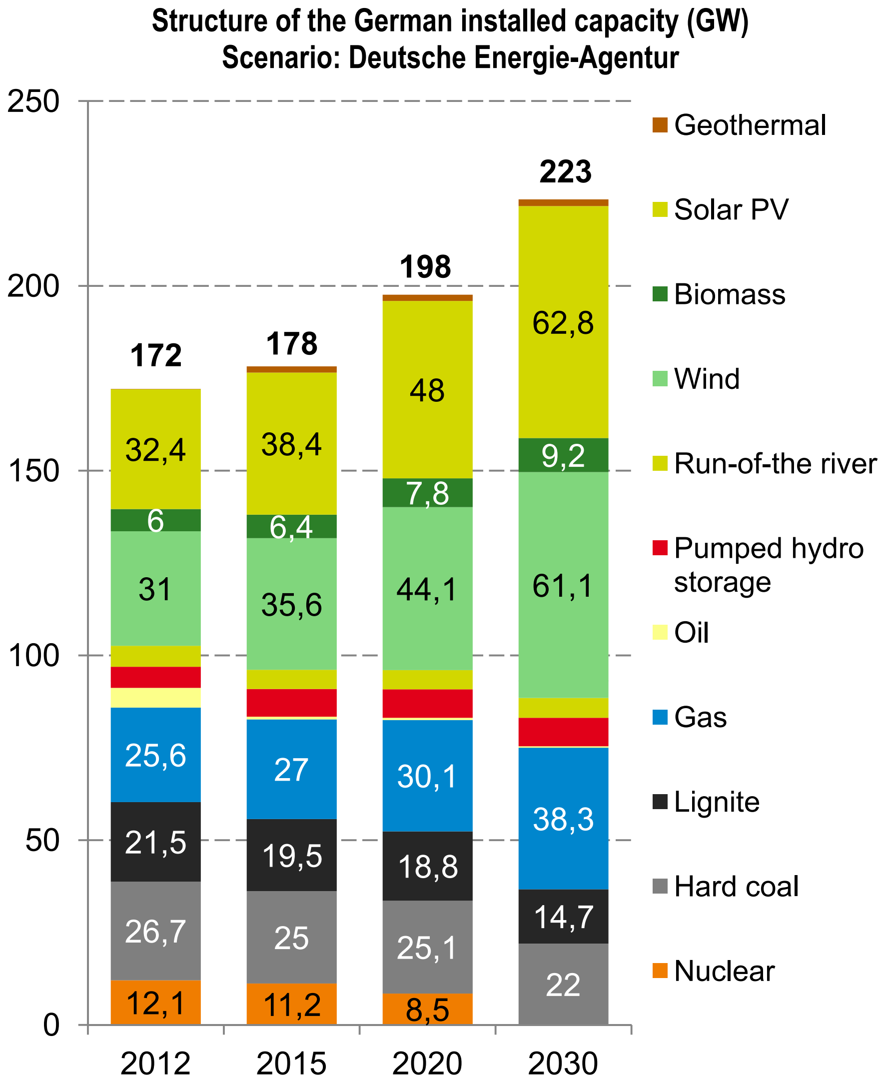


Quellen: BDEW für 2000, Erneuerbare Energien und das EEG: Zahlen, Fakten, Grafiken (2013), S. 37, Tab. 4, EEG-Auszahlungen und EEG-Differenzkosten nach Energieträgern; Stand: 31. Januar 2013; BMU - Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit, Zeitreihen zur Entwicklung der erneuerbaren Energien in Deutschland, Stand: Oktober 2013; Beschlussvorschlag zur Kabinettvorlage des BMWI, Datenblatt-Nr. 18/09119, Stand: 21. Januar 2014; Siemens eigene Berechnungen

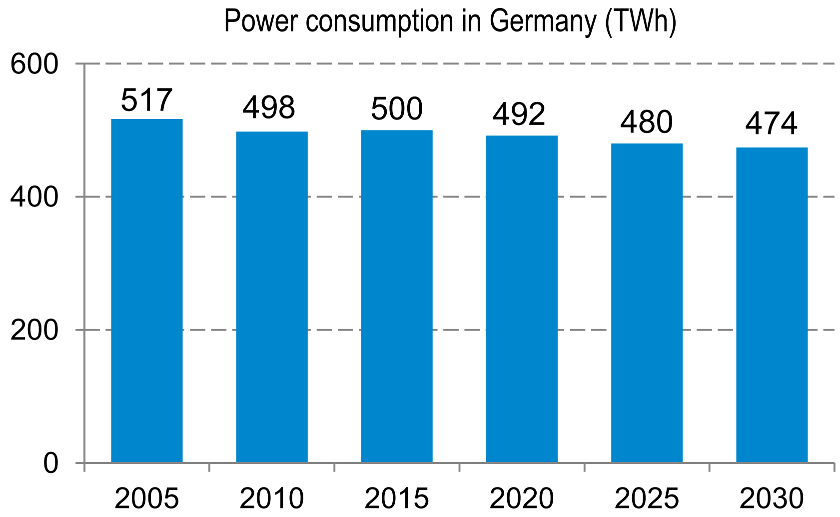
1) Prognosewert der EEG-Auszahlungen gemäß „Zeitreihen zur Entwicklung der Kosten des EEG", Stand: 15. Oktober 2013

Source: Siemens AG

The target-composition of the German generation fleet: Renewables and Natural Gas



Source: BDEW; Deutsche Energie-Agentur (Dena), Ausbau-und Innovationsbedarf der Strom-verteilnetze in Deutschland bis 2030, December 2012

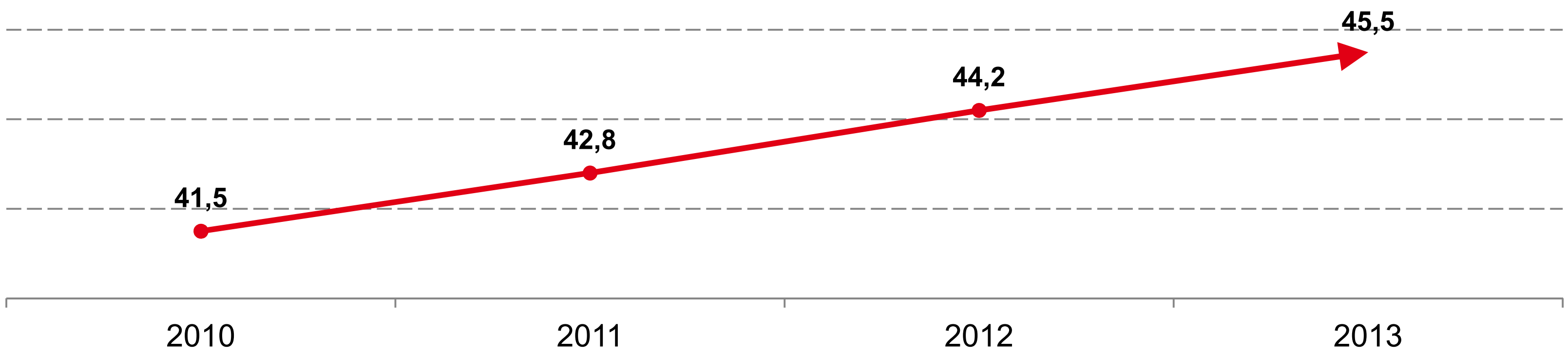


Source: Prognos, Bedarf an konventionneller Kraftswerke, April 2011

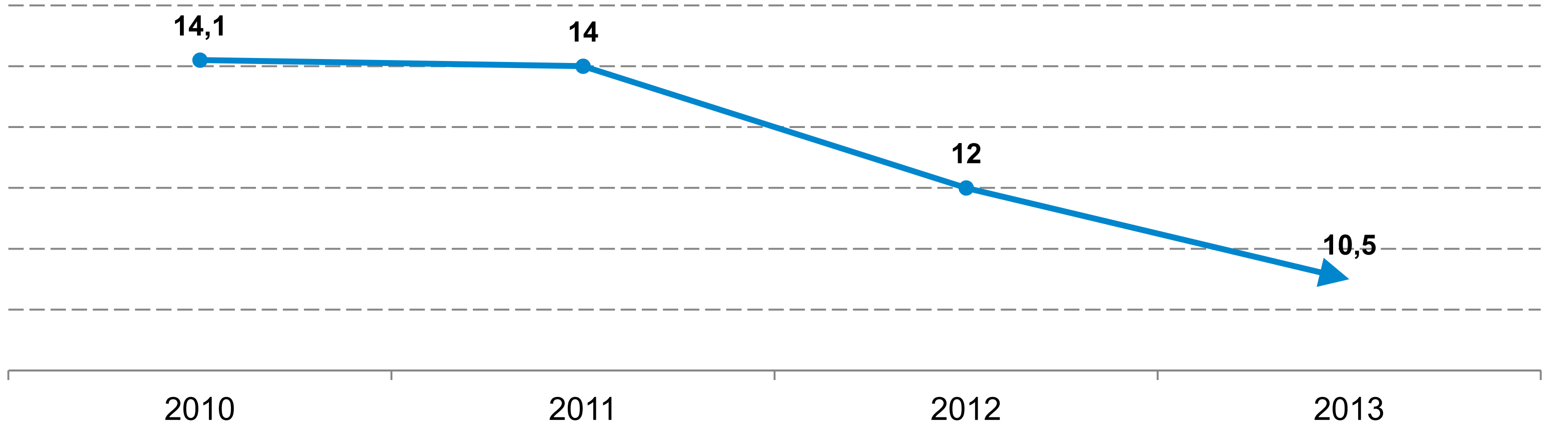
- **Increasing share of renewables in power generation:**
  - **2020: 35%**
  - **2030: 50%**
  - **2050: 80 %**
- **Significant increase of generation capacity from 158,1 GW in 2008 to more than 220 GW in 2030 (Dena)**
- **Strong increase of gas fired generation capacity from 2020 to 2030, but few full load hours:**
  - **2008: 3 375**
  - **2020: 3 289**
  - **2030: 2 154**

Coal is substiting Natural Gas

Share of coal in power production (%)

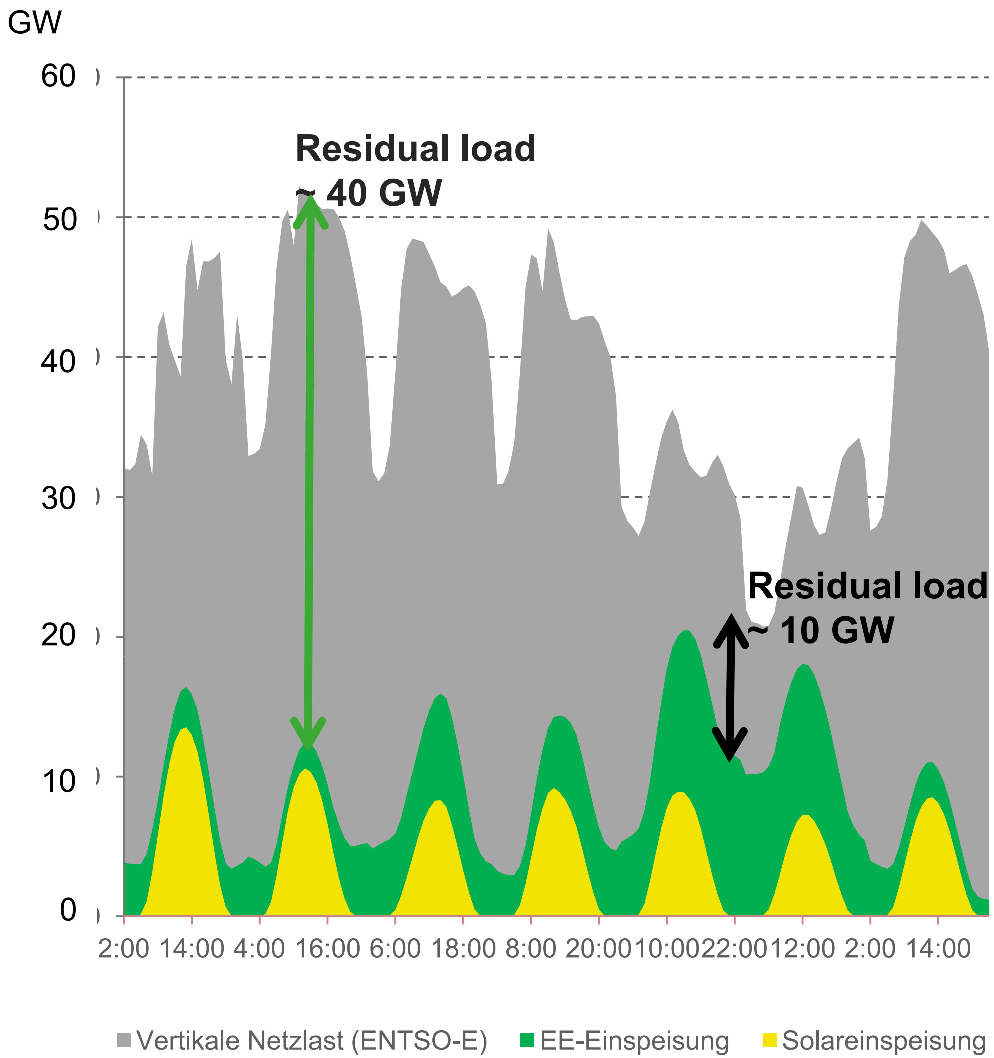


Share of gas in German power production (%)



Source: Frankfurter Allgemeine Zeitung, 21/02/2014

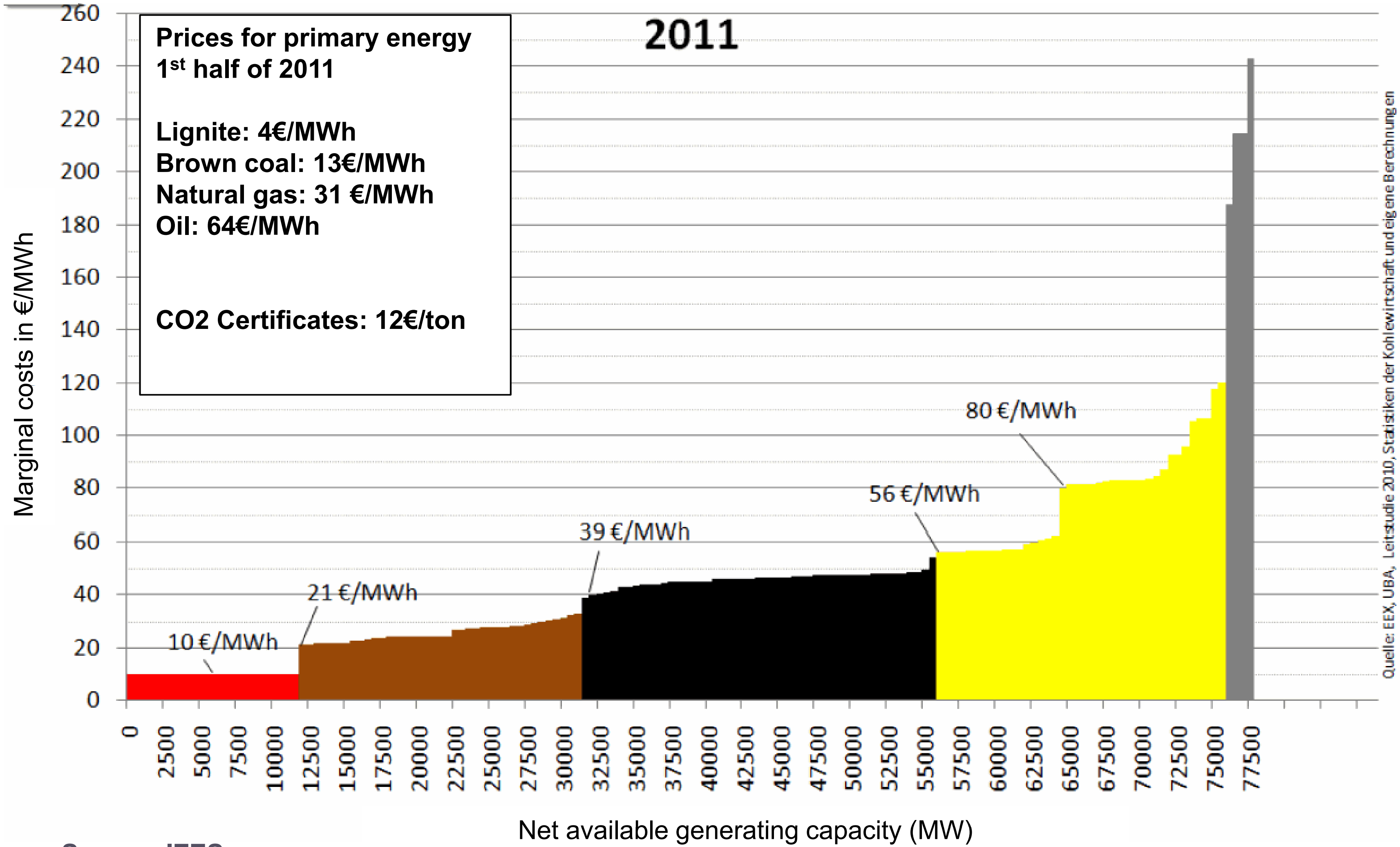
Functionality of the conventional generation fleet



- From a system perspective renewables are interruptible.
- Except for pump storage no solution for electricity storage is available.
- SOS thus requires the most expansive storage: a backup generation fleet
- Due to priority of RES in the system conventional fleet takes the role of residual supplier.
- Conventional plants provide flexibility to the system.

The "Cannibalization" Effect

Use of conventional power plants – without RES



Source: IZES

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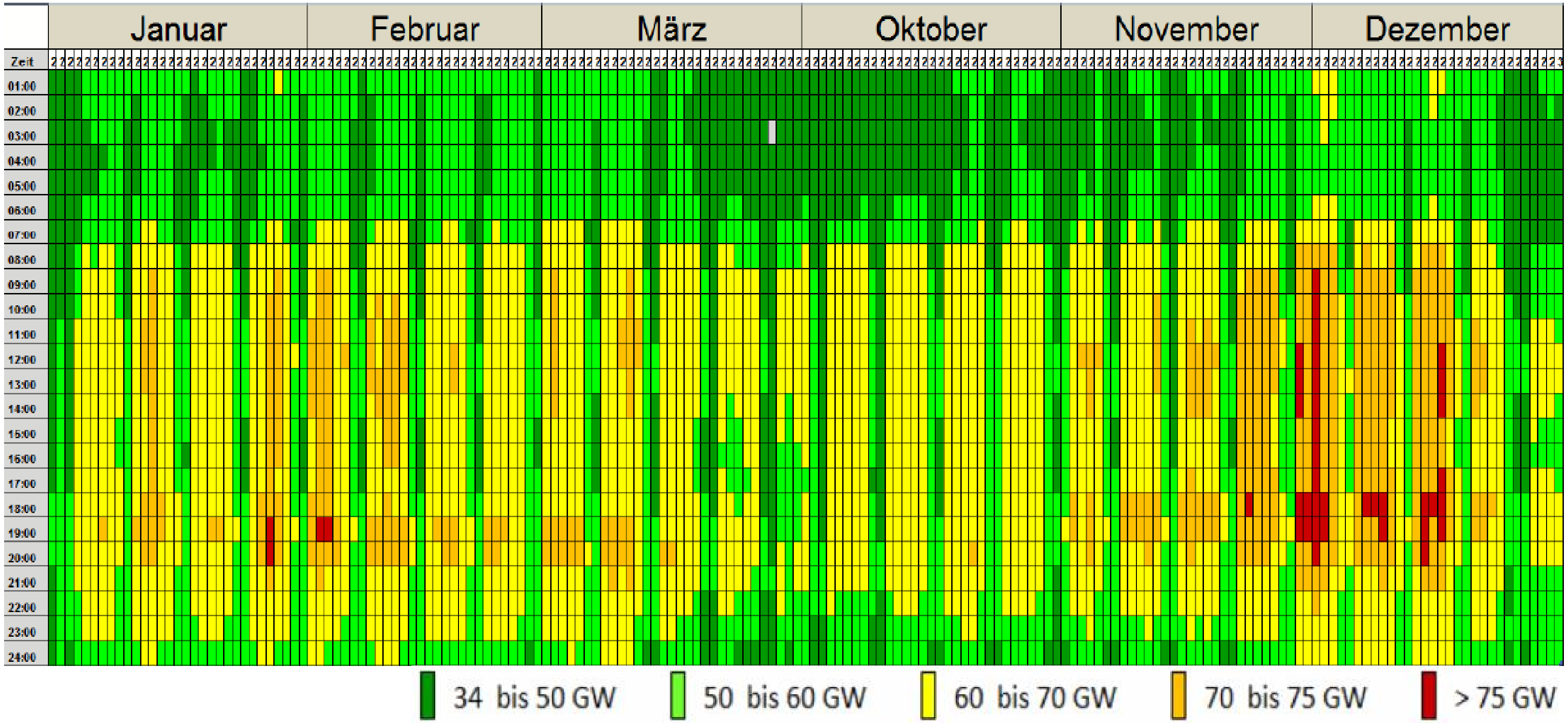
Implications on the load factor for conventional power plants ?

Hourly Winter-Load in Germany 2010

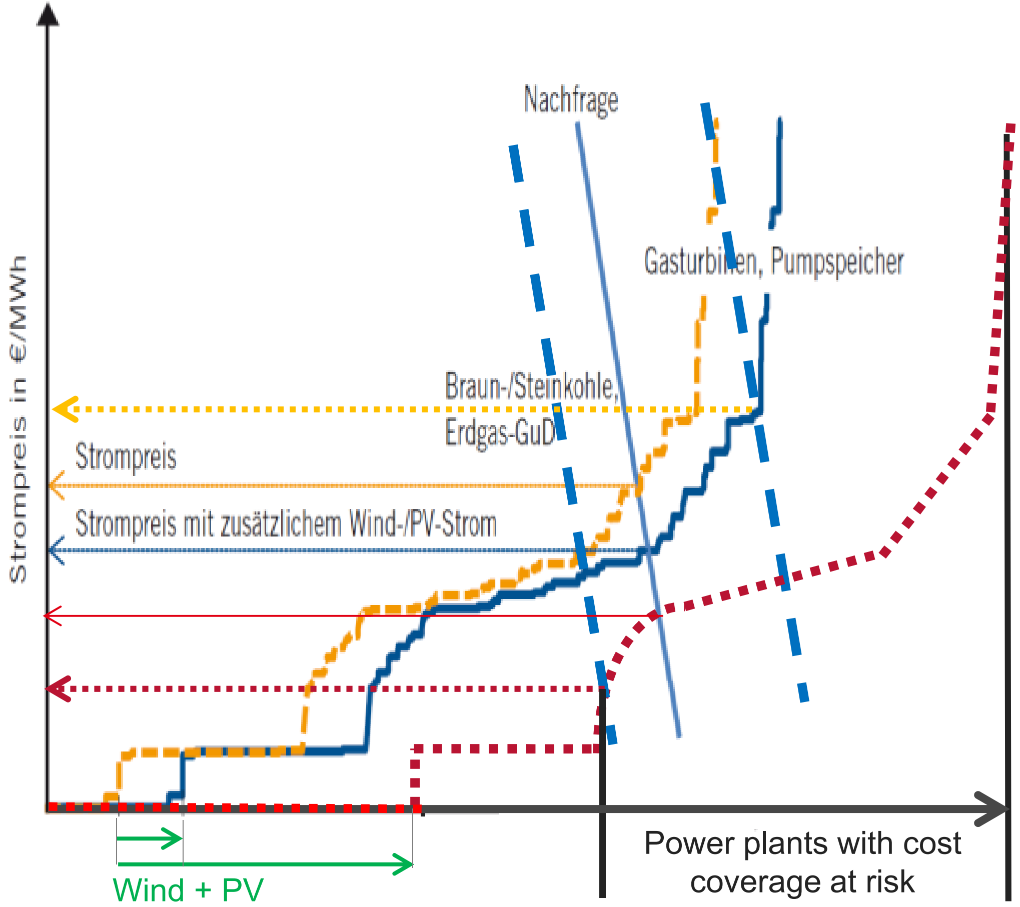


- Max Load above 75 GW only occurring in very few hours (in 2010: 40 h).
- Max Load during the week: between 60 und 70 GW.
- Sustainable RES injection: 10-20 GW. In winter the residual load during the week is at 40-65 GW.

Source: IZES

Deterred competition or "the cannibalization"

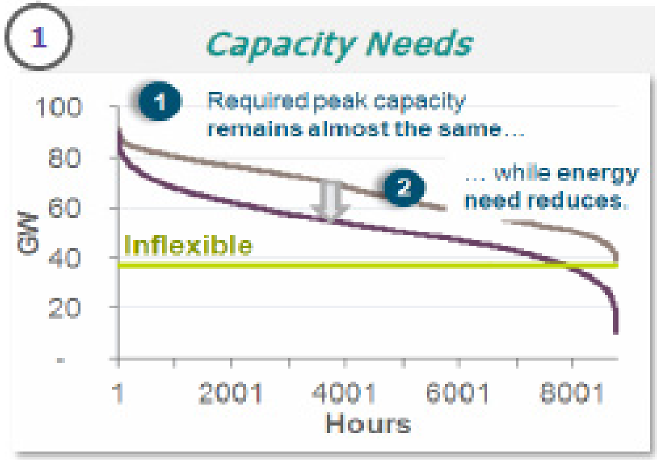
Conventional plants have to cover full costs from EOM revenues whereas RES get supports outside of the EOM. Nevertheless they compete in the same market.

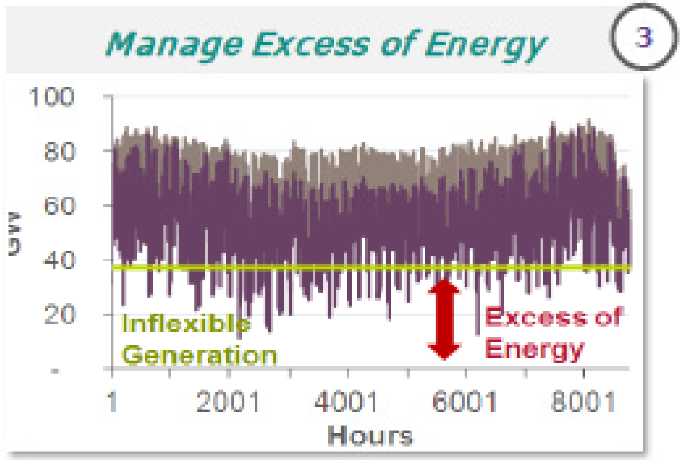


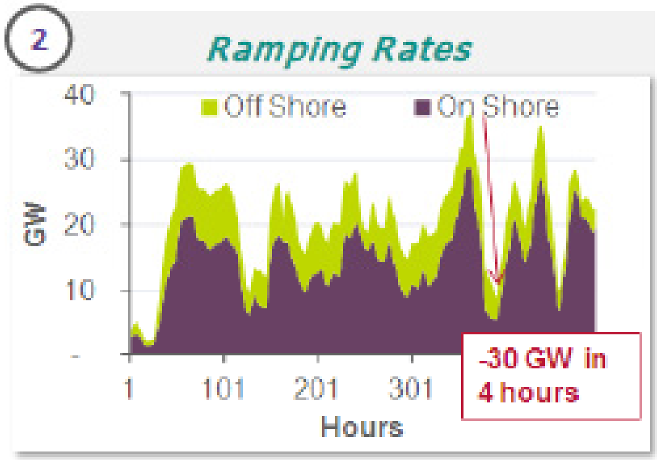
- Conventional plants are facing a load factor and cost coverage issue:
  Price peaks in EOM are not accepted (Southern Germany)
- A consolidation of conventional generation capacities is taking place –but plants are not allowed to decommission (ResKV).
- Gas fired power plants are affected most due to high variable cost
- RES are „kicking out" conventional generation:
  - gas is already hit,
  - coal will follow with higher RES shares

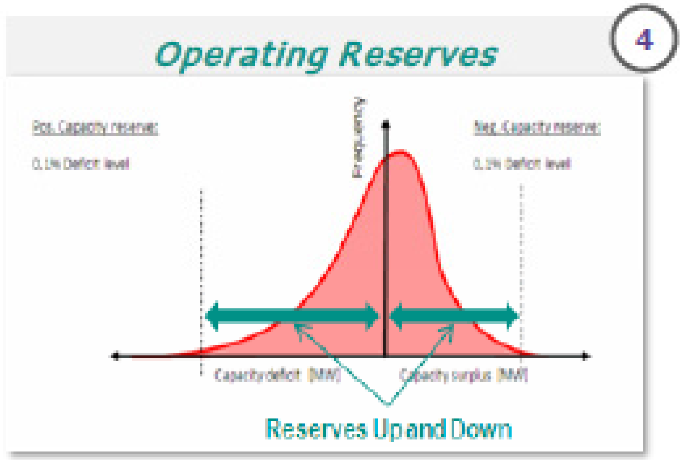
Remedies

Different Needs of the Electricity System to Ensure Adequacy





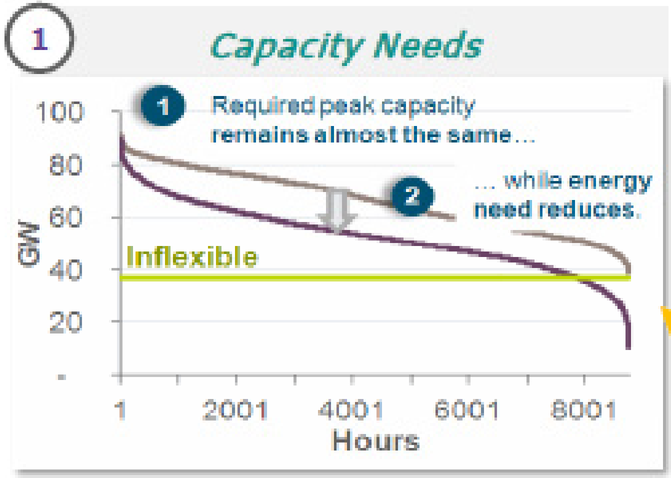


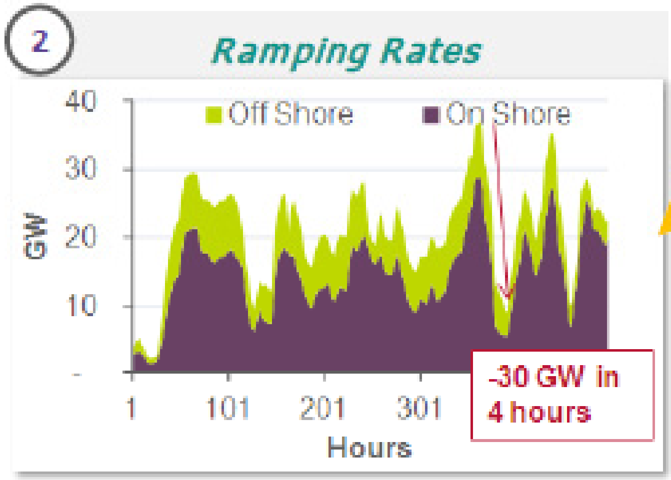


Not All Needs Are Currently Well Satiesfied

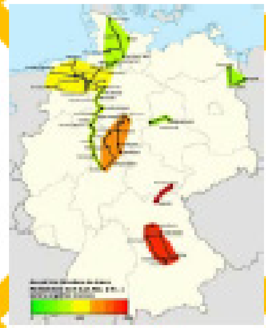
Need	Current situation	Issue(s)
1 **Peak capacity**	Investment signals are based on EOM prices	Is the current market design attracting the right <u>quantity</u> of capacity? What will be the impact of possible CRM?
2 **Ramping rates**	Flexibility is remunerated through EOM prices (incl. day-ahead, intraday and ancillary services)	Is the current market design attracting the right <u>quality</u> of capacity? What will be the impact of possible CRM?
3 **Manage excess of energy**	RES producers have priority access to the grid	Markets participants do not take the effect of their actions on the system into account. Remuneration not linked to market outcomes.
4 **Operating reserves**	Demand determined by TSOs/ regulator and linkage with energy market prices (arbitrage)	Where are the limits between the regulated measures and the market (intraday)?

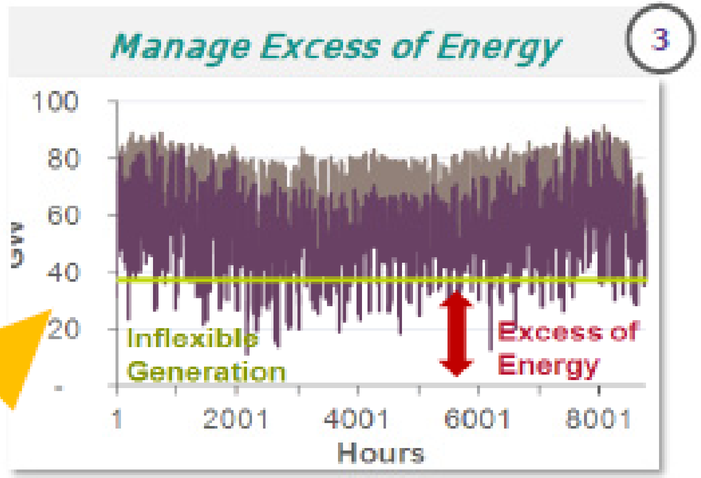
Network Constraints Define the Geographical Scope of a Need

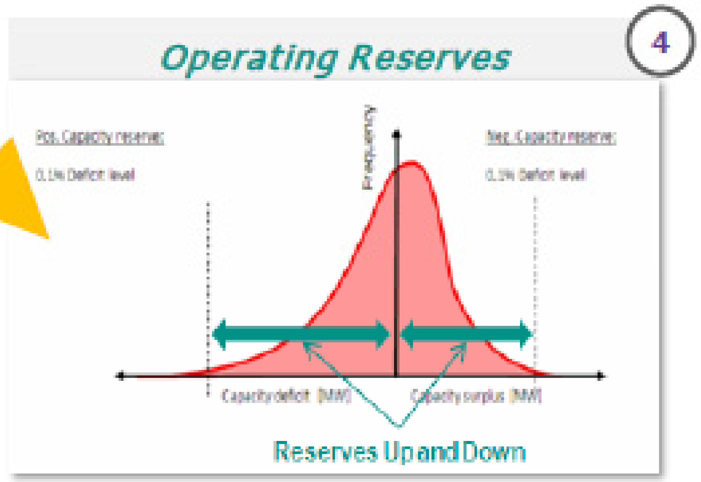




The state of the network can define regional needs







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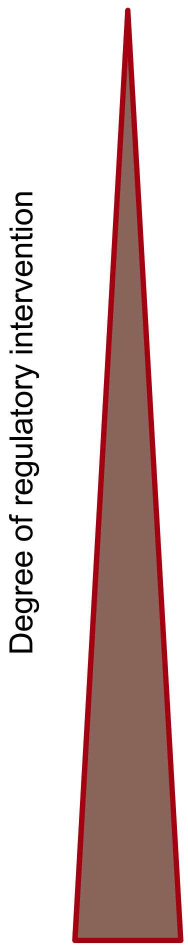
Capacity Remuneration Mechanisms (CRM)

Plenty of concepts to incentivize investment in generation capacities

Differences in regulatory scope (slippery slope) and time horizon



0 — Energy-Only Markets + Out-of-Market Measures — EOM-

Slippery slope risk: back to regulation in the long term?

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1 — Improving Energy-Only Markets — EOM+

- Solve the demand side flaw in Energy Only Markets
- [*Integrate in the demand the cost of system reserve*]

2 — Introducing Capacity Remuneration Mechanisms — CRM

- Strategic reserves
- Capacity markets
- Capacity payments / Investment subsidies
- [*Reliability options*]

Conclusions

Conclusions

- From a global view gas is the energy of choice.
- Gas to power in Europe is actually hit by a tripple whammy:
  - low demand
  - squeeze by coal
  - structural deficiencies of ETS and EOM.
- A reform of the electricity market design is indispensable.
- EOM is a short term tool and applicable for the optimization of existing plant and equipment only.
- Investments in long term generation adequacy require the full costs to be taken into account
- For Gas to Power in Europe the gas market and related markets need to adapt.
- However, we need to get the fundamentals right.

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