

# The German Energiewende and Implications for Utilities

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UC Davis IAEE Seminar 3<sup>rd</sup> June 2014

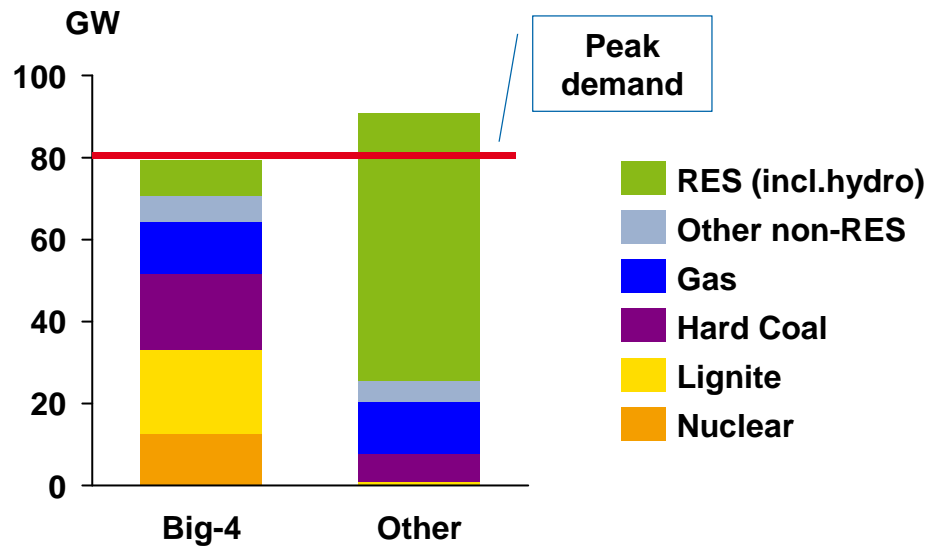


# Contents

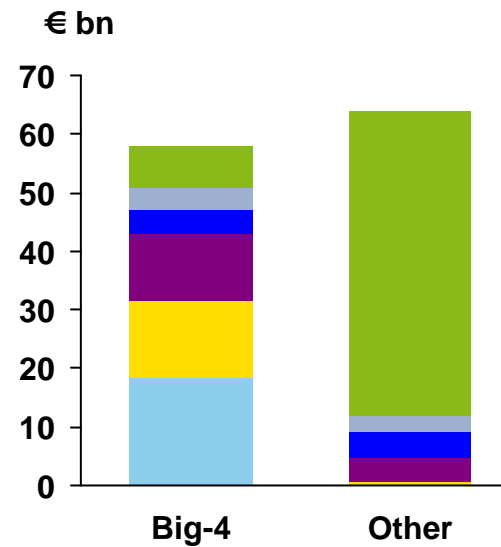
- 1. What is the position of the German utilities?**
2. What has brought them there?
3. What changes are underway in Berlin?
4. What will be the utilities' role in the future?

# The position of the German utilities – high capital invested in conventional plants...

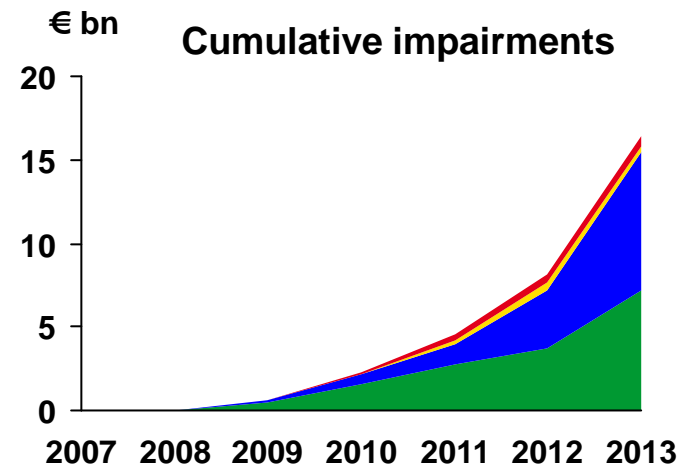
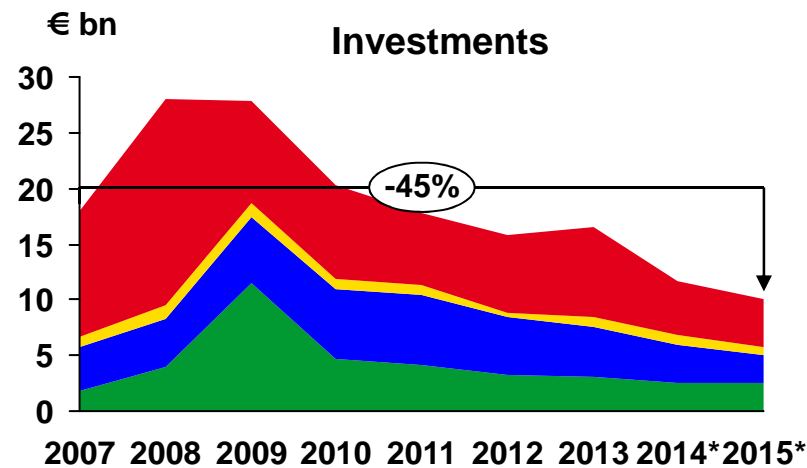
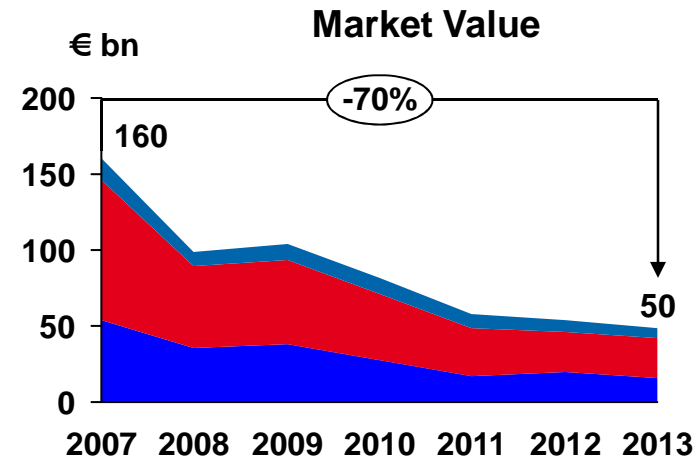
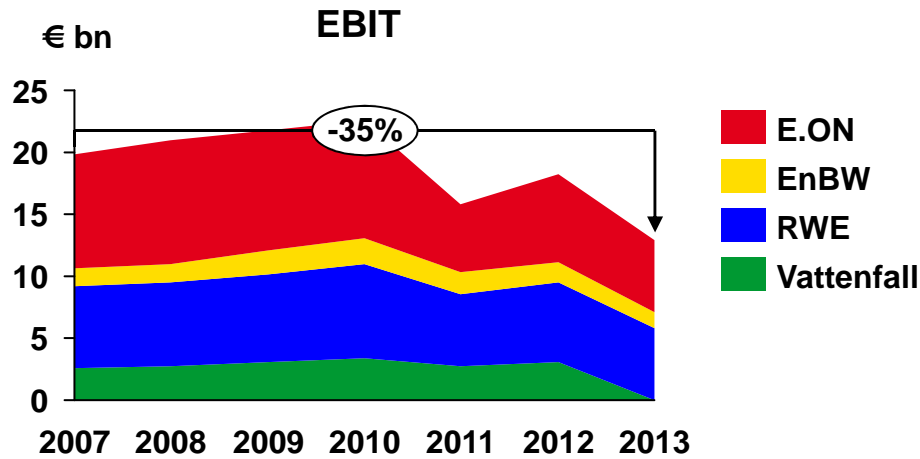
Net Capacity End 2012



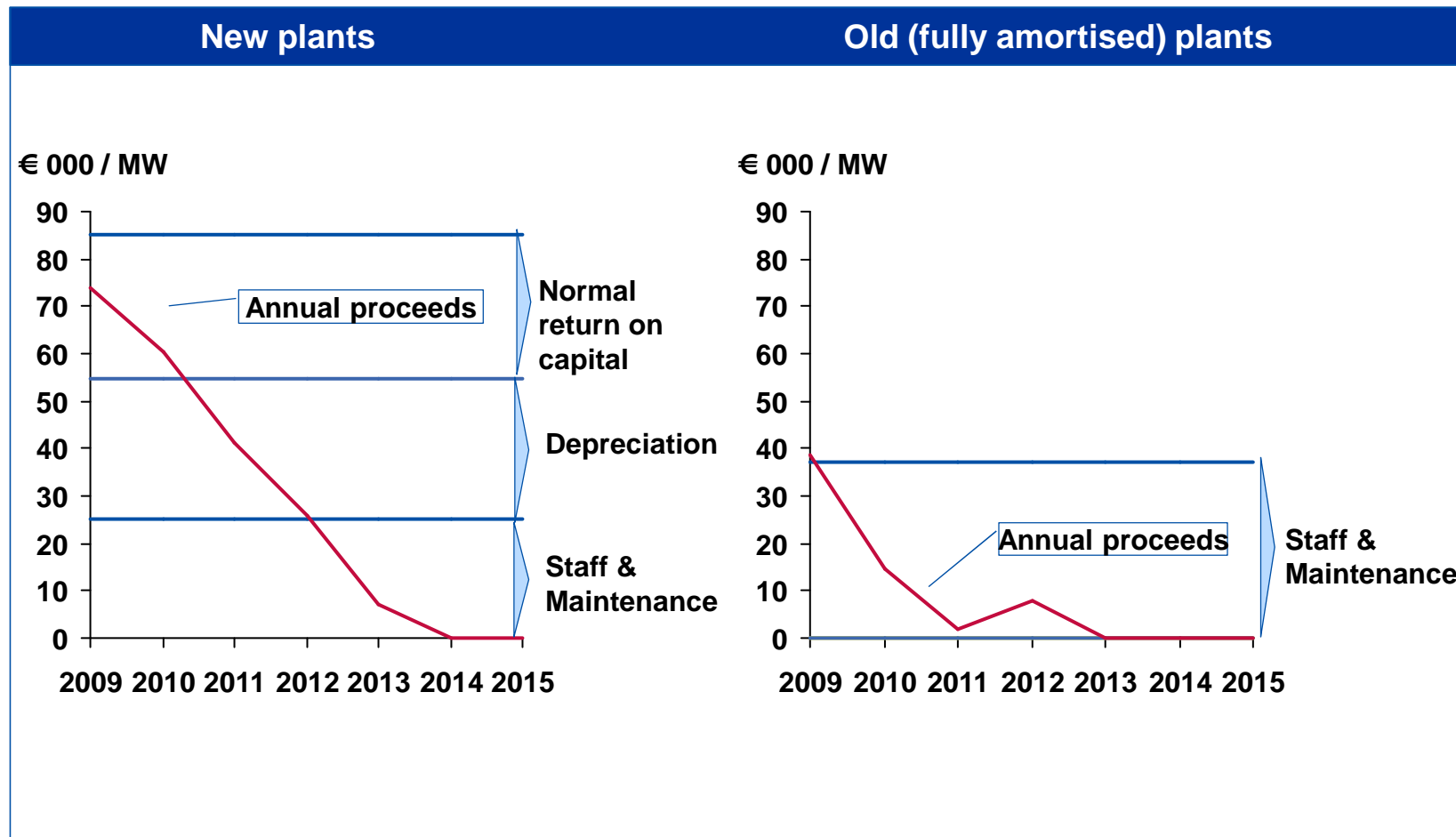
Indicative capital employed based on 50% new value



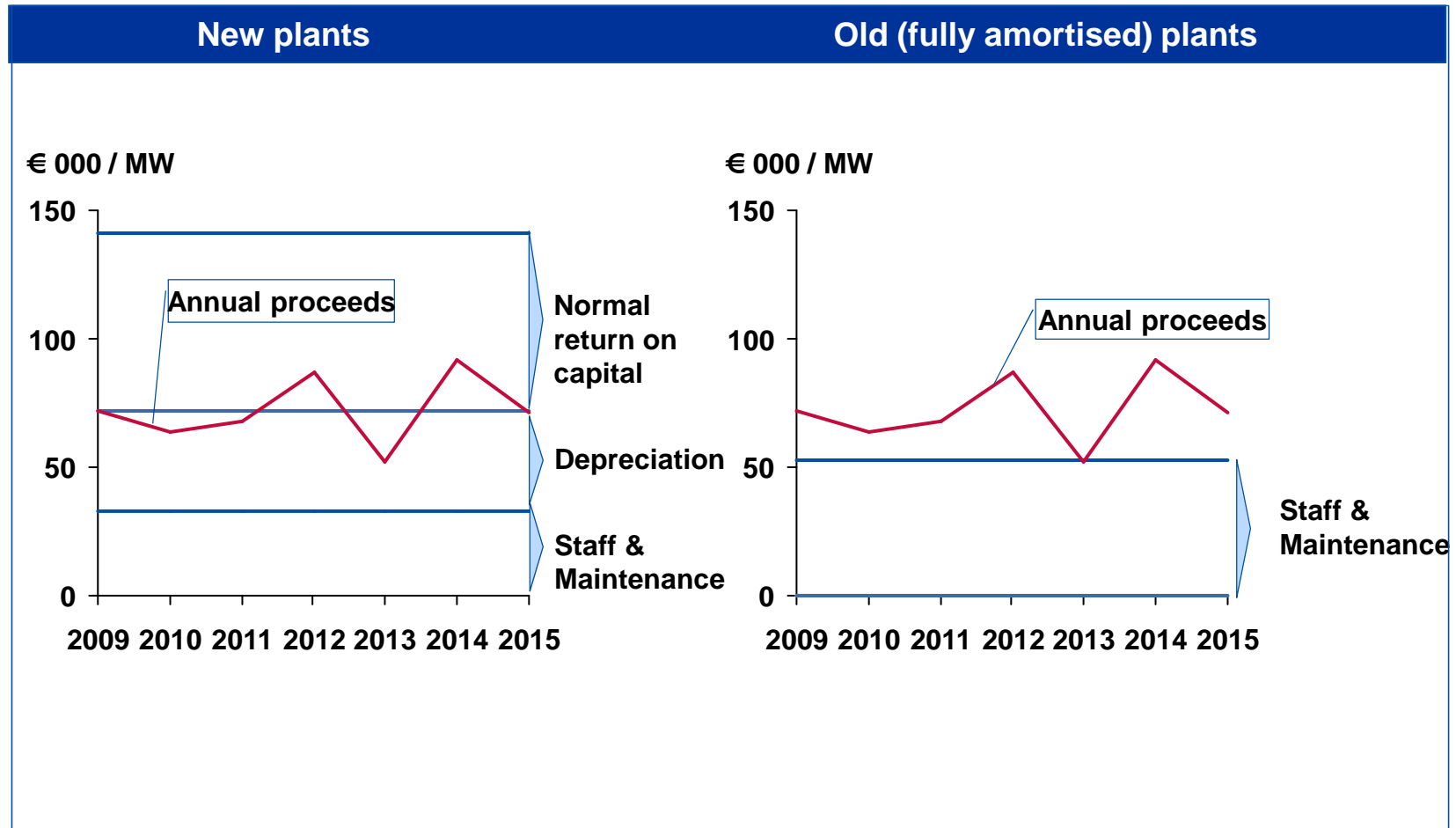
# ... but making a low EBIT with declining market value and reduced investments



# Gas plants never recovered their full costs; from 2011/2012 failed to cover depreciation then O&M



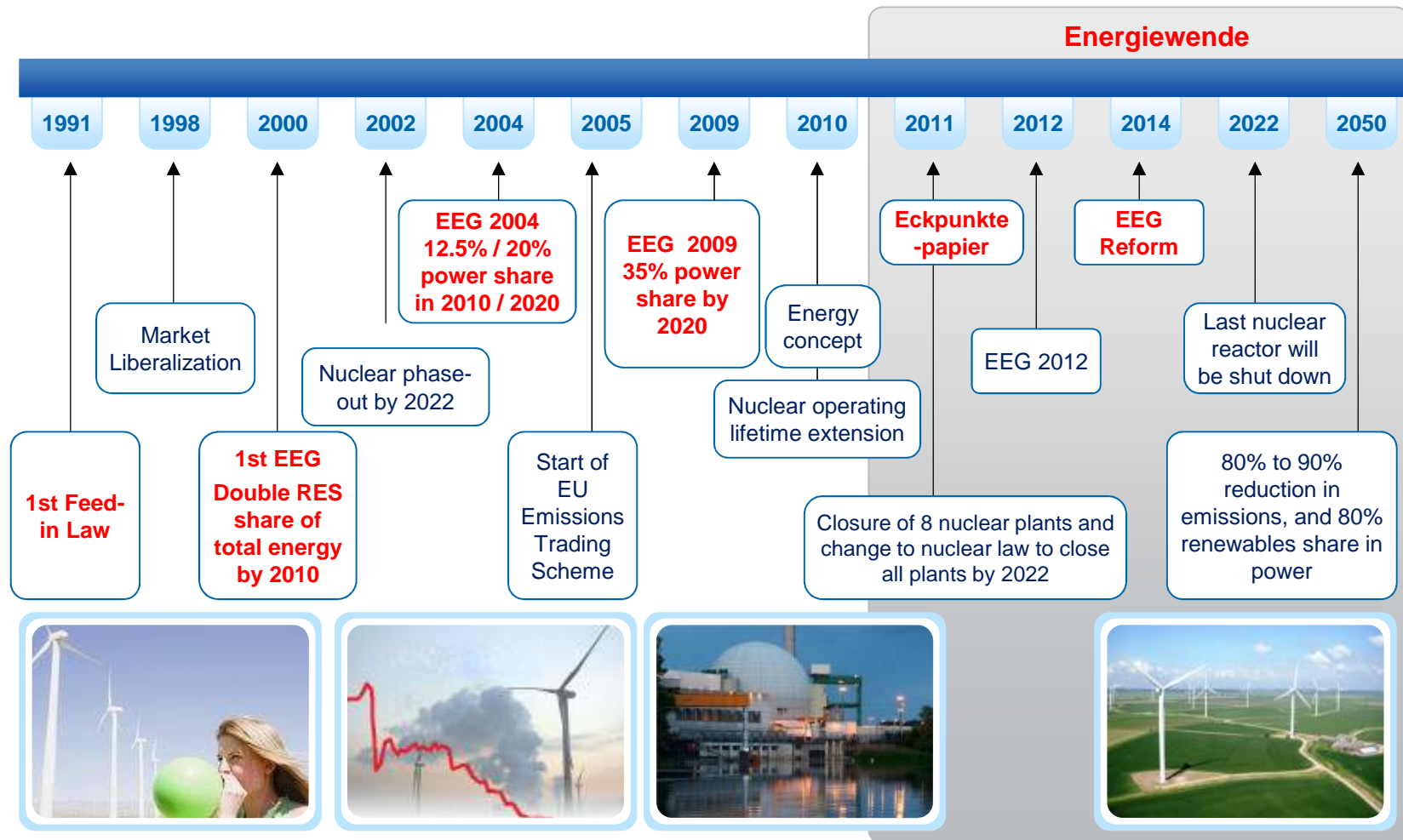
# ...but new coal plants not earning a return on capital whilst old plants covering fixed costs



# Contents

1. What is the position of the German utilities?
- 2. What has brought them there?**
3. What changes are underway in Berlin and Brussels?
4. What will be the utilities' role in the future?

# The Energiewende – a plan to move from nuclear and coal to renewables: milestones from 1991





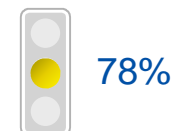
## Further targets introduced in 2011...

Firm goals		2020	2030	Instruments <sup>1</sup>
K1	Phase out nuclear power by 2022			2011 Nuclear Power Law
C0	Reduce greenhouse gas emissions compared to 1990 by	40%	55%	ETS with German version
C1	Increase proportion of renewables (RES) in gross final energy consumption to	18%	30%	Renewable heating, and Biomass laws,
C2	Increase the proportion of RES in gross elec. consumption to	35%	50%	EEG
C3	Reduce primary energy consumption compared to 2008 to	20%	-	Environmental tax, EnEV
C4	Reduce electricity consumption compared to 2008 by	10%	-	Environmental tax
C5	Increase energy efficiency compared to 2007 by	20%	-	Environmental tax and other laws
C6	Reduce heat demand of buildings compared to 2008 by	20%	-	EnEV
C7	Increase number of electric vehicles to	1 Mio.	6 Mio.	Energy and climate funds
C8	Reduce final energy consumption in transport vs.2008 by	10%	-	Reform car tax
N1	Grid expansion according to ENLAG	-	-	EnLAG
N2	Punctuality of the grid connection of offshore wind farms	-	-	EnWG
N3	Increase installed capacity of offshore wind to	10 GW	25 GW	EEG
V1	Supply security	-	-	Strategic Reserve
W1	Limit renewables surcharge to 3.5 cents/kWh			Not available
Currently only loosely defined goals				
C	Reduce heat demand of buildings compared to 2008	-	-	EnEV
C	Annual rate of energy-saving renovation in housing of 2%	-	-	Only indirect – loan programme
V	Additional construction of firm fossil fuel power plant capacity	10 GW	-	Not available

# ... which were badly off track after just two years, except for renewables growth

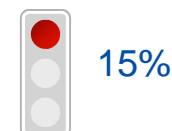
## Sustainability

1. Achievement of federal government's CO<sub>2</sub> reduction target (-40 %) increasingly unrealistic
2. Share of renewables rising in the case of electricity – stagnation in the transport and heating sectors
3. Due to first results from coalition talks the watering down of heating efficiency targets is likely



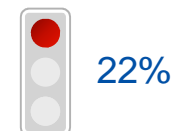
## Grid expansion

1. More than 80% of expansion projects still delayed
2. By 2015 a number of offshore wind farms will be completed, but key grid expansion projects for overland transmission of electricity will not be ready until that time
3. At least there is some improvement in sight for offshore wind power connections to the grid



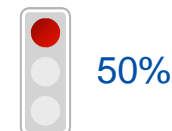
## Costs/EEG levy

1. With 6.2 ct /kwh the EEG levy has exceeded the government's own threshold of 3.5 ct/kWh by far
2. With the new government at least modest reforms that are targeting at limiting the costs are to expect, so we come to an neutral outlook for the next years, but situation will not improve quickly



## Security of supply

1. Increasing intervention by transmission system operators in the market to avoid critical situations with the power grid. The situation continued in whole 2013.
2. End of March 2013 there were some severe situations in the German grid due to very high wind feed-in.



Adherence to target path:

= 41%

Source: own calculations

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# The implications of the Energiewende together with the 2007 global recession

## 1. Renewables subsidy system without any cap

- annual support originally expected to be € 0,6 bn, not € 22 bn
- has its origins in the 2000 EEG, rather than the 2011 “Energiewende”
- costs (esp. PV) continually lower than subsidies = strong incentive

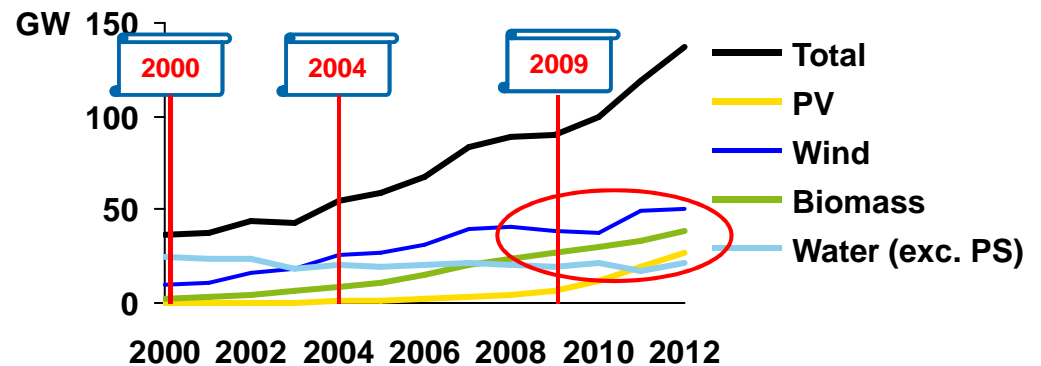
## 2. Recession

## 3. Low CO<sub>2</sub> prices

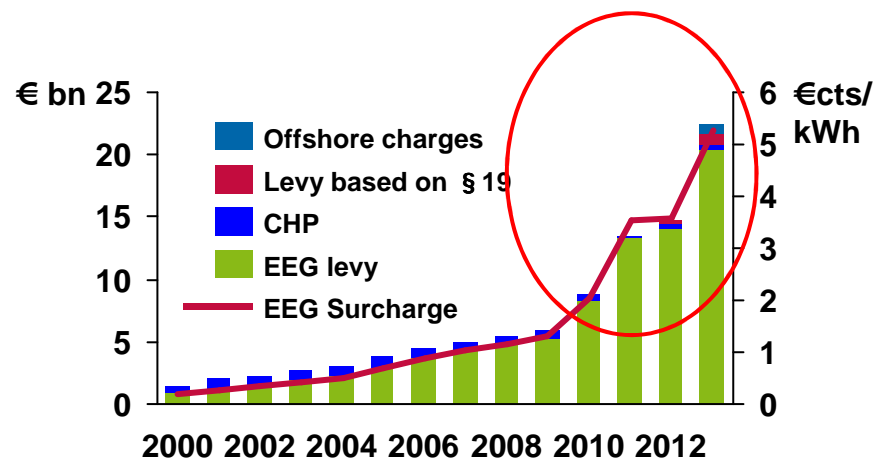
## 4. Low coal prices

## 5. Over-investment in conventional plant based on trend from early 2000's

Renewables capacity build-up

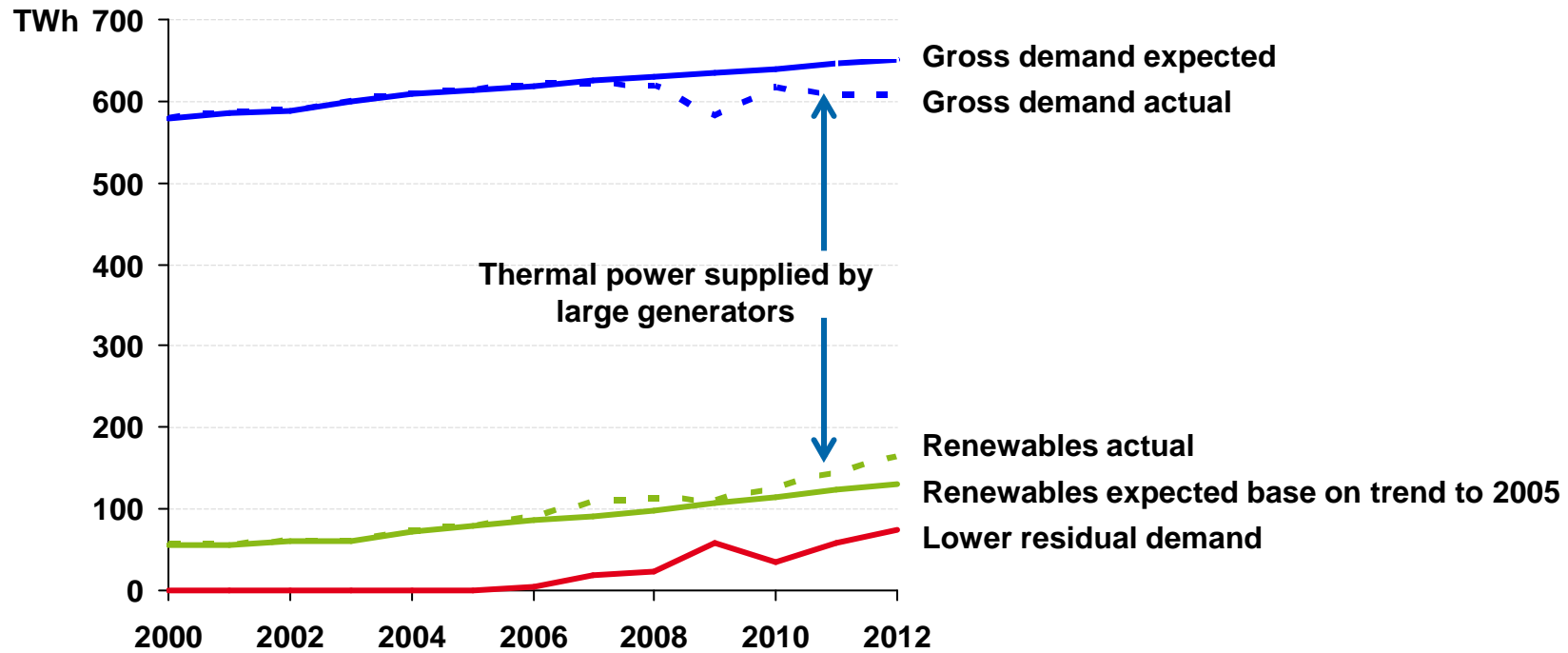


Subsidies for the Energiewende



# Generators suffered from two effects cutting volume by 15% vs. expected level...

Actual and expected (as of 2005) demand and renewables

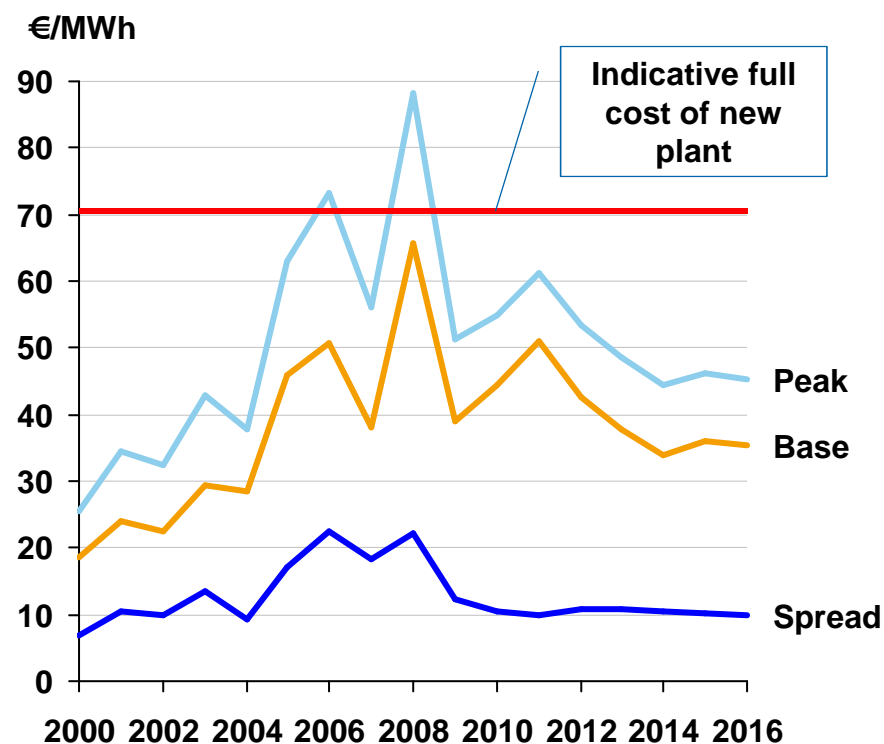


- 15% lower than expected demand due 60% to recession and 40% to renewables

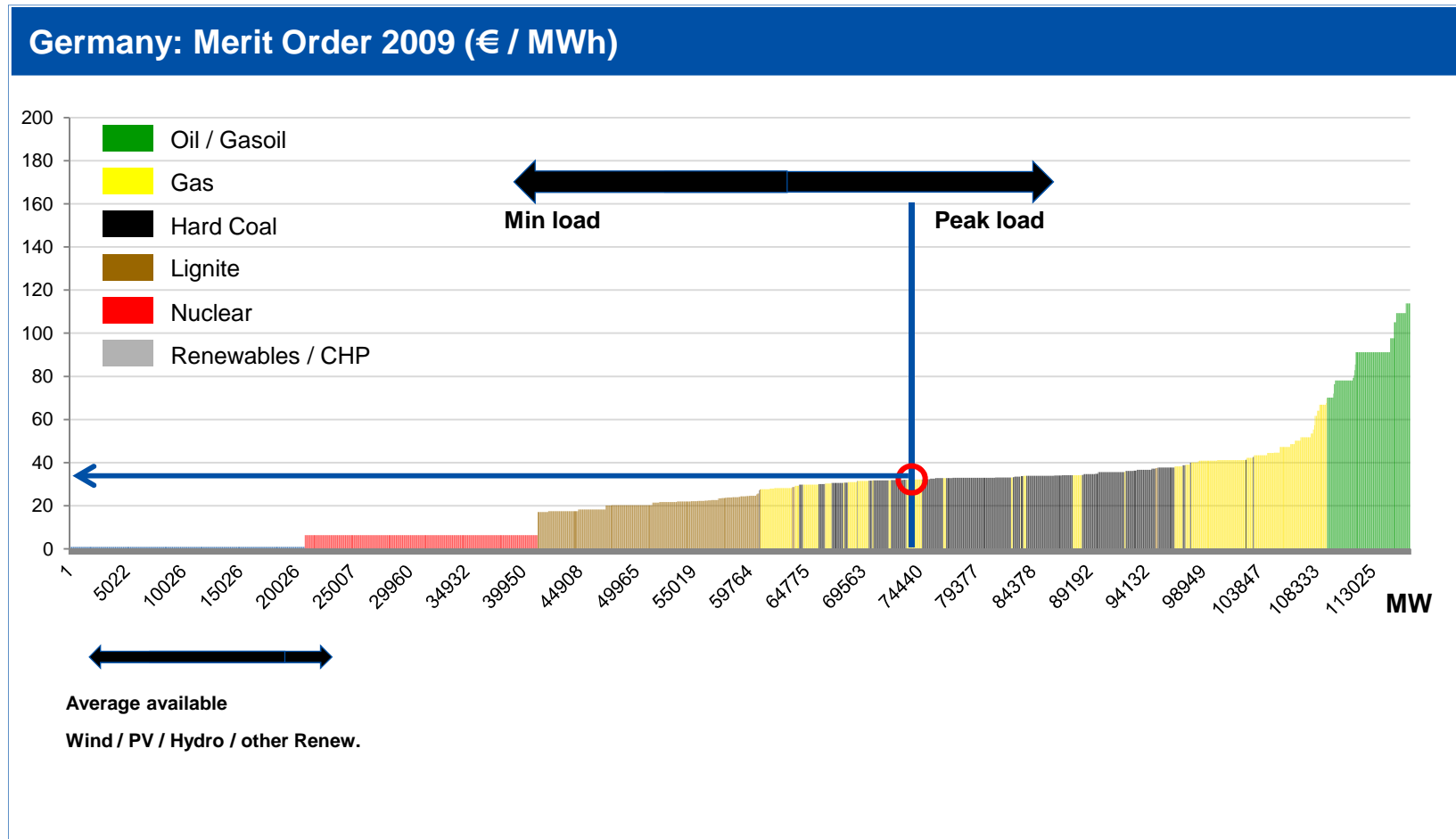
## ... and five effects cutting price by 50% vs. expected level (greater effect on margins)

1. Volume effect of higher than expected RES also pushed out merit-order curve
2. Volume effect of recession pushed out merit-order curve
3. PV had effect of flattening out daily peak price – important part of earning component
4. High CO<sub>2</sub> price expected - € 30 / t rather than € 5 / t
5. Higher coal price expected – flattened out merit-order curve

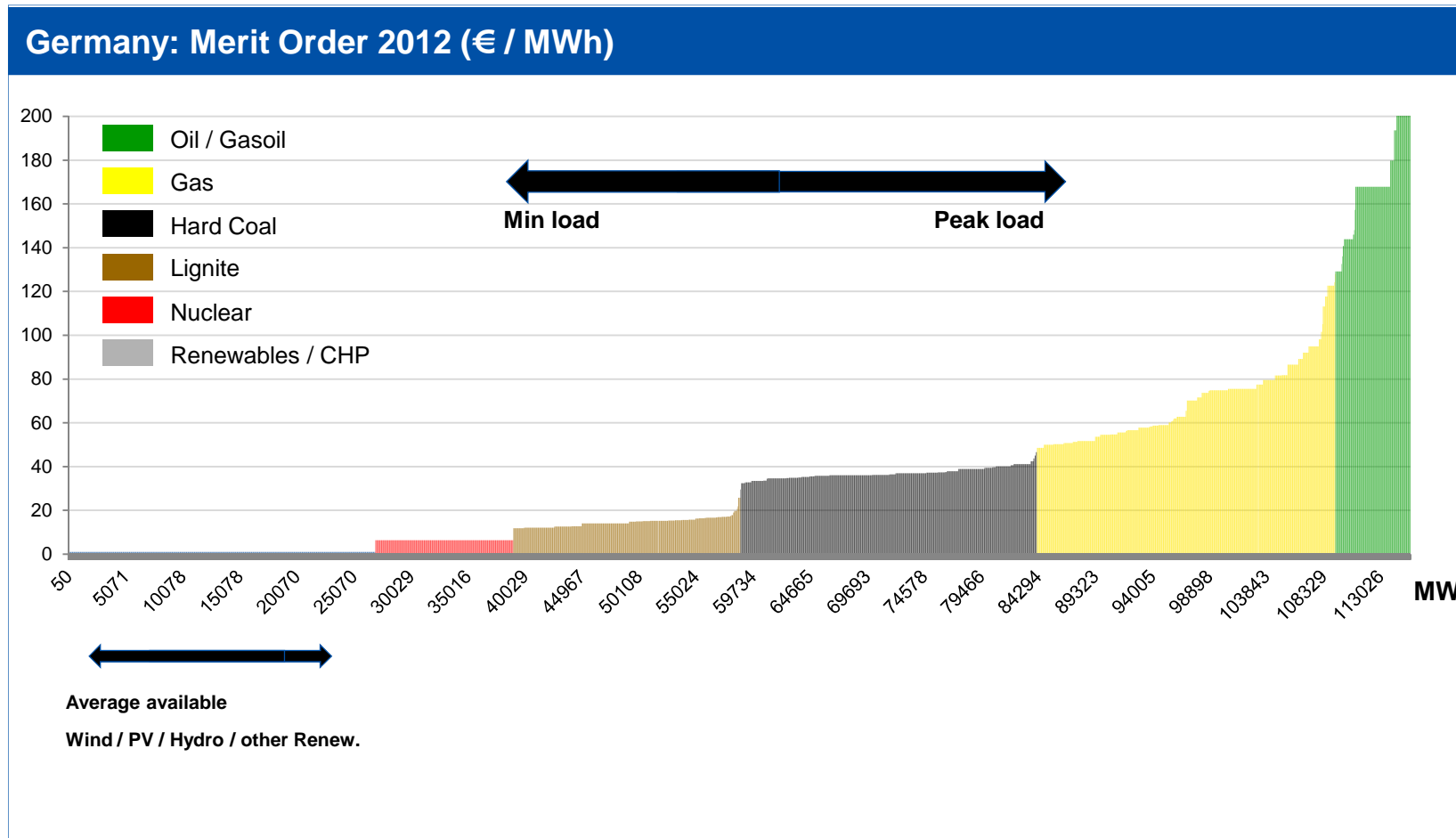
German power prices



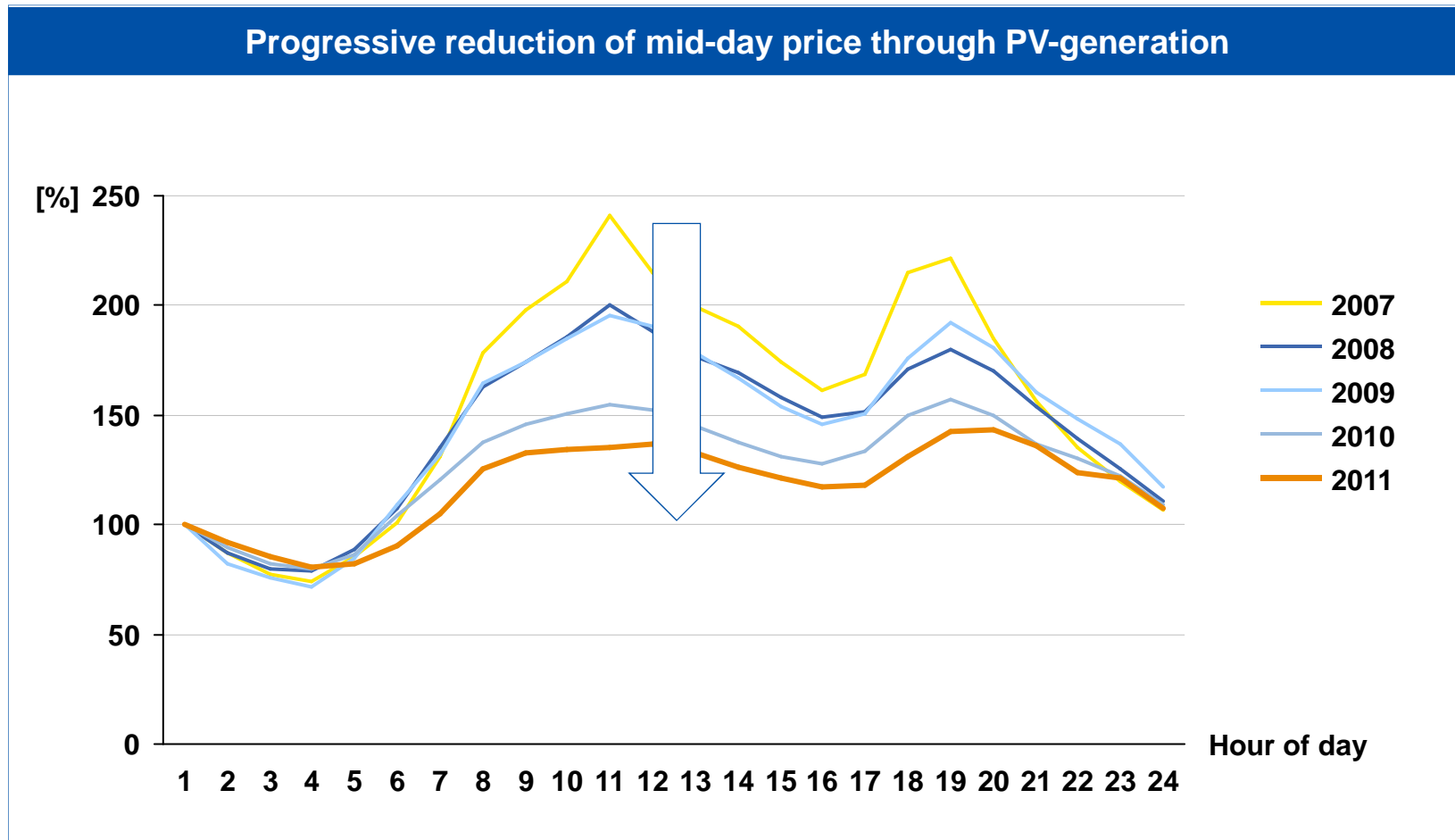
# Thermal plant Merit-Order 2009: new gas and hard coal plants competing strongly



# Thermal plant Merit Order 2012: hard coal plants with high utilisation but gas weakening

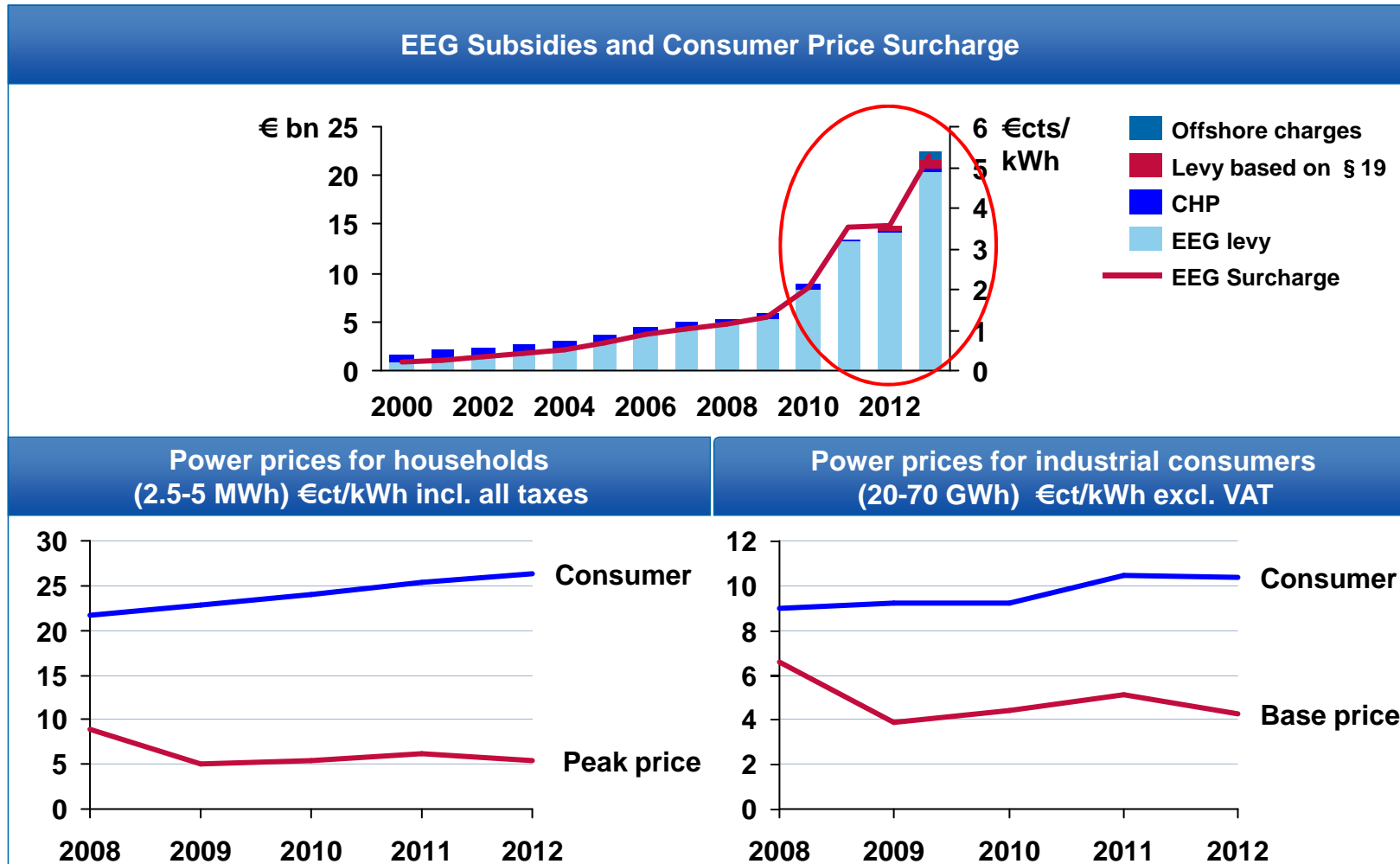


# The PV reduced the mid-day prices which accounted for high share of earnings

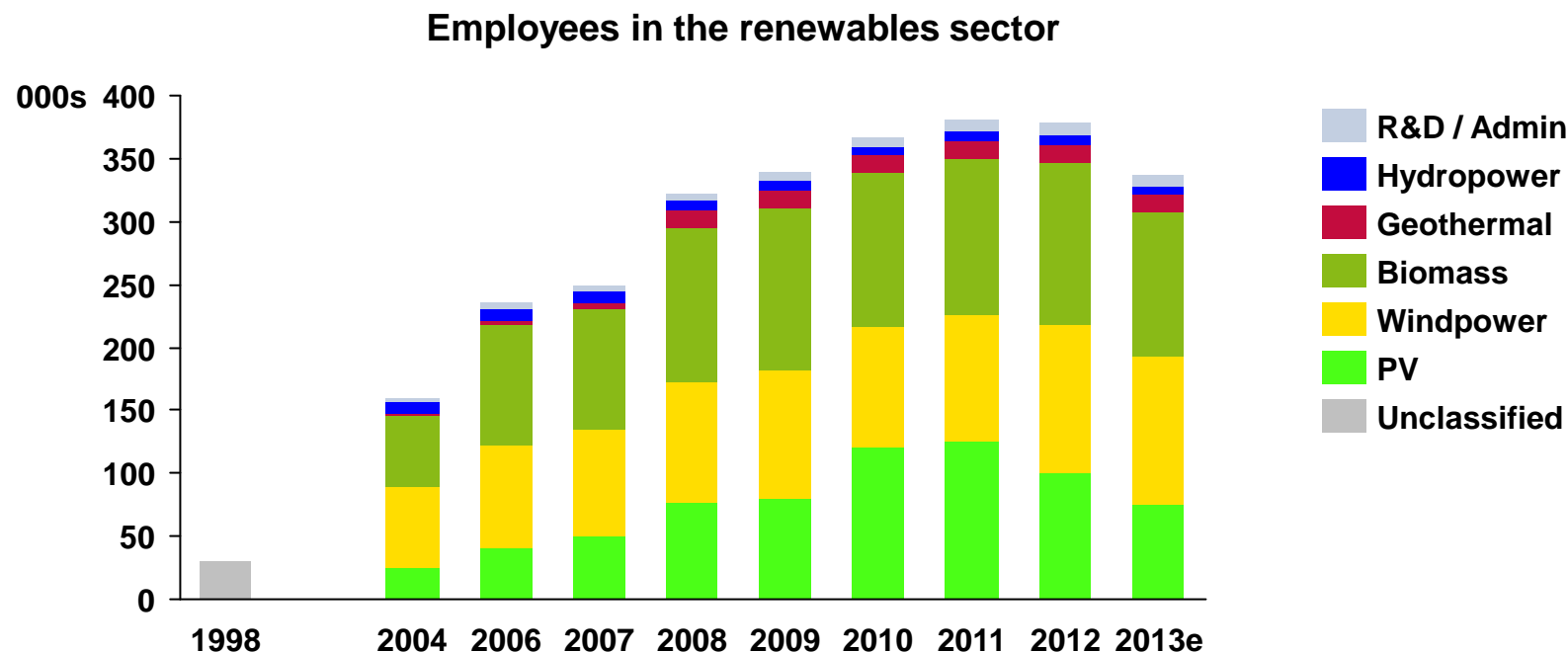




# The Consumer Price has been driven up by the surcharge despite a falling wholesale price



# The renewables policy has led to work for 0.8% of the German workforce



- Earlier Red-Green Coalition had hopes that 500 T jobs would be created by 2020
  - But loss of jobs (including growth prospects) in other sectors should be deducted
- Growing number of bankruptcies in renewables area since 2011, especially PV but also wind

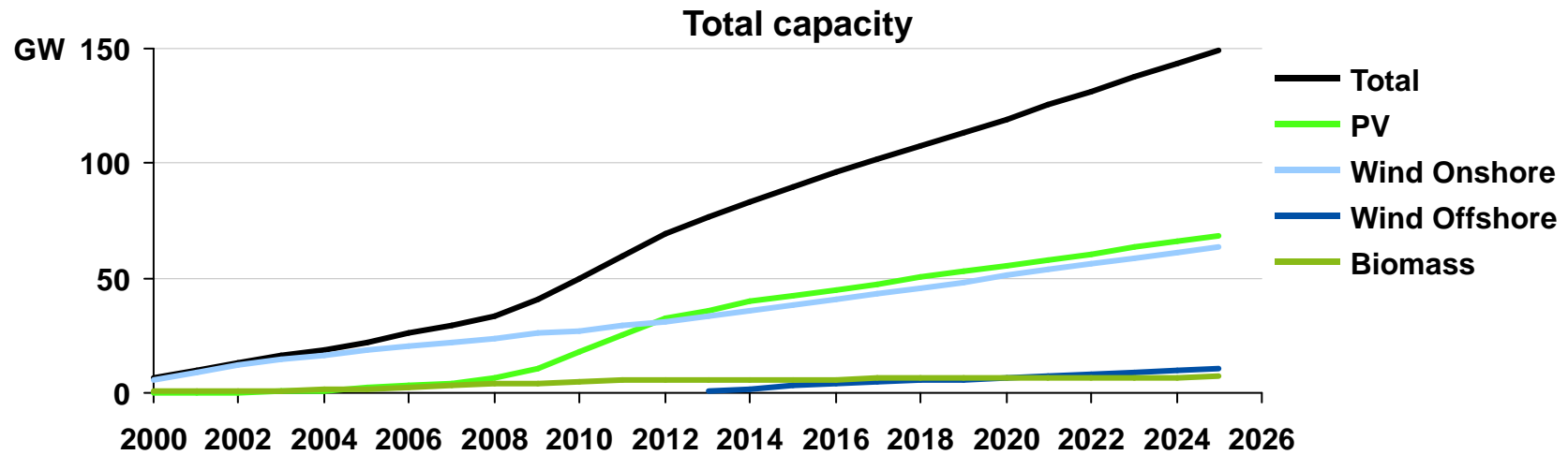
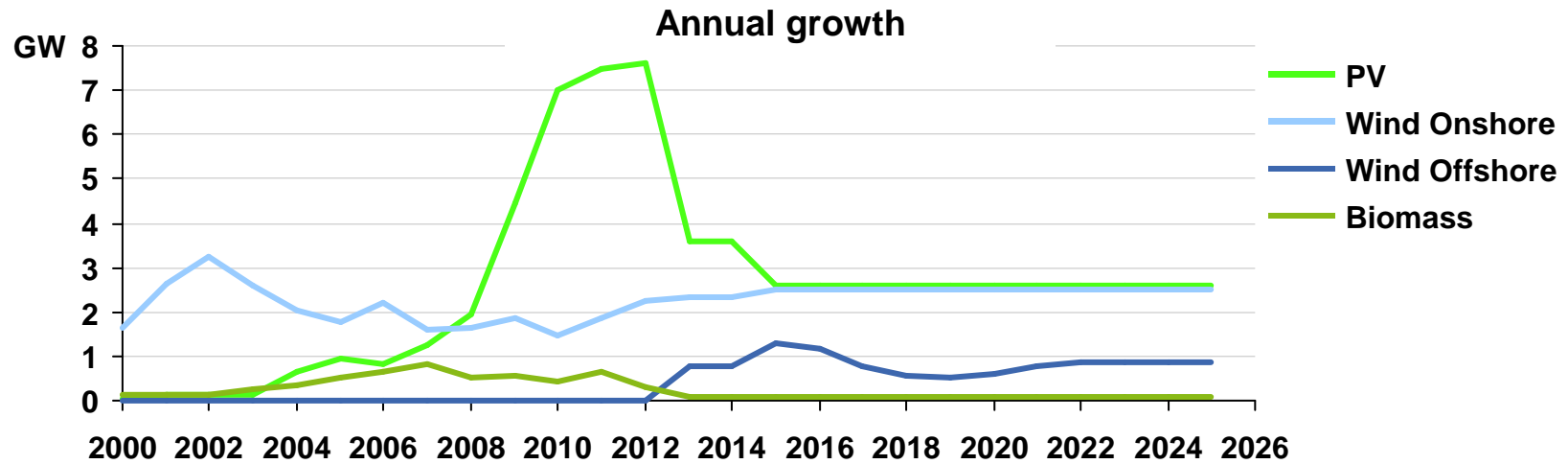
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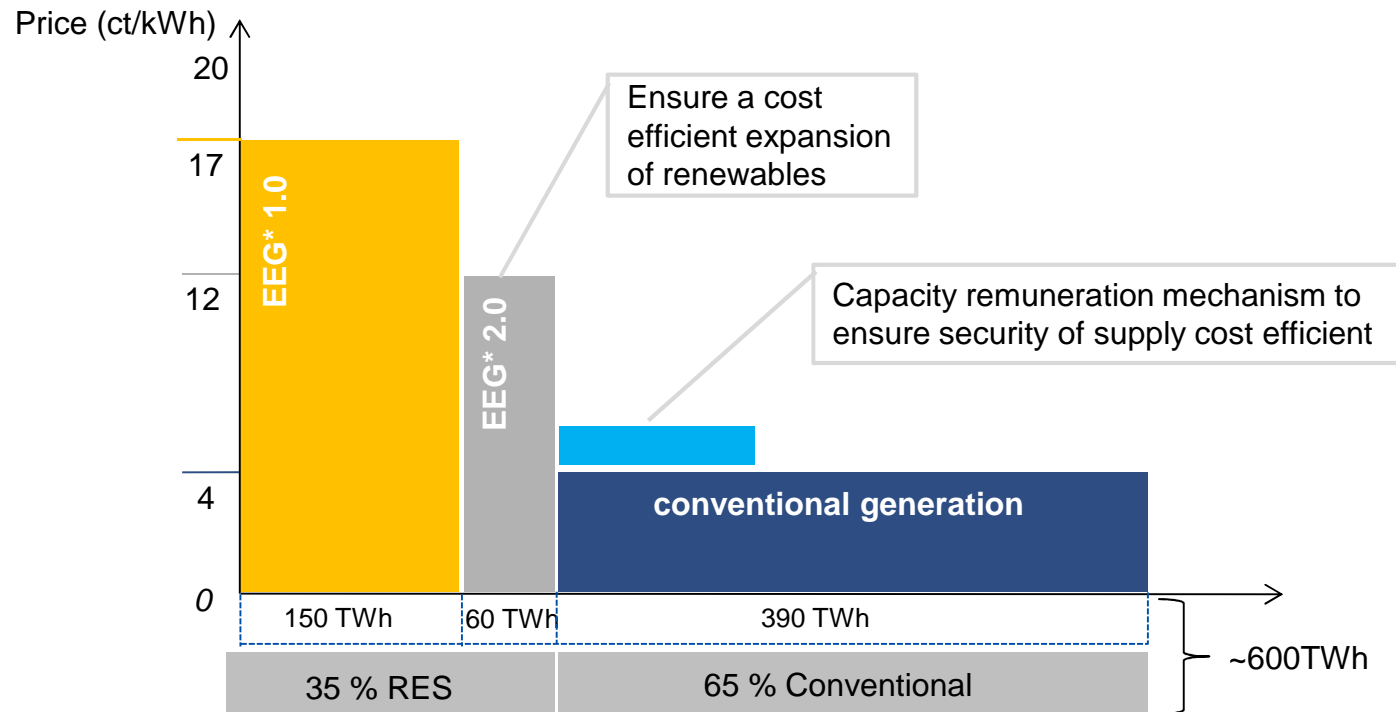
# The proposal for revision of the EEG agreed in Cabinet on 8th April 2014

- **Aim to reach 40-45% by 2025 then 55-60% by 2035 renewables share of power but always ensuring affordability and supply security**
- **Reduce average RES cost level from €cts 17 / kWh to € 12 / kWh**
- **RES growth corridor will be legally fixed**, with technology-specific instruments and focus on the most cost-efficient technologies
  - Offshore wind 6.5 GW to 2020 and 15 GW to 2030 and afterwards 2 wind-parks p.a.
  - Onshore wind and PV each a maximum growth of 2.5 GW p.a. (excluding repowering), with appropriate tariff adjustment
  - Biomass maximum 100 MW p.a. (considered too expensive for more)
- **Improved market integration** through a market-premium approach and direct marketing
- **New EEG (renewables law) will be fully EU-conform, including industry privileges**
- **Market design** – a capacity market is envisaged medium-term
  - not clear whether it will be technologically-neutral and all plants will be eligible
- **Time-plan** – Parliamentary process to be followed with aim of entering into law 1<sup>st</sup> August 2014

# Renewables growth path proposed by new EEG compared with past...



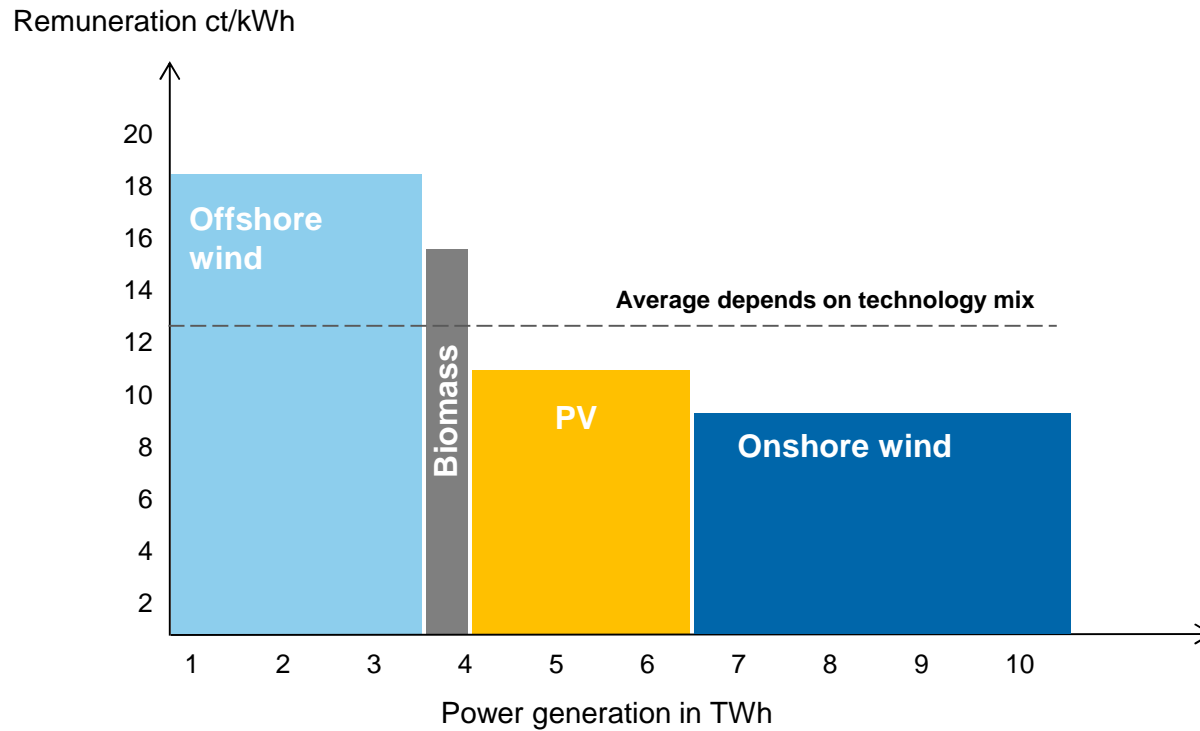
# The cost for power supply with a 35% RES share (target for 2020)



Source: Federal Ministry of Economic Affairs and Energy

\* EEG = German renewable energy act

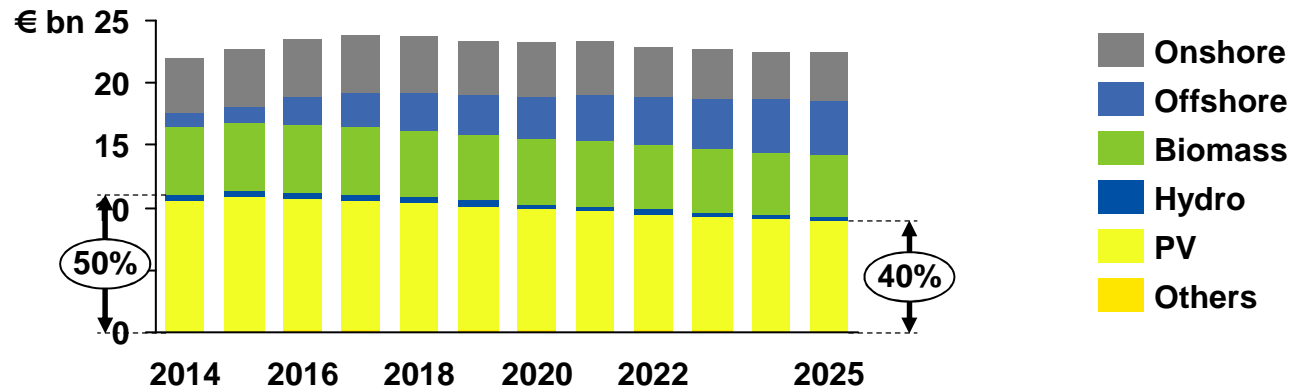
# The plan to reduce the average cost for incremental RES to €cts 12 /kWh



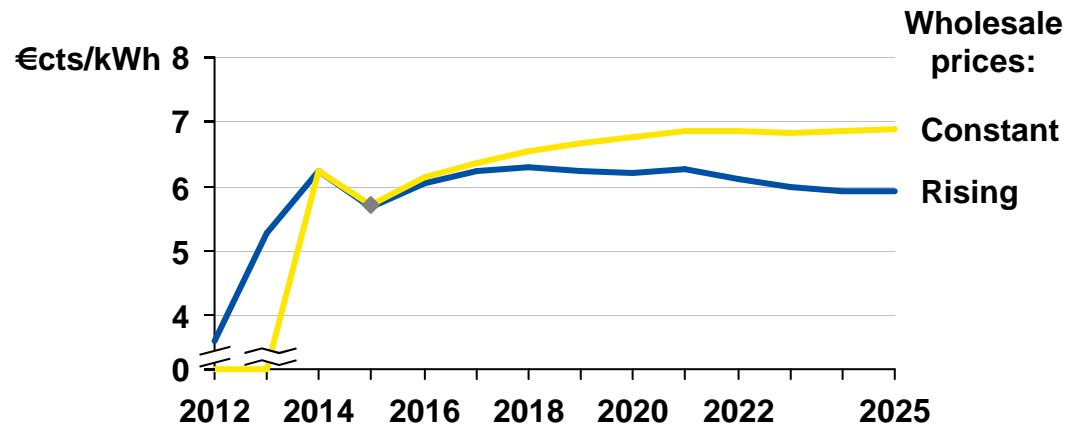
Source: Federal Ministry of Economic Affairs and Energy

# ... and putting a limit on subsidies and the EEG surcharge even in a worst case

Subsidy costs by type



EEG-Surcharge





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# Three essential elements to the supply

1. **Affordability** – the commodity (kWh) and service level must be delivered at lowest cost

- Use lowest cost fuels consistent with meeting EU carbon targets and most efficient plants
- Make use of existing thermal plants to provide service element



2. **Supply-security**

- Achieved by the round-the-clock availability of conventional plants and their increasing flexibility
- Also by introduction of further flexibility along delivery chain – smart grids, smart meters etc



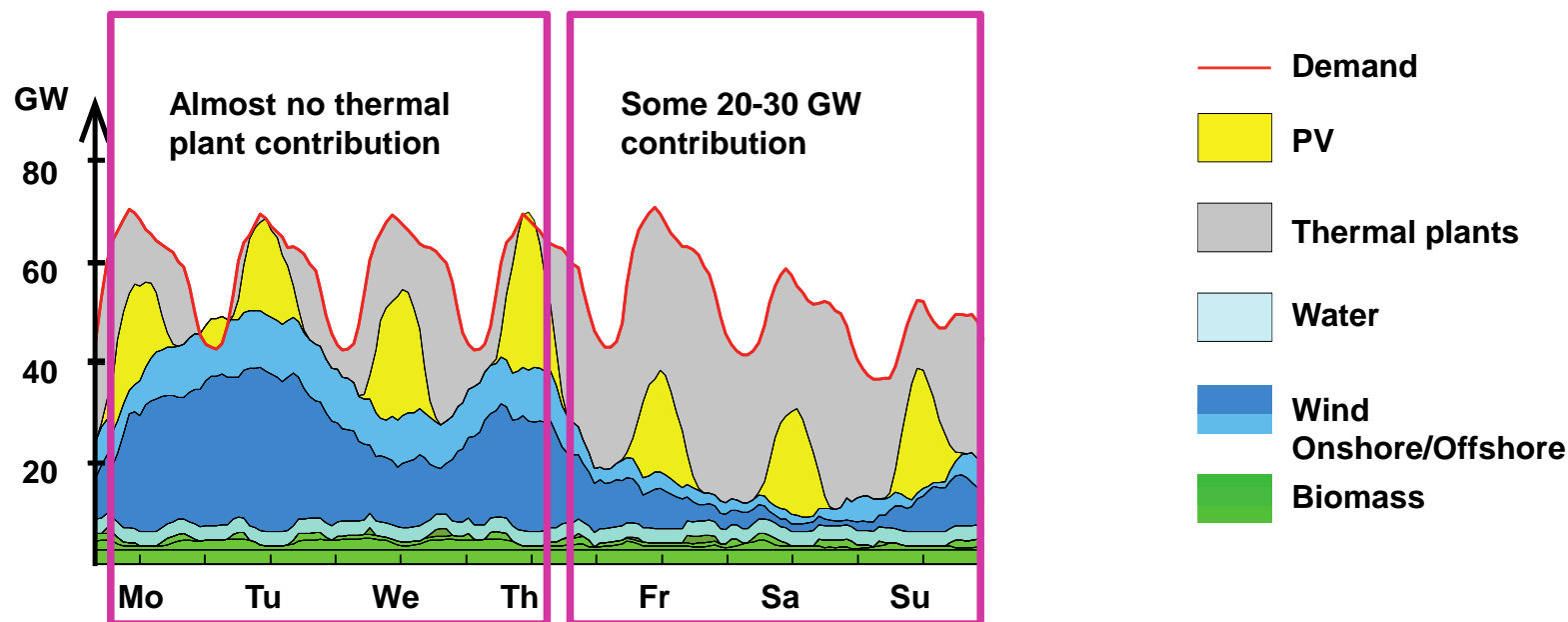
3. **Carbon reduction**

- Controlled by Emissions Trading Scheme – ensures targets are met
- Achieved by combination of renewables and fuel-switching



# The integration of renewables will require a much higher „service“ component

Indication of the role for thermal plants in August 2022

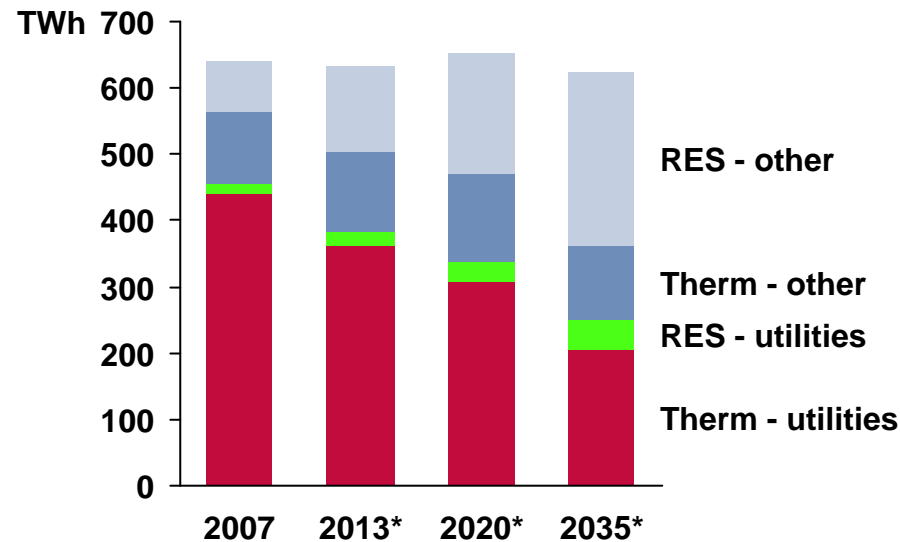


- Wind and PV will become the basis for power supply; the remaining plants will optimise themselves around this supply
- Most thermal plants will be only needed in the future at times of low wind / sun – there will be no longer base-load plants

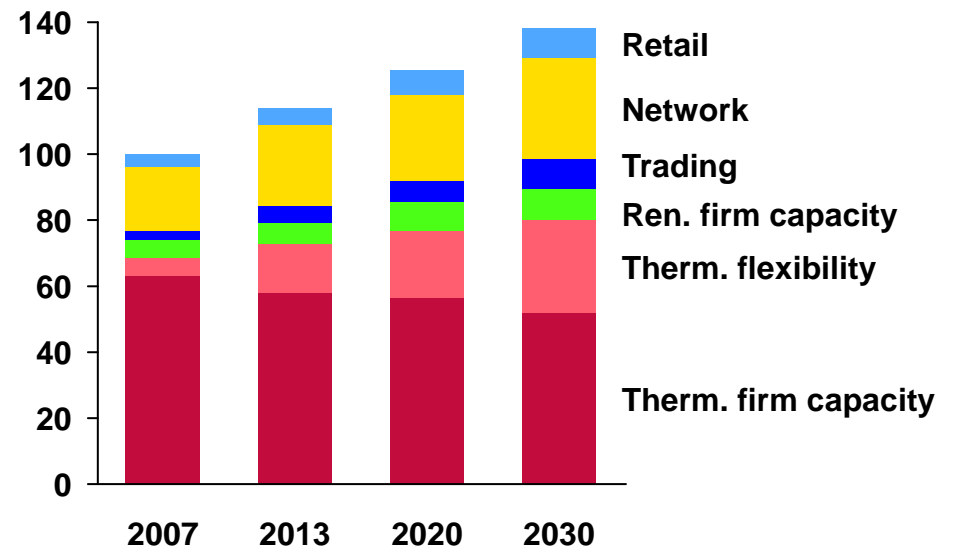
Source: Agora Energiewende (12 Thesen zur Energiewende, 2012)

# Where are the utilities going? Shifting from kWh production to even higher emphasis on service

Less conventional production  
(indicative figures)



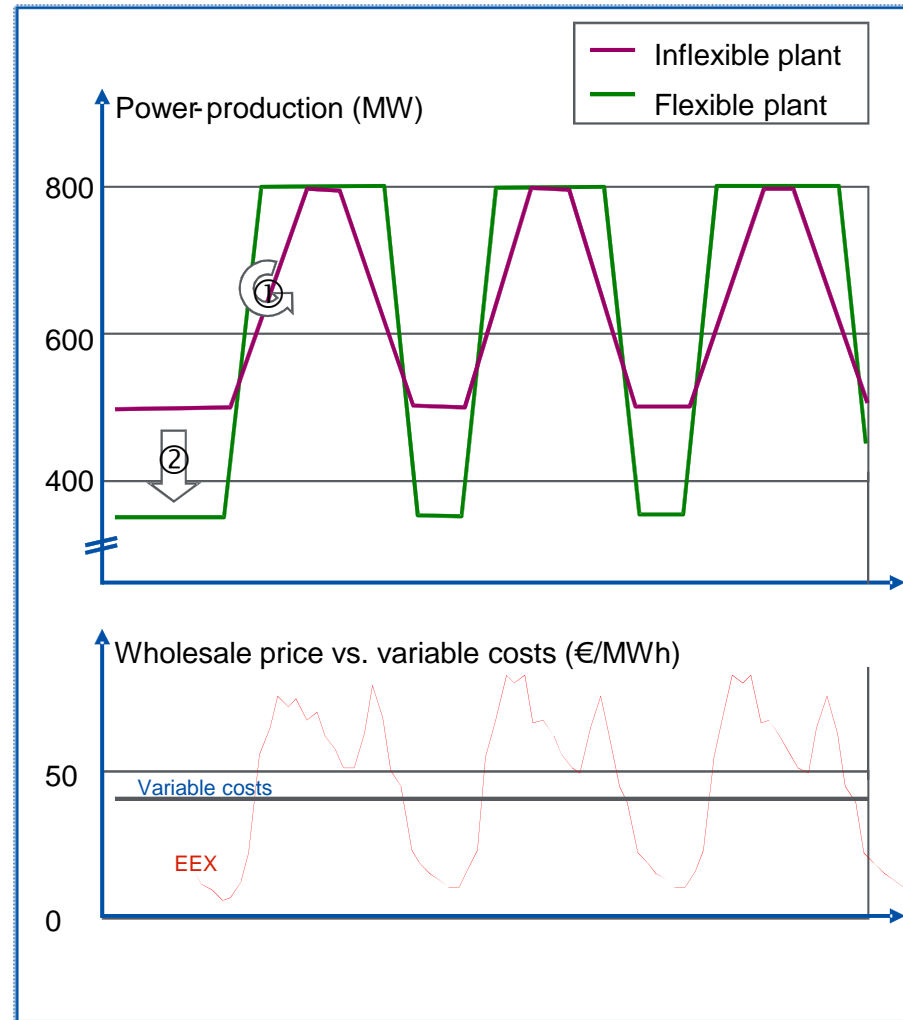
More effort on service  
Qualitative Index vs. 2010



RES. = renewables,  
Therm. = conventional thermal plants

# What does flexibility mean for power plants?

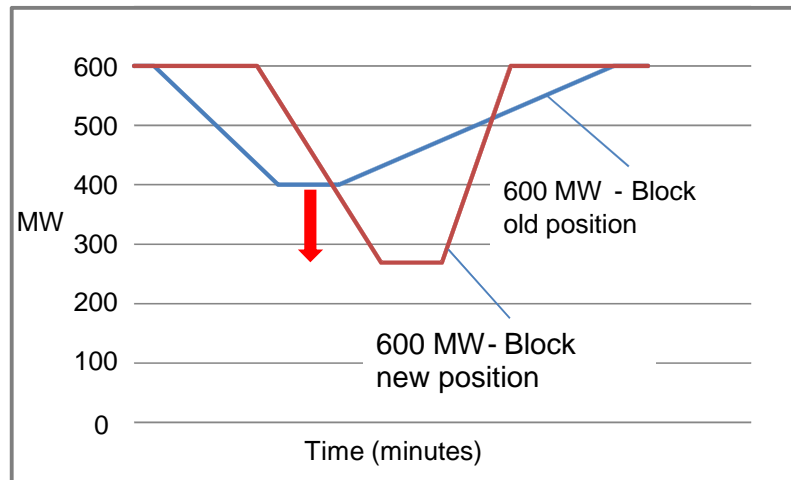
- Dynamic performance
  - High rate of changing load output
  - Short-times for ramping up/down
- Operational flexibility
  - Low minimum load with high efficiency
  - High number of start p.a.
  - Low costs for ramping up/down
  - Short minimum load times
- Organisational flexibility
  - Flexible shift models with wide range of staff qualifications
  - Market-orientated maintenance plan
- Additional factors
  - Permit restrictions, fuel quality and contract flexibility



# Example Weisweiler Lignite Plant: renewal of the Control Technology increases the load rates



- Retrofitting of all 600-MW-Blocks with modern digital control in combination with the required technical adjustments to the plant
- Renewal of the control system is the requirement to improve the ramping
- Increasing the flexibility of the 600-MW Lignite blocks: ramping rate increased to 10 MW/ minute and minimum load to 170 MW.
- Contributes to life-time extension
- Allows the plant to operate in the secondary markets



# RWE Contributions downstream - Smart grids

Smart Country - Smart Grid solution for rural areas has successfully passed practice test



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RWE implements "more intelligence" in the low voltage grid with the project "smart operator"

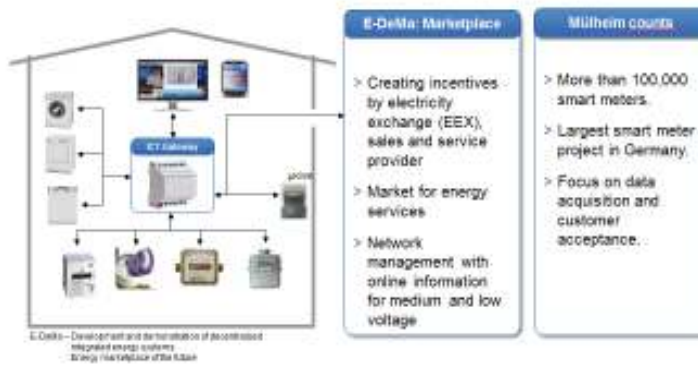


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RWE Deutschland AG

November 2012

Energy users become prosumers - this implies ICT and new market models



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RWE Deutschland

Power-to-gas demonstration plant of RWE - A look into the future of storage

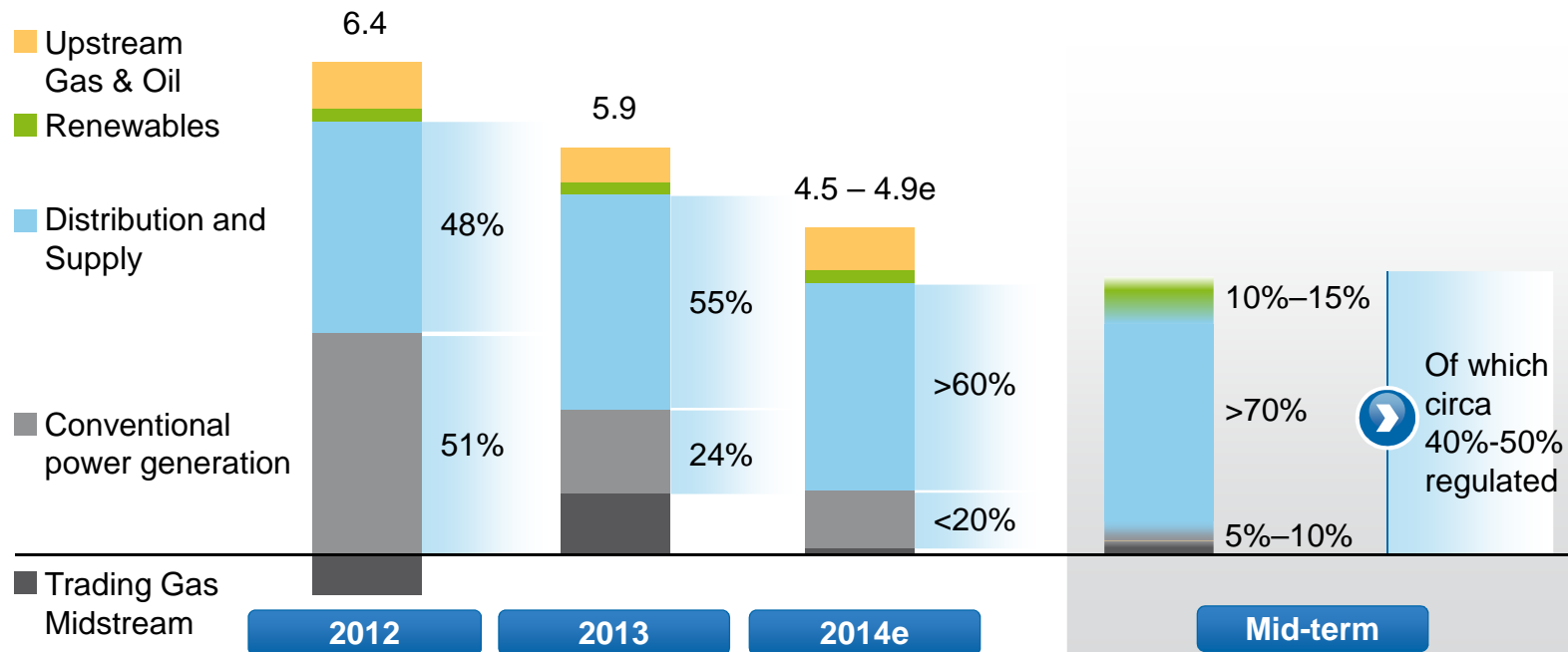
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# Summary – examples RWE: future earnings shifting from production to service side

RWE develops towards an attractive stable downstream business profile with additional focus on renewables and upside potential from conventional power generation

Operating result in € bn





THANK YOU VERY MUCH FOR  
YOUR ATTENTION.

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