The Role of the Energy Industry in the EU and the World

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Conclusions of my Speech on 25.01.2016

- The shock of the energy transformation makes traditional electricity business models obsolete
- Part of the challenge is distributed generation and self-generation
- Ideas for new business models exist, but expected margins remain small and are hardly to be implemented by incumbents
- As a way out of the dilemma, energy industries become dependent on political regulation

Agenda of Today

- What are the reasons for sustainable low electricity prices on wholesale prices?
- What could be the directions of lobbying activities?
- Are other business models promising? Examples
  - regulation power supply
  - New approaches such as Power-to-Heat or Power-to Gas
  - Investing into energy storage
  - Provision of energy (infrastructure) services

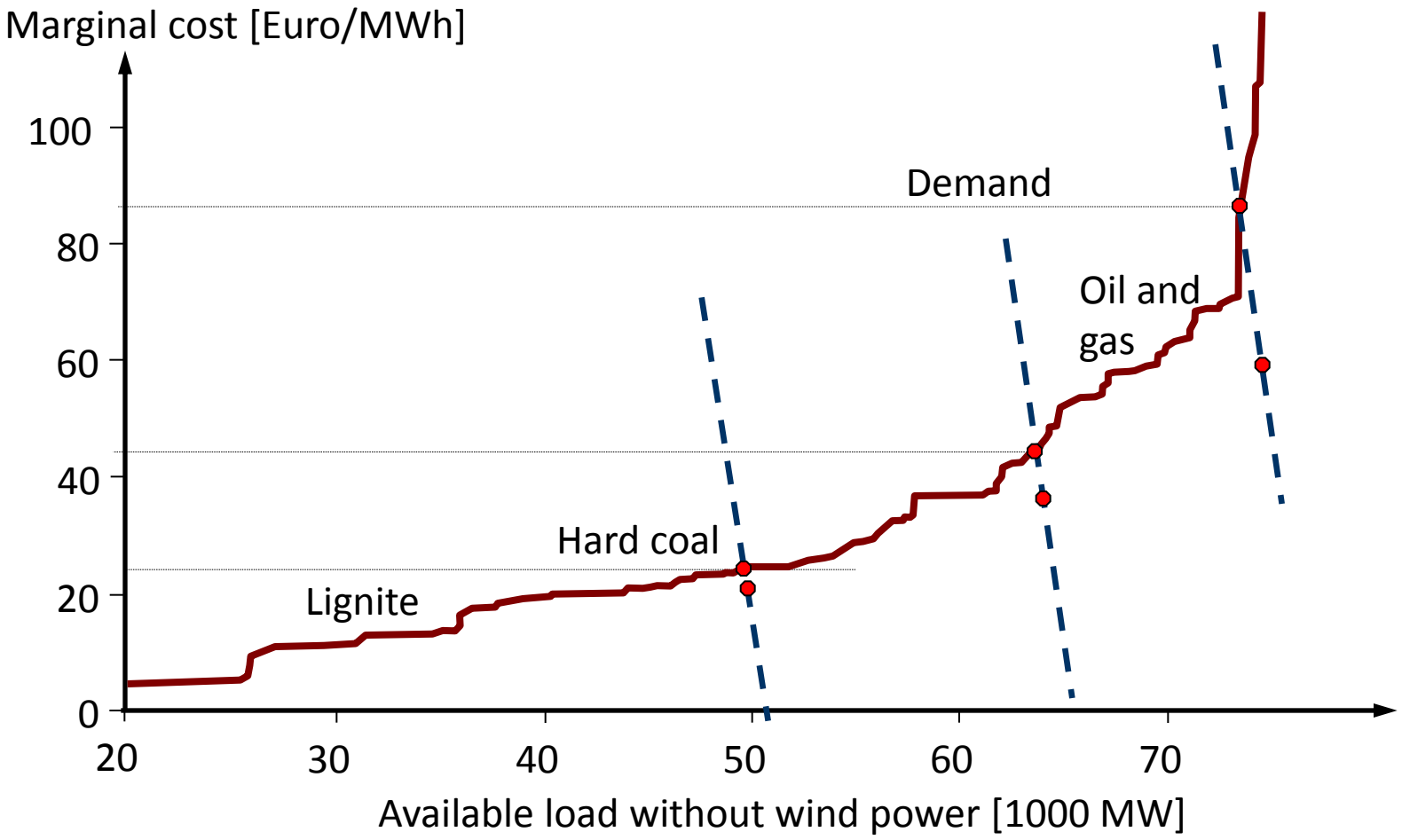
Merit Order Effect of Renewables

- Dispatch of the plants according to the marginal costs per MWh such as
  - expenditures for fuel
  - greenhouse gas allowances
  - wear of the equipment

- Compared to fossil fuel plants, wind and PV generators have low marginal costs

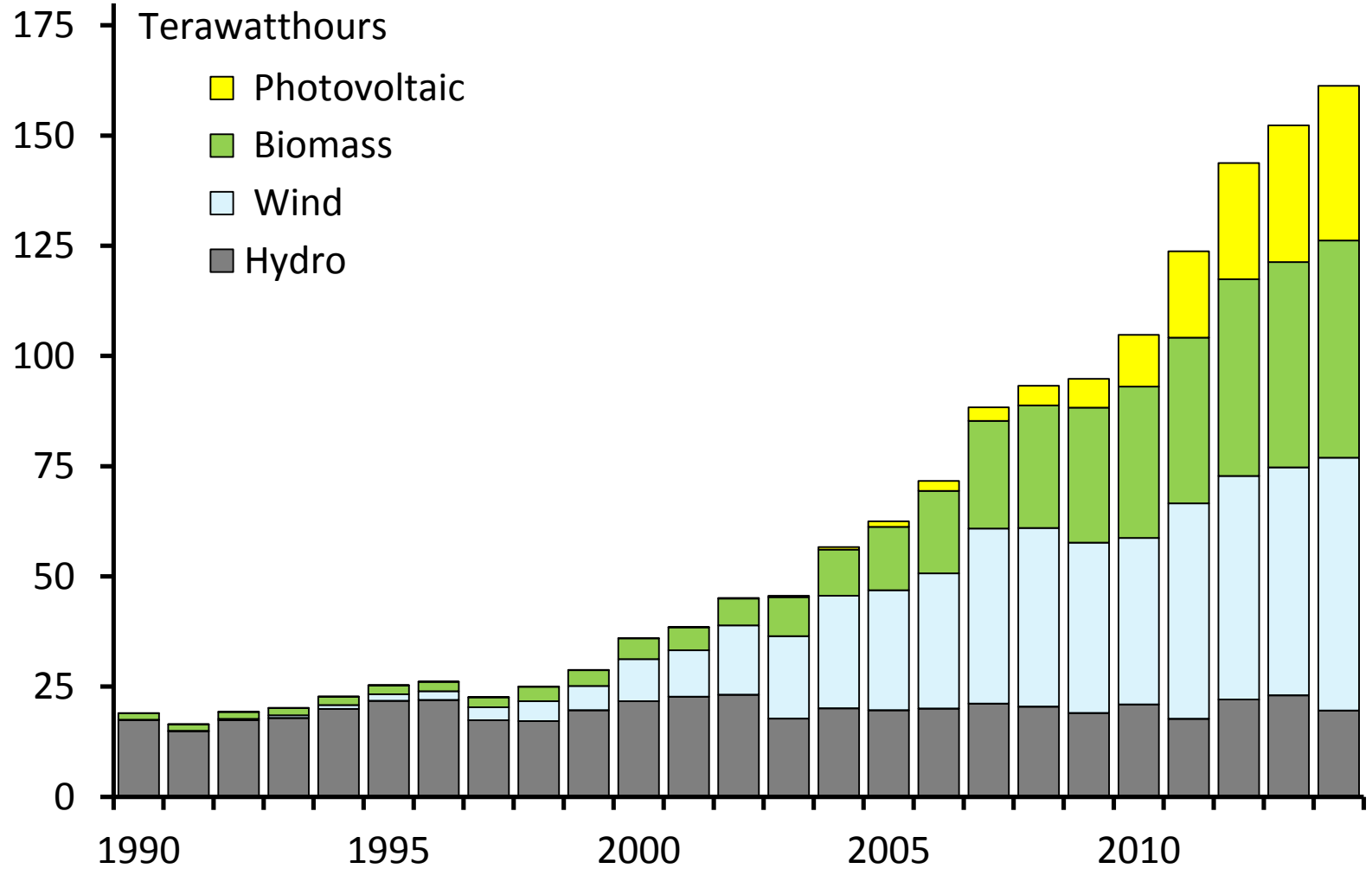
Merit Order Curve for Germany

[without CO_2 cost; data source: EU Sector Enquiry 2007, p. 260]



Renewable Electricity Generation in Germany

[33% share in 2015; source: Arbeitsgemeinschaft Energiebilanzen]

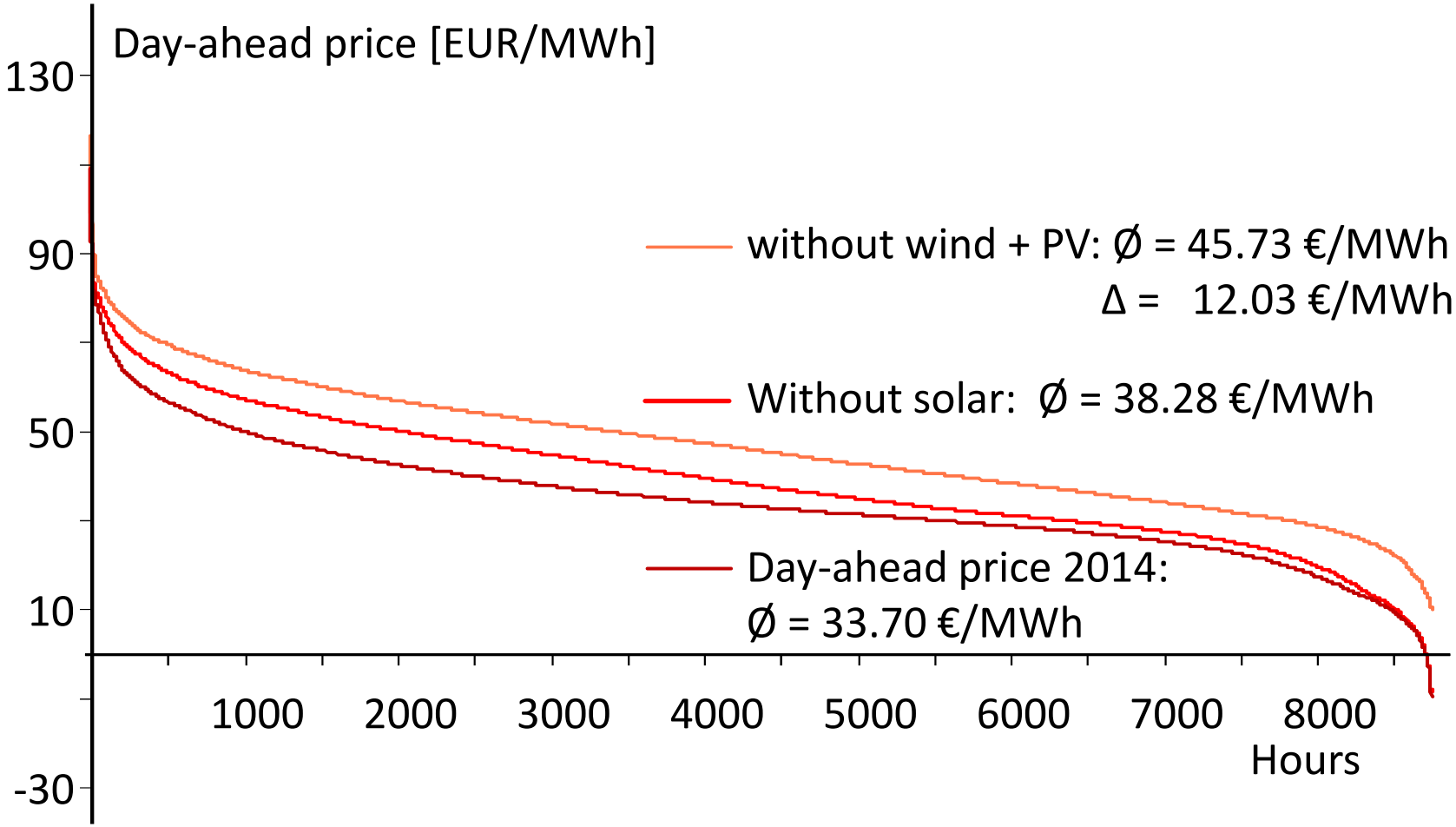


Merit Order Effect of Wind and PV in Germany

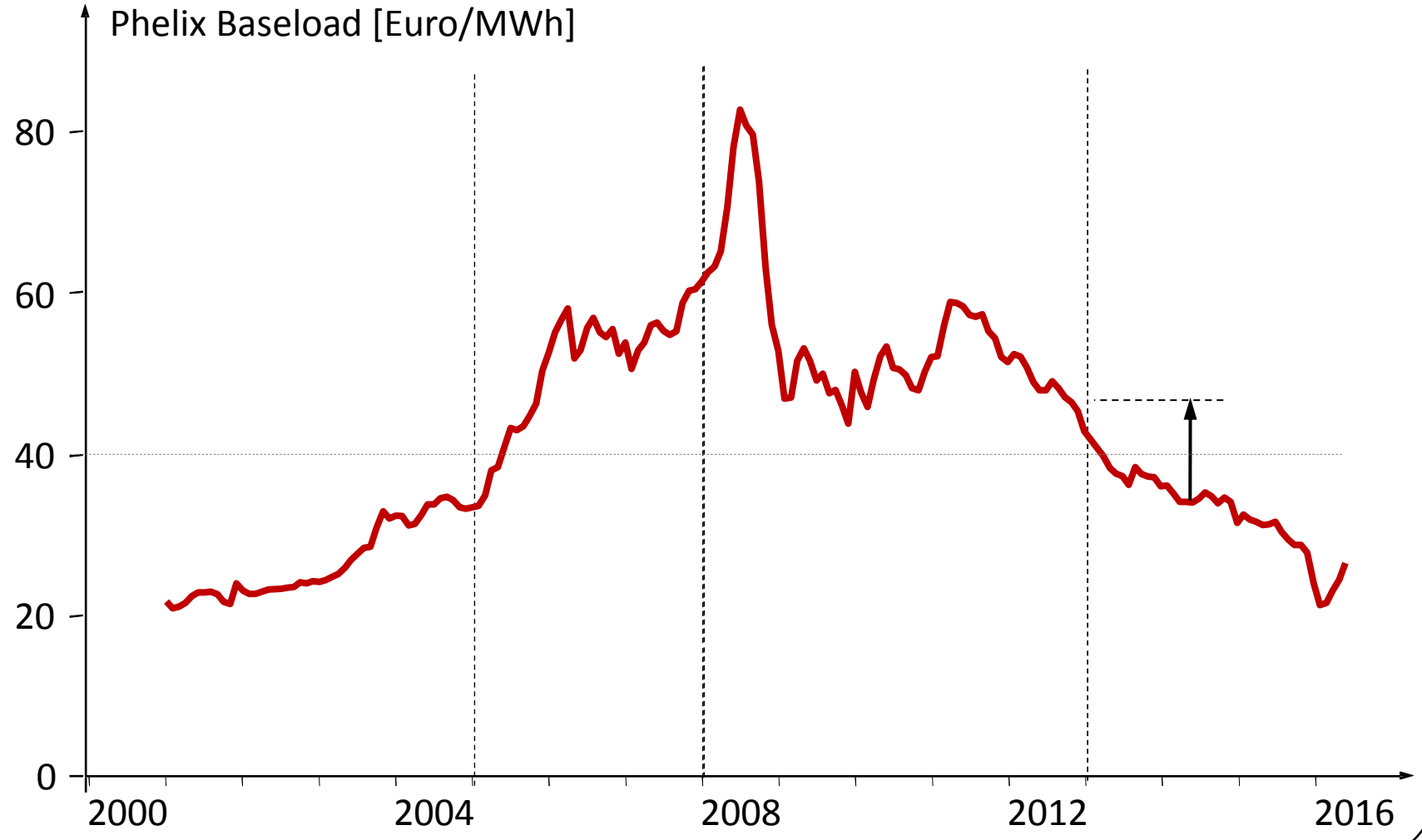
Literature review	2006	2007	2008	2009	2010	2011	2012
	Euro/MWh						
Sensfuß et al. (2008)	-7.8						
Weigt (2009)	-6.2	-10.4	-13.0				
vbw (2011)					-8.0		
Sensfuß (2012)		-5.8	-5.3	-6.0	-5.2	-8.7	-8.9
Speth, Stark (2012)					-5.6	-5.6	
Cludius et al. (2013)			-10.8	-7.8	-6.0	-7.7	-10.1

Merit-Order-Effect of REN Electricity in 2014

[Own calculations based on data from EEX and TSO data]



Day-ahead Power Price [in Germany; data surce EPEX]



Implications of the Merit Order Effect

- Low and wholesale power prices puts traditional generation business into crisis

- Proposals out of the dilemma will not solve the problem unless successful lobbying:
  - Accelerated Phase-out of (coal) capacities
  - Capping (sponsored) renewable investments
  - Additional cash flows in on top of the wholesale electricity markets (example capacity payments)

Agenda of Today

- What are the reasons for sustainable low electricity prices on wholesale prices?
- What could be the directions of lobbying activities?
- New business models more promising? Examples
  - Regulation power supply
  - New approaches such as Power-to-Heat or Power-to Gas
  - Investing into energy storage
  - Provision of energy (infrastructure) services

Markets for Regulation Power in Germany

[in 2016; Source: www.regelleistung.net]

	Primary control	Secondary control	Minute reserve
Auction interval	Weekly	Weekly	Daily
Auction time	Week ahead Tuesday	Week ahead Wednesday	Day ahead
Auctioned products	Combined positive/ negative control	Separate positive/ negative control	Separate positive/ negative control
Time slice	1 week	Day HT / NT	6 x 4hours
Minimum bid (pooling allowed)	1 MW	5 MW	5 MW
Activation time	30 seconds	5 minutes	15 minutes
Award criteria	Offered power price		
Load compensation	Offered power price (pay as bid)		
Compensation for energy	Offered energy price (pay as bid)		

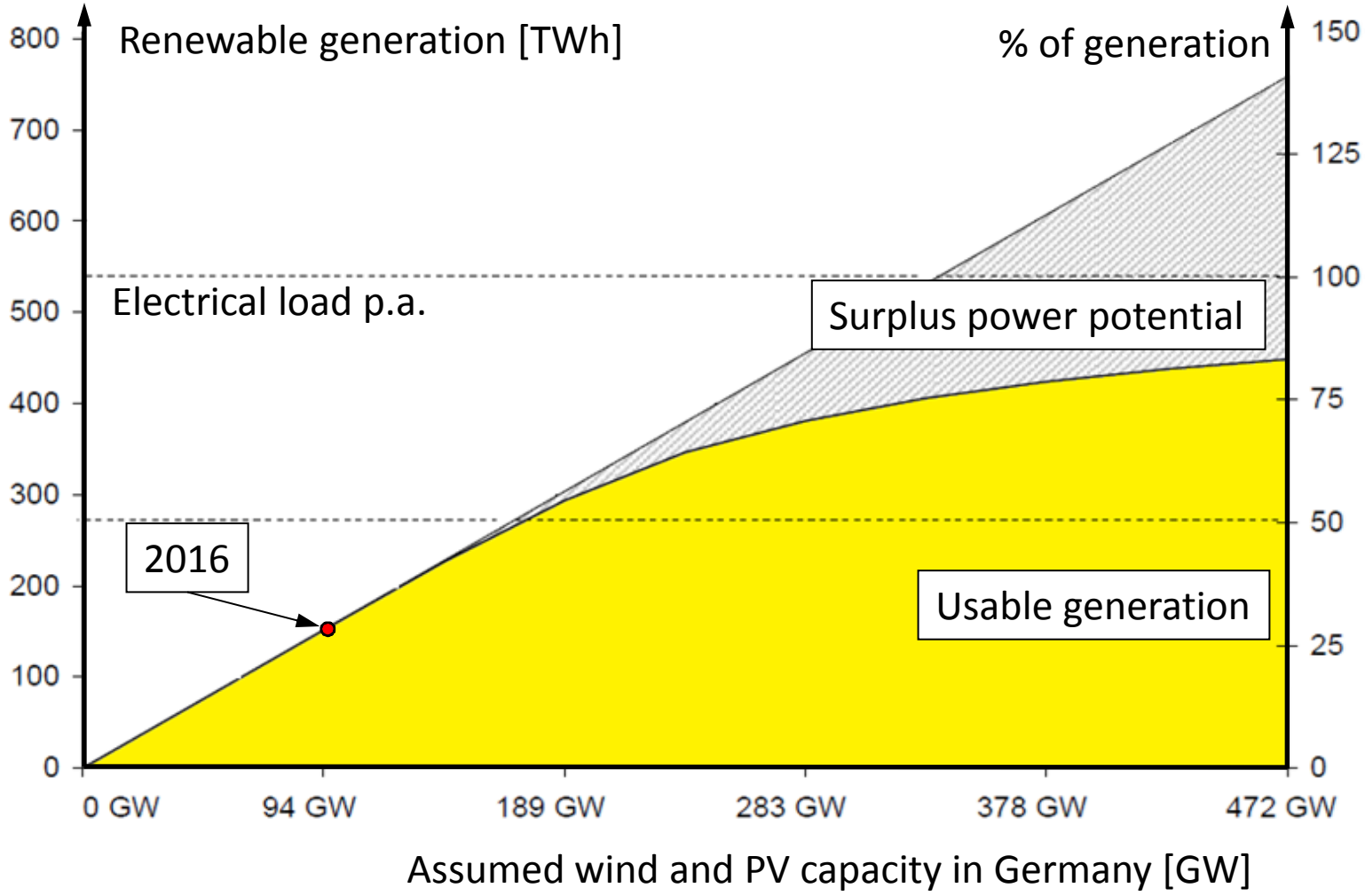
Average Regulation Power Prices

[Source: calculated from www.regelleistung.net]

Year	Secondary control Euro/(MW·h)		Minute reserve Euro/(MW·h)	
	positive	negative	positive	negative
2010	10.67	12.87	1.11	3.18
2011	8.08	10.89	0.30	4.29
2012	2.37	10.92	0.61	3.01
2013	7.87	11.83	0.94	5.72
2014	7.83	5.16	0.55	4.02
2015	6.07	2.63	0.60	1.86

Electricity Generation from Wind and PV

[Source: from Grosse Böckmann 2010]



Nature of the Problem to be Solved

- Hours with excess electricity requires curtailment of renewable electricity. Curtailment can also be due to grid bottlenecks

- Using excess renewable electricity in other energy demand sectors such as
  - Transportation market (electric mobility)
  - Heat market (Power-to-Heat)
  - Chemistry, refineries (Power-to-Gas, …)

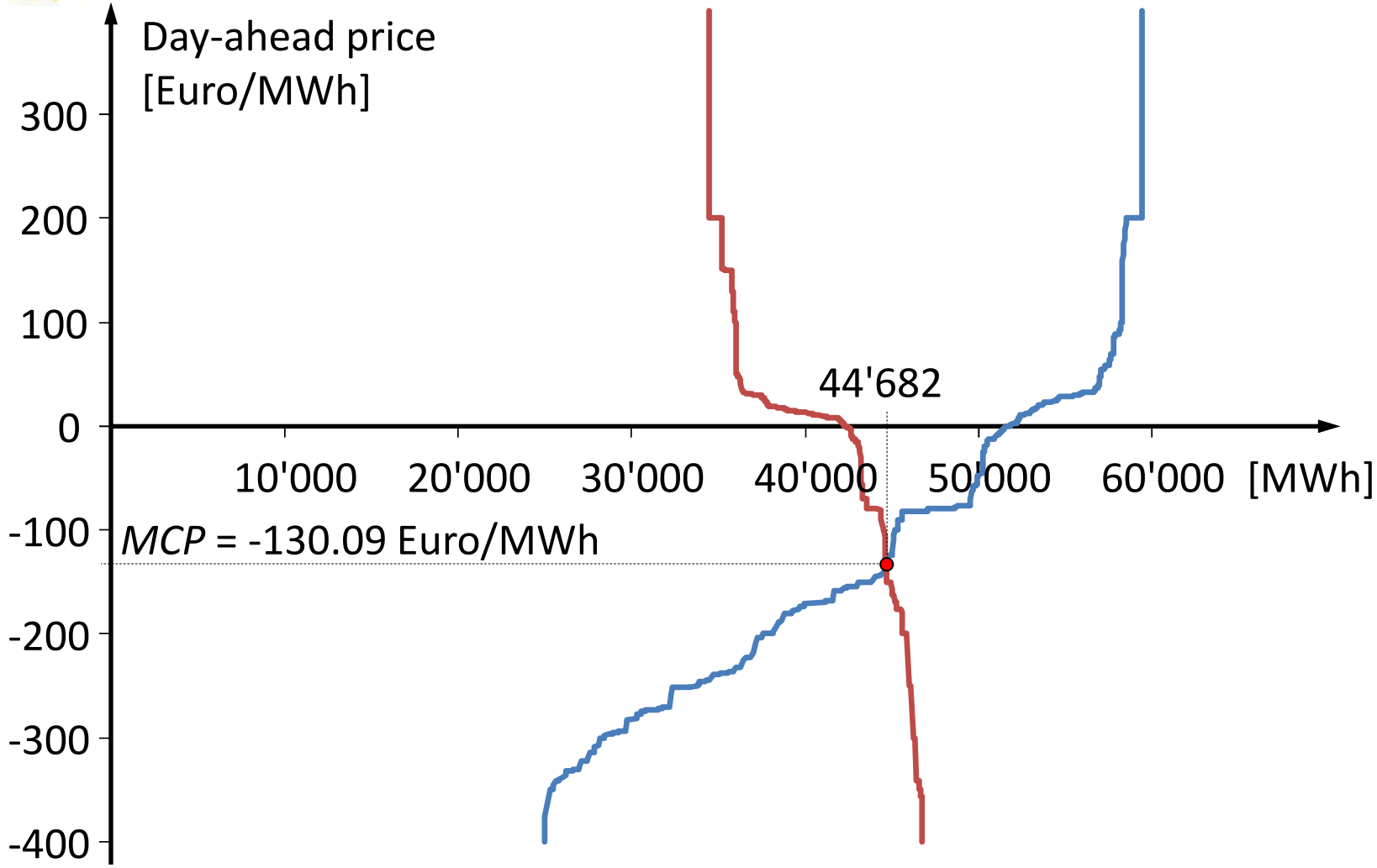
- To be economically feasible, these concepts require electricity end-user prices to be lower than the price of the substituted fuel

Negative Day-ahead Prices in Germany

[Own calculations; data source: EPEX]

Year	Number of hours with day ahead price ≤ 0	Minimal day-ahead price [Euro/MWh]
2010	12	-20.45
2011	16	-38.82
2012	55	-221.99
2013	621	-100.93
2014	61	-65.03
2015	118	-79.94
2016	?	-130.09

What happened on 08.05.2016 at 14-15 h?

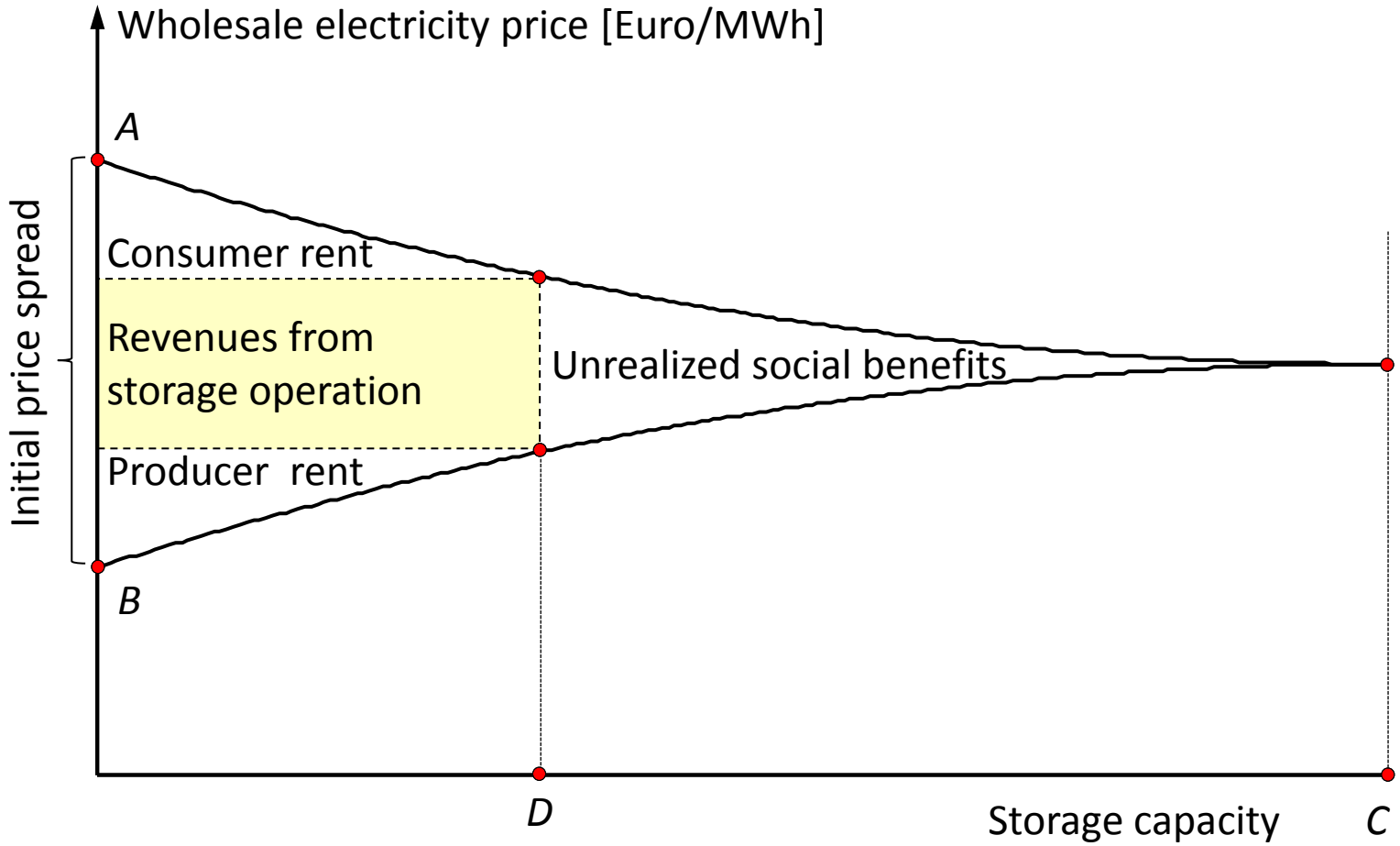


Electricity Price Components in Germany in the Year 2016

	Power purchase from the grid	Auto generation	Generation in „local context“
	Euro/MWh		
Grid fee	18.00 – 30.00		18.00 – 30.00
REN levy	63.54	22.24	0.00
Electricity tax	20.50	Legally unclear	
Concession fee	1.1 – 23.90		1.1 – 23.90
CHP levy	4.45		4.45
§ 19 StromNEV	3.78		3.78
Offshore levy	0.40		0.40
Total	86.77 – 121.57	22.24 – 42.74	23.73 – 83.03

Price Spread and Power Storage Capacities

[Source: Ehlers 2010]



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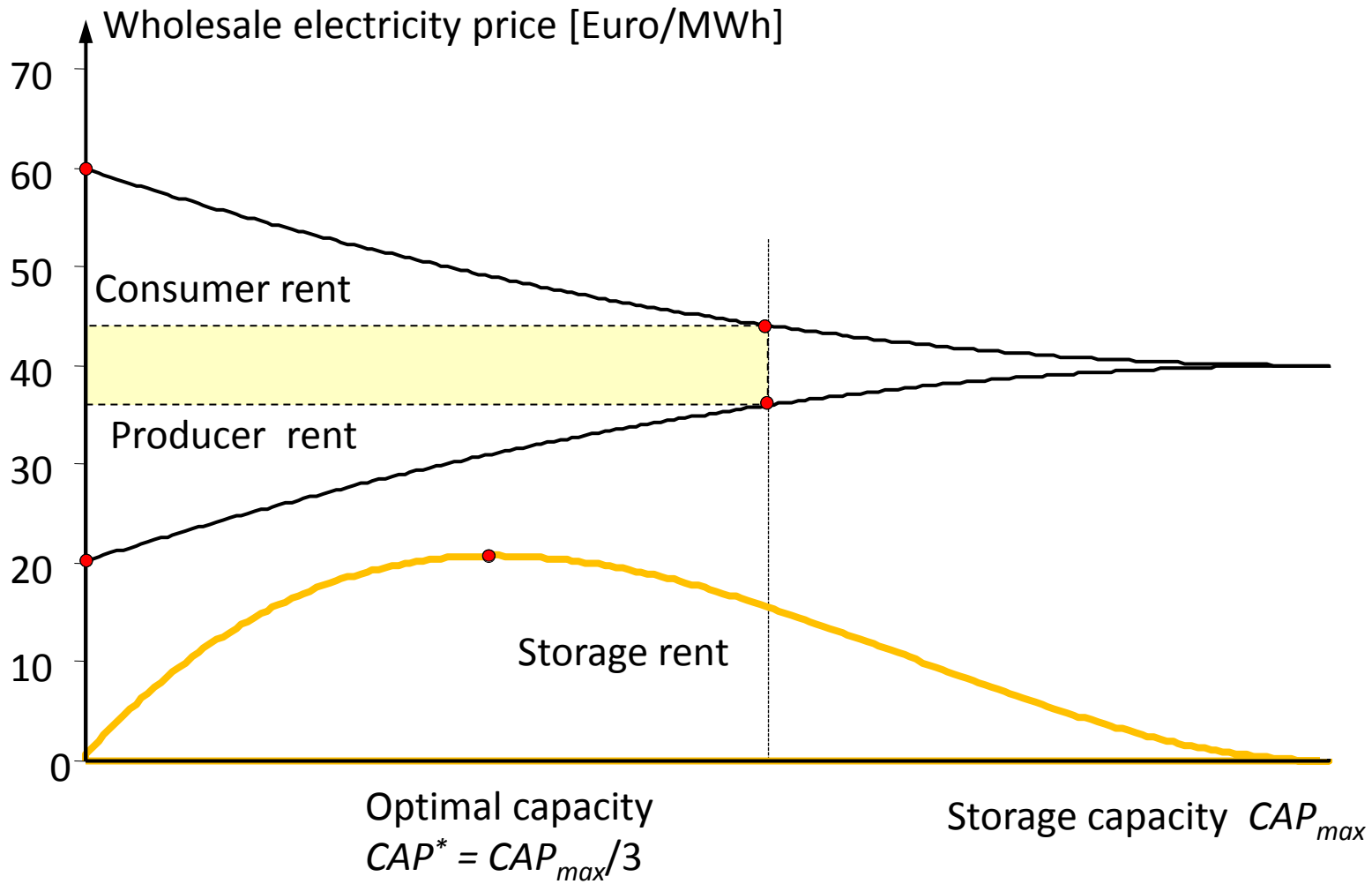

Economics of Energy Storage Investments

- Merchant investments into energy storage are economic if the price spread between different time periods is sufficiently large. (Similarly investments into electricity grids are economic if regional price spreads are sufficiently large)

- Cannibalization effect of storage investments: Additions into storage volumes reduce the price spread. This underlines the complexity of competitive markets for electricity storage infrastructures (grid infrastructures)

Developing Energy Services

- Business cases in the electric industry (beyond the regulated grid business) which can generate sustainable revenues
- What (energy) services customers are ready to pay fore (on top of a secure and affordable electricity supply)?
- What are, from the point of view of (urban) citizens, key requirements of (energy) infrastructures in a digitalized low carbon economy with growing shares of elderly people?
- How to overcome the commodity trap of enerrgy?

Hvala!

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