

Electricity price formation

Wholesale price formation
mechanism and impact of RES

May 2013

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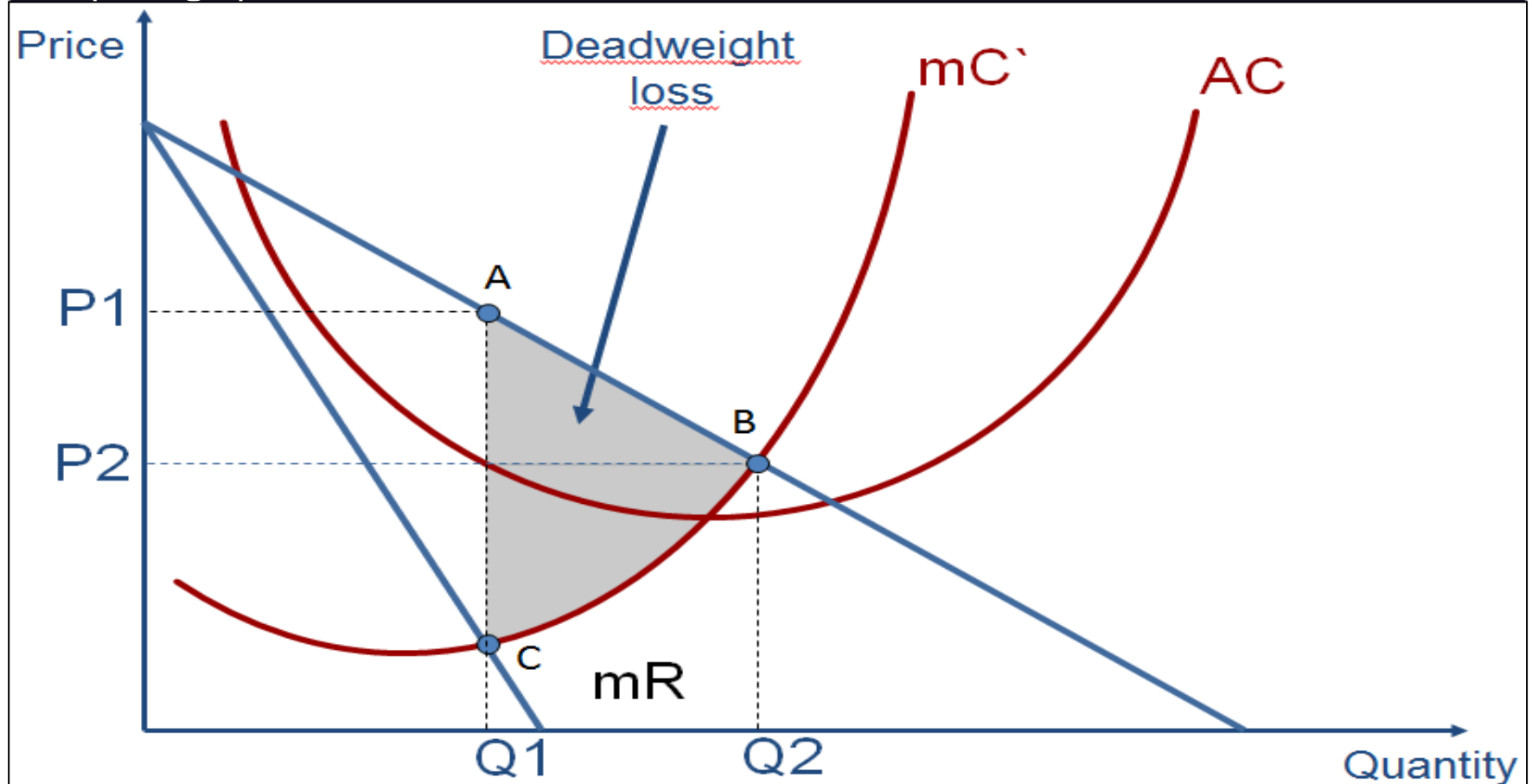
1. Theoretical overview
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3. Impact of RES and regional price dynamics
4. Conclusions

Theoretical overview:

Competitive vs. monopolistic pricing

Competitive vs. monopolistic pricing

Two pricing options: $MC = D$ vs. $MC = MR$



Determinants of marginal costs in el. generation

1. Fuel

- ✓ Commodity cost
- ✓ Transportation cost
- ✓ Taxes

2. Environment

- ✓ CO₂
- ✓ Emission charges

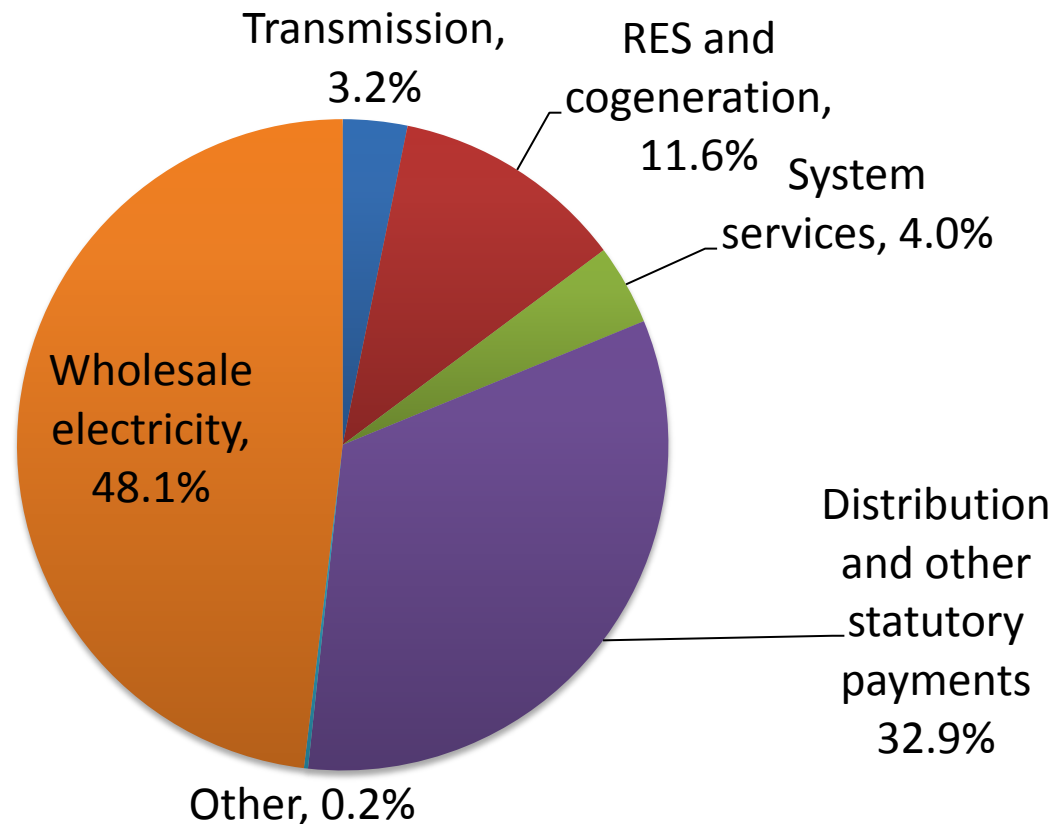
3. Energy conversion efficiency

4. Variable O&M

Merit-order rule

Share of wholesale price on the final price

Low voltage price breakdown without state subsidy for RES

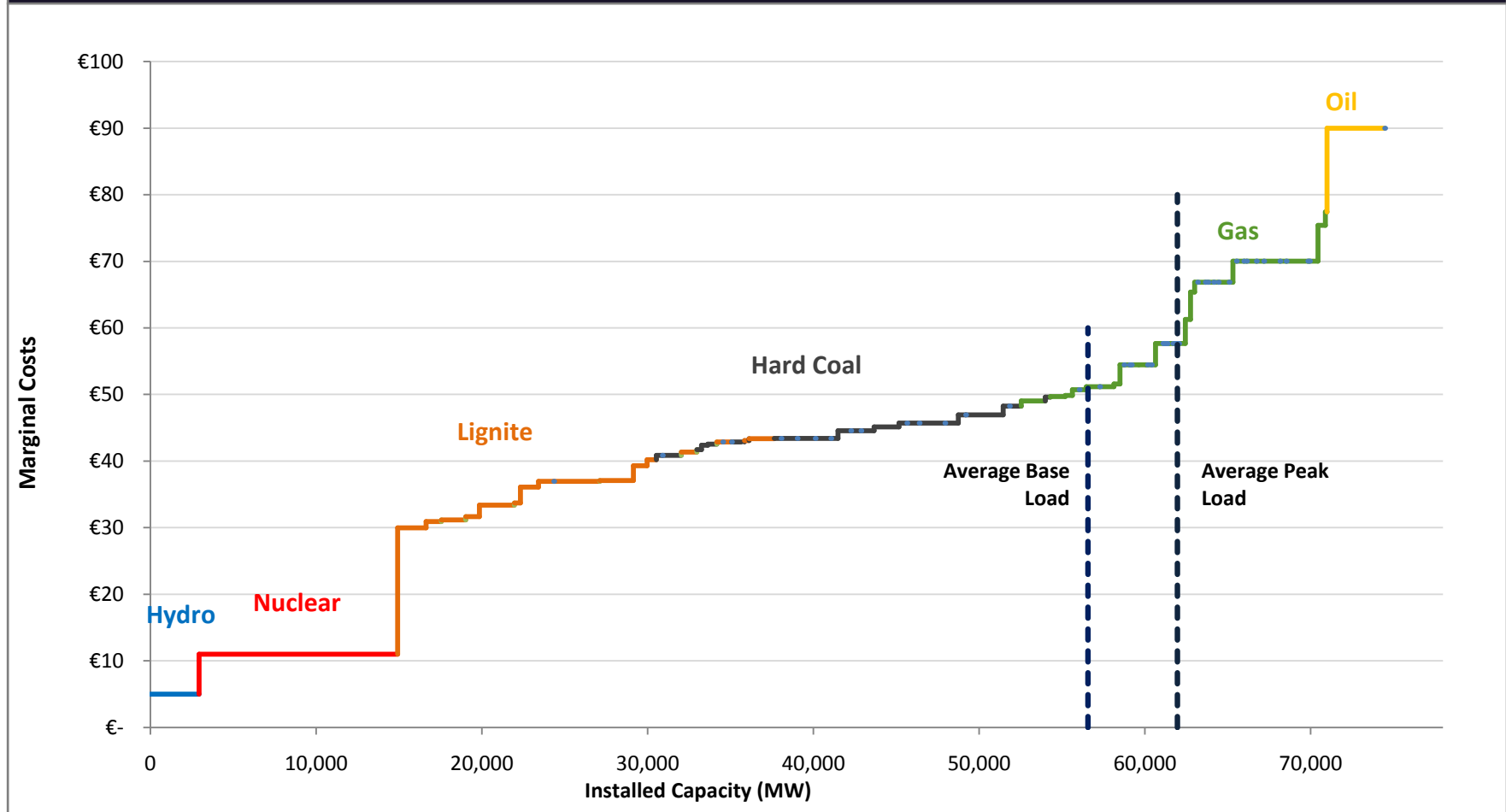


What is merit-order rule?

- **Electricity price formation in a competitive market.**
 - ✓ Generators bid their output based on their marginal costs.
 - ✓ Bids are ordered from lowest to highest and form a merit-order curve.
 - ✓ Price is cleared at a level of marginal costs of the last power plant on the merit-order curve which is needed to satisfy demand.

Merit-order rule in Germany

Marginal costs by fuel type (ex-RES) and demand in 2011



Source: own calculations

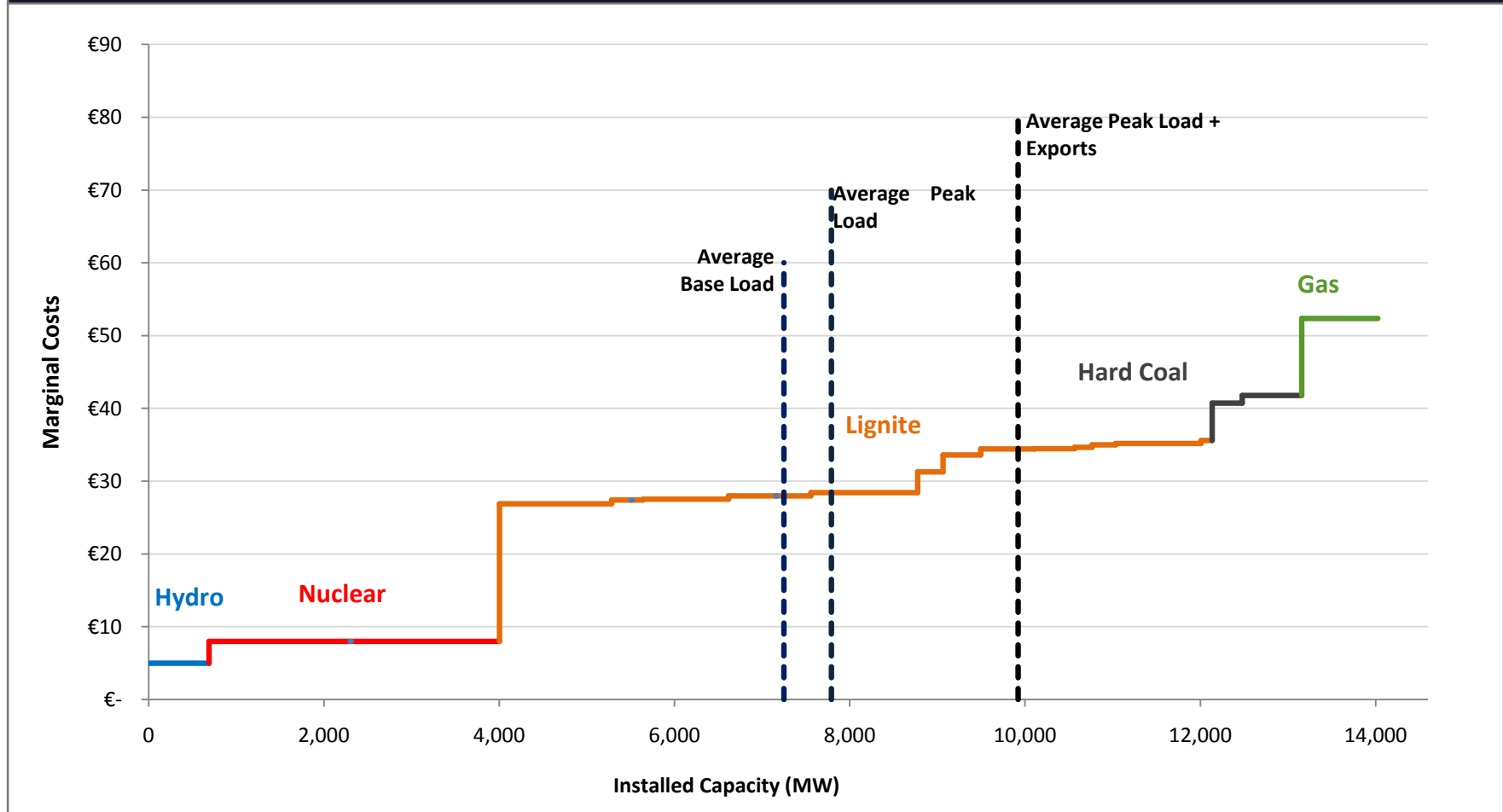
Merit-order rule in Germany

Merit-order rule results and EEX price , EUR/MWh, 2011			
	Fuel type	Base load	Peak load
Merit-order rule	Gas	€ 51.15	€ 57.67
EEX day-ahead avg.	---	€ 51.12	€ 57.12

Source: EEX, Own calculations

Merit-order rule in CZ

Marginal costs by fuel type (ex-RES) and demand in 2011



Source: own calculations

Merit-order rule in Czech Republic

Merit-order rule results and OTE price , EUR/MWh, 2011			
	Fuel type	Base load	Peak load
Merit-order rule	Lignite	€ 27.98	€28.44
OTE day-ahead avg.	---	€ 50.60	€ 56.90

Source: OTE, own calculations

Impact of RES on wholesale electricity price and regional price dynamics

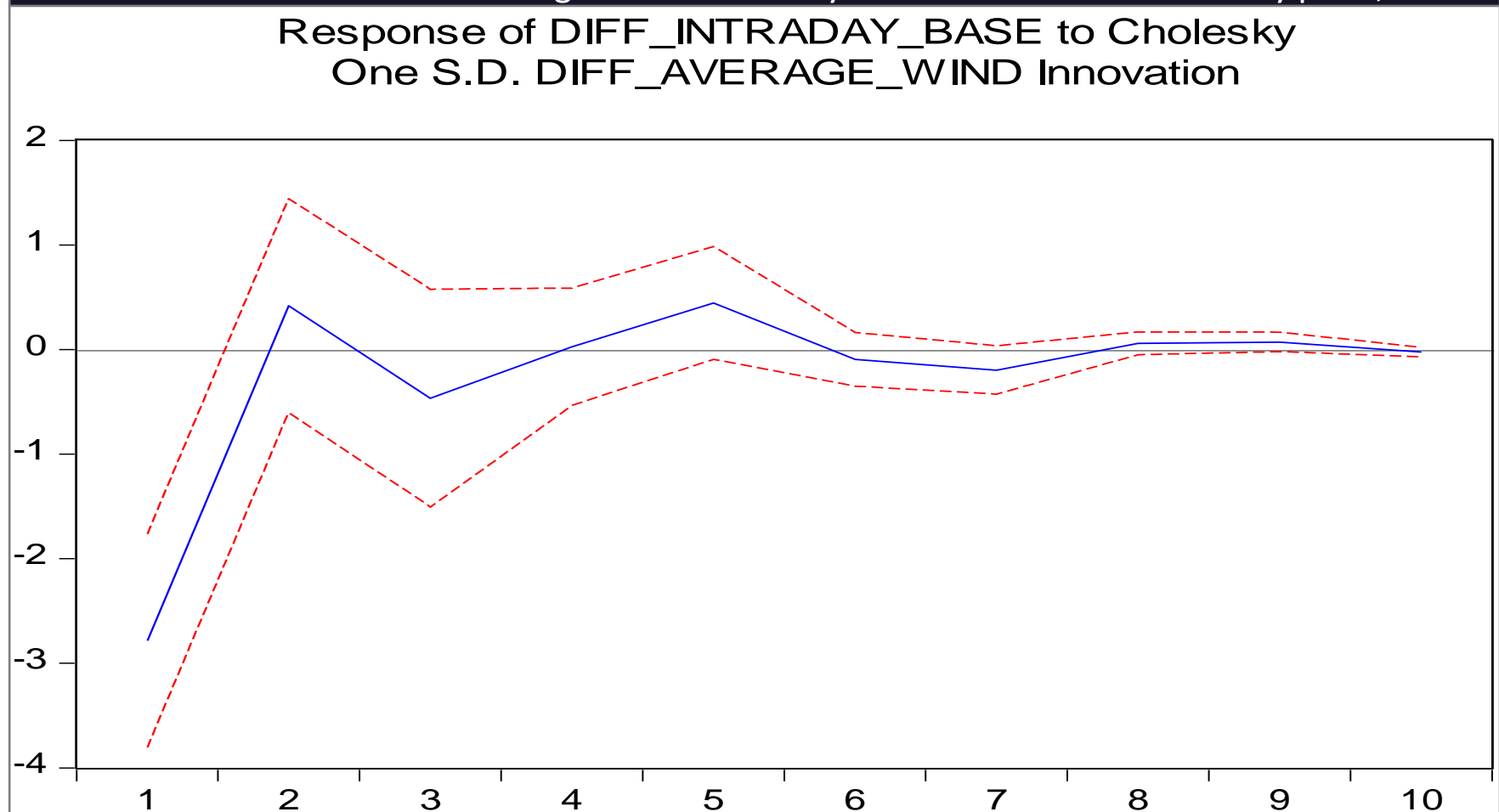
Two dominant effects:

- 1. Downward pressure on average spot price.**
- 2. Increased frequency of negative outliers¹ on the spot market.**

¹ Observations smaller than 2 standard deviations from the mean.

Significant downward pressure on spot price

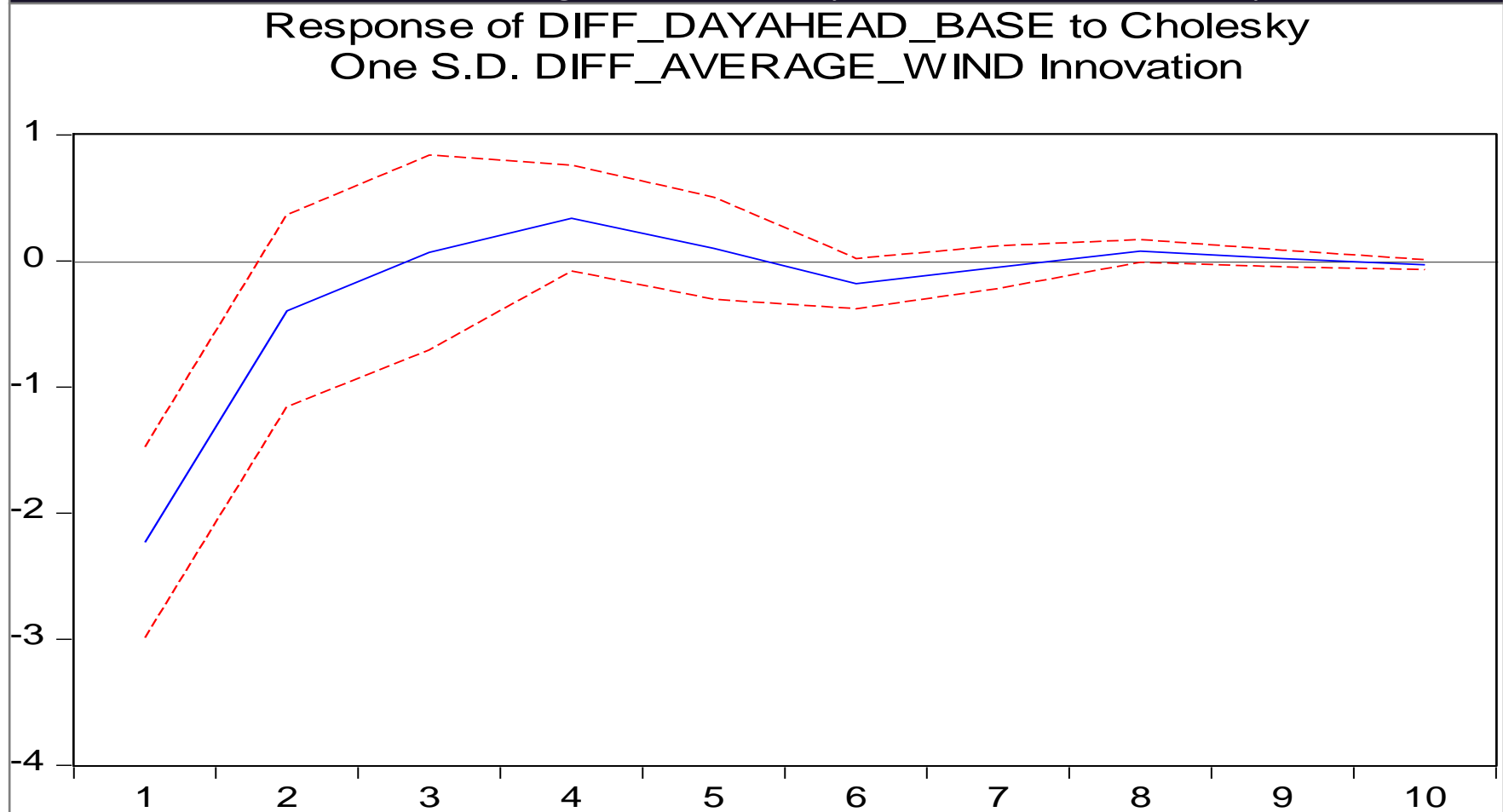
Effect of 1 standard deviation change in wind velocity in the Baltic on EEX Intraday price, 2011



Source: EEX, Deutscher Wetterdienst, own calculations

Significant downward pressure on spot price

Effect of 1 standard deviation change in wind velocity in the Baltic on EEX DAM price, 2011



Source: EEX, Deutscher Wetterdienst, own calculations

Regional co-integration: Power exchanges*

■ Year-ahead base delivery in 2012

	Germany	Czech	Hungary	Romania	Slovakia**
Germany		S	NS	-	NS
Czech			NS	-	NS
Hungary				-	NS
Romania					-

■ Quarter-ahead base delivery in 2012

	Germany	Czech	Hungary	Romania	Slovakia**
Germany		S	NS	-	NS
Czech			NS	-	NS
Hungary				-	NS
Romania					-

*confidence level set at 0.10

**2013 values

Regional co-integration: Power exchanges*

■ Day-ahead base delivery in 2012

	Germany	Czech	Hungary	Romania	Slovakia
Germany		S	S	S	S
Czech			S	S	S
Hungary				S	S
Romania					S

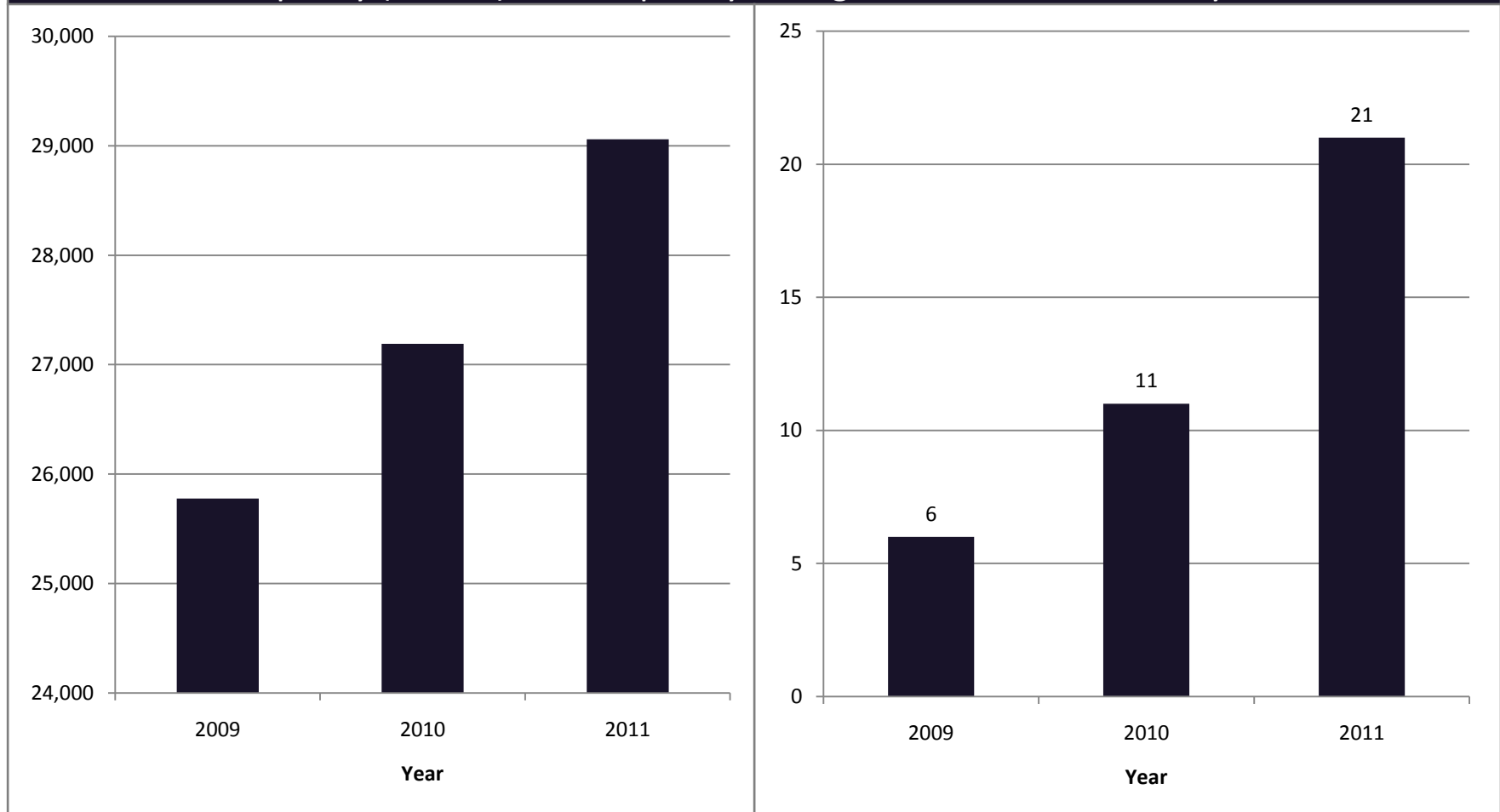
■ Intraday base delivery in 2012

	Germany	Czech	Hungary	Romania	Slovakia
Germany		S	-	-	-
Czech			-	-	-
Hungary				-	-
Romania					-

*confidence level set at 0.10

Significant increase in negative outliers

Wind installed capacity (in MW) and frequency of negative outliers on the day-ahead market



Source: EEX, Deutsches Windenergie Institut, own calculations

Conclusions

- 1.** Competitive markets follow marginal cost of generation,
- 2.** RES put downward pressure on avg. spot price and
- 3.** increase frequency of negative outliers.

Thank you for your attention

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