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Feed-in Tariffs in Turmoil

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Roadmap

- FITs, defined
- FITs > RPSs?
- Germany, *e.g.*
- Lessons and Implications

FIT

=

Purchase Obligation

+

Incentive Price

+

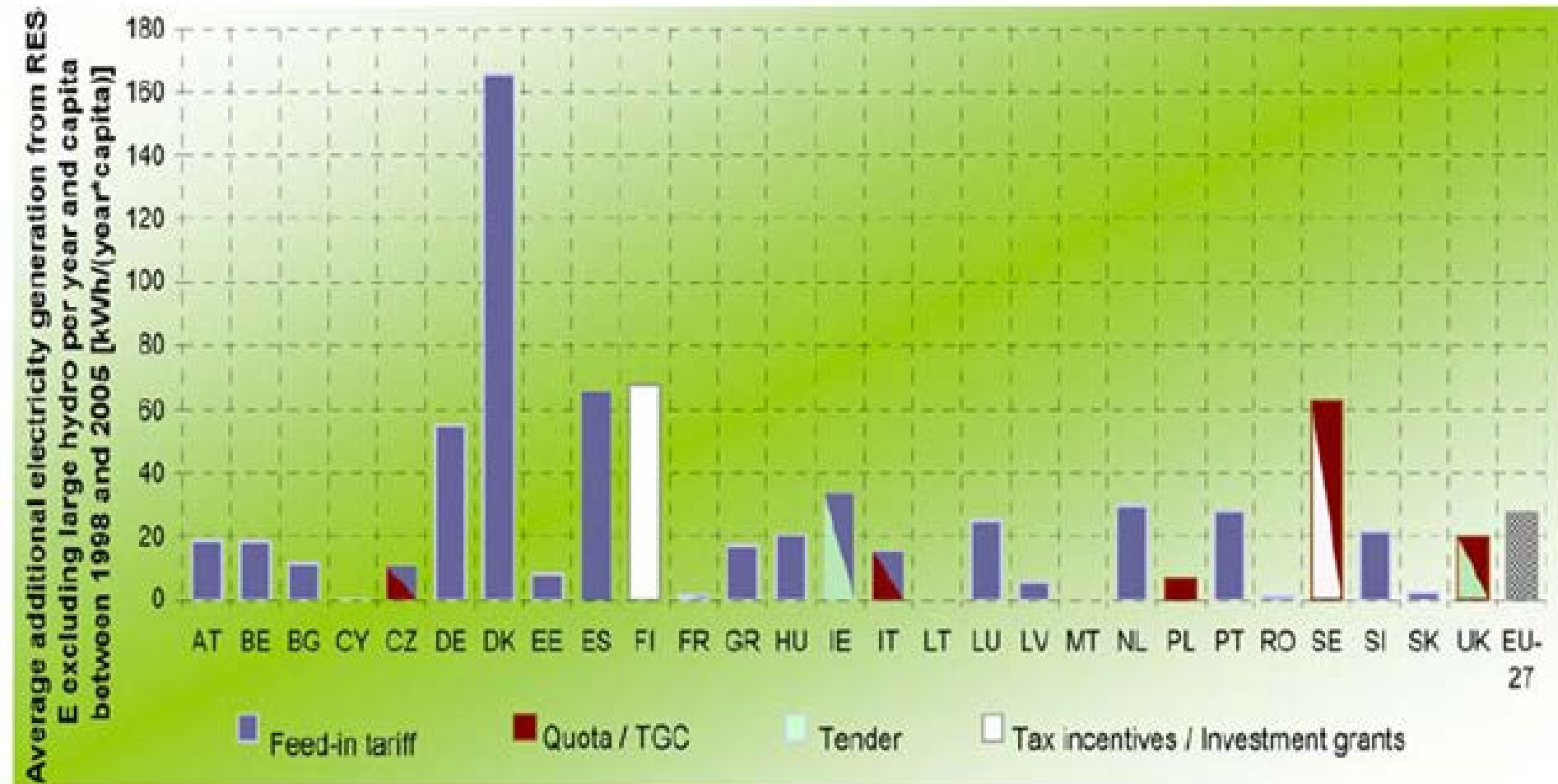
Interconnection Mandate

Policy Efficacy: FITs v. RPSs (1990-2001)



Source: Haas et al., 15 Renewable & Sustainable Energy Rev. 1003 (2011)

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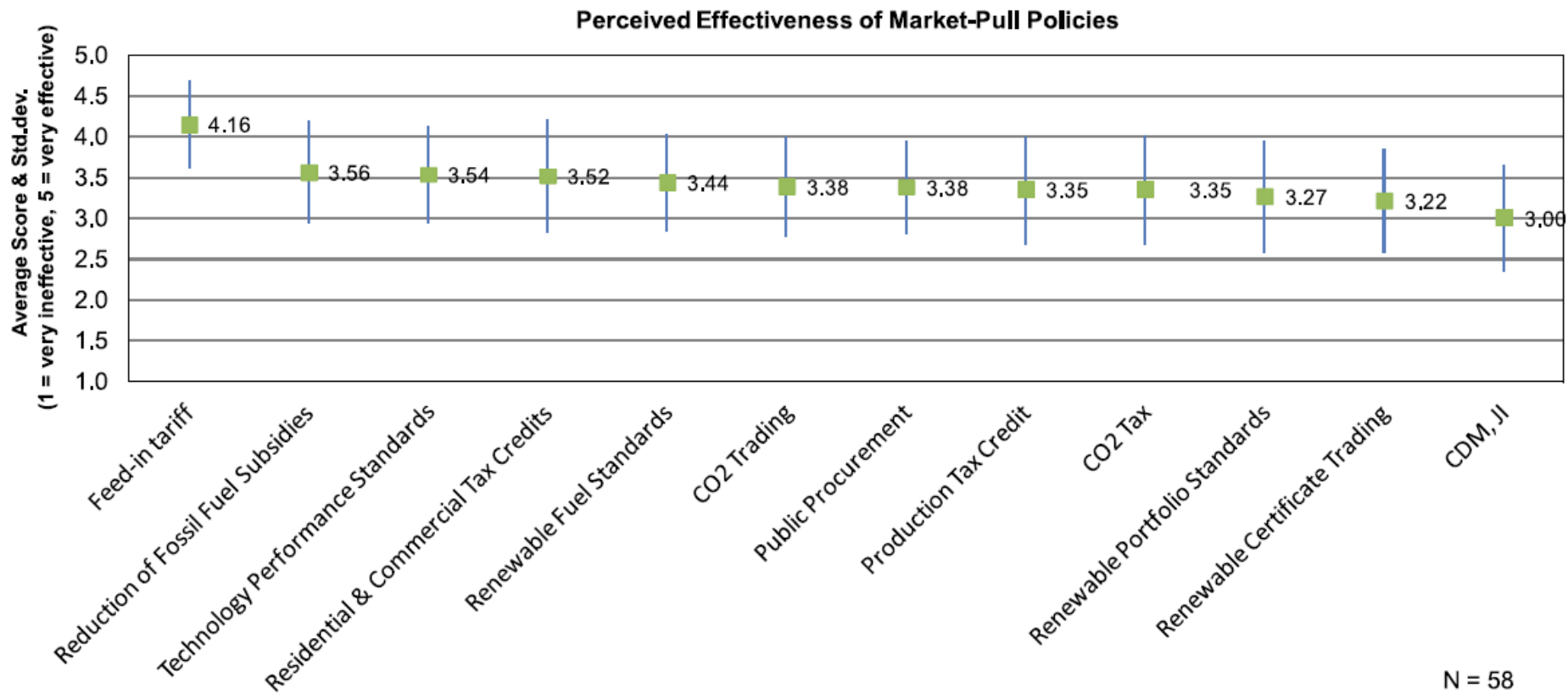


Fig. 3. Venture capital and private equity investor assessment of effectiveness of market-pull policies.

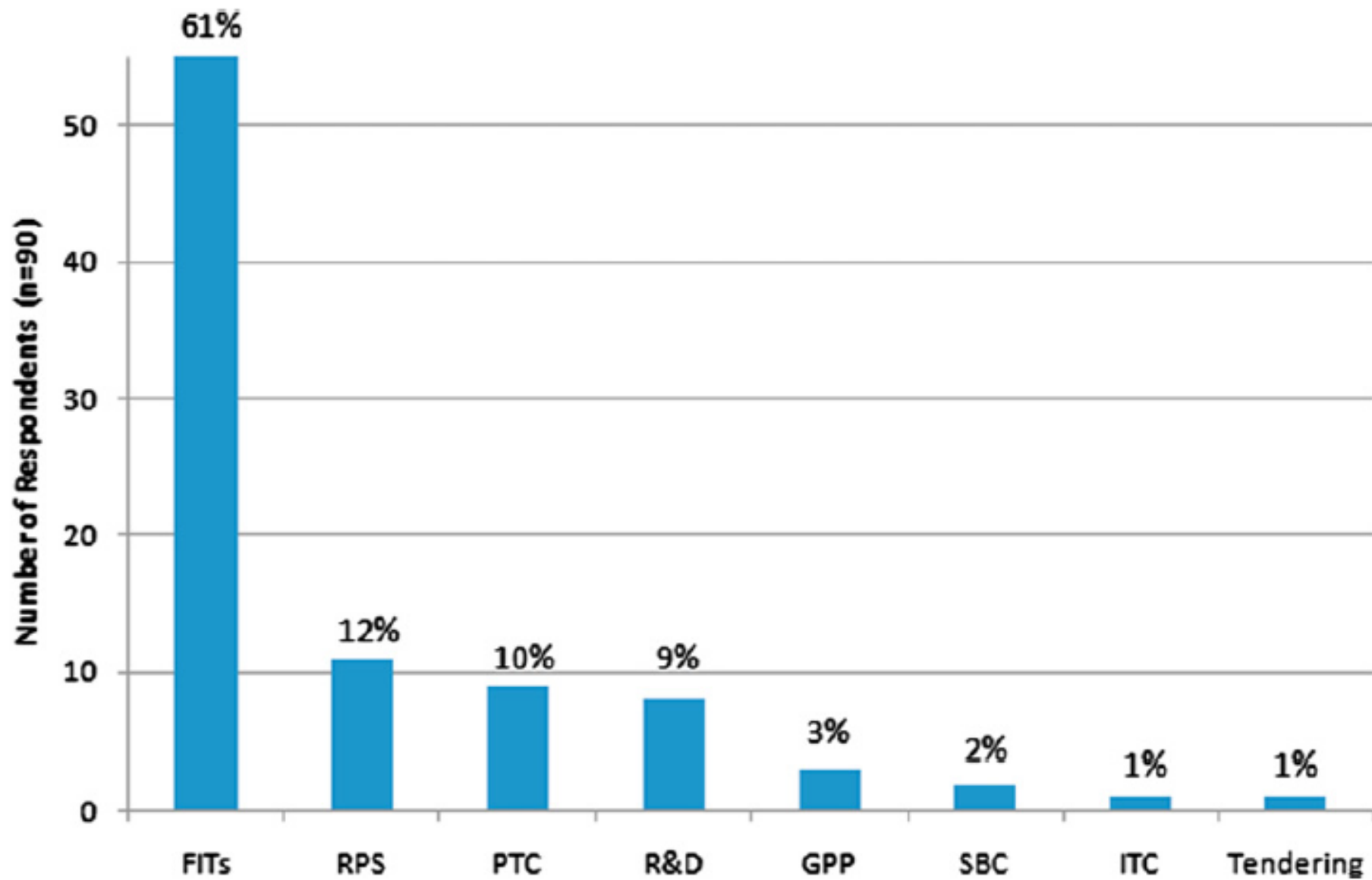


Fig. 5. Most Preferred Policy Mechanism Selected by Participants.

Germany: A Bit of History

- *Stromeinspeisegesetz* (1990) (“StrEG”)
 - ✓ Utilities must connect renewable generators
 - ✓ Buy renewable energy output
 - ✓ Fixed rates from 65-90% retail tariff
- *Erneuerbare-Energie-Gesetz* (2000) (“EEG”)
 - ✓ Higher tariffs
 - ✓ Longer payout terms
 - ✓ Resource-based prices

EEG Structure

- Guaranteed purchase
- Guaranteed grid connection
- Fixed, resource-based price
- For a 20-year term

Energiewende

- 35% of produced electricity by 2020
- 50% by 2030
- 65% by 2040
- 80% by 2050



möbel horten

möbel h

Langerwehe

orten

möbel horten

möbel horten

versand
Küchen & Wohnmöbel
Küchen & Wohnmöbel
Küchen & Wohnmöbel

möbel horten
KÜCHEN * WOHNMÖBEL * TISCHLEREI

möbel horten
KÜCHEN * WOHNMÖBEL * TISCHLEREI







Stadtwerke
Heidelberg

Stadtwerke
Heidelberg

Stadtwerke
Heidelberg

Stadtwerke
Heidelberg

Stadtwerke
Heidelberg
Besucherparkplatz
Bitte beachten: Dieser Bereich ist für Besucher reserviert. Die Nutzung ist nur für Besucher gestattet. Die Nutzung ist nur für Besucher gestattet.

für dich

Solaranlagen

SWH-Dach

Maximalleistung der Anlage: 1,98 kW_p
Inbetriebnahme: 23.04.1997



Außentemperatur

23.6 °C

Aktuelle Leistung

170 Watt

Tagesertrag

10.6 kWh

Gesamtertrag

27361 kWh

SWH-Fassade

Maximalleistung der Anlage: 10,36 kW_p
Inbetriebnahme: 21.09.2001



Aktuelle Leistung

190 Watt

Tagesertrag

48.2 kWh

Gesamtertrag

85795 kWh

SWH-Dach

Maximalleistung der Anlage: 23,36 kW_p
Inbetriebnahme: 30.01.2004



Aktuelle Leistung

1090 Watt

Tagesertrag

19.2 kWh

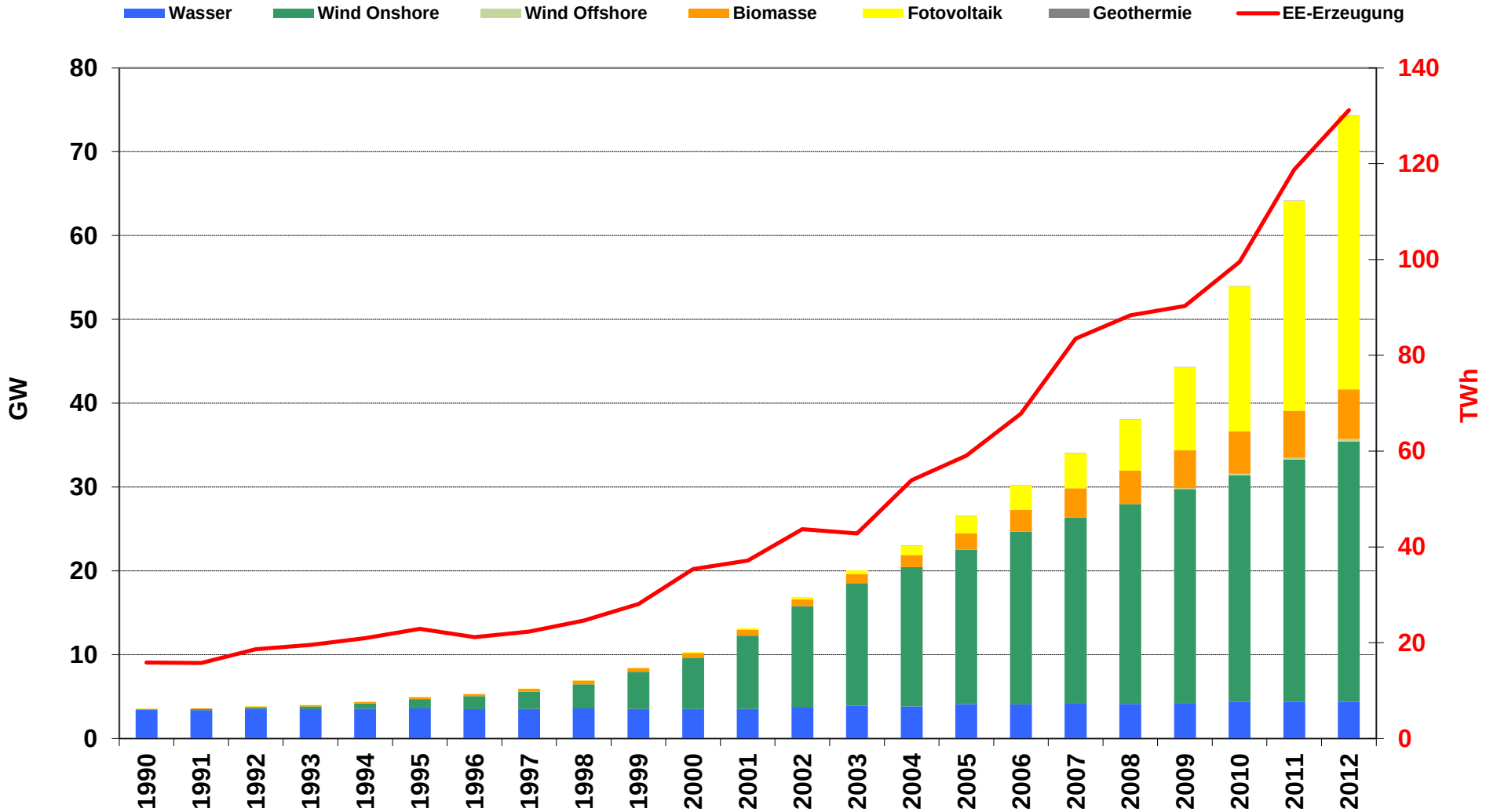
Gesamtertrag

183364 kWh

› heidelberg GREEN



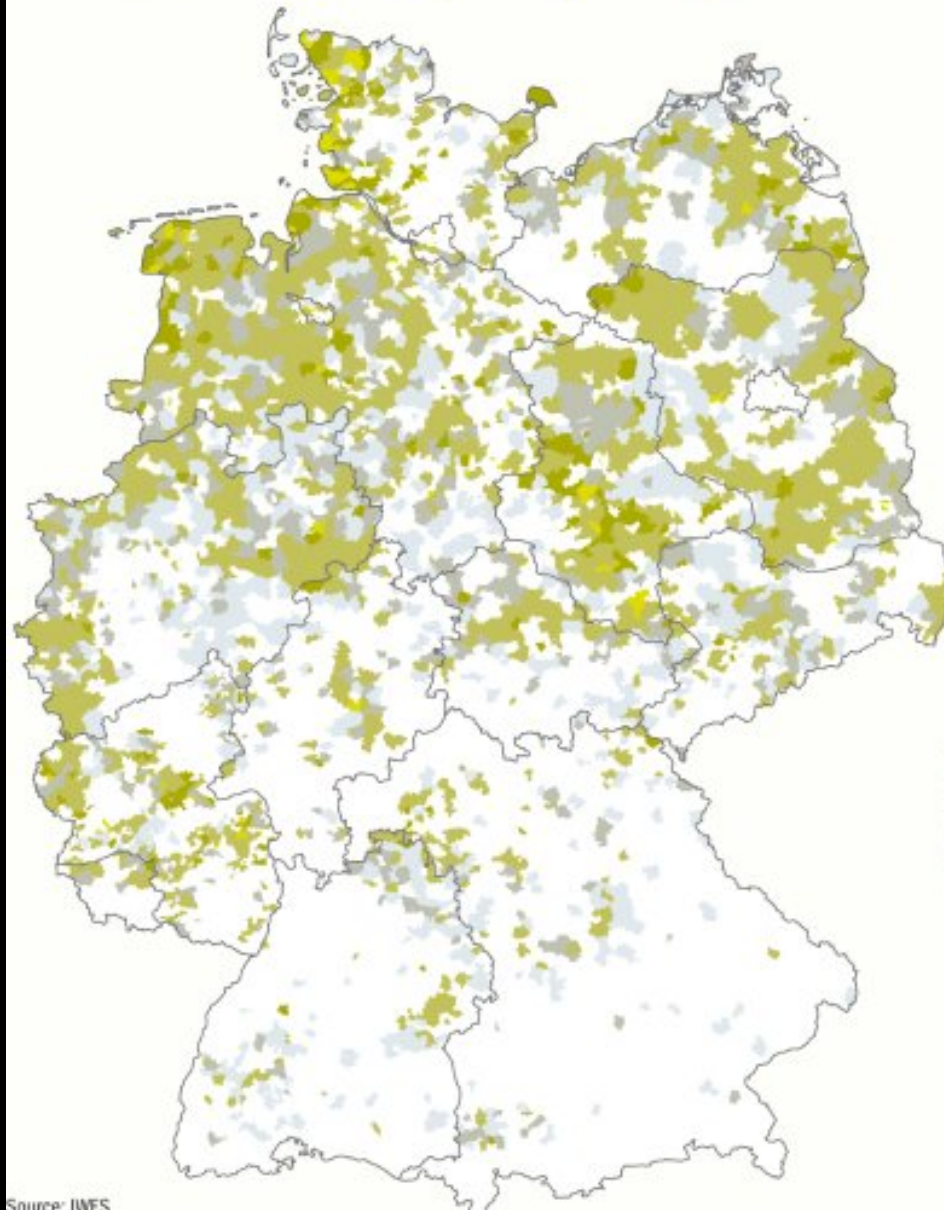
Renewable Energy Deployment

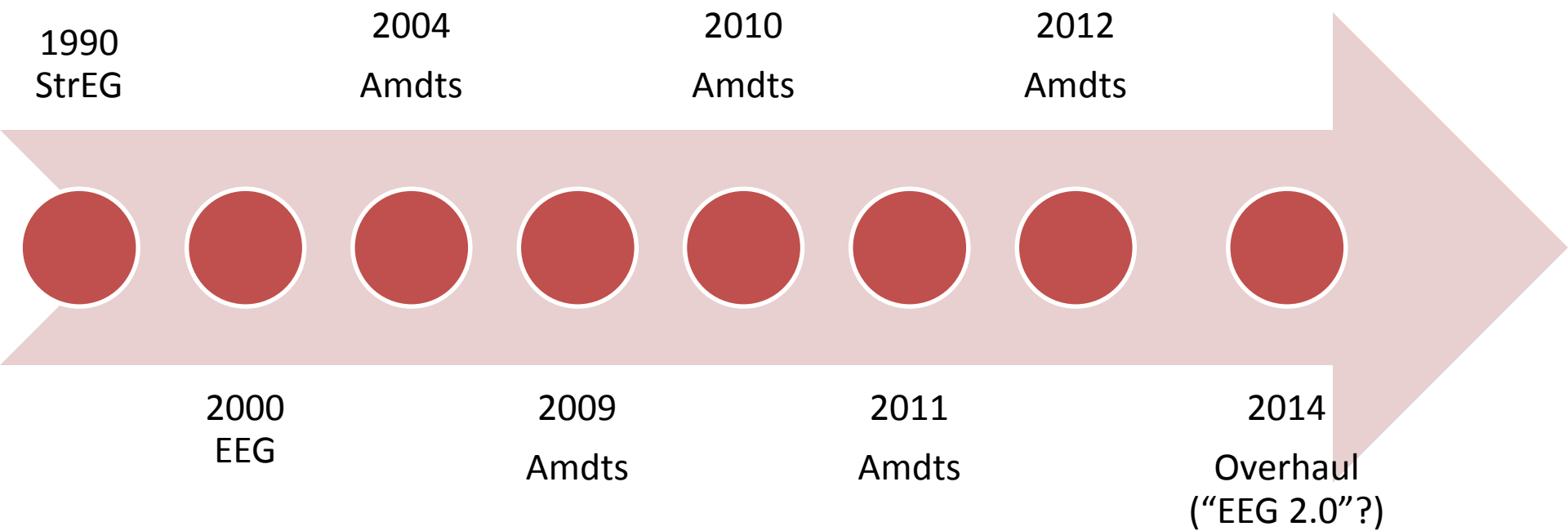


The Rotor Republic

The distribution of onshore wind turbines throughout Germany, measured by output density per square kilometer in megawatts (2012)

0.05 0.1 0.5 1 5+





EEG Evolution – Some Wrinkles

- Quadrennial revision
- Annual solar degression
- Solar breathing cap (*atmender Deckel*)
- Market premium option
- EEG surcharge (*umlage*)
 - ✓ Difference between
 - ✓ EEG tariff rate and
 - ✓ Wholesale market price
 - ✓ Spread over utility customers, but
 - ✓ Large industries exempted

Solar PV Tariffs

<u>Facility</u>	<u>2009</u>	<u>2010</u>	<u>July 2010</u>	<u>Oct. 2010</u>	<u>2011</u>	<u>2012</u>
Up to 30 kW	43.01	39.14	34.05	33.03	28.74	24.43
Up to 100 kW	40.91	37.23	32.39	31.42	27.33	23.23
Up to 1 MW	39.58	35.23	30.65	29.73	25.86	21.98
Over 1 MW	33.00	29.37	25.55	24.79	21.56	18.33
Freestanding	31.94	28.43	25.02	24.26	21.11	17.94

Solar PV Tariffs

	up to 10 kWp	up to 40 kWp	up to 1 MWp	up to 10 MWp	up to 10 MWp
Start of Operations					
from 01.01.2013	17.016084	16.143465	14.398225	11.780366	11.780366
Rounded	17.02	16.14	14.40	11.78	11.78
Degression			2.2%		
from 01.02.2013	16.641730	15.788308	14.081464	11.521198	11.521198
Rounded	16.64	15.79	14.08	11.52	11.52
Degression			2.2%		
from 01.03.2013	16.275612	15.440966	13.771672	11.267732	11.267732
Rounded	16.28	15.44	13.77	11.27	11.27
Degression			2.2%		
from 01.04.2013	15.917549	15.101264	13.468695	11.019841	11.019841
Rounded	15.92	15.10	13.47	11.02	11.02
Degression			1.80%		
from 01.05.2013	15.631033	14.829442	13.226259	10.821484	10.821484
Rounded	15.63	14.83	13.23	10.82	10.82
Degression			1.80%		
from 01.06.2013	15.349674	14.562512	12.988186	10.626698	10.626698
Rounded	15.35	14.56	12.99	10.63	10.63
Degression			1.80%		
from 01.07.2013	15.073380	14.300386	12.754399	10.435417	10.435417
Rounded	15.07	14.30	12.75	10.44	10.44
Degression			1.80%		
from 01.08.2013	14.802059	14.042979	12.524819	10.247580	10.247580
Rounded	14.80	14.04	12.52	10.25	10.25
Degression			1.80%		
from 01.09.2013	14.535622	13.790206	12.299373	10.063123	10.063123
Rounded	14.54	13.79	12.30	10.06	10.06
Degression			1.80%		
from 01.10.2013	14.273981	13.541982	12.077984	9.881987	9.881987
Rounded	14.27	13.54	12.08	9.88	9.88
from 01.11.2013	14.074145	14.352394	11.908892	9.743639	9.743639
Rounded	14.07	13.35	11.91	9.74	9.74
Degression			1.40%		
from 01.12.2013	13.877107	13.165461	11.742168	9.607228	9.607228
Rounded	13.88	13.17	11.74	9.61	9.61
Degression			1.40%		
from 01.01.2014	13.682828	12.981144	11.577777	9.472727	9.472727
Rounded	13.68	12.98	11.58	9.47	9.47

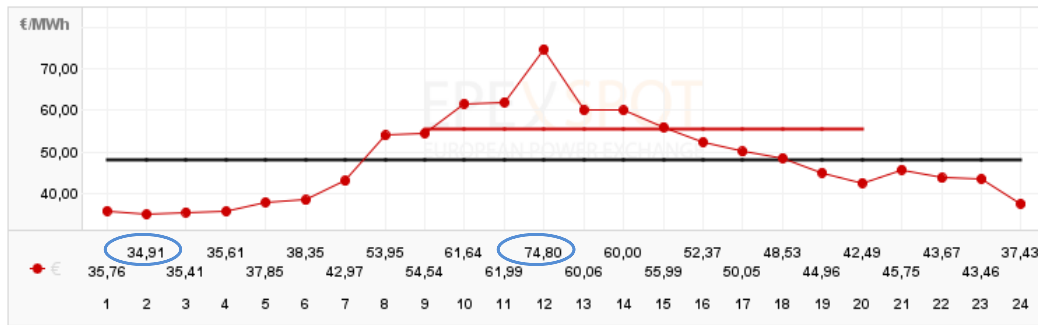
Degression

Year of commissioning	up to 500 kW in ct/kWh	up to 2 MW in ct/kWh	up to 5 MW in ct/kWh	up to 10 MW in ct/kWh	up to 20 MW in ct/kWh	up to 50 MW in ct/kWh	over 50 MW in ct/kWh
2012	12.70	8.30	6.30	5.50	5.30	4.20	3.40
2013	12.57	8.22	6.24	5.45	5.25	4.16	3.37
2014	12.45	8.13	6.17	5.39	5.19	4.12	3.33
2015	12.32	8.05	6.11	5.34	5.14	4.08	3.30
2016	12.20	7.97	6.05	5.28	5.09	4.03	3.27
2017	12.08	7.89	5.99	5.23	5.04	3.99	3.23
2018	11.96	7.81	5.93	5.18	4.99	3.95	3.20
2019	11.84	7.74	5.87	5.13	4.94	3.91	3.17
2020	11.72	7.66	5.81	5.08	4.89	3.88	3.14
2021	11.60	7.58	5.76	5.02	4.84	3.84	3.11

Market Spot Prices

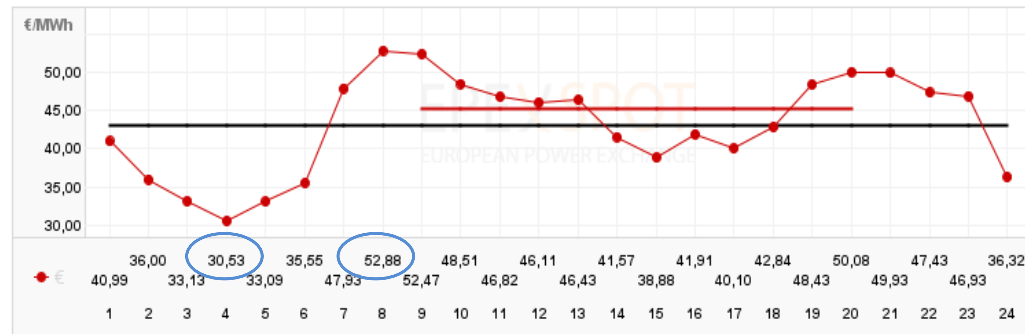
Spot Price Curve 12.05.2005

Preis



Spot Price Curve 10.05.2012

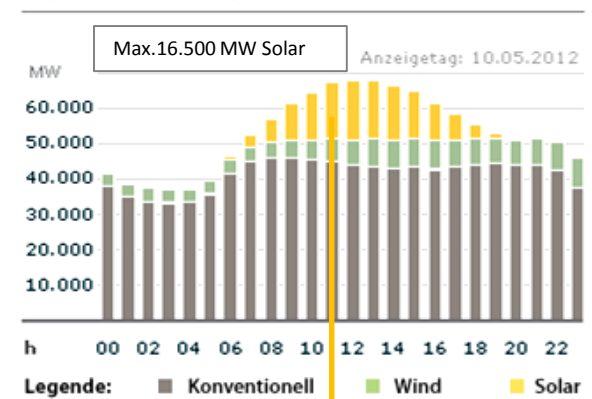
Preis



Legende



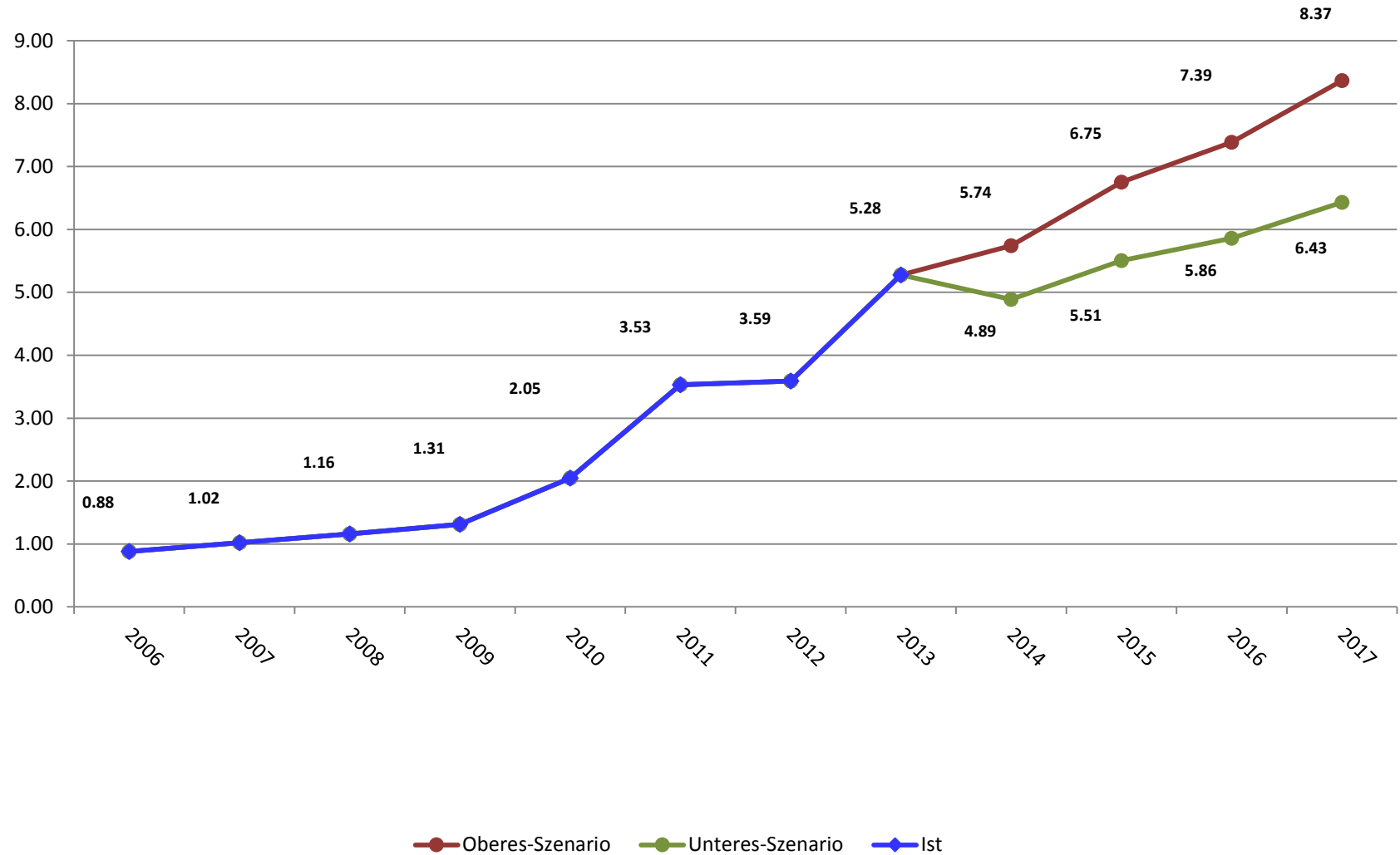
Geplante Produktion (Strom)



Spot Market Integration	Price Base €/MWh		Price Peak €/MWh		Delivery day
<u>European Electricity Index (ELIX)</u>	-17.29	↗	-36.72	↗	2013/06/16
Spot Hourly Auction Hour Contracts	Price Base €/MWh		Price Peak €/MWh		Delivery day
<u>Germany/Austria (Phelix)</u>	-3.33	↗	-18.99	↗	2013/06/16
<u>France</u>	-40.99	↗	-20.29	↗	2013/06/16
<u>Switzerland (Swissix)</u>	7.88	↘	4.71	↘	2013/06/16
KWK-Index (Germany)*			42.27 €/MWh		Q1/2013

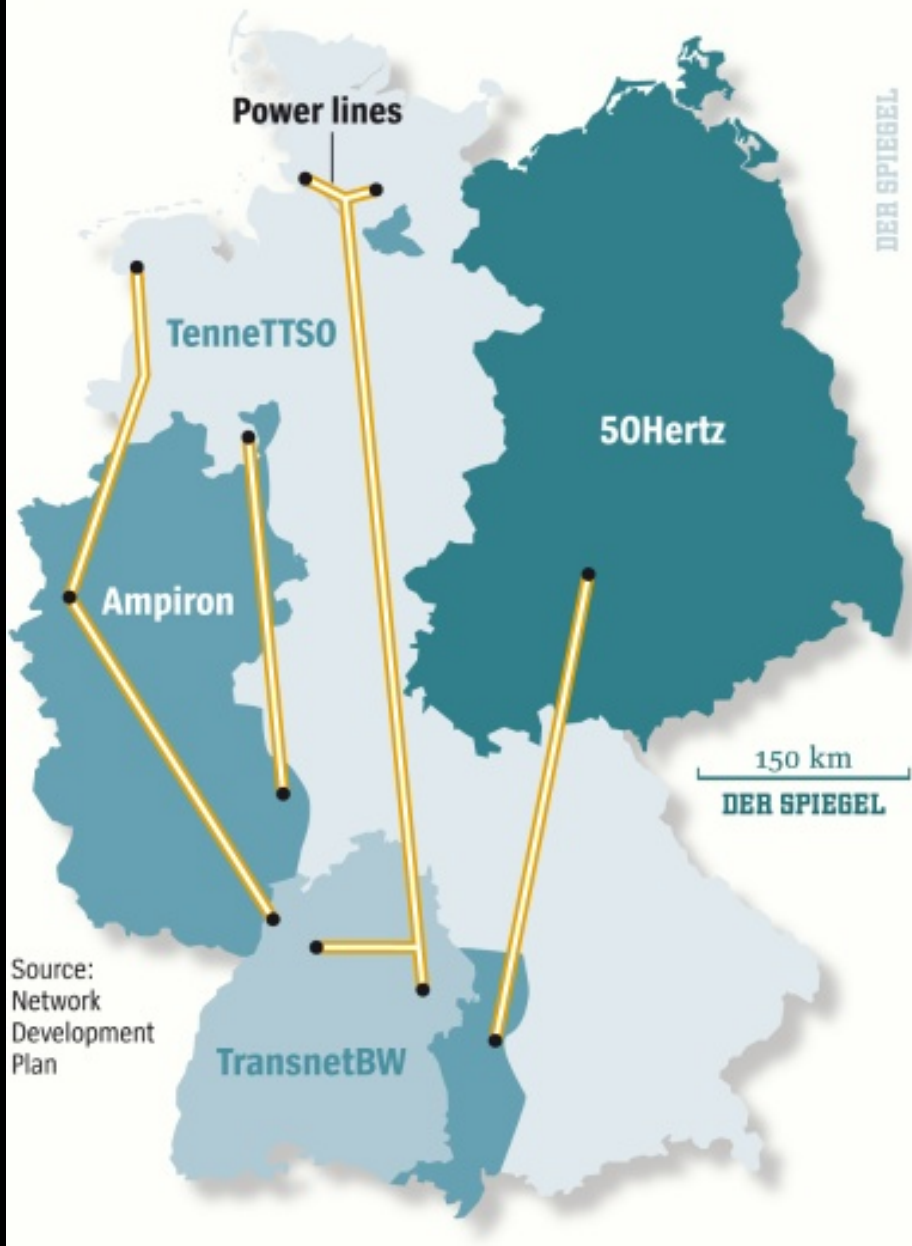
EEG Umlage

ct/kWh



Long Lines

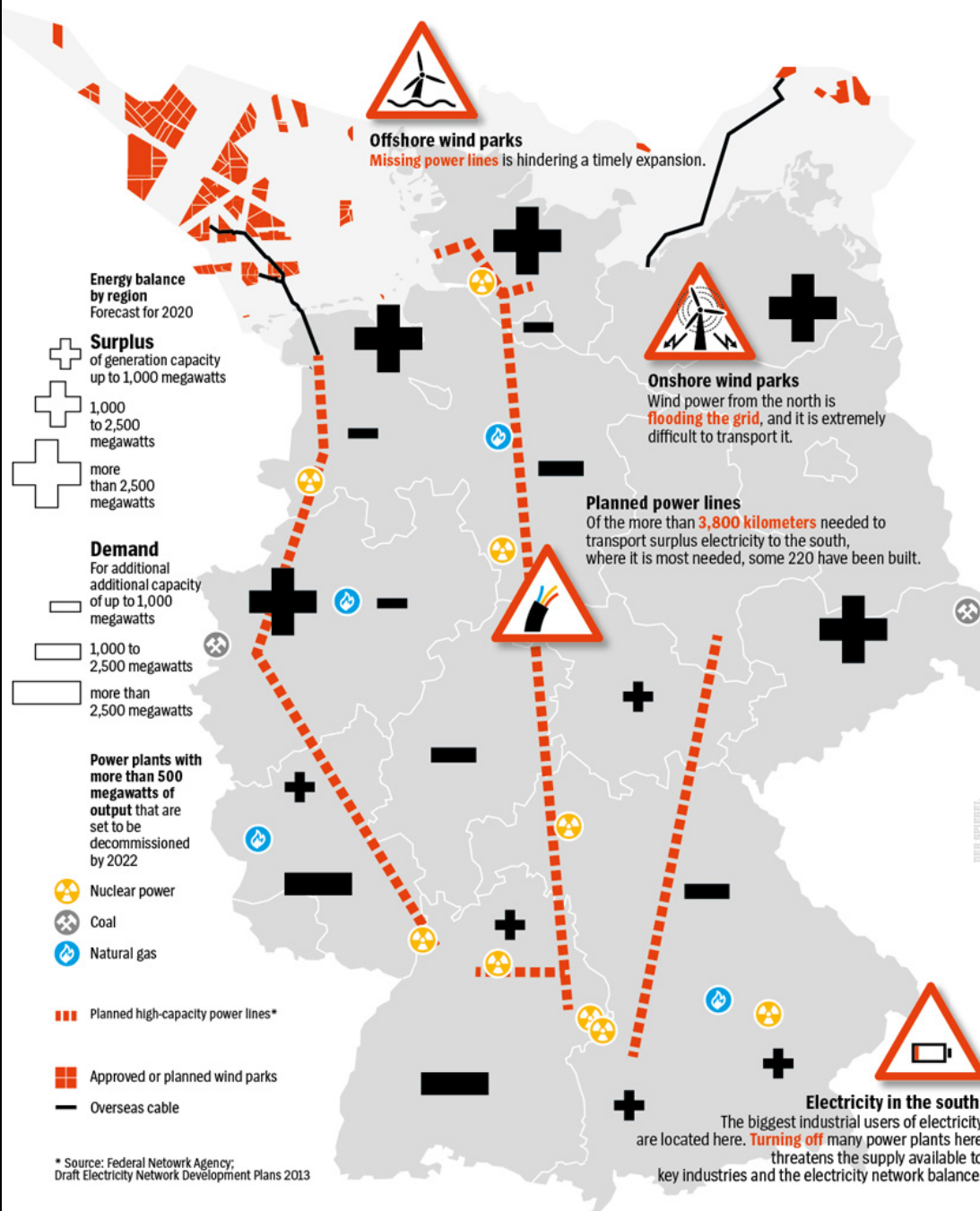
Power-grid operators and the planned power-line expansion



Source:
Network
Development
Plan

Electricity Fluctuations

How the Energiewende is throwing the electricity grid off balance



Electricity bill

for an average three-person household per year

1998
€598.80

2013
€1,005.60

+68%

The renewable energy surcharge stipulated by Germany's Renewable Energy Act (EEG) could climb to around €220 in 2014.

€2.80

€184.70

DER SPIEGEL

Source: German Association of Energy and Water Industries

Lessons and Implications

- Paradox of feed-in tariffs
 - ✓ Need for change
 - ✓ Resistance to change
- Efficacy
- Demand for internal policy design change
 - ✓ Cost management
 - ✓ Equity
 - ✓ Market participation
- External effects
- Balancing flexibility and stability

LUXUS STROM



Warum Energie immer teurer wird –
und was die Politik dagegen tun muss