



Recent Wind Activities in Germany

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Facts on the German renewable energy act

Facts and figures according the renewable energy act

Major tasks based on the renewable energy law (EEG) :

- Support development of renewable sources in Germany
- Set fixed prices depending on the energy source and year of installation.
- All German end-consumer are obliged to be supplied by a continuous amount of renewable energy (nearly 15 % of their energy consumption) - independent from their location.
- TSOs buy energy from operators for fixed price and sell it on the whole sale market (power exchange). TSOs are balancing responsible party for renewable energy.
- TSOs are remunerated. 2010: $\sim 2 \text{ ct}/_{\text{kWh}}$; 2011: $\sim 3.5 \text{ ct}/_{\text{kWh}}$ (according to press)
- The total generation of renewable power must be shared online between the 4 German TSOs (due to the renewable energy law), especially for wind energy.

Facts and figures according the renewable energy act

Installed wind capacity in August 2010:



Control Area	Install. wind capacity [MW]	Number of WTs	Installed capacity [%]
Tennet TSO Germany (e.on Netz)	10224,7	9032	39,2 %
50Hertz Transmission	10759,9	7871	41,2 %
Amprion	4611,7	3927	17,7 %
EnBW	489,4	392	1,9 %
Total	26085,7	21222	100 %

Data source: IWES, September 2010

Facts and figures according the renewable energy act

Installed renewable energy capacity for Amprion / Germany:

- Installed wind capacity: Germany 26,086 MW in total
- Installed wind capacity Offshore: 55 MW
- Installed photovoltaic capacity:
 - Amprion: 3,300 MW (Data source: Amprion database Sep. 2010).
 - Amprion: min. 4,400 MW (estimated for Sep. 2010).
 - Germany: 15,500 MW (estimated for Sep. 2010).
- Installed generation from biomass plants in Amprion: 847 MW
- Installed generation from small hydro in Amprion : 344 MW
- Large hydro is not supported by the EEG

Downloadable Database of all renewable power plants in Germany (splitted in 4 control areas)

STRASSE	POSTLEIT	ORT	LEISTUN	ENERGI	IBJAHR	INBETRIEBN	FIRMENNAME
Hiöfer	58256	Ennepetal	3,77	SOL	2006	27.09.2006	AVU Netz GmbH
Ottostraße	58332	Schwelm	4,5	SOL	2006	16.10.2006	AVU Netz GmbH
An der Hesse	45527	Hattingen	4,81	SOL	2006	18.10.2006	AVU Netz GmbH
In der Stüfke	45549	Sprockhövel	5,13	SOL	2006	20.10.2006	AVU Netz GmbH
In der Behrer	45527	Hattingen	7,92	SOL	2006	06.11.2006	AVU Netz GmbH
Königsberger	58332	Schwelm	3,24	SOL	2006	07.11.2006	AVU Netz GmbH
Im Holte 93	58285	Gevelsberg	3,7	SOL	2006	08.11.2006	AVU Netz GmbH
Taubenstraße	58285	Gevelsberg	2,59	SOL	2006	13.11.2006	AVU Netz GmbH
Beyenburger	58332	Schwelm	20,41	SOL	2006	22.11.2006	AVU Netz GmbH
Sven-Hedin-S	58300	Wetter	2,22	SOL	2006	28.11.2006	AVU Netz GmbH
Sven-Hedin-S	58300	Wetter	1,85	SOL	2006	28.11.2006	AVU Netz GmbH
Bergstraße	58300	Wetter	5,28	SOL	2006	04.12.2006	AVU Netz GmbH
Siedlung Heid	58256	Ennepetal	5,4	SOL	2006	05.12.2006	AVU Netz GmbH
Linderhauser	58332	Schwelm	3	SOL	2006	08.12.2006	AVU Netz GmbH
Hauptstraße	58332	Schwelm	2	SOL	2006	13.12.2006	AVU Netz GmbH
Beyenburger	58332	Schwelm	30	SOL	2006	19.12.2006	AVU Netz GmbH
Stollenweg	58300	Wetter	4,8	SOL	2006	20.12.2006	AVU Netz GmbH
Vogelsanger	58300	Wetter	4,8	SOL	2006	20.12.2006	AVU Netz GmbH
Siepen	45549	Sprockhövel	14,08	SOL	2006	20.12.2006	AVU Netz GmbH
Beyenburger	58332	Schwelm	34,96	SOL	2006	20.12.2006	AVU Netz GmbH
Brinkerstraße	45549	Sprockhövel	4,6	SOL	2006	21.12.2006	AVU Netz GmbH
Weuste	45549	Sprockhövel	4,62	SOL	2006	27.12.2006	AVU Netz GmbH
Königsfelder	58256	Ennepetal	30	SOL	2006	28.12.2006	AVU Netz GmbH
Königsfelder	58256	Ennepetal	9,8	SOL	2006	29.12.2006	AVU Netz GmbH
Steinhauser B	58332	Schwelm	3,77	SOL	2007	23.01.2007	AVU Netz GmbH
Hauptstraße	45549	Sprockhövel	5,94	SOL	2007	29.01.2007	AVU Netz GmbH
Am Kornacke	58300	Wetter	6,84	SOL	2007	13.03.2007	AVU Netz GmbH

Database links:

Amprion:

<http://www.amprion.net/eeg-anlagenstammdaten-aktuell>

Tennet Germany:

[http://www.tennetso.de/pages/tennetso_de/EEG_KWK-G/Erneuerbare-Energien-Gesetz/EEG-Daten_nach_52_\(EEG-Anlagen\)/Einspeisung_und_Anlagenregister/index.htm](http://www.tennetso.de/pages/tennetso_de/EEG_KWK-G/Erneuerbare-Energien-Gesetz/EEG-Daten_nach_52_(EEG-Anlagen)/Einspeisung_und_Anlagenregister/index.htm)

50Hertz:

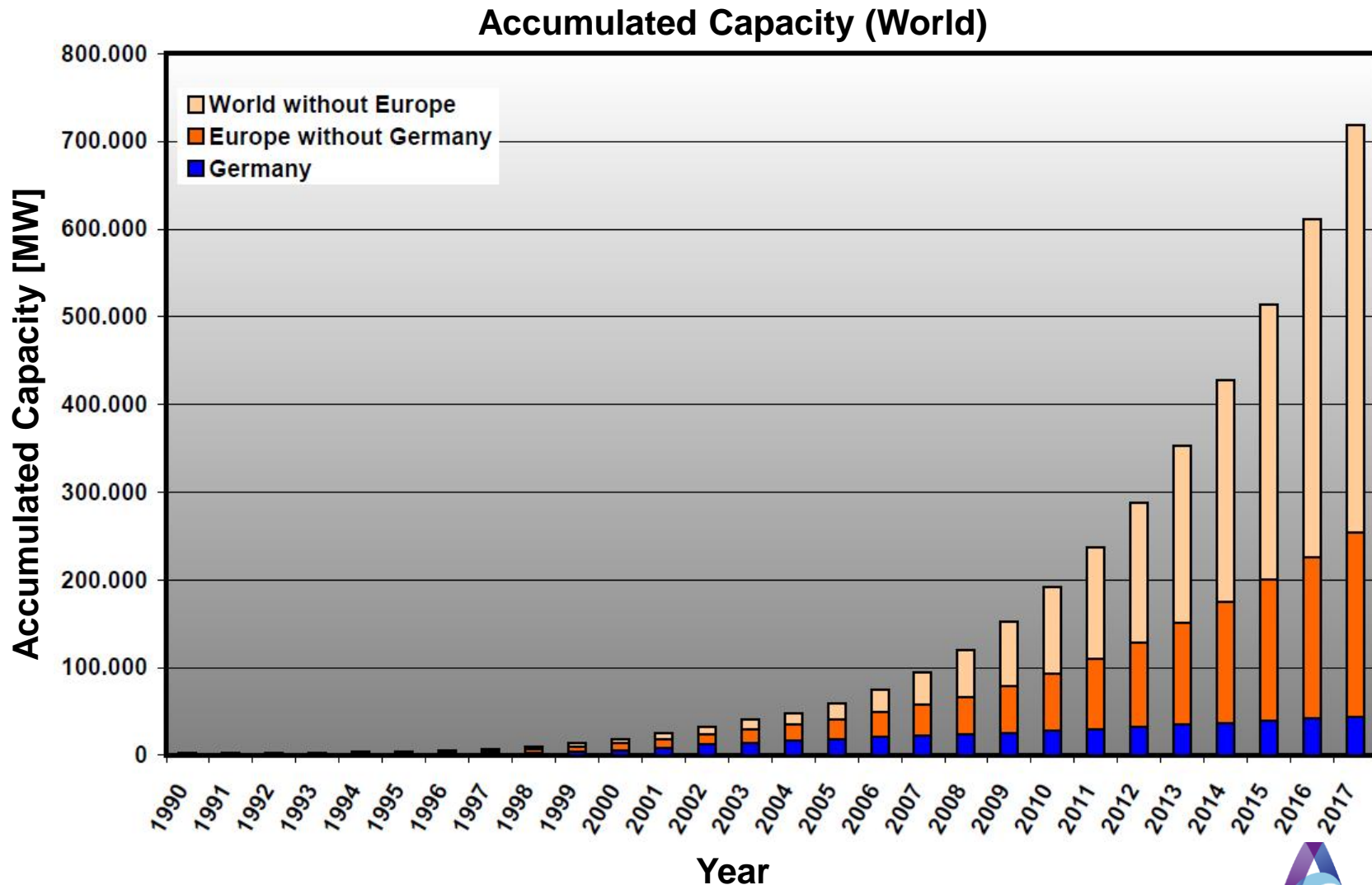
http://www.50hertz-transmission.net/cps/rde/xc/hg/trm_de/hs.xsl/165.htm

EnBW TNG:

http://www.enbw.com/content/de/netznutzer/strom/erneuerbare_energien/anlagendaten_tng/anlagendaten_suche/index.jsp

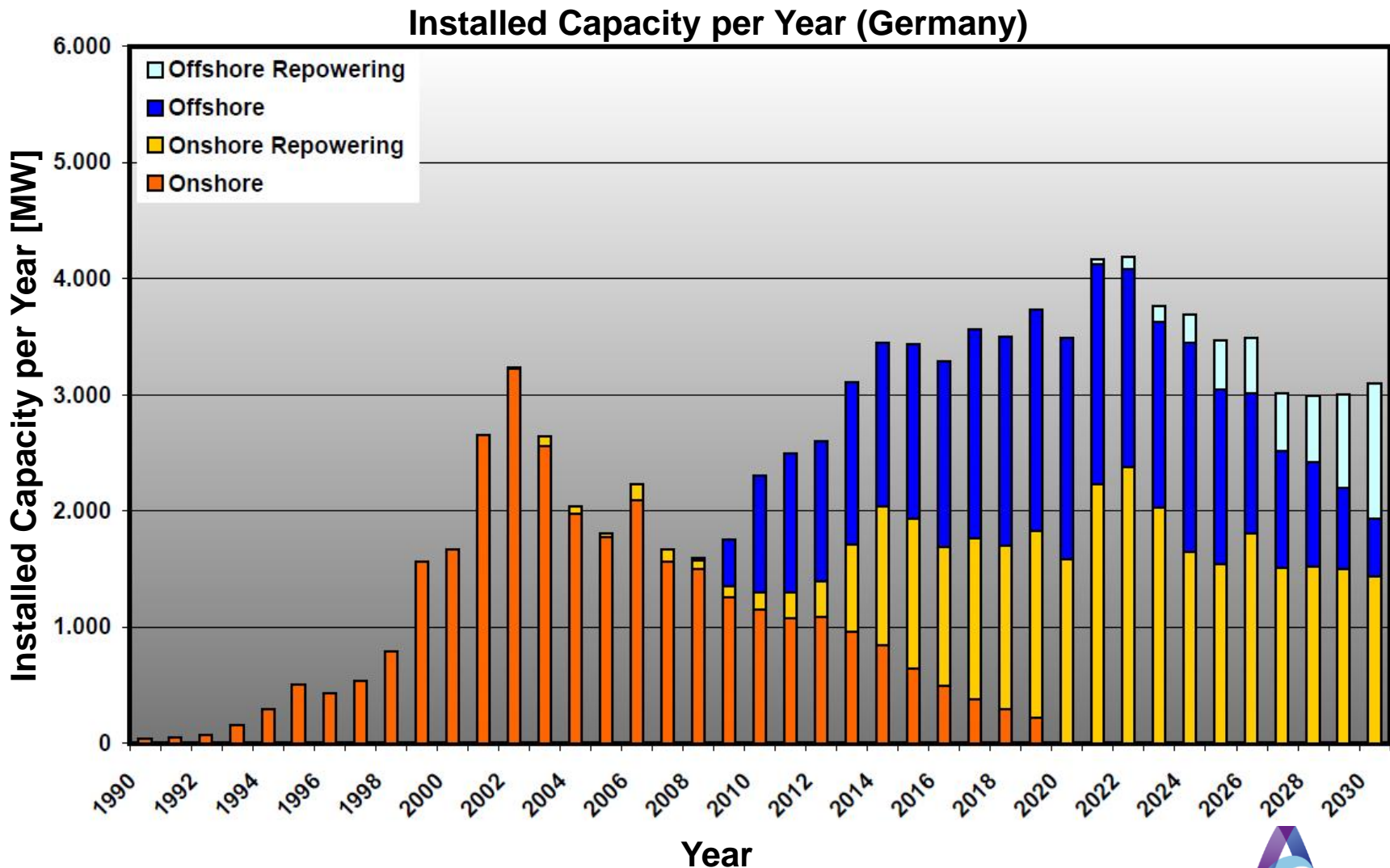


Facts and figures according the renewable energy act



Source: WindEnergy Study 2008 for HUSUM WindEnergy 2008 and Hamburg Messe

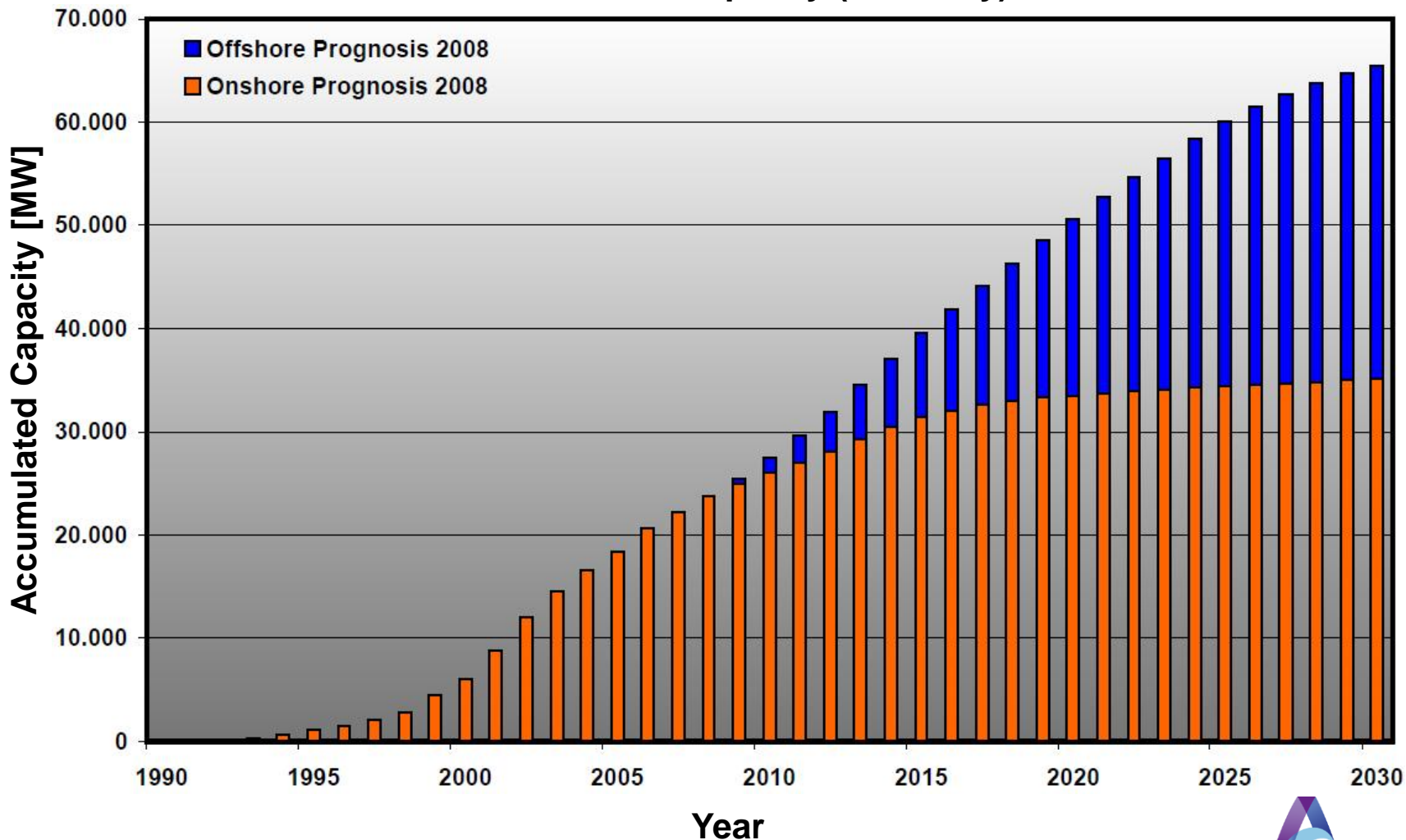
Facts and figures according the renewable energy act



Source: WindEnergy Study 2008 for HUSUM WindEnergy 2008 and Hamburg Messe

Facts and figures according the renewable energy act

Accumulated Capacity (Germany)



Source: WindEnergy Study 2008 for HUSUM WindEnergy 2008 and Hamburg Messe

Update on forecast errors

Optimal Combination – *Find the best combined forecast*

- Combine different deterministic NWP to minimize the error of wind power forecasts with a focus on finding an optimal combination of weather models with regard to different weather situations
- RMSE normalized to the installed capacity after training:
 - in 2008: 4.1 %
 - in 2009: 3.9 %

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Grid Development

Grid Development

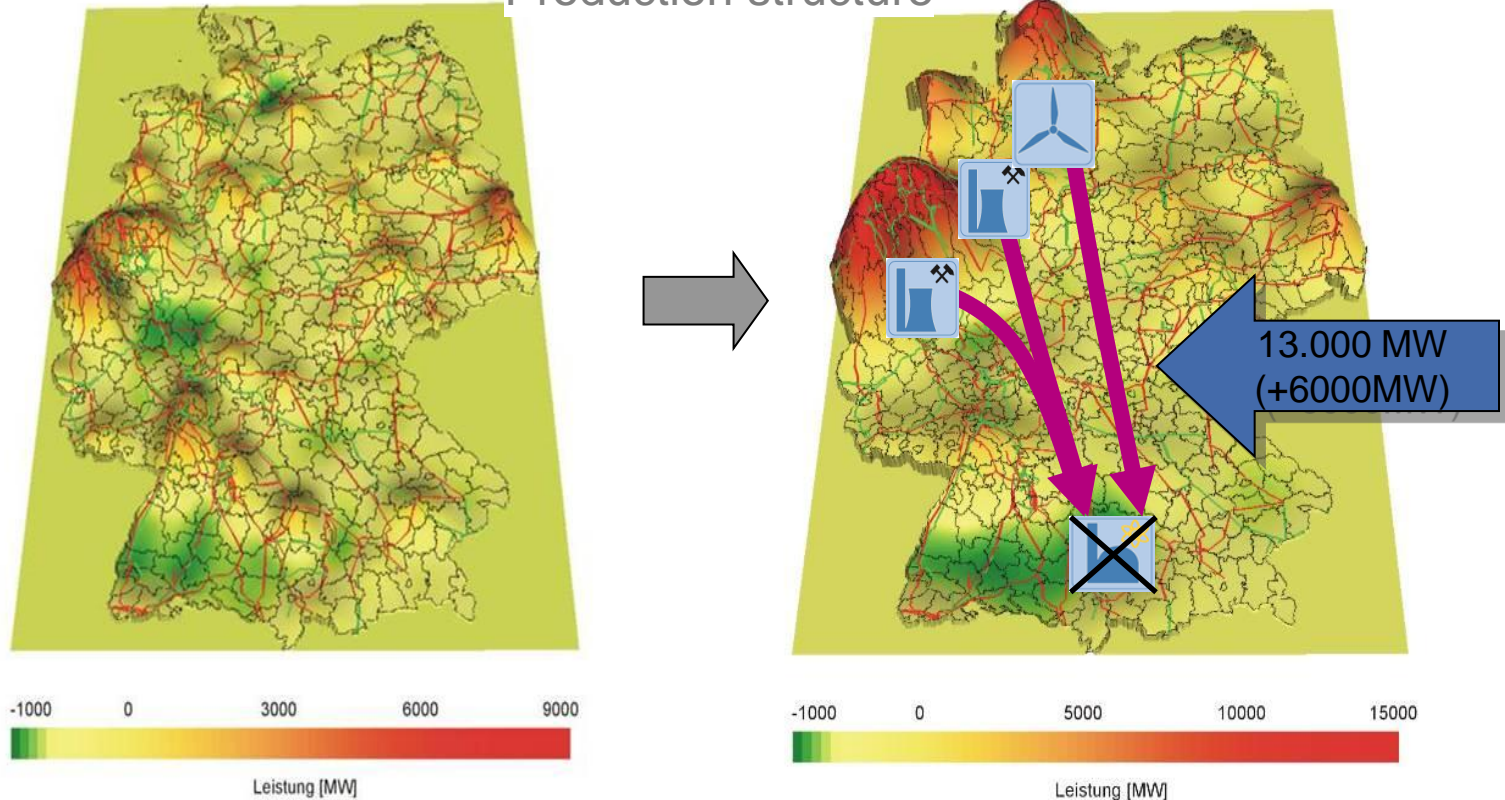
Essential grid development caused by renewable energy producer:

- Priority access for renewable energy
- Installed renewable energy capacity: over 50000 MW
- Most wind capacity installed in the North of Germany
- Most load in the South and West of Germany

➡ New transmission lines are necessary.

Grid Development

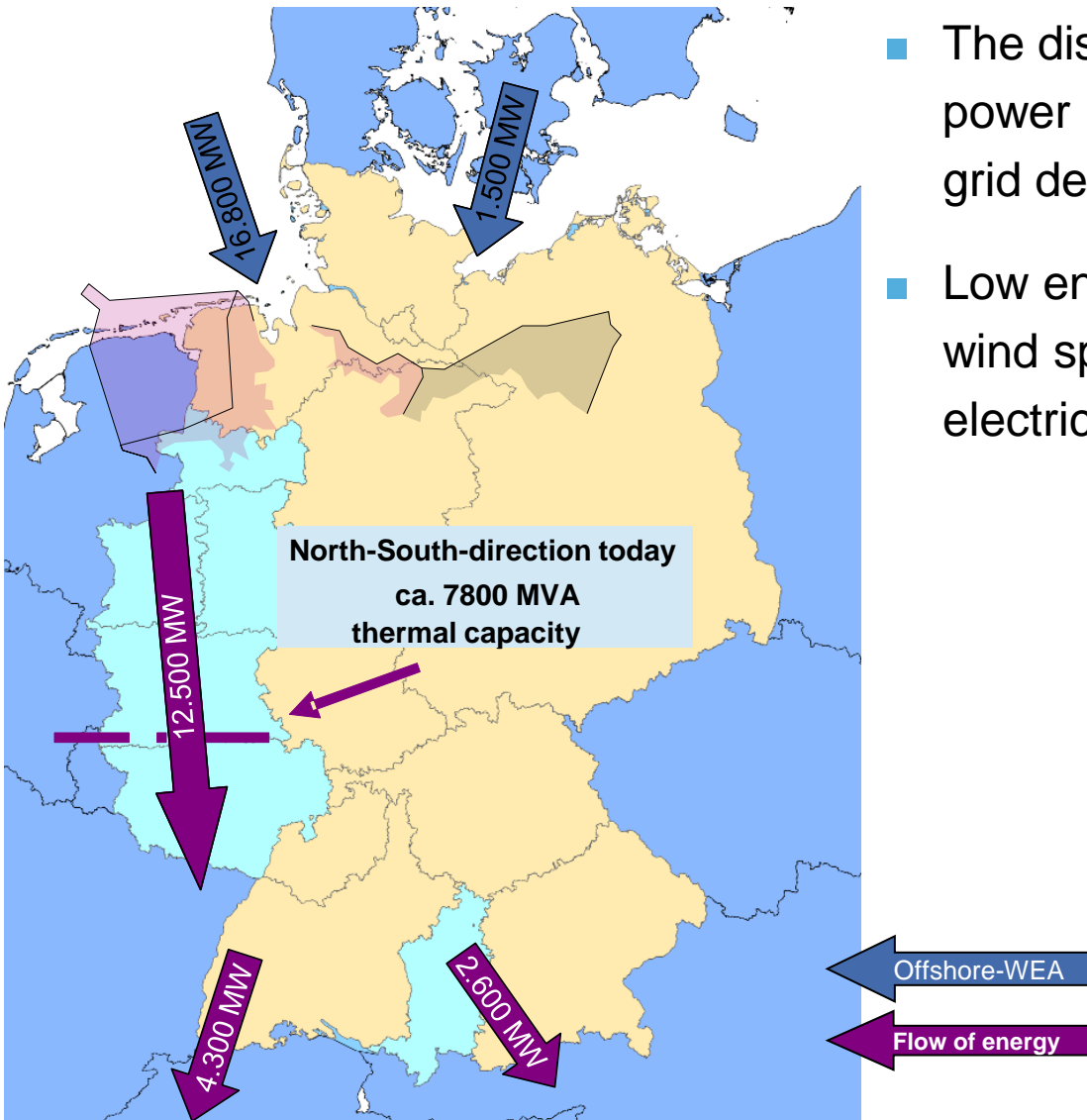
Production structure



Change of energy generation and liberalization of the energy market require massiv extension of the transmission grid

- Exigency of grid development, Elimination of bottlenecks
- Allocation of reactive power

Grid Development



- The discussion of disconnection of nuclear power plants will not have big effects in the grid development
- Low energy market prices causing by high wind speeds involve an aggravate import of electricity of Switzerland and Austria

Beispiel: Lastfluss bei Starkwind
ohne Kernkraftausstieg

Thank you for your attention!

www.amprion.net

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