Bundesnetzagentur

Integrating renewables in the grid and the market: Insights from the German *Energiewende* and lessons learnt

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US Delegation – Berlin, 25 Sept. 2017

Bundesnetzagentur: German multi-sector NRA

- Independent higher federal authority in the scope of business of the Federal Ministry of Economics and Energy

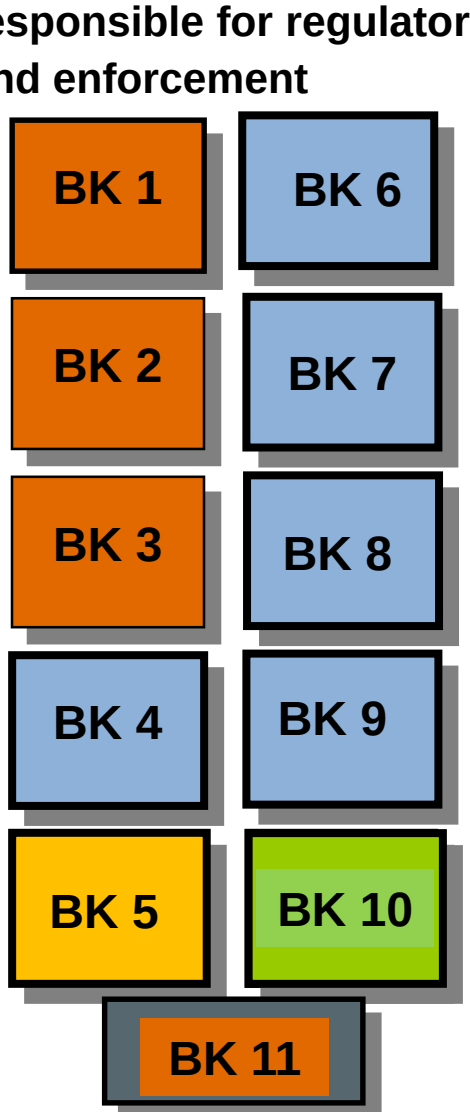
- **Sector-specific regulator** tasked with **ensuring effective competition** in 5 network industries:
  - **Telecommunications and Posts** (since 1998),
  - **Electricity and Gas** (since 2005), and
  - **Railways** (since 2006)
- Electricity **network planning** (since 2011), and electricity network **permitting** (2013) as a result of the *Energiewende*

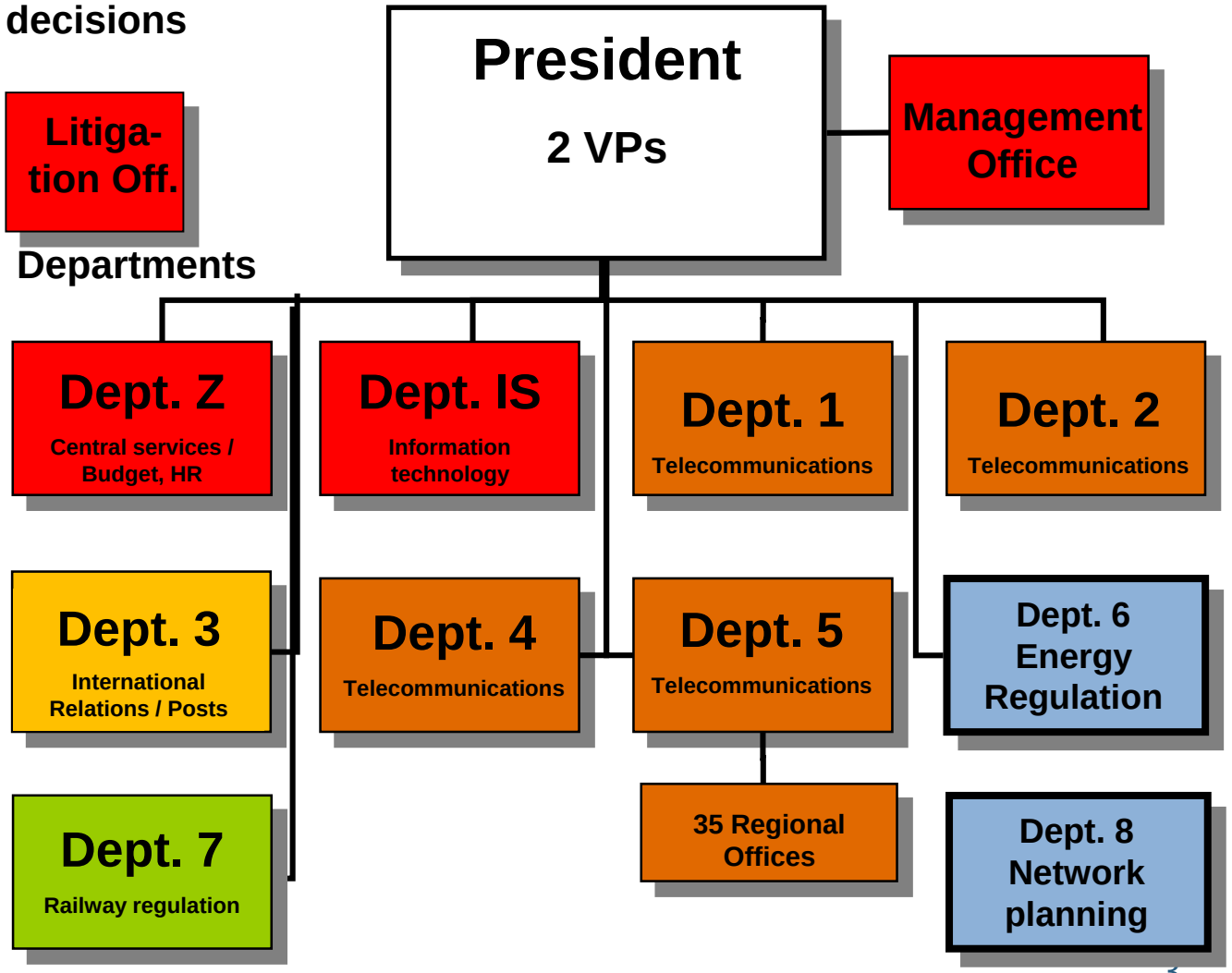
HQ in Bonn

- BNetzA employs ar. 200 staff in energy regulation, up to 240 staff are being recruited for HV electricity network planning and permitting (of national a. XB transm. lines)
  Overall headcount for all sectors: ar. 3,000 staff members
- Budget: 214m euro (2016), BNetzA is tax funded

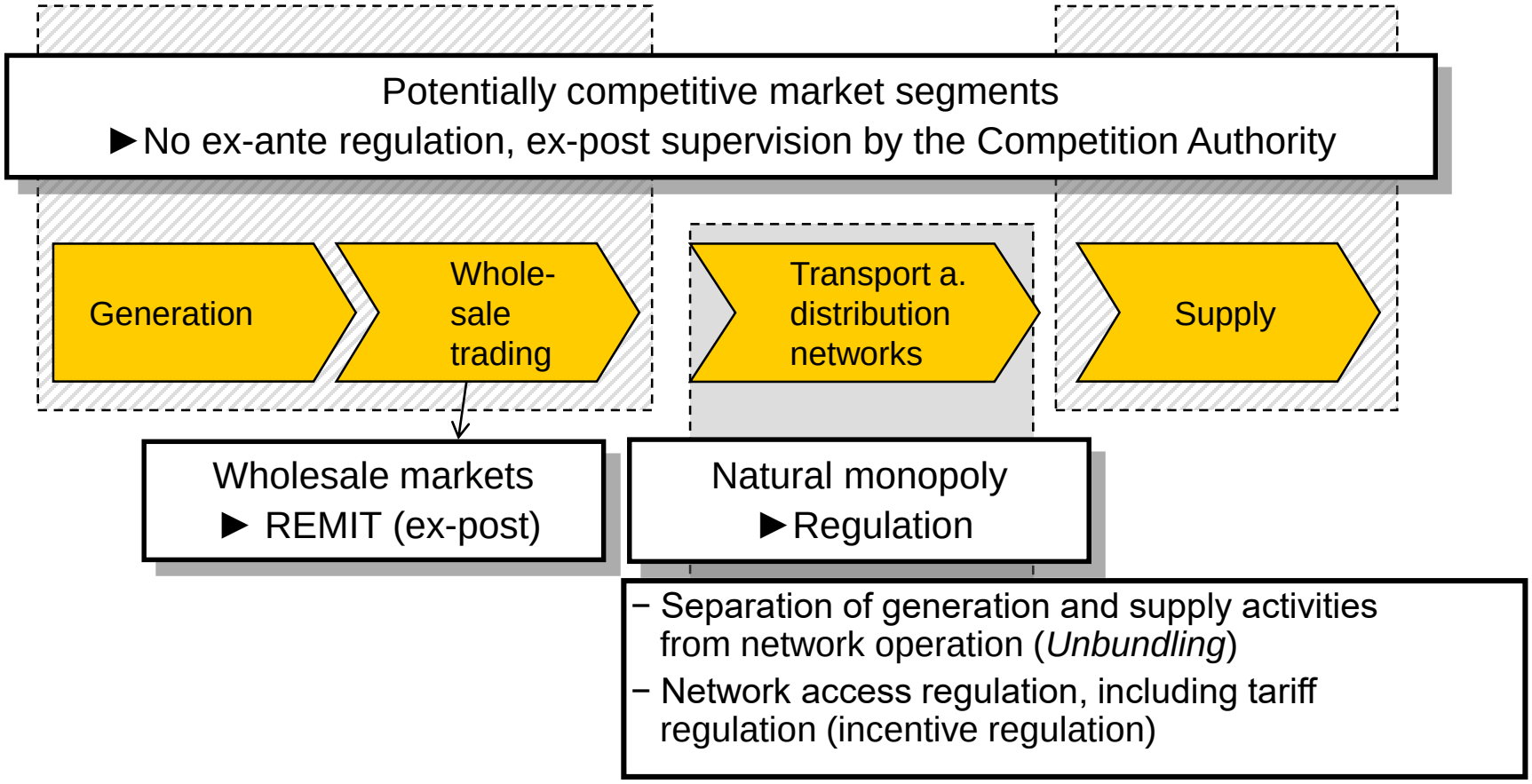
Bundesnetzagentur: German multisector regulator

Ruling Chambers (Beschlusskammern), responsible for regulatory decisions and enforcement





Network regulation in the energy market value chain



Limited responsibility of Bundesnetzagentur in comparison with other national energy regulators − More recently, however, rapidly growing fields of activity linked to the *Energiewende*: grid planning + permit.

Legal Basis for BNetzA actions (1)

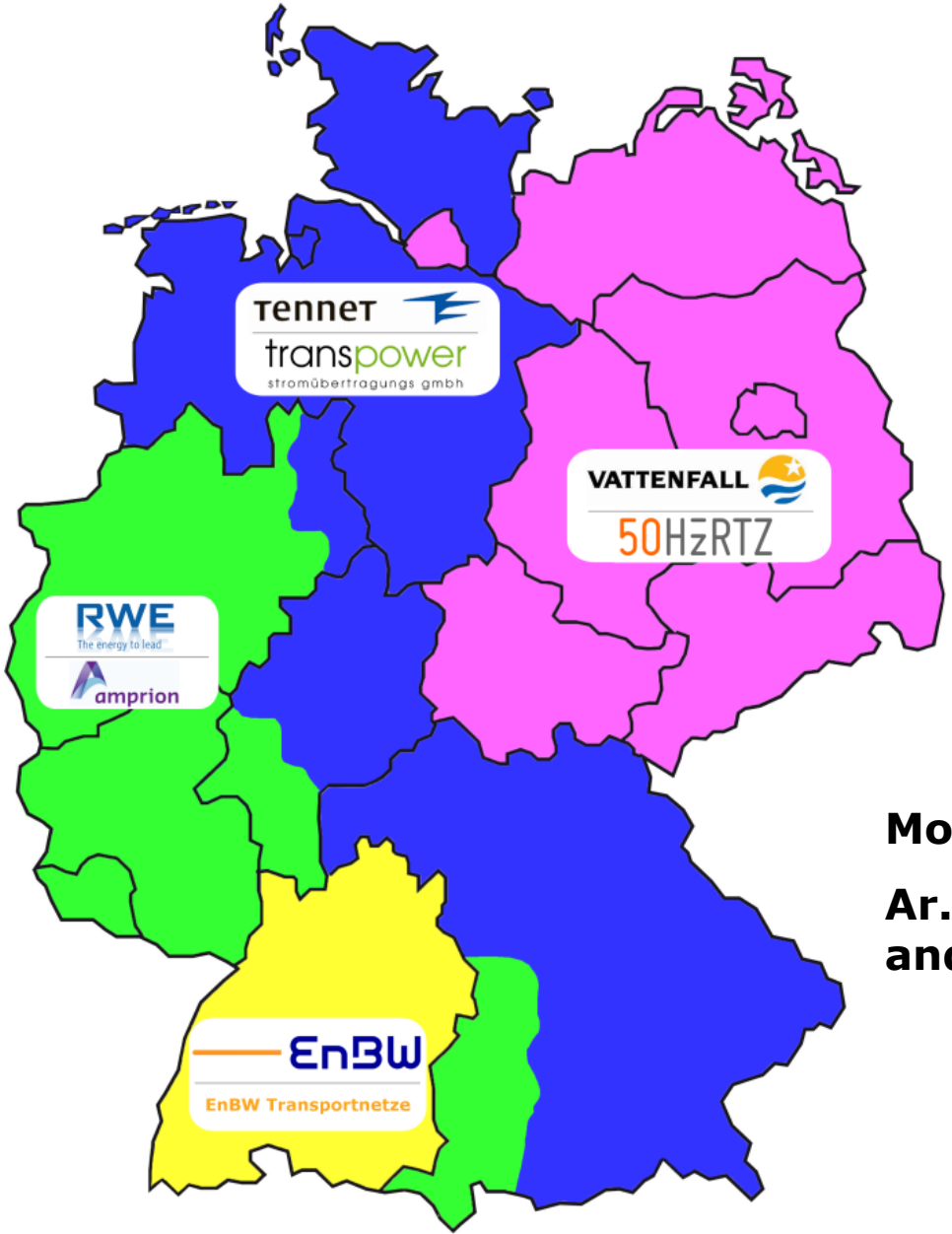
- **Energiewirtschaftsgesetz (EnWG of 7 July 2005)**
  - Energy regulation means ex-ante regulation of TSOs and DSOs by BNetzA and LandesRBs (PUCs)
  - Grids are necessary for energy suppliers and producers
  - One TSO/DSO per grid area = natural monopoly = regulation ensures that TSOs/DSOs do not abuse dominant position to provide discriminatory access to the grid at excessive prices
  - Goal of Energy regulation = more competition upstream and downstream (for generators, wholesale energy traders, energy suppliers [retail level])
  - How?
    - Determine grid tariffs
    - Ensure non discriminatory third party grid access to suppliers and consumers
    - Standardise ernergy supply
    - Improve conditions for grid connections of generating capacity

Electricity Transmission System Operators

TenneT
(formerly
E.ON Netz,
acquired by
TenneT,
publicly-owned
Dutch TSO,
Ownership
Unbundling)

Amprion
(subsidiary
of RWE,
a Vertically
Integrated
Undertaking)

TransnetBW
(subsidiary
of EnBW,
a Vertically
Integrated
Undertaking)



50Hertz
(formerly
Vattenfall Europe
Transmission,
acquired by Elia,
publicly-owned
Belgian TSO
and IFM,
an Australian
investment fund,
Ownership
Unbundling)

More than 10 gas TSOs,

Ar. 1600 electricity and gas DSOs

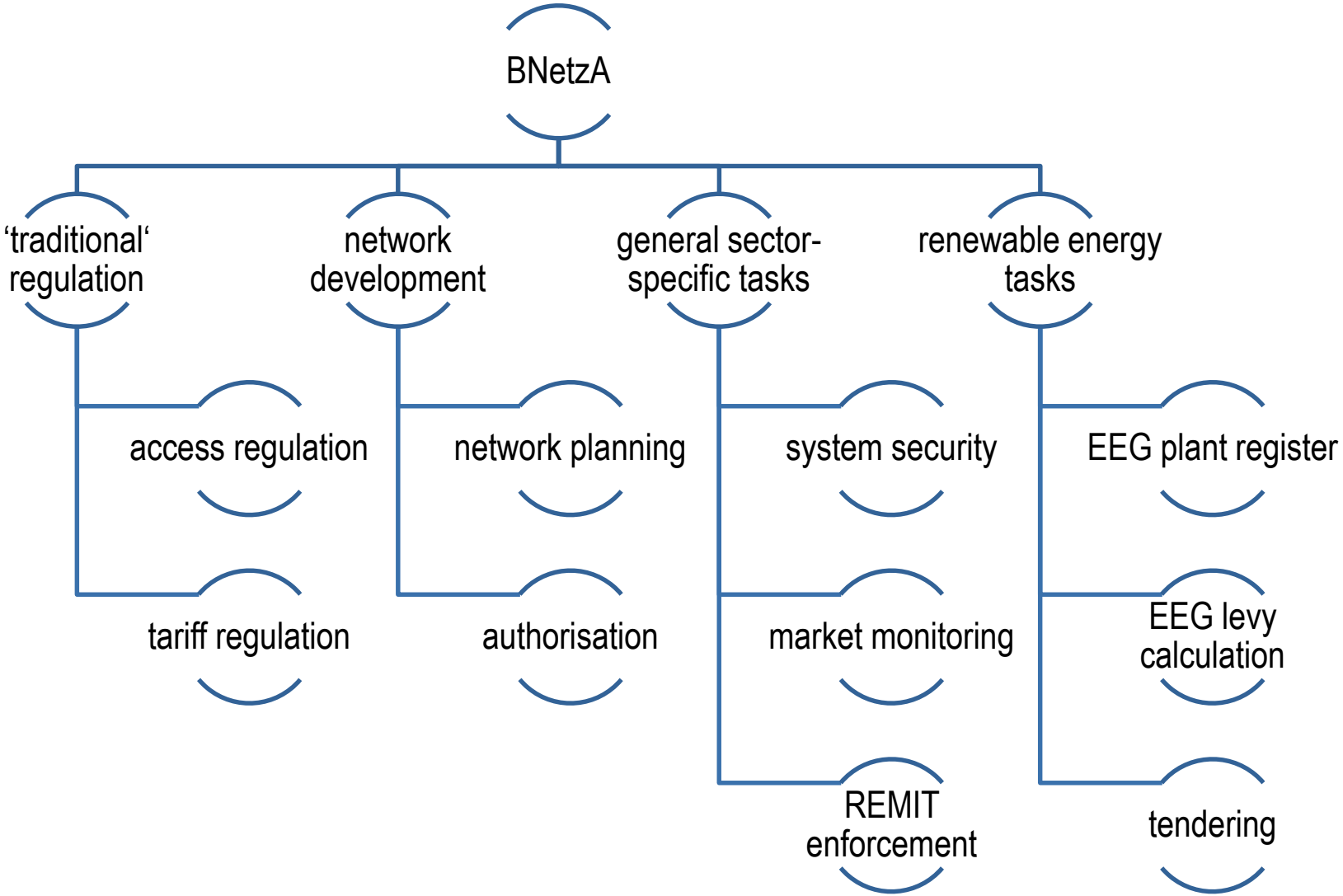
Main Competences (1)

- Create the conditions for effective competition in the upstream and downstream markets by regulating the grid which is a natural monopoly
- Ensuring non-discriminatory network access
- Ex-ante control of the network tariffs levied by the grid operators for usage of the grid
- Monitoring of the regulations concerning the unbundling of network areas and the system responsibility of the supply network operators
- Supervision of anti-competitive practices
- Examination of end customer prices does not fall into the Federal Network Agency's sphere of responsibility
  - Objections to excessive rates for end users will continue to be dealt with by the federal states (Landes Cartel Authorities) or by the civil courts.
  - The Federal Cartel Office is responsible for verification in the case of energy prices levied by energy suppliers operating on a nationwide basis.

Main Competences (2)

- **Following the transposition of the 3rd Internal Energy Market Package of 2009 in Germany with the amended Energy Industry Act 2011:**
  - Decision on grid access
  - Decision on grid access tariffs – incentive regulation
  - Decisions on unbundling
  - Monitoring of the wholesale and retail markets
  - Surveillance of wholesale markets
  - More independence of the Regulatory Authority
  - More consumer protection and transparency for consumer rights
  - Cooperation within European Energy Agency (ACER)

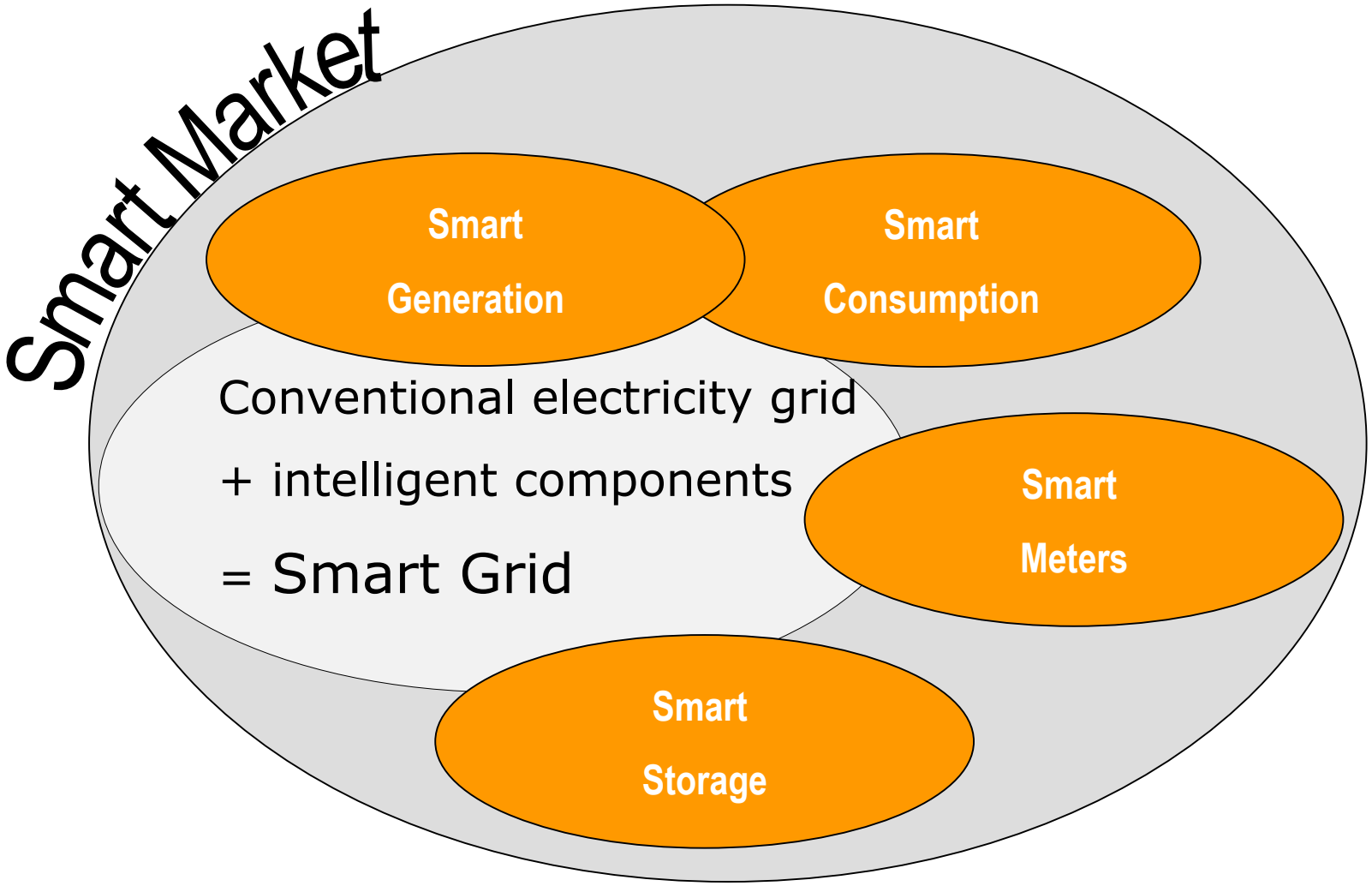
BNetzA's tasks in energy regulation



Changing role of the regulator

- Given the changes of the energy system needed to integrate RES into the grid and markets, the regulator has more responsibilities than in the past
- Not only the traditional regulation of the grid (access and rates regulation) as a natural monopoly, but
- More and more tasks regarding the **market integration of RES**, e.g. tendering of RES (solar, wind tenders)
- **Speeding up** the **grid expansion** to ensure the grid structure and capacity is in line with the growth of RES (new tasks of planning and permitting were given to BNetzA in 2011) and confirmation of the network development plan submitted by the 4 electricity TSOs
- **Cooperation** with all national regulators of EU Member States and observers in the European bodies (ACER) to ensure the development of the **internal energy market** in Europe is promoted and no cross-border barriers hamper energy trading and cooperation to ensure SoS
- Ensuring secure, efficient and sustainable energy supply at reasonable prices to consumers: moving towards a **customer-centric model** away from the current operator oriented model

Smart market



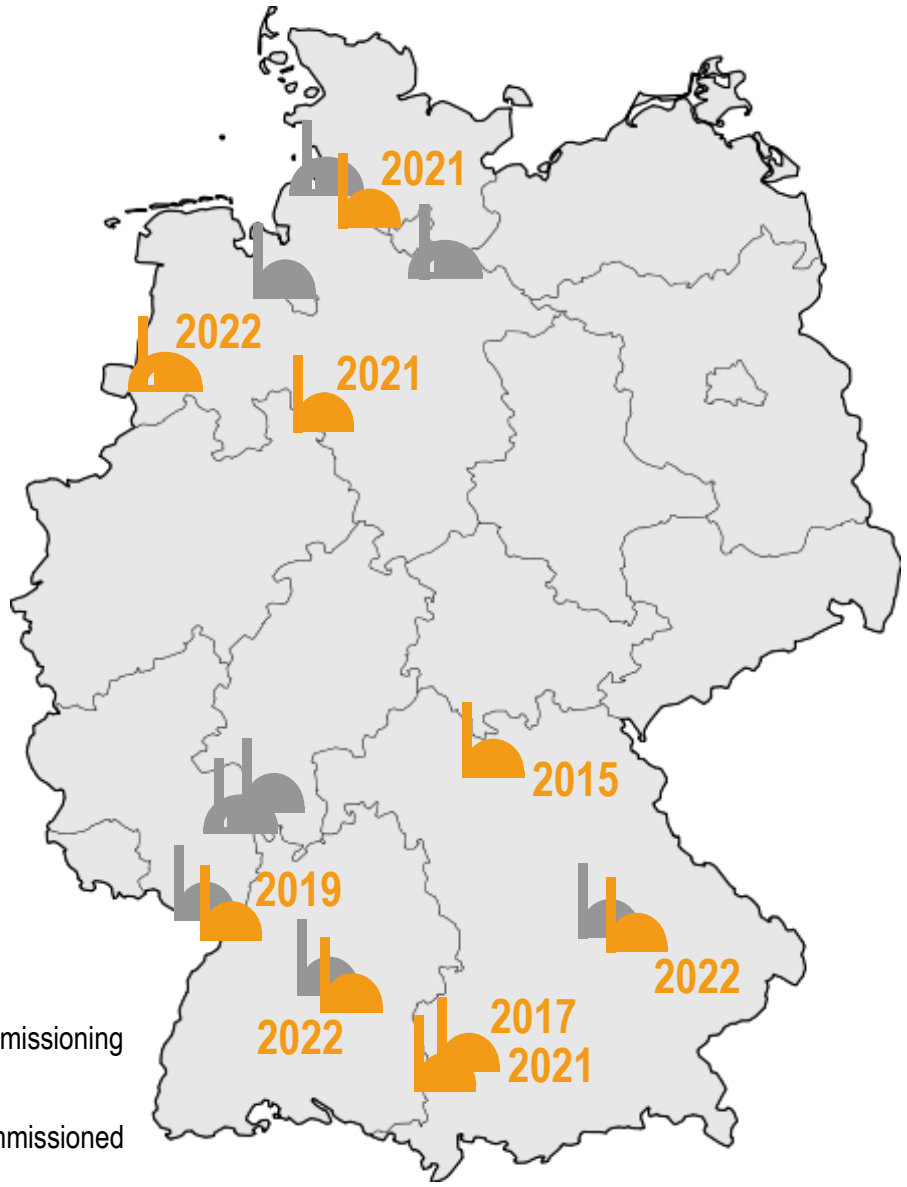
Agenda

- The German Energy Transition 2011
  - Recap of the German *Energiewende* decisions
  - Impacts of the German *Energiewende*
- Solutions: Reforms 2016
  (amendments to the 2011 energy legislation)
  - Grid Expansion Acceleration Act
  - Renewables growth and reform of the Renewable Energy Act in Germany
  - Amendments to the Energy Industry Act: the Electricity Market Design Act (EOM 2.0)
- Challenges and new tasks for the regulator
- Conclusions and lessons learnt

Key Messages

- **No change of direction** – the "*Energiewende*" is *the* project of the Government who committed in the coalition agreement 2013 to make the "*Energiewende*" a success story, but adjustments are needed
- **Synchronization** of the grid expansion with the RES growth needed in order to integrate renewables into the grid, grid expansion lagging behind
- **Speed up grid expansion**, in particular build 3 new major HVDC transmission lines from North to South, planning and permitting by BNetzA to bring RES from the North to the load centres in the South
- **Reform** of the Renewable Energy Act for a more cost-effective and more **targeted renewables growth** in force since 1 August 2014 to stop/reduce „*produce-and-forget*" mentality with a market-based approach; cabinet resolution 8 June 2016: corridors confirmed, but more cost-efficient growth
- **Generation**: conventional and renewable energy must be better balanced to ensure sufficient capacity is made available where and when needed, i.e. increase **flexibility** and find an appropriate market design: **EOM 2.0** (Draft Electricity Market Design Act prop. on 4th Nov. 2015), **adopted 8 July 2016**
- **Smart markets**, i.e. make distribution grids smarter and foster flexible **demand side response** to increase **flexibility**
- **Energy efficiency** increased, but more to do
- **Conclusion:** let's turn the big challenges of moving towards a low-carbon economy into chances by moving on jointly towards **a more market-based approach**, i.e. a smart market design providing **proper price signals**

"*Energiewende*": Changes in the German energy mix (1)



- **Following the Fukushima catastrophe in 2011, the orientations set in 2010 have been complemented by an accelerated nuclear generation exit (previously foreseen for 2036)**
- **Moratorium imposed by the Government on the 8 oldest nuclear power plants immediately after the Fukushima catastrophe rendered permanent**
- **Shutdown of the remaining nine nuclear power plants by 2022**
- **<u>BNetzA assessing generation adequacy and network development requirements</u>**

Legal Basis for BNetzA actions (2)

- **NABEG (from 28 July 2011) Not a regulatory competence!**
  - **NABEG**: Grid Expansion Acceleration Act
  - Increase of renewables (wind and solar energy) requires grid adjustment
  - Electricity grids must transport more RES
  - Grids must be reinforced and expanded
  - BNetzA must ensure rapid and efficient grid expansion and grid reinforcement
  - **How?**

  TSOs (50Hertz Transmission GmbH, Amprion GmbH, TenneT TSO GmbH and Transnet BW GmbH) plan and manage transmission grids.
  - If new lines are necessary, TSOs prepare a plan setting out all effective measures to optimize, reinforce and develop the network
  - BNetzA approves the grid expansion after evaluation of the necessity

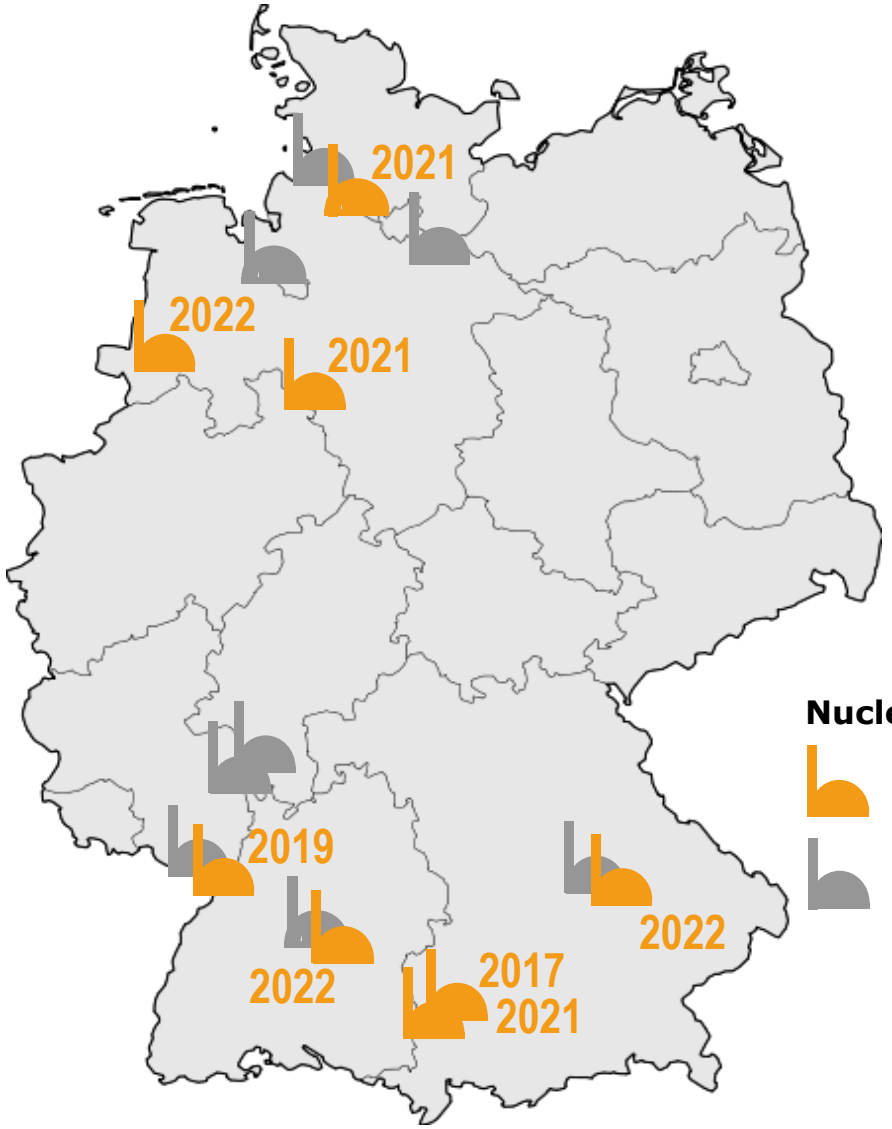
"Energiewende": Changes in the German energy mix (2)

Offshore wind power

Installed 2014:
0.9 GW
Expansion by 2025:
+9.6 GW

PV

Installed 2014:
38.2 GW
Expansion by 2025:
+16.7 GW



Onshore wind power

Installed 2014:
38.1 GW
Expansion by 2025:
+25.7 GW

Nuclear power plants

Planned shutdown

Already decommissioned

Energy transition: path towards 2030

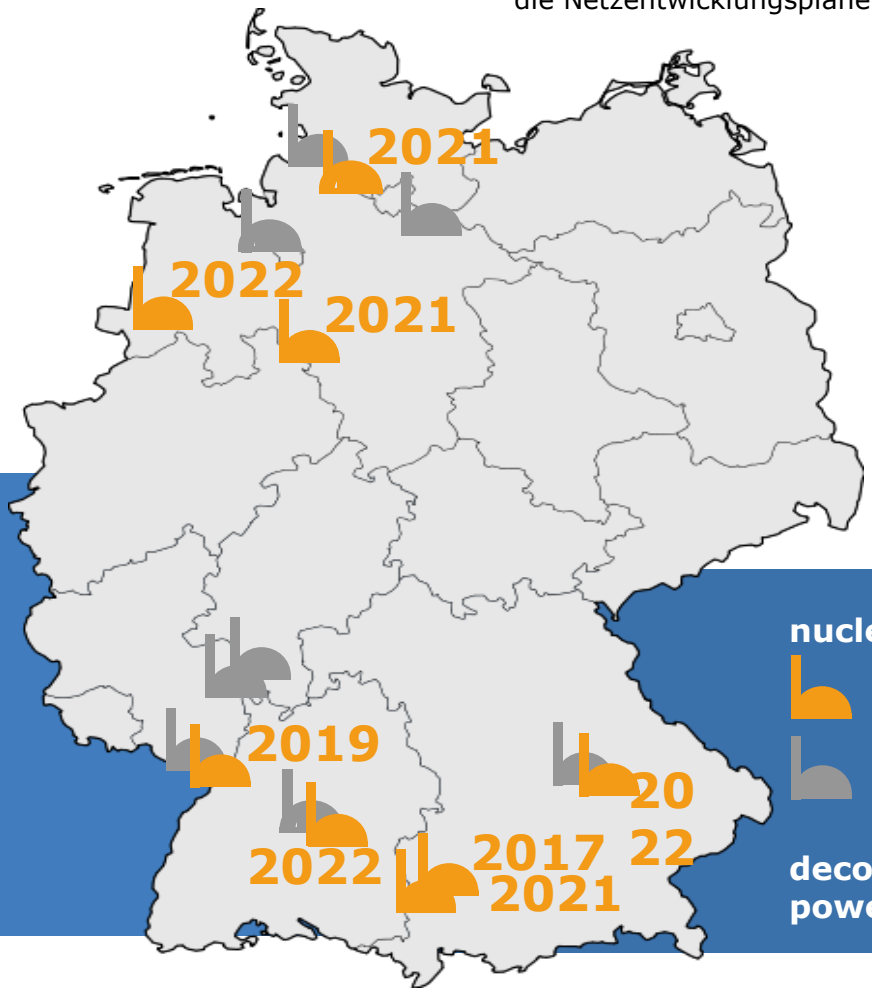
Source: Zubauraten: Ausbaupfad gem. § 3 EEG und

Genehmigung der Bundesnetzagentur zum Szenarorahmen für die Netzentwicklungspläne Strom 2017-2030, Szenario B 2030

offshore wind

installed capacity

2015:	3.4 GW
2030:	15.0 GW
new plants:	**11.6 GW**



onshore wind

installed capacity

2015:	41.2 GW
2030:	58.5 GW
new plants:	17.3 GW

photovoltaics

installed capacity

2015:	39.3 GW
2030:	66.3 GW
new plants:	**27.0 GW**

nuclear power plants

planned shutdown

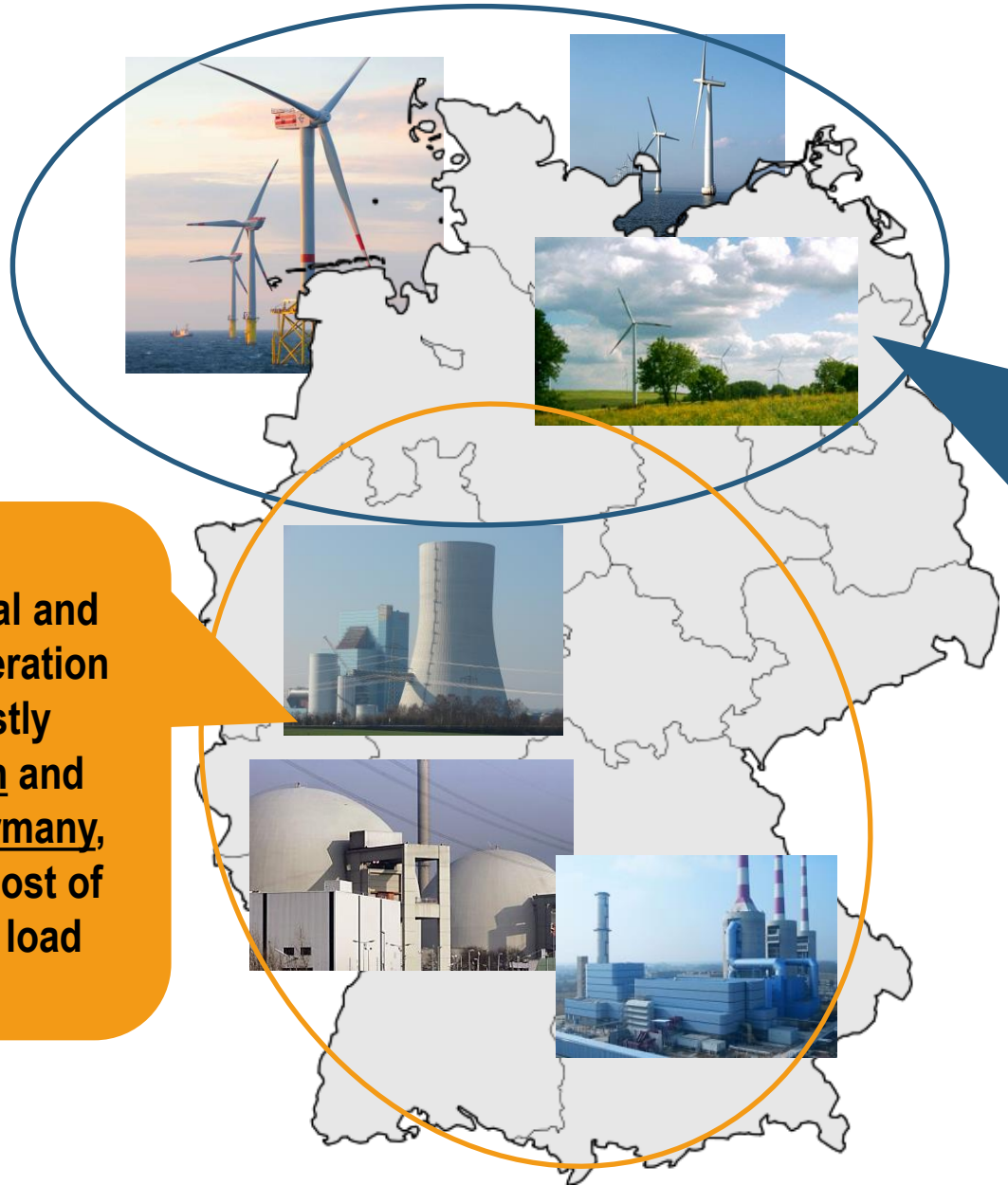
already shut down

10.8 GW

decommissioning of lignite power plants: 2.7 GW

Large amount of volatile RES needs to be integrated – both into the grid and the market

Changes in the energy mix – Grid implications

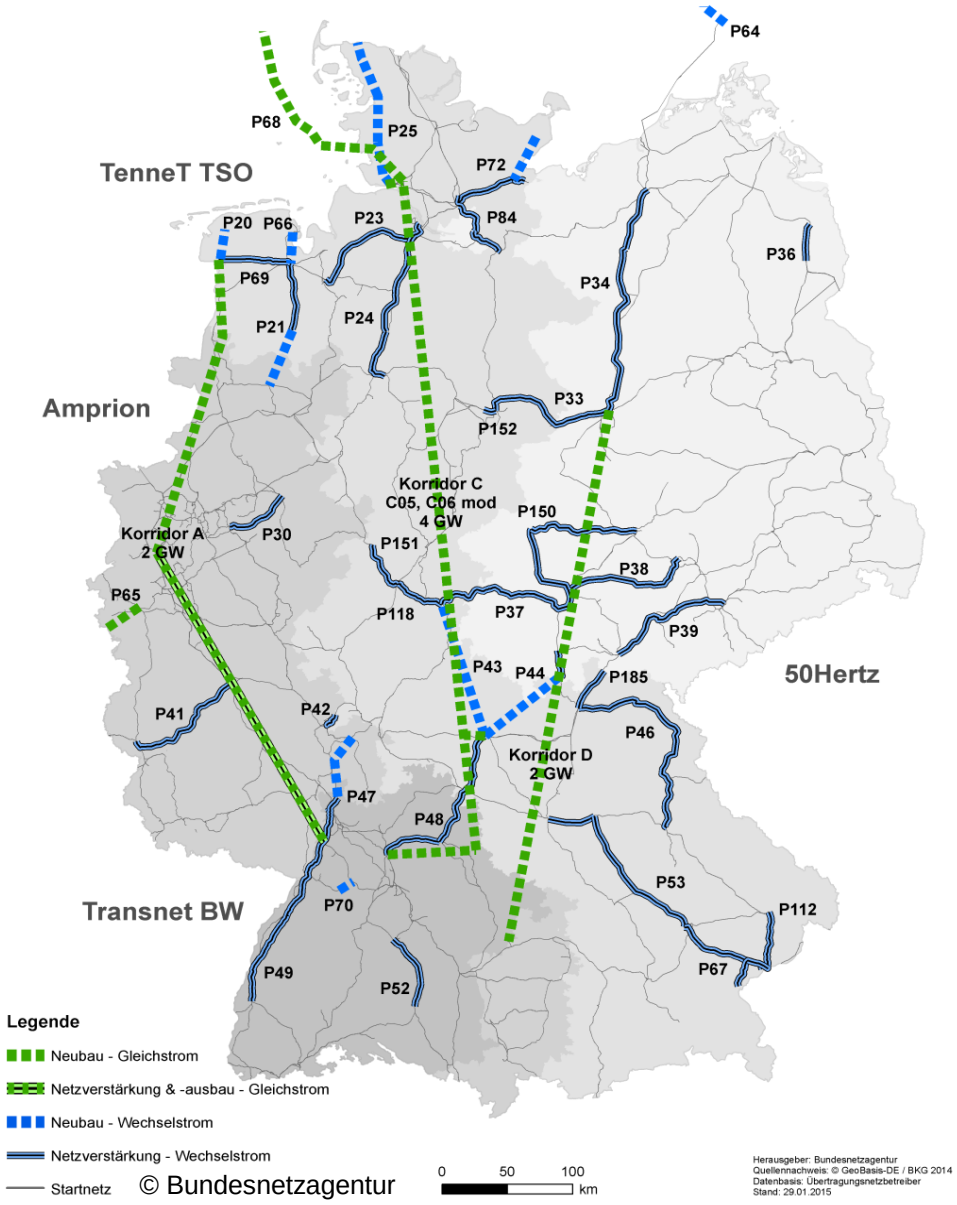


Renewable energy sited mostly in Northern Germany (esp. wind)

Conventional and nuclear generation sited mostly in Southern and Western Germany, as well as most of (industrial) load

Confirmation of Network Development Plan

Confirmed NEP 2024 (Scenario B 2024)



- Annual transmission network development plan process
- 34,841 km existing lines in 2012
- 63/92 transmission measures confirmed in 2014
- 5,800 km of lines
  (2,750 km new lines
  3,050 km reinforcements)
- 3 main No-South HVDC corridors
- <u>Estimated costs:</u>
  16 billion € (if overhead lines only)
  26 billion € (if realized including 10% underground cable)
  31 billion Euro (if all DC lines and 20 % of AC lines are build as underground cables)
- 19 billion € offshore connection cable

Grid expansion: Electricity grid planning process – the 5 steps

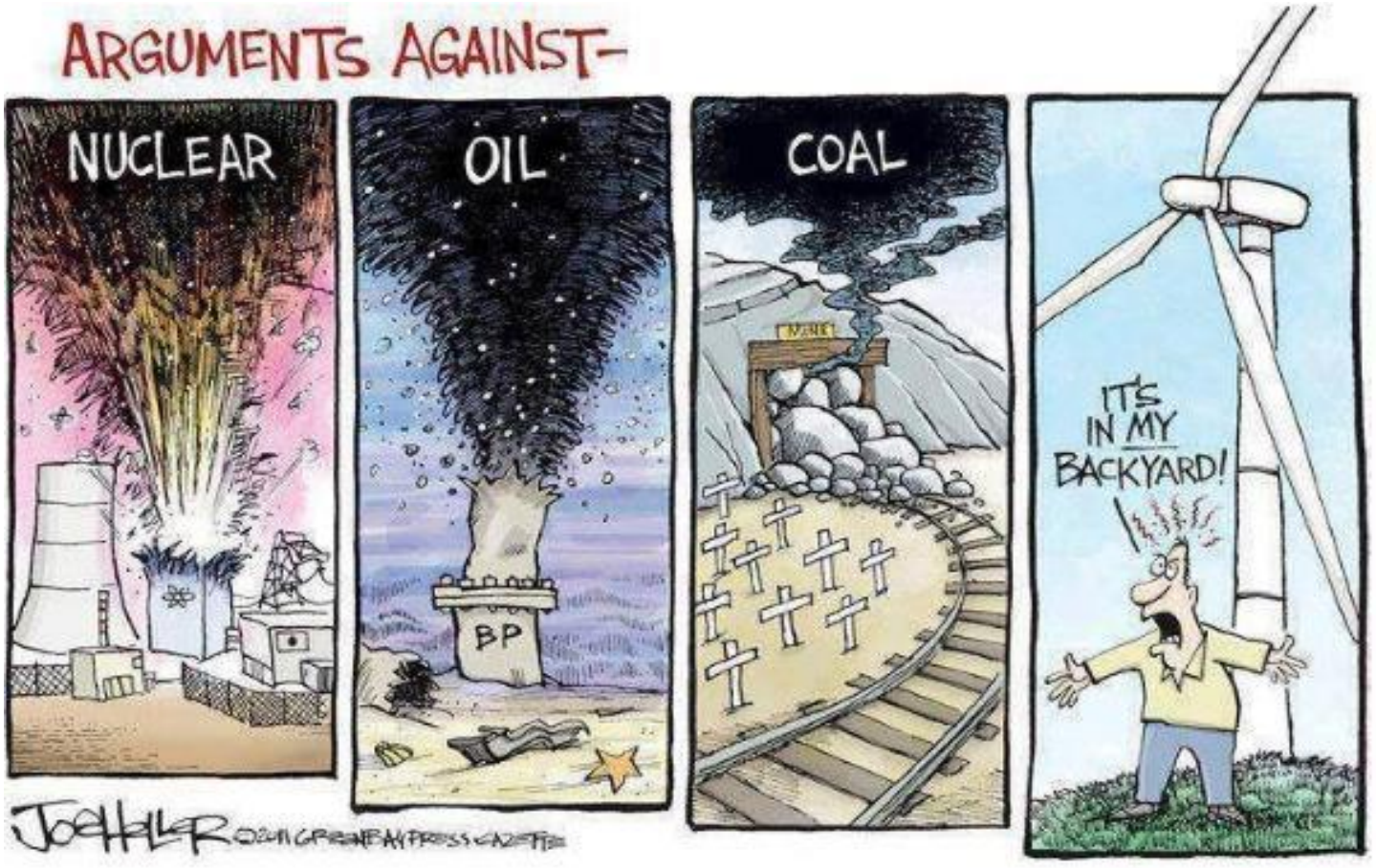
annual process

I SCENARIO FRAMEWORK	II REGIONA-LIZATION	III MARKET MODELLING	IV POWER FLOW CALCULATIONS	V GRID EXPANSION ASSESSMENT
scenario A scenario B scenario C (10 years) scenario B (20 years)	regional allocation of generation and consumption	simulation of generation and consumption per hour in each electrical grid node	calculations and analysis based on the start-grid	definition of adequate grid reinforcement and expansion projects
What will be the expansion of renewable energy? (RES-share)	Where will renewable energy feed in to the grid? (north migration)	Which conventional power plants will cover the remaining load? (fossil fuel mix)	Where and when will the grid be overloaded? (grid bottlenecks)	Which are the right measures? (NOVA-principle, technology selection)

Participation in the NDP process (1)

Participation of stakeholders at all stages …

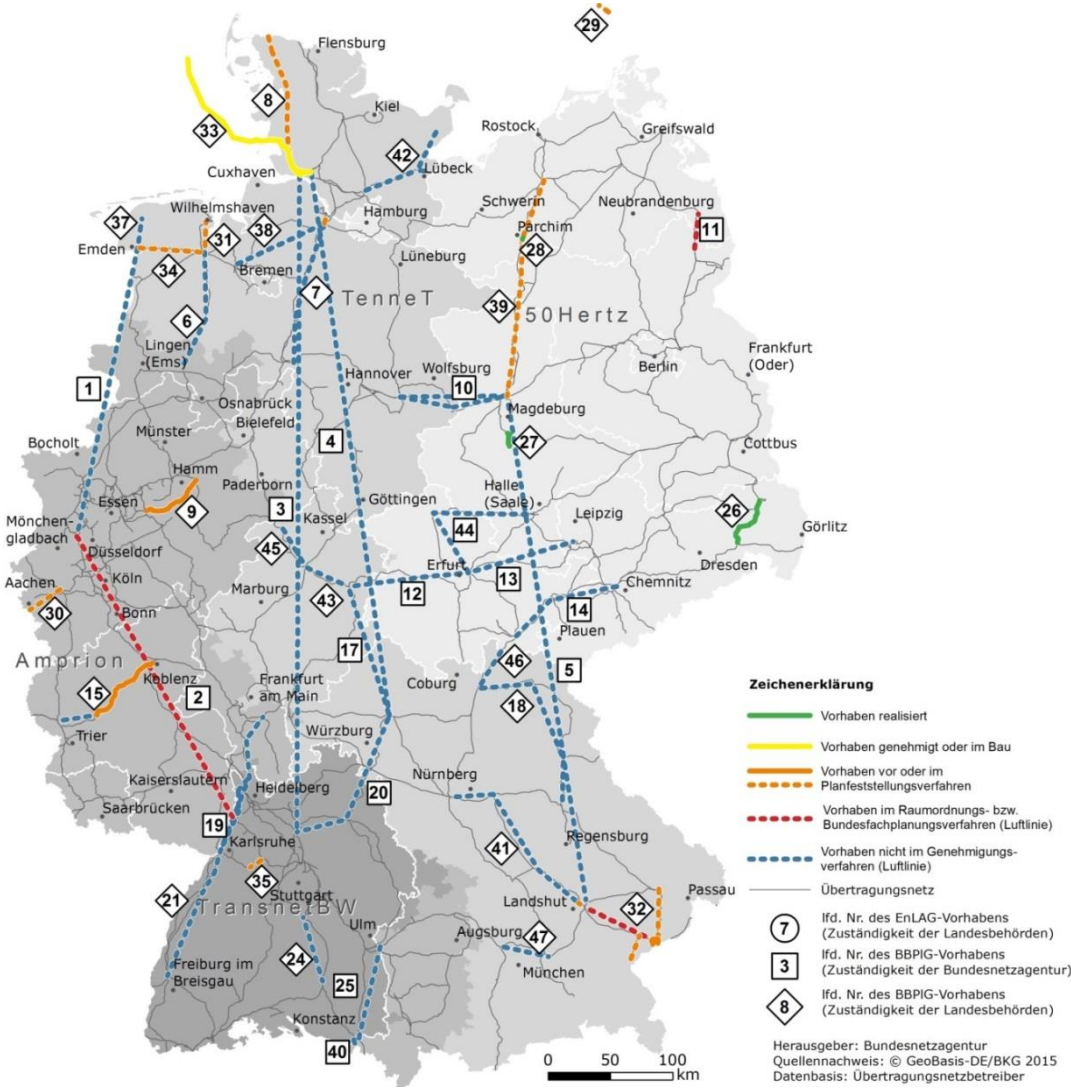
Participation in the NDP process (2)



…. but NIMBY effect remains

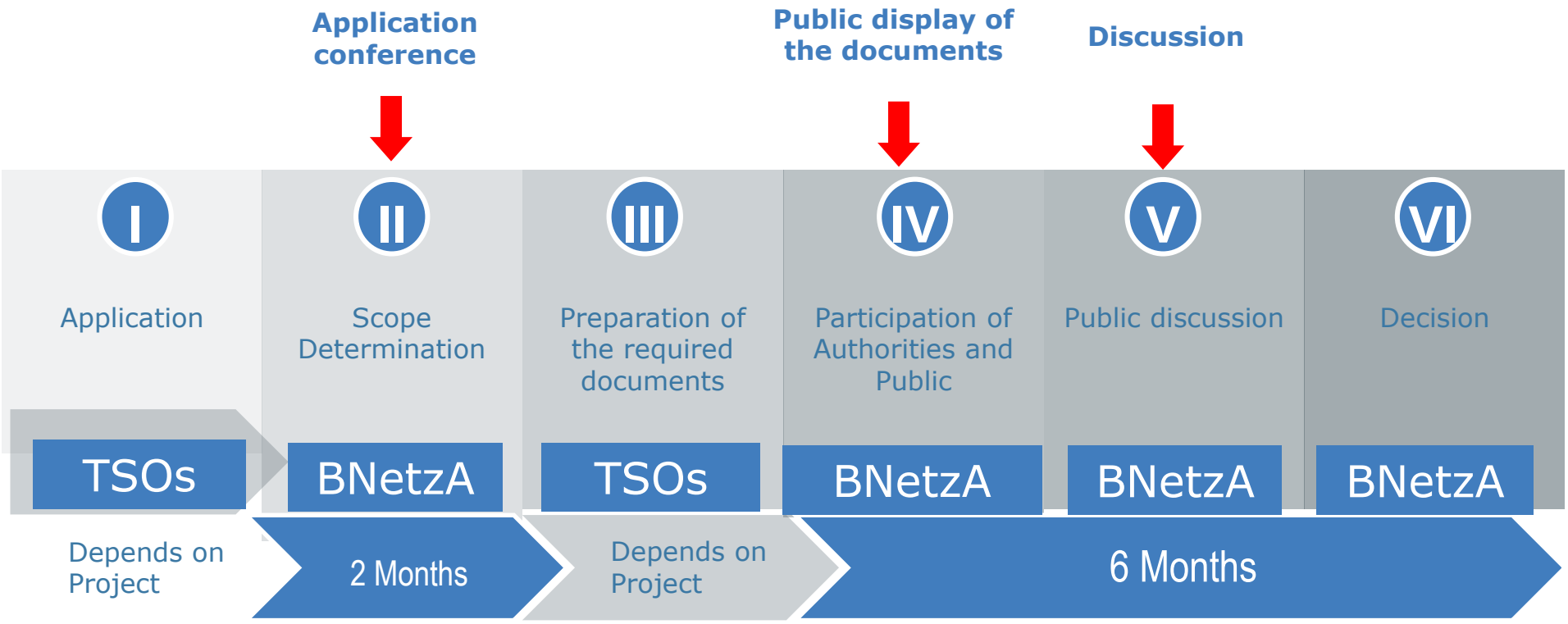
Step 3 – Federal Requirements Plan Act (2015)

- **46 Projects**
  - 16 projects within the competence of BNetzA (according to Planning Approval Responsibilities Ordinance)
  - which are essential for the energy sector and urgently required
  - including 5 projects for direct current (DC) extra high voltage lines generally as underground cables



Step 4 – Federal Sectoral Planning

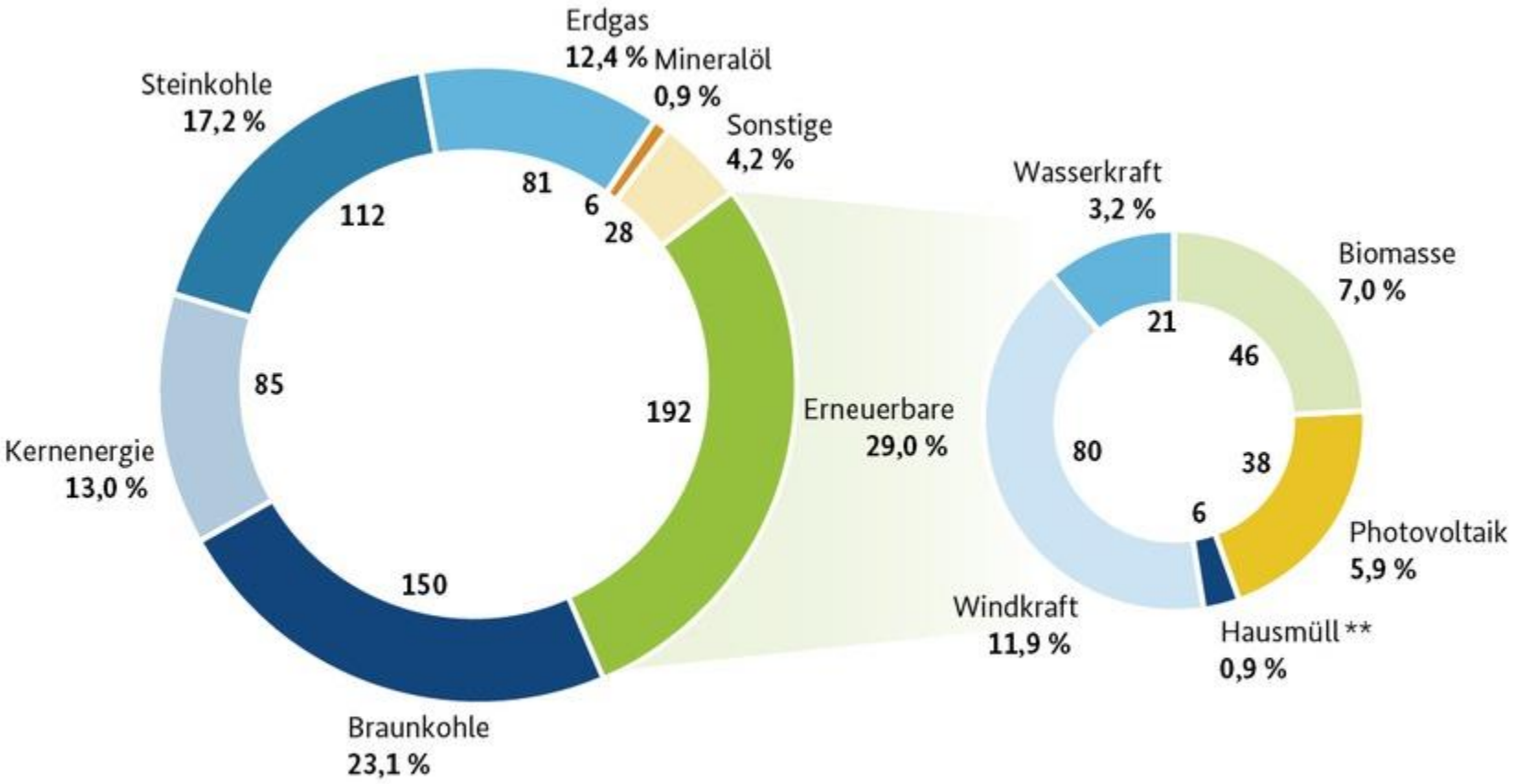
Time-line



Today 2 important applications on Suedost-Link and Suedlink were submitted for evaluation by BNetzA

RES IS No 1 IN THE GERMAN ENERGY MIX (1)

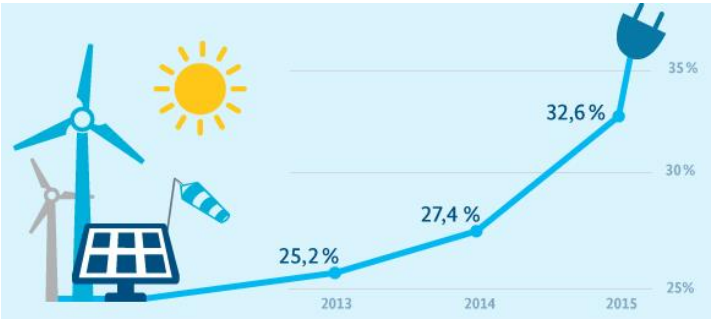
Gross electricity production in Germany 2016 in TWh – March 2017, source: BMWi

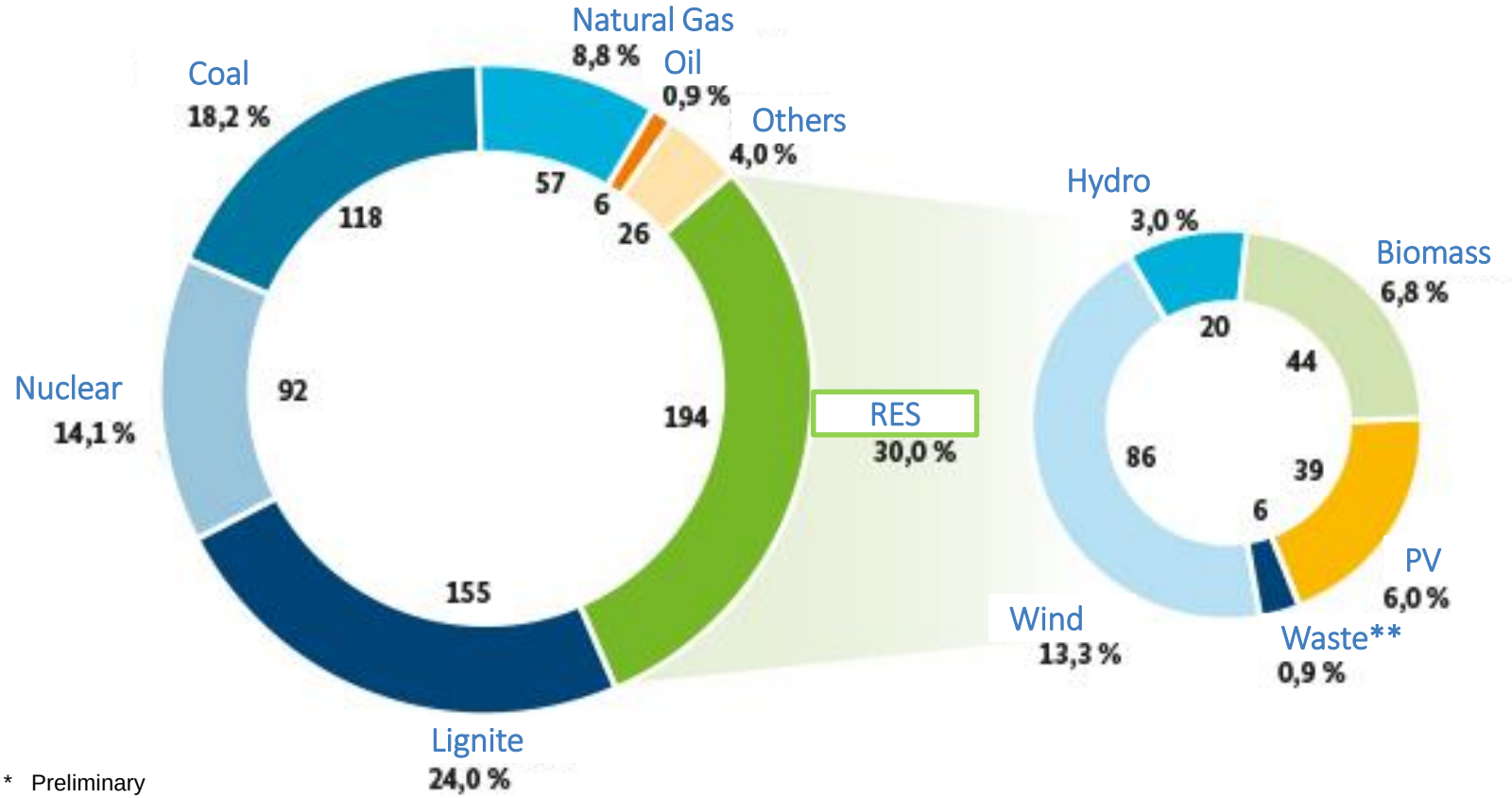


Geothermie aufgrund der geringen Menge in Photovoltaik (PV)
*vorläufg, **regenerativer Anteil

RES IS No 1 IN THE GERMAN ENERGY MIX (1a)

Gross electricity production in Germany 2015: 648 TWh*



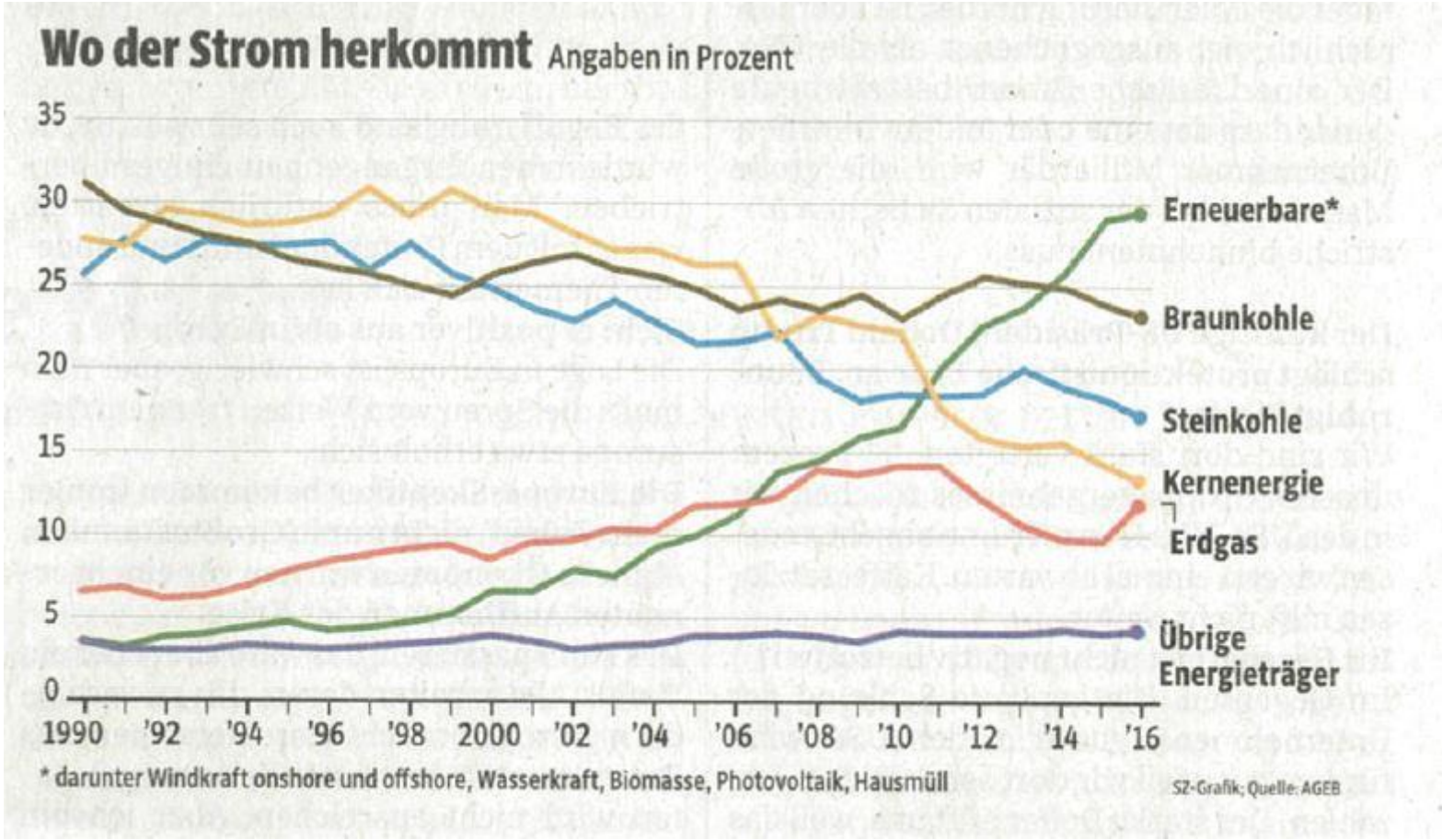


* Preliminary

** Renewable share

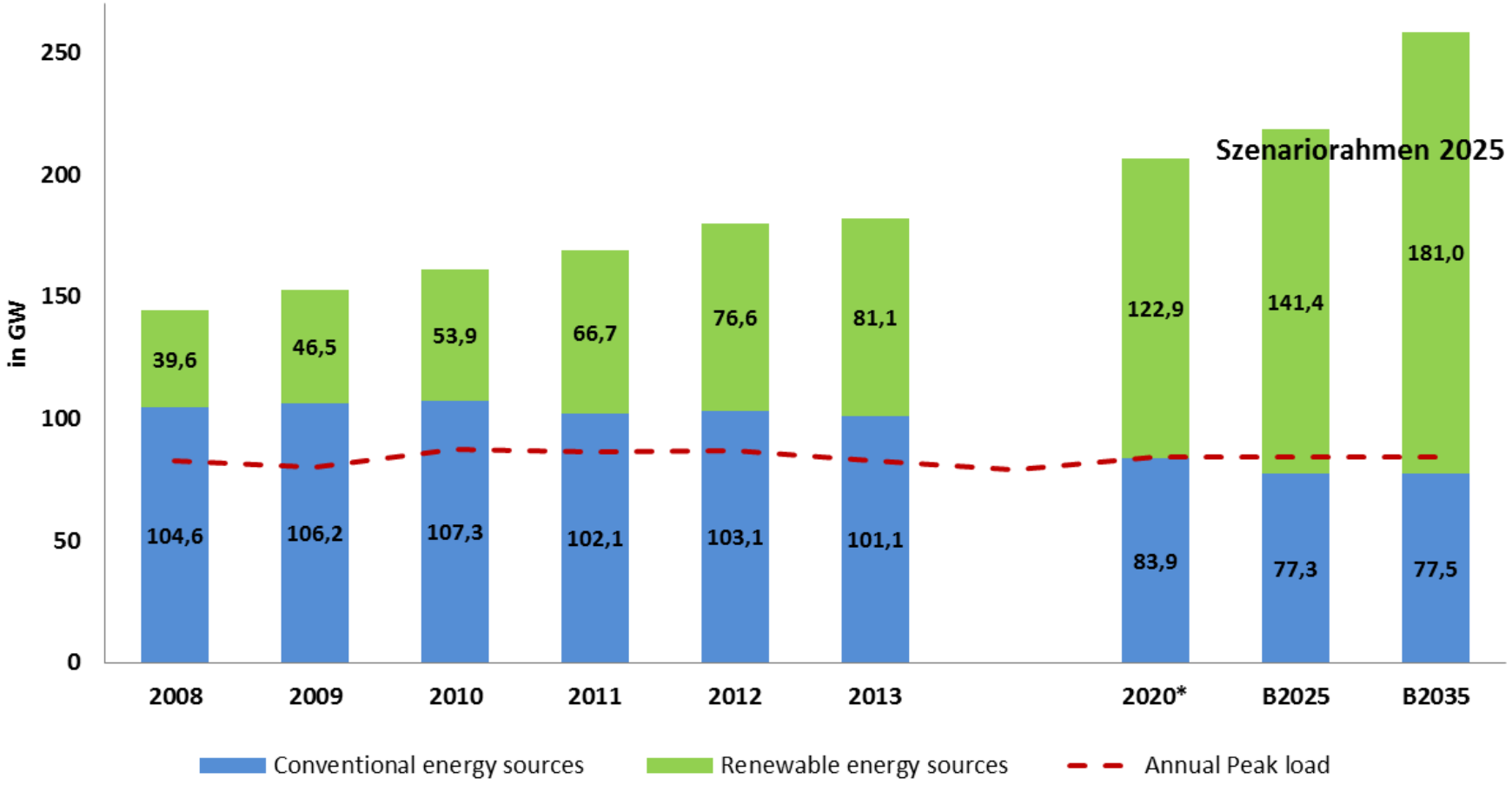
Source: BMWI

RES IS No 1 IN THE GERMAN ENERGY MIX (2)

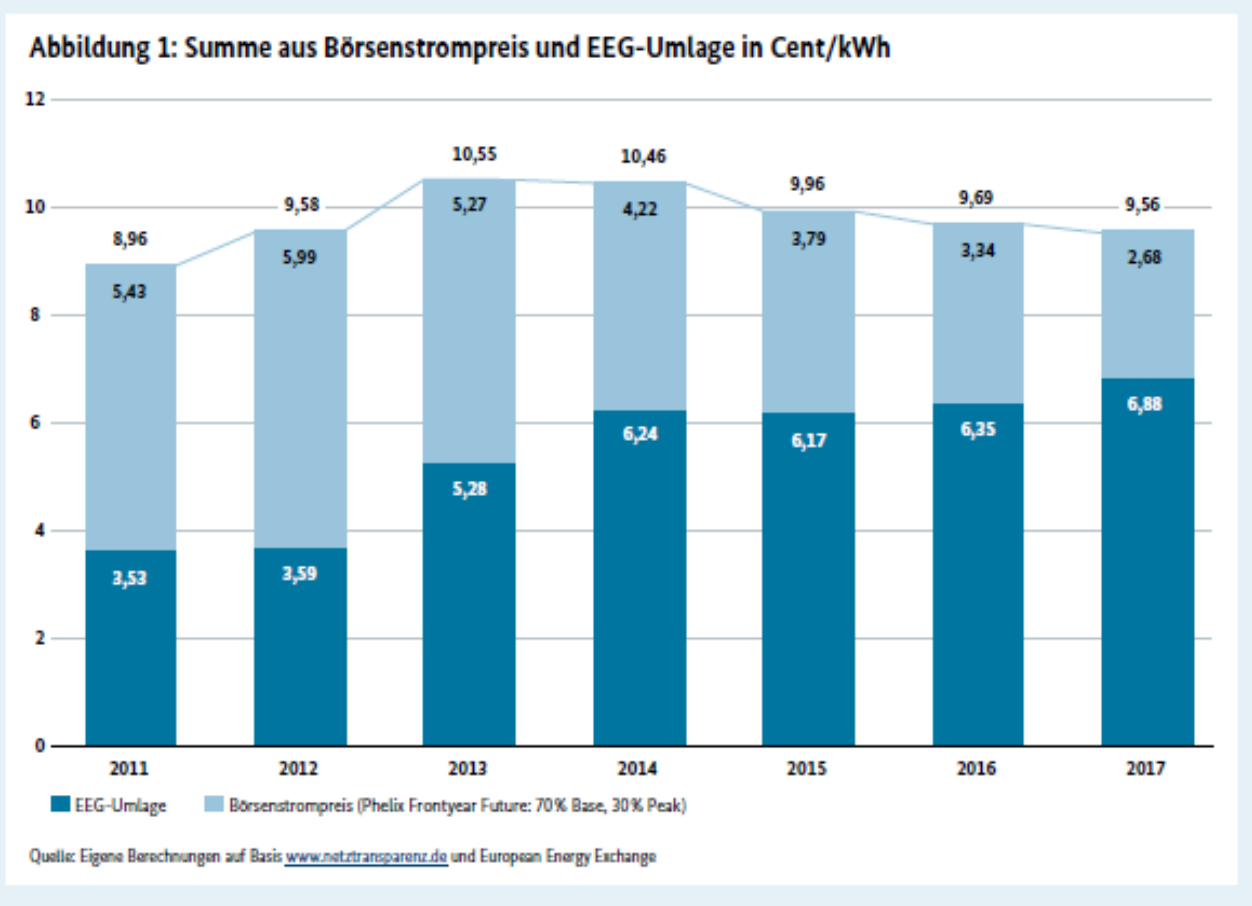


Sueddeutsche Zeitung, 16 Jan 2017

Installed capacity by energy source



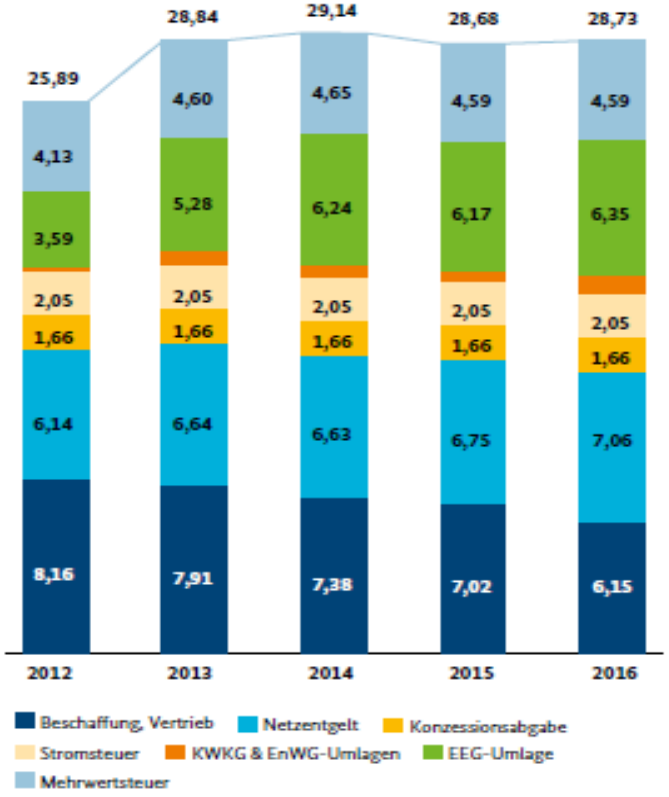
Renewable Energy Surcharge a. wholesale price



… but it comes with a cost for consumers: increase of RES surcharge since 2011 covering the difference between the power exchange price and the costs for the support of RES (total sup. costs in 2016: 25.4 bn. €)

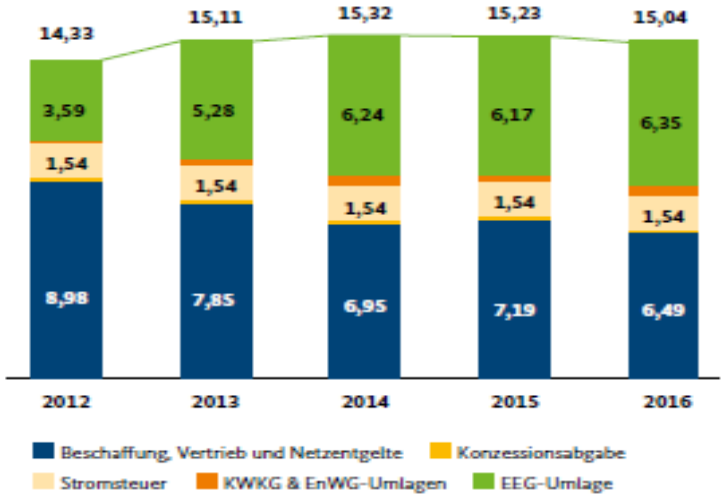
Electricity prices for residential and business customers in Germany since 2012

Abbildung 2: Durchschnittlicher Strompreis für einen Haushalt in Cent/kWh (Jahresverbrauch: 3.500 kWh)



Quelle: BDEW Strompreisanalyse 2016

Abbildung 3: Durchschnittlicher Strompreis für ein Industrieunternehmen in Cent/kWh (Jahresverbrauch: 160 MWh bis 20 GWh)



Quelle: BDEW Strompreisanalyse 2016

Impacts of the German energy transition (1)

- The increase of RES capacity has **decreased wholesale prices** at the power exchange dramatically (sometimes we see even negative prices).
- Due to increased demand from abroad electricity **exports** from Germany have **increased**.
- Due to physical principles electricity always takes the way of least resistance: **physical flows may deviate from trading results**.
- Electricity from North East Germany may take the way through the grids of Poland and the Czech Republic to its consumers in Austria and in the South of Germany: **unplanned transit flows** and loop flows.
- RES produced electricity on its way from the North to the South of Germany or to Austria causes **network congestions**: TSOs have to carry out a lot of **redispatch** and to contract **reserve capacities**.
- **Grid expansion** is lagging behind RES growth and need to be **synchronized** – 2016 reform of the RES Act to offset 2015 change of Grid Expansion Acceleration Act giving priority to underground cabling (slowing down/delaying roll-out and increasing costs considerably)

Impacts of the German energy transition (2)

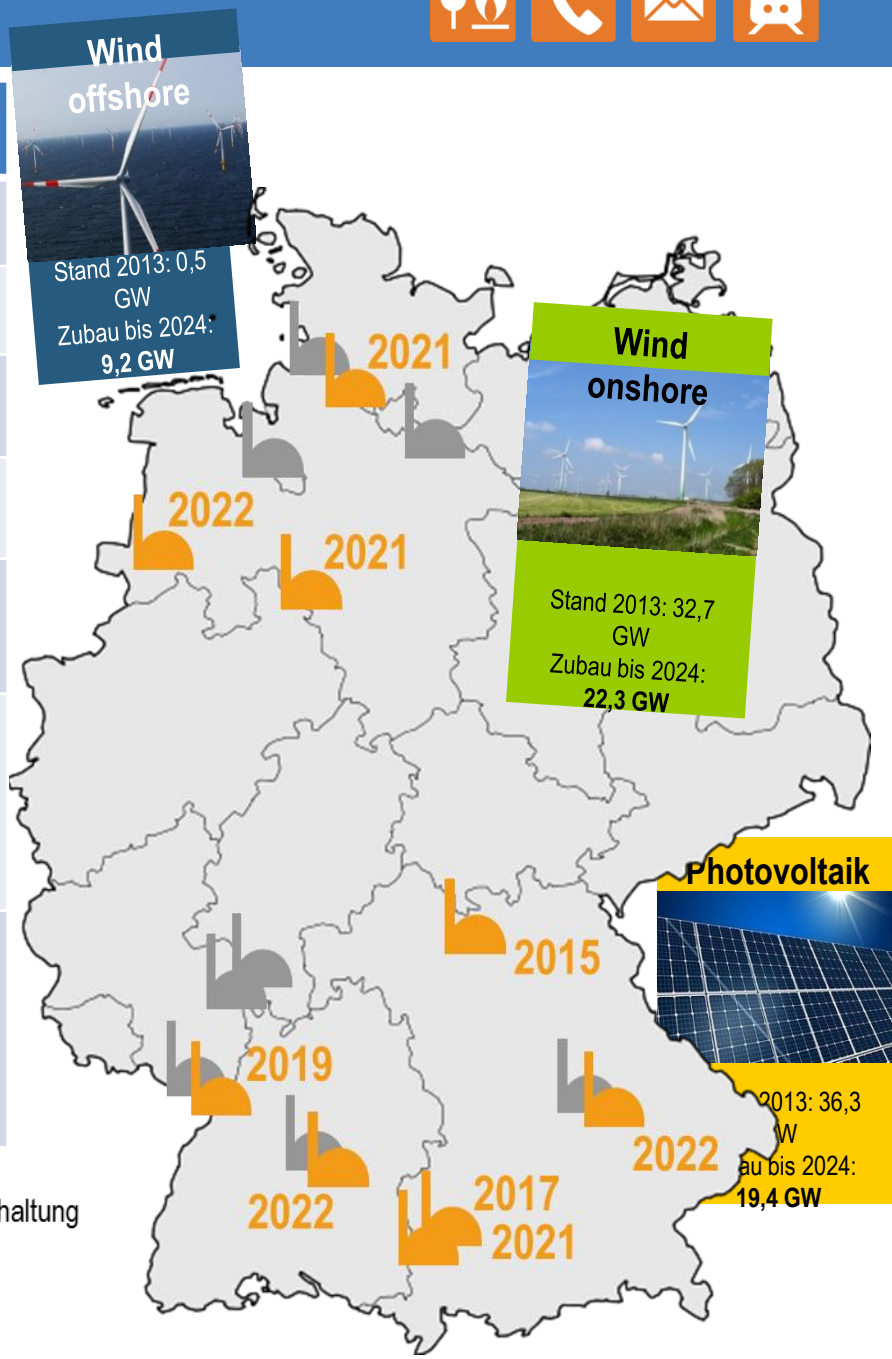
- **Unplanned flows** may **endanger operational security**.
- TSOs have to take more and more **short term measures**:
  - Internal grid measures (*redispatch*), costs increased, but reliability of the grid is not affected (due to resilience stemming from the past)
  - Reduction of transmission capacity available for cross-border trade (needs to be done in conformity with European capacity allocation and congestion management rules)
  - Agreement with conventional power plants and consumers to reduce/increase load/feed-in
  - **Curtailment** of conventional electricity producers
  - Last option: Curtailment of RES electricity producers (as they have absolute priority), problem: produce and forget
- These short term measures can only be an **intermediate step**.
- Ultimately, the **grid has to be adapted** in order to handle the flows stemming from the *Energiewende* a. **integrate RES into the grid**

Impacts of the German energy transition (3)

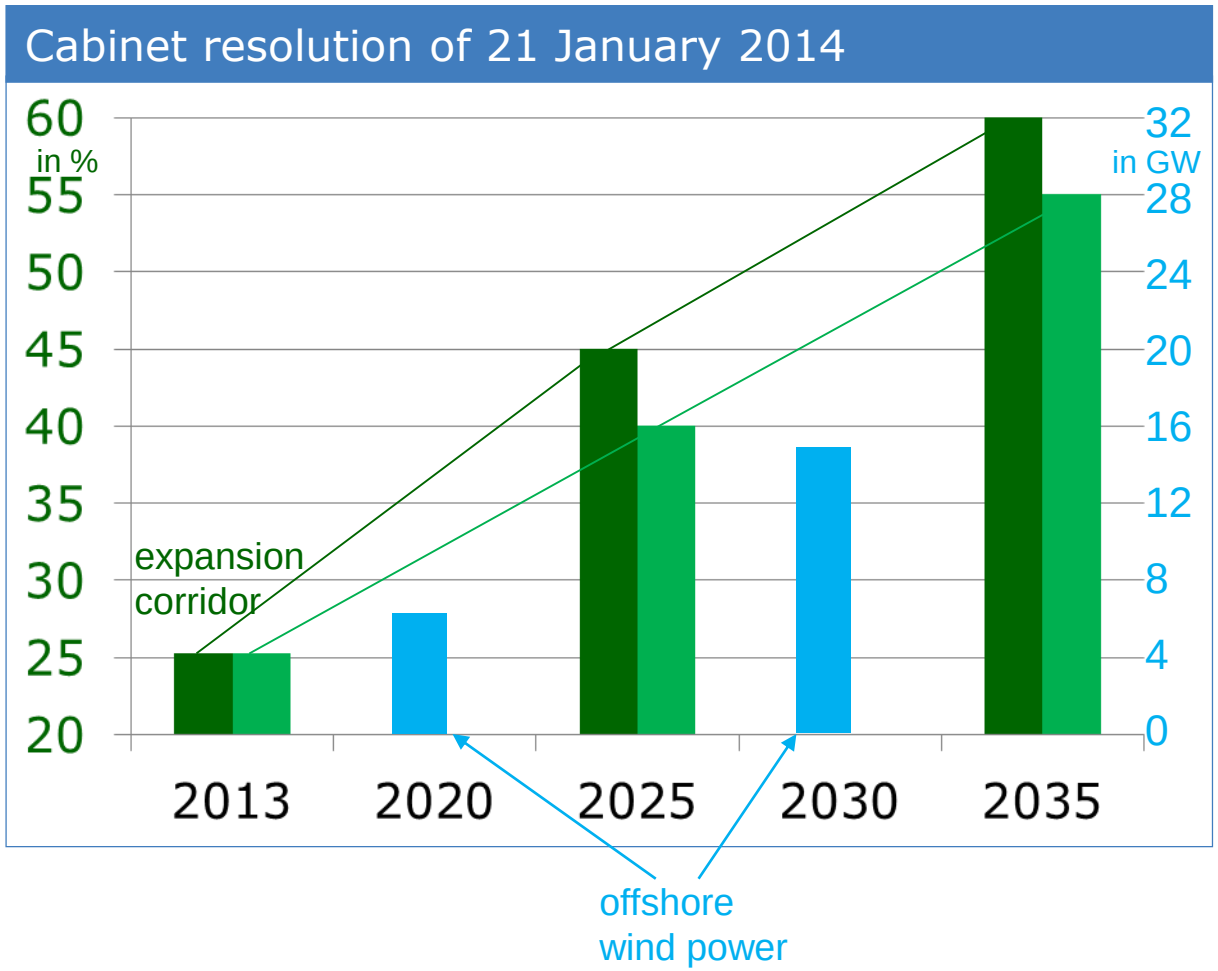
- **Important:** Germany has no generation adequacy or SoS problem (still overcapacity of conventional power plants), only **regional imbalances** (between the North and the South of Germany)
- Question arising regarding the need of a capacity mechanism (CRM) answered with the Draft Electricity Market Design Act presented in Sept. 2015: No, for the reason mentioned above there is **no need for a CRM**
- Draft Law foresees an **Energy Only Market** – **EOM 2.0** relying on proper **price signals**: market based approach (as also preferred by the European Commission that foresees CRM only as second best option because of the cross-border effects (cons. July 2015); adopted in parliament on 8 July 2016
- Allowing price signals to work reacts to the need for more **flexibility** as in an environment that is increasingly volatile a "*command and control*" is no longer working, change can only be managed with a **market based approach** and will – with some further measures of the 2016 reform of the Renewable Energy Act – also ensure **market integration** of RES producers
- Changing roles for TSOs and above all for DSOs as they become energy service providers in a **smart market** (smart grids and smart meter roll out)

The challenge

	2013	expectation 2025
peak load	82,8 GW	84 GW
net consumption	543,6 TWh	544 TWh
conventional generation capacity	101,1 GW	77,3
including storages	6,4 GW	8,6 GW
renewable generation capacity	81,1 GW	141,4 GW
including onshore wind OffShore wind photovoltaic	 33,8 GW 0,5 GW 36,3 GW	 63,8 GW 10,5 GW 54,9 GW
interconnector capacity to neighboring countries	from Germany to … 29 GW	to Germany from … 31,3



Government targets for renewable energy



RES-share on gross electrictiy consumption in %

- **expansion corridor's upper boundary**
- **expansion corridor's lower boundary**

Key aspects:

- **RES expansion corridor**
  40-45% (2025)
  50-60% (2035)
- **Offshore wind**
  6.5 GW (2020)
  15 GW (2030)
- **Volume control**
  PV + 2.5 GW/a
  Onshore wind + 2.5 GW/a
  Biomass + 0.1 GW/a

2016 – Cabinet resolution

- **RES corridors confirm., but steadying it and more cost-efficient**
- **Cap for expansion of wind in areas with network "bottlenecks"**
- **Safeguard prod. mix**

Regulation on Grid Expansion Areas (2017) - I

- **Motivation behind**: Synchronation need between RES installation and grid expansion
- Renewable Energy Act (2017) mentions this issue already in its preamble
- Onshore wind as the backbone of the „*Energiewende*“
- Designation is useful where feed-in from onshore is most frequently capped -> To relieve the transmission lines.
- In clearly critical congestion situations between North (EE producer) and South (consumer) Germany: higher share of leverage lays in North.

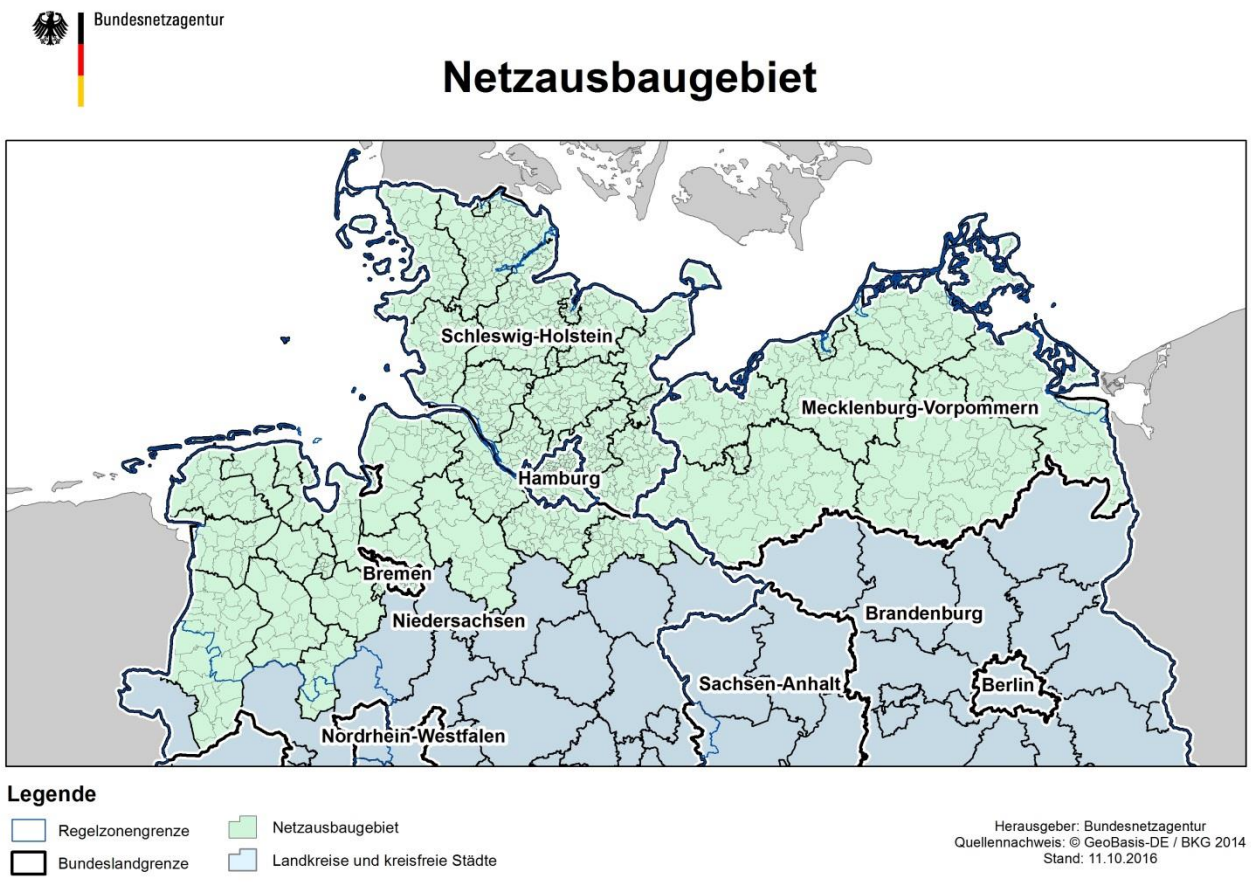
Regulation on Grid Expansion Areas (2017) - II

- **How does it work?**
  - BNetzA limits the premium in off-shore wind auctions after a certain installed capacity has been installed.
  - By doing so, 2800 MW initially can be dispensed in these areas
  - Upper limit for new capacity is 58% of avarage installation between 2013-2015
  - Max. size of these areal may not exceed 20% national territory

- This Regulation enacted by BNetzA on 20 February 2017 is
  - neither a temporary instrument or feed in quota or North-South quota.
  - nor a deviation from the RES targets and grid expansion
  - Evaluation 31.07.2019: Next amendment is possible by earliest on 01.01.2020 (planning certainty for investors)

Current Grid expansion area (2017)

- Grid expansion area



RES SUPPORT: A FEW FUNDAMENTALS OF THE EEG

1. **Full cost recovery** for RES installations through **technology specific support per kWh guaranteed for 20 years → Security of investment** in RES installations (seems expensive, in fact the lowest-cost approach)
2. **Market integration** of all RES produced electricity (through direct marketing or via the TSOs) and a **well-adjusted risk distribution** between RES and conventional producers.
3. **RES specific deployment path**
4. **Transparent & fair funding** of RES support schemes.
5. **Appropriate rules for small RES installations** (e.g. FIT) to ensure **acceptance** for the "Energiewende".
6. **Responsibility for locational & technical features** of RES installations in the hands of RES producers.

POINT 1: CURRENT REFERENCE VALUES FOR NEW INSTALLATIONS (as of 01.01.2016)

Technology	Reference value for FIP & FIT
Wind Onshore	8.9 ct/kWh (first 5 years); 4.95 ct/kWh (basic RV)
Wind Offshore	15.40 ct/kWh (first 12 years); 3.90 ct/kWh (basic RV)
Rooftop PV up to 10 kWp	12.70 ct/kWh
Rooftop PV up to 40 kWp	12.36 ct/kWh
Rooftop PV up to 1 MWp	11.09 ct/kWh
Other PV up to 10 MWp	8.91 ct/kWh
Hydropower (different size categories)	3.325 ct/kWh (>50 MW) to 11.89 ct/kWh (< 500 kW)
Geothermal	25.20 ct/kWh

- **Reference value is the reference for the calculation of the FIT and the FIP.**
- **FIT = Reference value - 0,2 ct/KWh** for hydro, biogas, geothermal

  = Reference value - 0,4 ct/Kwh for PV and Wind (intermittent RES)

POINT 2: MEANS TO ACHIEVE RES-MARKET INTEGRATION

For all new RES installations

(except smaller installations < 100 KW)

Direct marketing

- RES producers sell electricity **directly** on the energy market (e.g. SPOT, OTC, forward & balancing markets)
- RES quantities influence the market outcome

Sliding market premium

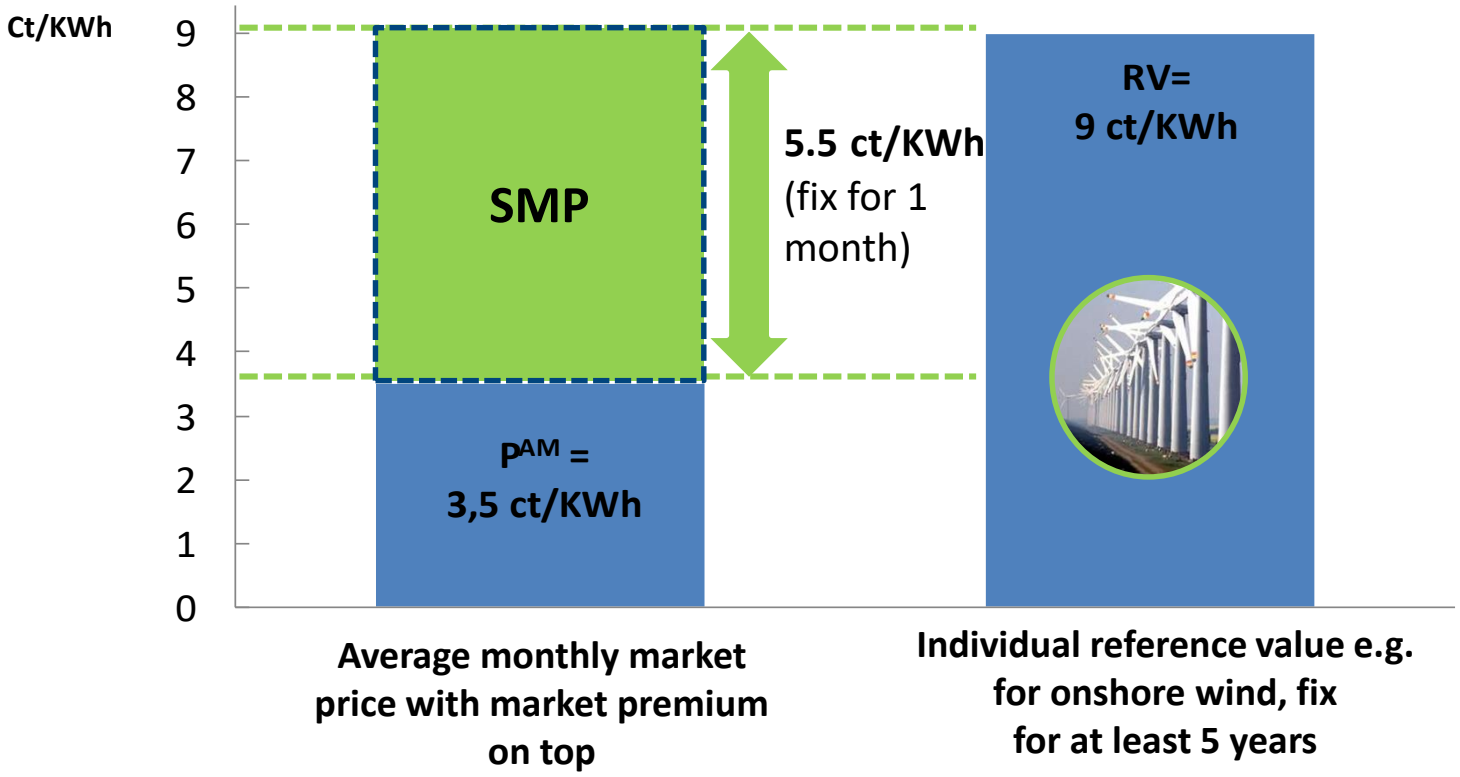
- Support as a **sliding market premium** (see next slide)
- Incentive for a rational selling behaviour
- Avoiding overcompensation and a „produce and forget“ mentality

Bearing of key market risks

- Financing and operational risks
- Financial settlement (forecast accuracy) risks
- Risks linked to the **availability** of e.g. sun & wind (not born by conventional producers)
- RES producers are shielded from the long term **market price** risk (which is born by conventional producers)

POINT 2: THE SLIDING MARKET PREMIUM CONCEPT

- The Market Premium paid is the difference between the **average monthly market price** (P^{AM}) and the installation specific **reference value (RV)**
- "Average monthly" means: the German model is a fixed market premium with monthly adjustment → incentive to best possible marketing but shielded from long term market-price risks



POINT 3: STEERED DEPLOYMENT PATH & CONTROLLED COSTS

2,400 to 2,600 MW p.a.
Support levels adapted quartely: **-0.4%**

2,400 to 2,600 MW p.a. & max. 52 GW
Support levels adapted monthly: **-0.5%**

↓or↑support depending on whether # of new installed capacities **undercut or exceeded the limits of the corridor**

max. 100 MW per year
Support levels adapted monthly: **-0.5%**

↓1.27% > 100 MW

6,500 MW up to 2020 & **15,000 MW** up to 2030
Support levels adapted in 2018, 2020, 2021

Forecasts for 2016:

€ 1.8 bn. revenues < **€ 24.8 bn. expenditures**

Funding gap: € 23 bn. Euro („*differential costs*“); 2017: 25.4 bn Euro

EEG-surcharge: 2017: 6.88 ct/kWh; 2016: 6,354 ct/kWh (2015: 6,17 ct/kWh)

- To cover the difference between the **expenditures** (feed-in tariffs paid, costs for IT, registration at the energy exchange, interest rates, liquidity reserves, forecasts, etc.) and **revenues** (from marketing renewable electricity on the power exchange), TSOs claim **reimbursement** from suppliers (“*EEG surcharge*”).

- Suppliers pass on the EEG surcharge to final customers

2014 REFORM OF RES LAW INTRODUCES TENDERING PROCEDURES

Status Quo

- Support levels (reference values) are determined administratively and set in the EEG for all RES technologies.
- Overcompensation of PV was an issue in the years 2008 to 2012
- Reduction of support level (successfully) linked to growth rate of new installations since 2009 (so called "**breathing cap**") → sharp decline in number of new PV-installations observed

New Approach

- Tendering of "support entitlements"
- Goals:
  - Using competitive market instead of administration → **reduction of bureaucracy**
  - Better match support levels to the costs of investors → **reduction of costs**
  - Direct steering the number of new installations → **controlled capacity deployment**

SINCE AUGUST 2014, THE SUPPORT SCHEME IS BASED ON FIPs. FITs REMAIN IN PLACE ONLY FOR SMALL RES INSTALLATIONS

Support

- **Market premium paid** in addition to market price
- Incentive for a **rational selling behaviour**
- Avoiding a „**produce and forget**“ mentality

Market integration

- RES producers **sell electricity** directly **on the energy market**
- RES quantities influence the market outcome (wholesale price level)

Market risks

- Financing and operational risks
- Financial settlement (forecast accuracy) risks
- Risks linked to the availability of e.g. sun & wind
- RES producers are **shielded from the long term market price** risk (which is born by conventional producers)

POINT 4: FUNDING OF RES SUPPORT SCHEME

- A **broad funding basis is key for ensuring the acceptance for RES support**: In Germany, RES support is funded through a RES surcharge of **6,17 ct/kWh** *(6,24 ct/kWh in 2014)* paid in principle by all electricity consumers.
- However, **some consumers are partly or fully exempted**:
  - **Partly:** Energy-intensive companies (necessary)
  - **Fully until August 2014**: Auto-consumed self-generated electricity (problematic)
  - **From August 2014**:
    - **RES surcharge due in full for electricity generated from** new conventional power plants
    - **30% - 40% of RES surcharge due** for electricity generated from new RES installations
    - **Full exemption remain for specific types of self-consumption (**e.g. electricity consumed in the generation process , 100% self-consumers , small scale installations < 10 kW)
    - **Security of investment** is ensured by leaving existing installations largely unaffected by these legal changes = no ex-post changes of rules.
- Auto-consumed self-generated electricity is **not only exempted from the RES surcharge (for existing installations until 8/2014)**, but also from other electricity price components such as network charges, concession levies and electricity taxation.

2014 REFORM OF RES LAW INTRODUCES TENDERING PROCEDURES

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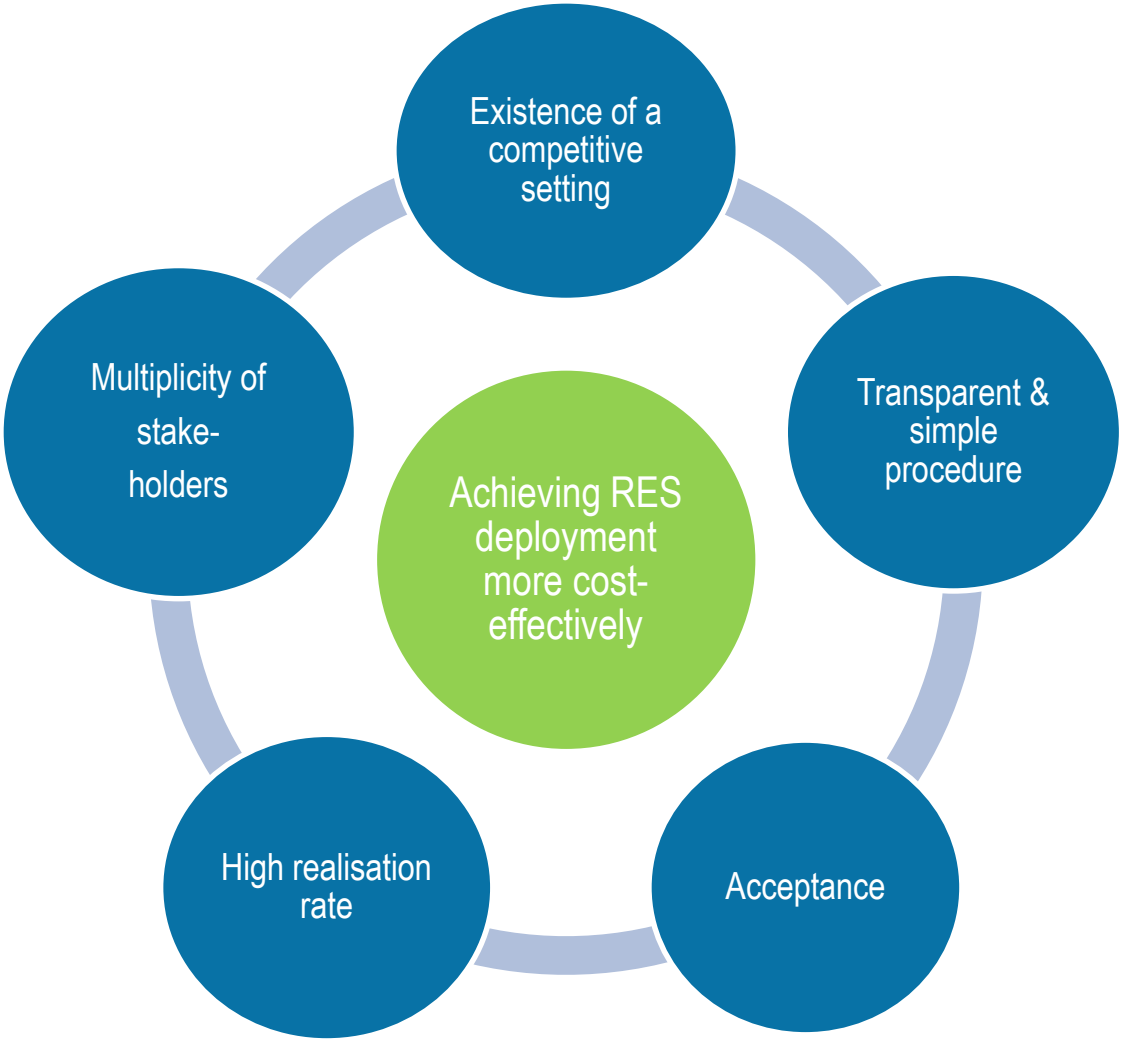
EXPECTATIONS FROM COMPETITIVE BIDDING PROCEDURES



POSITIVE EXPERIENCE GAINED WITH FIRST TENDERING ROUNDS

Multiplicity of actors

- ✓ **Very high participation**
  - 1st round: 170 bids, 715 MW (150 MW tendered)
  - 2nd round: 136 bids, 558 MW (150 MW tendered)
  - 3rd round: 127 bids, 562 MW (200 MW tendered)
- ✓ **Multiplicity of bidders but**:
  - Successful bidders mostly established project developers
  - Multiplicity of operators will be known only once projects are realised (projects incl. support entitlement can be sold)

Cost-efficient support levels

- ✓ **1st round** (pay-as-bid): **Ø 9,17 ct/kWh** (ranging from 8,48 ct/kWh to 9,43 ct/kWh and with price cap set at 11,29 ct/kWh)
- ✓ **2nd round** (uniform pricing): **8,49 ct/kWh** (lowest bid 1 ct/kWh and with price cap set at 11,18 ct/kWh)
- ✓ **3rd round** (uniform pricing): **8 ct/kWh**

BUT FUNDAMENTAL QUESTIONS REMAIN…

Realisation rate?

- Results of first round (April 2015) show a high degree of realisation (15/05/17)
- Have penalties and prequalifications been well chosen?
- Key to achieve deployment targets

Competition?

- **Precondition for successful** tenders
- Might **contradict the achievement of RES targets**
- What about the **competitiveness of small bidders**?

Transferability for wind?

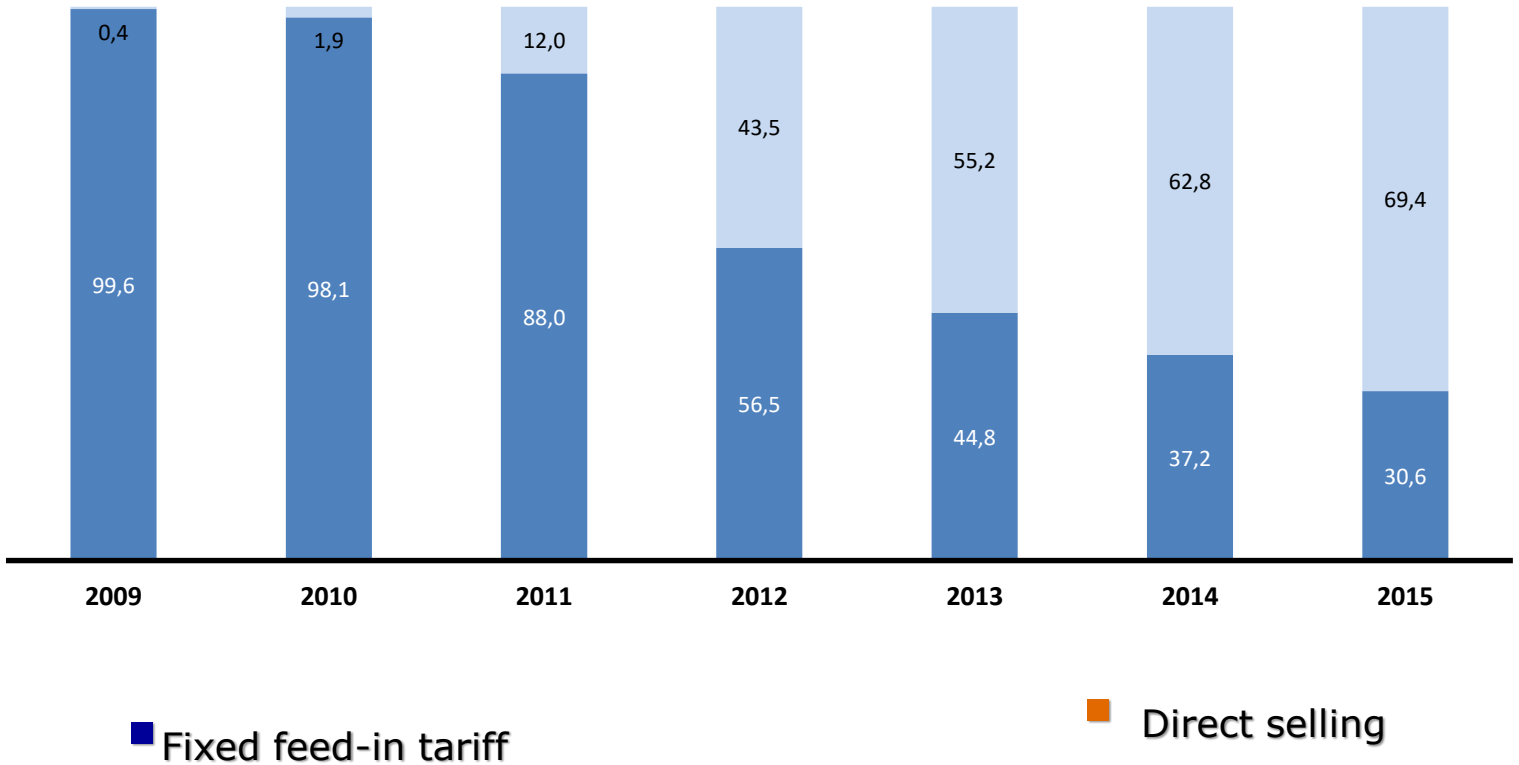
- Actor multiplicity difficult as wind projects are bigger than PV projects
- **Greater realisation and planning time** for wind projects (at least 3 -4 years compared to a few months for PV)
- **More complex** project development (e.g. more permissions needed, scarcity of locations)
- **Issue of location**
- Tendering design need to give answers as how to ensure **security of project development**

LEVEL OF SUPPORT WILL INCREASINGLY BE DETERMINED TRHOUGH COMPETITIVE BIDDING PROCEDURES

- **Pilot tendering procedure** for ground-mounted PV will **last until 2017** (third round of 2015 accomplished).
- **Major revision of legal framework foreseen for 2016 (EEG 2016)** to introduce **tendering processes** in 2017 for wind onshore (> 1 MW), PV rooftop panels (> 1 MW). Tendering procedures for wind offshore will be defined in a separate law.
- For **other RES technologies** such as biomass, geothermal and hydropower, the reference support values will **continue to be determined through an administrative procedure** (reason: no competitive setting)
- **Regional cooperation** with neighboring MS are under discussion

on the right track …

~~Average annual feed-in by fixed feed-in tariff and direct selling~~
~~%~~ of electricity generated from RES by fixed feed-in tariff and direct selling



Overview of German energy market legislation and regulation (incl. Energy transition laws)

interplay

Renewable Energy Act
Reform 2014
Reform 2016

Grid Expansion Acceleration Act 2011
Reform 2015

Synchronization of RES growth and grid expansion

Conventional power plant legislation, 2011: decision to exit nuclear

Decrease of power exchange prices

TSO/DSOs new roles, smart grids

Internal Energy Market 3rd IEM Package 2009, 2015 EC EMD consult. 2016 - Winterpackage

2016 Electricity Market Design Act – EOM 2.0, price signals / flexibility

Energy Industry Act 2005; 2011; 2016

2016 Digitisation Act DSR, smart meters, "prosumers", energy efficiency

Incentive Regulation Or. 2011 Adjustments 2016 Reform

Transition towards a flexible energy system

2016 Energy Legislation/Regulation in Germany

„*Energiewende*" in Germany:

- Already high achievements regarding competition and SoS
- Nevertheless, the energy transition requires amendments: White Book of the Ministry (BMWi), 2015: Electricity Market 2.0

Main Amendments (as adopted on **8 July 2016**)**:**

- **Energy Industry Act** (Energiewirtschaftsgesetz, EnWG): strengthening market mechanisms while also introducing instruments to ensure security of supply with the **EOM 2.0 Act**
- **Incentive Regulation** (Anreizregulierungsverordnung, ARegV): Switch from revenue caps to cost-of-service regulation for capital costs of DSOs (strong lobbying)
- **Renewable Energy Act** (Erneuerbare-Energien-Gesetz, EEG): further integrating RES into the energy market (more *tendering*) and more cost efficient growth corridors of RES (targets)
- **Act on Digitisation of the Energy Transition**: Smart Meter as key elements of the future electricity market: promote the use of digital technologies to enable DSR and "*prosumers*"

Draft Electricity Market Act (1)

- The „**Draft Electricity Market Act**" was published on 14th September 2015 following largely the White Paper and the agreement of 1st July 2015
- **Electricity Market 2.0 (EOM)** considered sufficient to ensure generation adequacy
- Most important instrument to ensure the necessary capacity is financed and made available when required is an **undistorted price signal**, i.e. allowing also price peaks without intervention to give investors confidence
  - Principle of the Electricity Market Design is going to be incorporated into the Energy Act
  - No capacity renumeration mechanism foreseen
- A more efficient network expansion planning is incorporated as well to bring the network expansion in line with the faster than expected RES expansion corridors of the RES Act 2014 (**synchronisation**)

Energy Decisions of the Cabinet in Nov 2015

- On 4th Nov 2015 the Cabinet decided to initiate the following legislative acts:
  - **Electricity Market Act** („Electricity market 2.0“) (basically sticking to the Energy Only Market (EOM) with a capacity reserve to be activitated only if needed to ensure security of supply) to integrate renewables and ensure the energy system is future proof
  - **Digitisation** of the „*Energiewende*“, i.e. mandatory roll-out of smart meters (for industry) when passing a certain treshold of annual consumption to increase energy efficiency (a. where the benefit outweighs the costs) starting in 2017, costs of installation are to be born by customers; strict rules on data security and privacy
- The **Electricity Market Act** clearly states the priority of competition and commits to not interfere in price setting

Purpose of the Electricity Market Act

Provision of several instruments

- Guaranteeing free price formation. The principle of unconstraint pricing in electricity trading will be anchored in the EnWG.
- Fostering the balancing energy market. More providers will have access which furthers more competition and lower prices.
- Additional backup instruments for the energy market:
  - continous monitoring of security of supply
  - capacity reserve } ***-> SoS***
  - network reserve
  - capacities on-call (selected lignite power plants), „Sicherheitsbereitschaft“

(Draft) Electricity Market Act (2)

- To ensure generation adequacy a so-called **„capacity and climate reserve“** is established *outside* the market (i.e. not allowed to participate in the market) which is activated only if the market is not delivering the necessary capacity
- The capacity segment of the reserve will be tendered by BNetzA
- The climate segment of the reserve is made up of lignite plants
- This part is under scrutiny of the European Commission as it may be considered „state aid“, no final result yet
- Additionally the „network reserve“ (whereby power plants are contracted and „system-relevant“ plants cannot be mothballed) is extended beyond 2017
- Monitoring report of the SoS every 2 years foreseen
- The Ministry tabled the **Draft Electricity Market Act** in Nov. 2015
- After the parlamentarian process the Act was finally adopted on 8 July 2016 and published in the Official Gazette on 26/29 July 16

Electricity Market 2.0 and Capacity reserve

Security of Supply in terms of potential capacity shortfalls in the future

Capacity reserves serve as a buffer for times of insufficient supply, despite free pricing mechanisms

- The new capacity reserve is **intended as backup** in case of **unforeseeable events** in the electricity network and if market-based options are not available anymore.
- The reserve will be **contracted through auctions.** The auctions will not be limited to one technology only, but do not include demand side solutions.
- The aim is to **limit distortion of the electricity market** as much as possible and to avoid unjustified windfall profits for power plant operators.

- **Dual function possible:** power plants in Southern Germany may also serve as network reserve

Reform of the Renewable Energy Act 2016

Direction of travel: LEVEL OF SUPPORT WILL INCREASINGLY BE DETERMINED TRHOUGH COMPETITIVE BIDDING PROCEDURES

- **Pilot tendering procedure** for ground-mounted PV will **last until 2017** (third round in 2015).
- Reform of **Renewable Energy Act ("EEG 2017")** towards more tendering, also for wind energy
- **Major revision of legal framework 2016** to introduce **tendering processes** for wind onshore, wind offshore, PV rooftop panels (with de minimis threshold).
- For **other RES technologies** such as biomass, geothermal and hydropower, the reference support values will **continue to be determined through an administrative procedure** (reason: no competitive setting)
- **Regional cooperation** with neighboring Member States are under discussion

Law on Development and promotion of Offshore energy (WindSeeG – 2017) - I

- **Motivation behind:** Due to the introduction of the „auction model“ there was a need of new rules for grid connections of offshore windparks (OWP)
- Only recipients of auction premium have a right to a grid connection. Transmission right is limited to the auctioned amount.
- TSOs can amend their grid expansion plans consequent to the auctioned amounts.
- WindSeeG stipulates special rules for pilot offshore facilities: BNetzA with BSH might allocate additional connection capacities (max. 50 MW) on existing or initially planned lines.

Law on Development and promotion of Offshore energy (WindSeeG – 2017) - II

- BNetzA started the first tendering procedure for offshore windparks to be opened after 31 Dec. 2020 on 30 Jan. 17
- Entitled to participate are OWP with a permission issued before Aug. 2016 or where the permitting proceedings are in an advanced state; the OWP have to be located in the North- or Baltic Sea.
- The connections to the onshore grid is laid down in the Offshore Network Development Plan 2025
- The total volume tendered is 1,550 MW
- The max. price is fixed 12 €-cent/kWh, the bids with the lowest price offered will be awarded the lot
- Offers had to be submitted by 3rd April 2017
- Results were published on 13/04 (av. strike price 0.44 €c/kWh)
- Due to the change of RES support schemes, a number of OWP operators got permissions by end of 2016 and can choose between the old and new support scheme
- On 8/3/17 BNetzA also started the tendering of onshore wind

Overview on the German incentive regulation

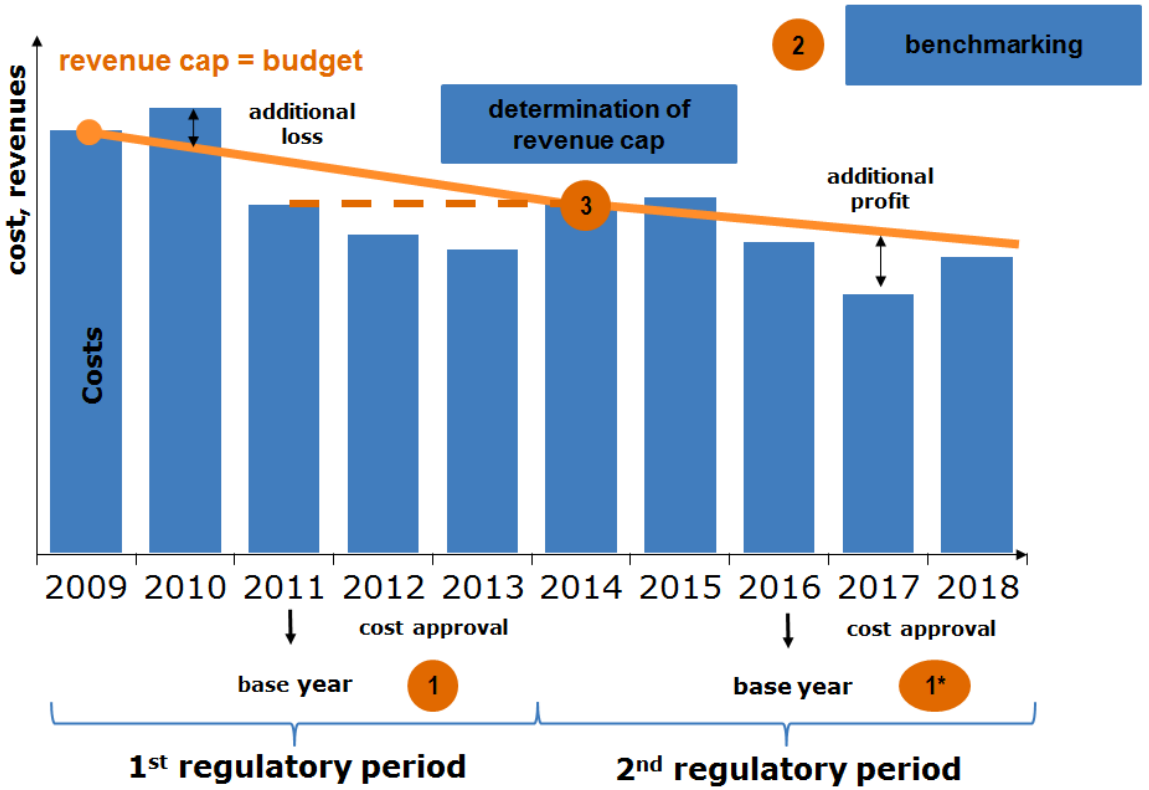
Objective:
Enhance the monopolist's focus on efficiency and quality of supply

Type:
Revenue-cap-regulation (not price cap)

Implementation

Benchmarking:

- compare efficiency among network operators
- efficiency target (catch up to best in class)



Key features:

Revenues and costs decoupled for a regulatory period

- regulator approves **revenues** ex-ante (budget)
- regulatory periods of five years
- network operators control **costs** autonomously within regulatory period (losses and profits)

Incentives for efficient investments

How can regulation incentivise the most efficient grid solutions?

1. **Costs and benefits of smart planning concepts and technologies depend on the circumstances in the respective network**

2. **Network operator (not the regulator) should select appropriate planning concepts and intelligent technologies**

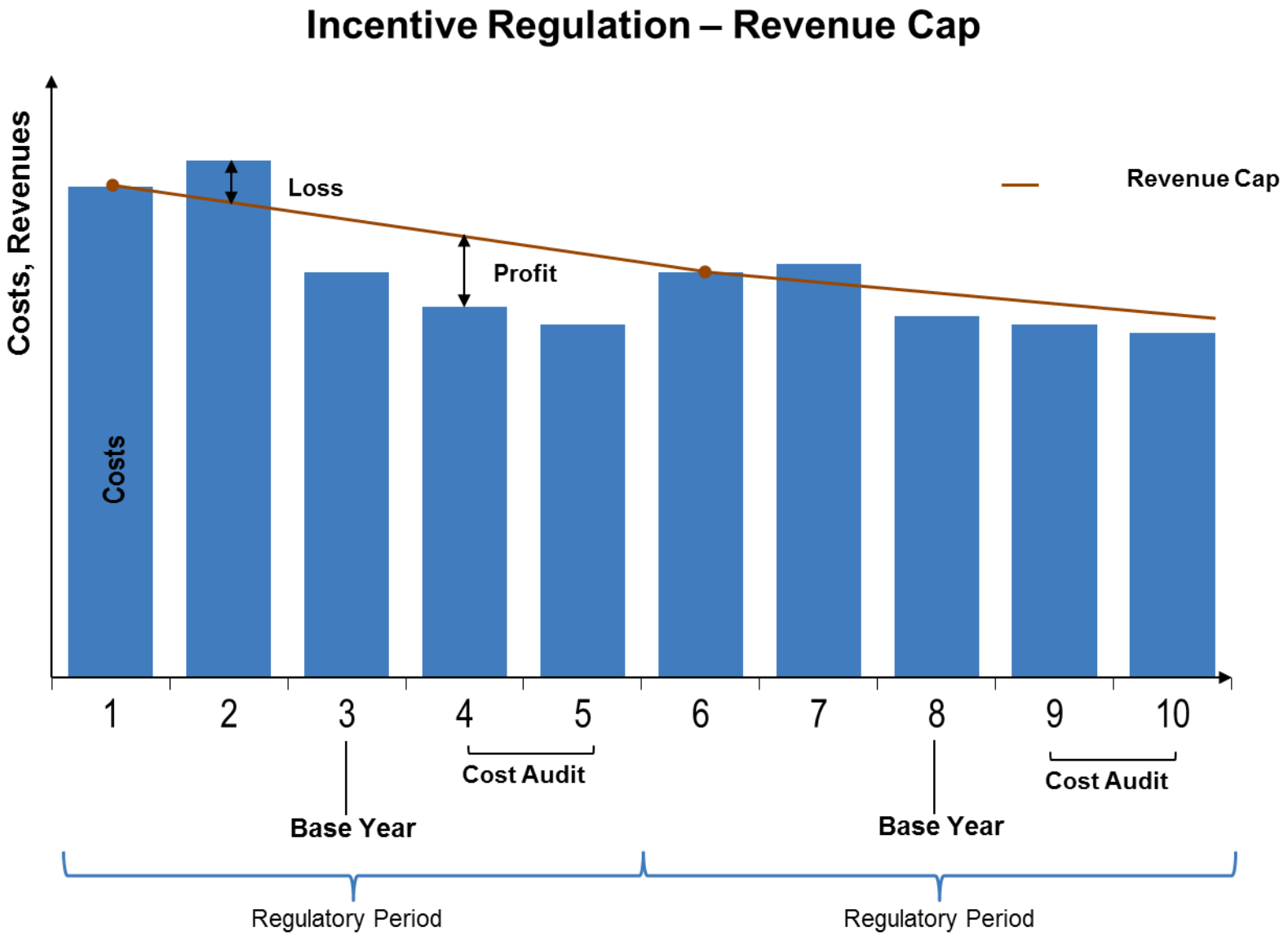
3. **Network operator should bear costs and enjoy benefits of its decisions**

4. **German incentive regulation works fairly well, nevertheless some adjustments should be made to the current scheme**

   Additional incentives for long term efficient smart solutions (e.g. efficient carry over or “Bonus” for very efficient DSOs)

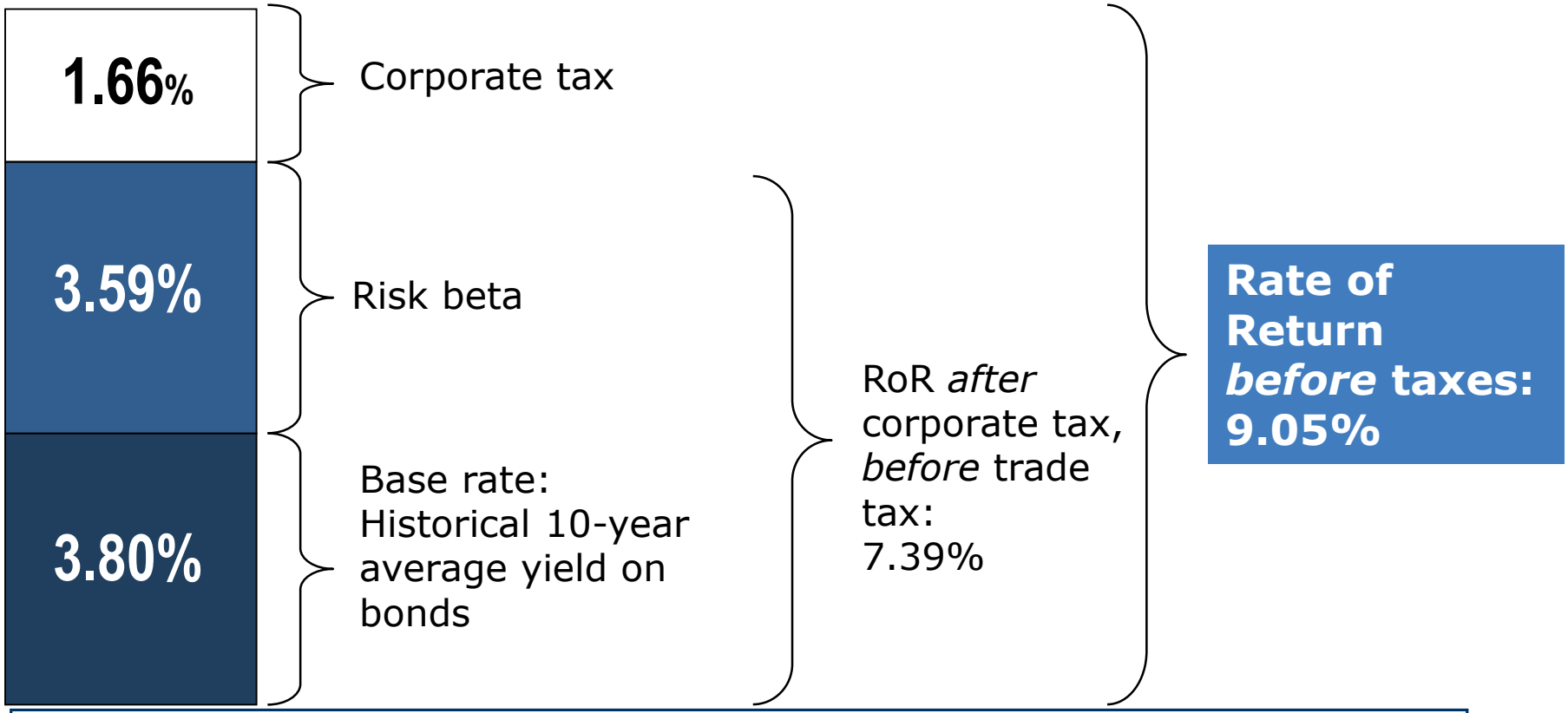
   Improving financial conditions for network extensions (abolishment of time delay of the expansion factor)

Principles of incentive regulation



Regulated rate of return on equity (1)

Rate of return for the 2nd regulatory period



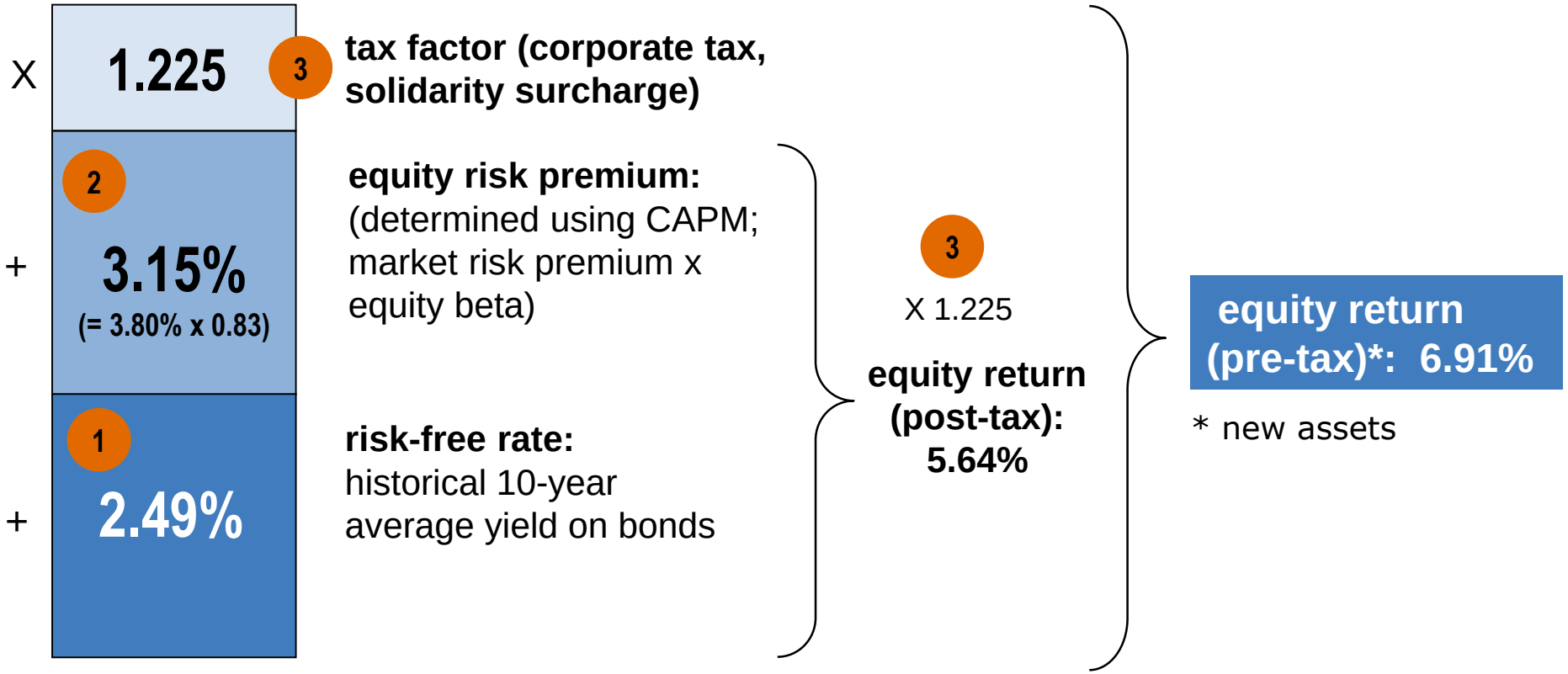
The full RoR is paid on up to 40% of the necessary assets.
The regulated RoR on equity exceeding the 40% share is currently ca. 4 %.
The cost of debt is passed through as long as it corresponds to current market rates (ca. 3%).
Decision of BNetzA was confirmed by the Court in Duesseldorf on 18 May 2017

Regulated rate of return on equity (2)

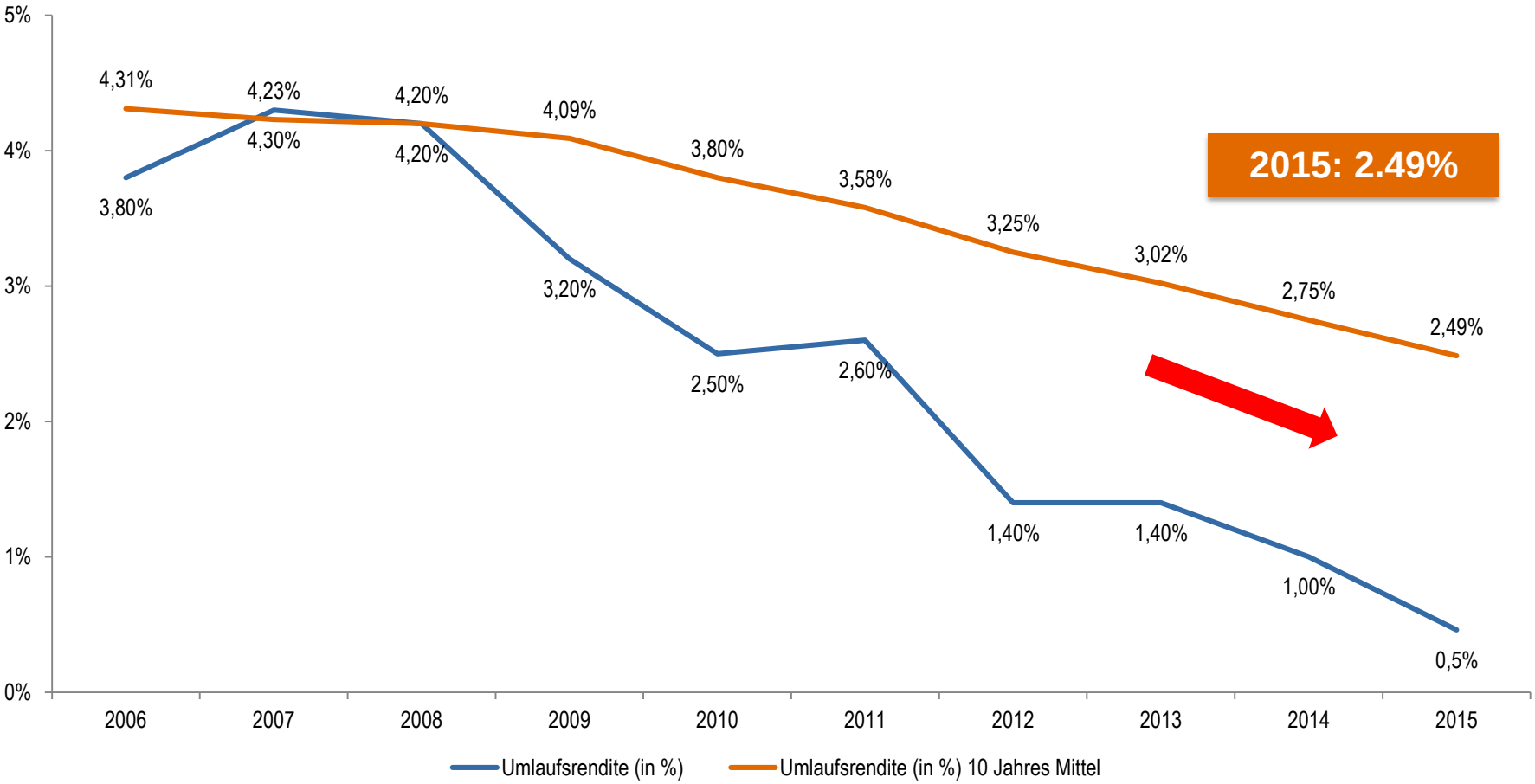
The equity return is determined by the Ruling Chamber 4.

Determination from 05.10.2016 for the 3rd regulatory period.

Determination for electricity and gas.



1 Building block 1: risk-free rate



Current average risk-free rate 2016: 0.25%

2 Building block 2: equity risk premium

- equity risk premium = market risk premium x ß
- market risk premium (3.8%):
  - Premium on investments in a fully diversified portfolio
  - long-term time series over > 100 years
  - world wide approach (23 countries: AU, AT, BE, CA, CN, DK, FI, FR, DE, IE, IT, JP, NL, NZ, NO, PT, SA, RU, ES, SE, CH, UK, USA)
  - Determination as average of arithmetic average and geometric average based on the time series from Dimson/Marsh/Staunton
- ß (equity beta = 0.83)
  - company specific risk
  - 14 network operators from 8 countries
- equity risk premium 2015* = 3.8% x 0.83 = **3.15%**

*equity risk premium 2007: 3.59%, 2010: 3.59%

Building block 3: taxes

- imputed taxes
- tax factor for corporate tax and solidarity surcharge

1.225

- trade tax reflected in tax factor; considered as seperate cost categorie in cost approval

- Comparison Rate of return on equity:

Asset type	Rate of return on equity for the 2nd period (before tax)	Rate of return on equity for the 3rd period (before tax)
New assets (activated as of 1 Jan. 2006)	9.05%	6.91%
Old assets (activated until 31 Dec. 2005)	7.14%	5.12%

Incentive Regulation Ordinance

- **Incentive Regulation**

- Evaluation of the incentive regulation scheme (Anreizregulierungsverordnung, ARegV) by BNetzA showed no barriers to investment (Report published in 2015)

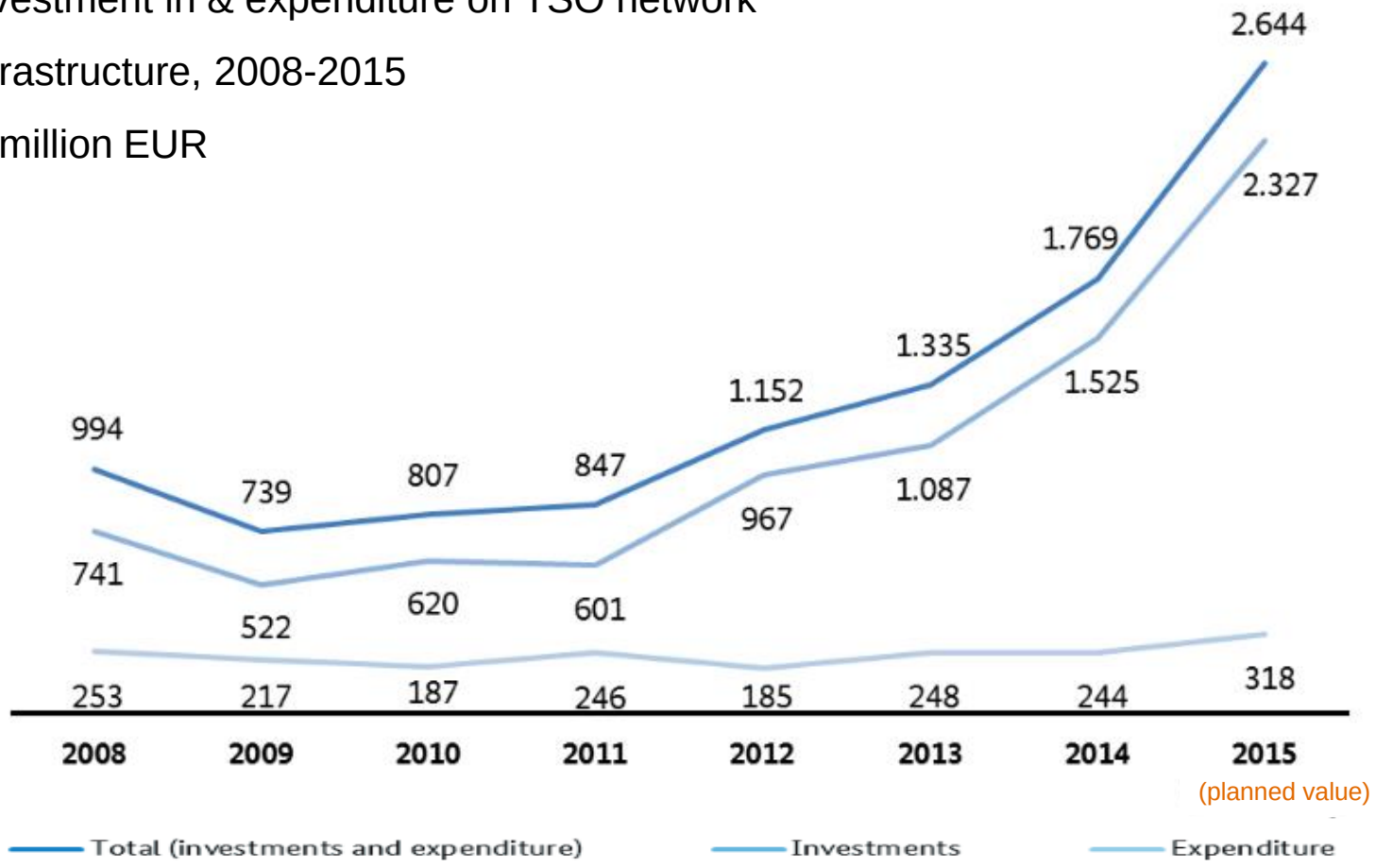
- An optimal combination of innovative planning concepts and using intelligent technologies can half the investment necessary and reduce average annual supplementary costs by up to 20%.

- Political discussion focused nevertheless on the re-introduction of a cost-of-service regulation for capital costs

Important increase in investments and expenditures for TSO network

Investment in & expenditure on TSO network infrastructure, 2008-2015

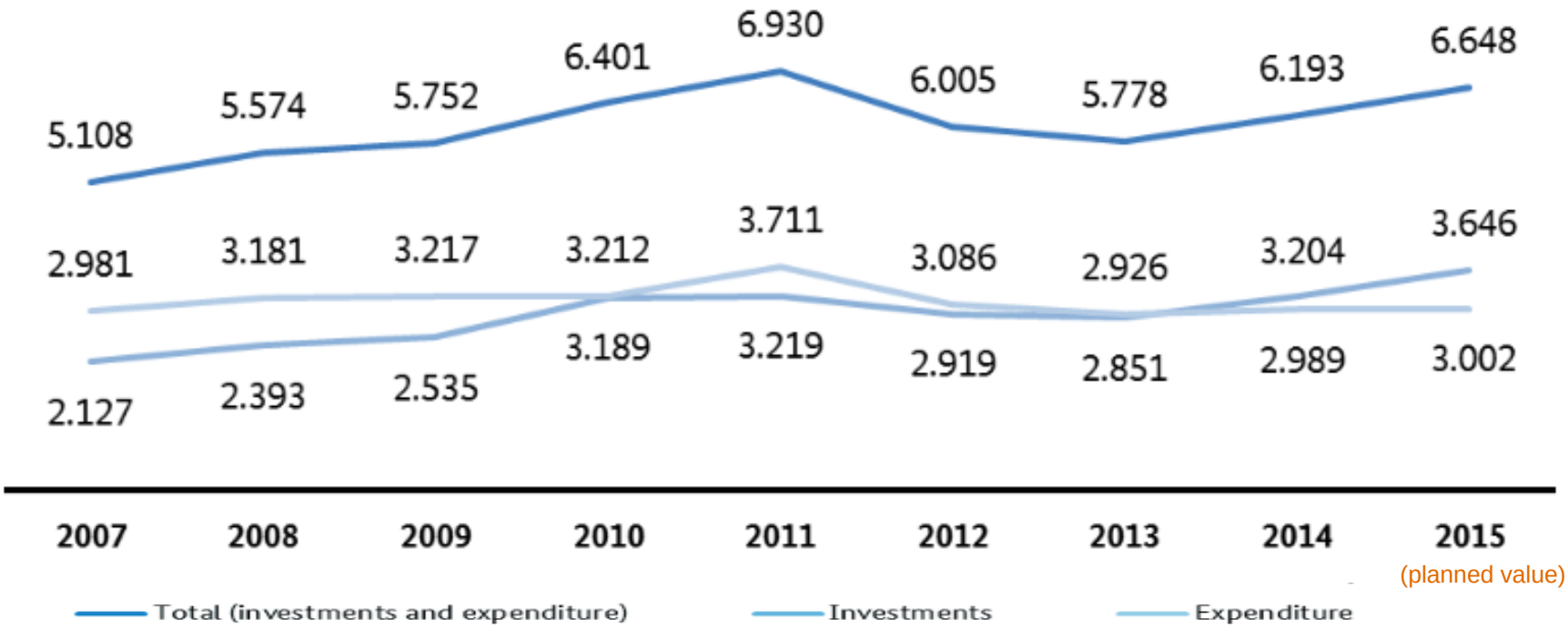
in million EUR



Slight increase in investments a. expenditures for DSO network infrastructure

Investment in & expenditure on DSO network infrastructure, 2007-2015

in million EUR



Incentive Regulation – Evaluation of proposed changes

- However, the energy transition („*Energiewende*“) requires incentives for a **cost-optimal network development**

- Revenue caps (as currently applied) ensure that the network operator has the **incentive** to implement the optimal technological solution for each case
- Going back to a cost-of-service regulation will hamper innovations that have high cost of operation compared to the need for capital
- The energy transition will in the end be more expensive than necessary – consumers will pay the bill!

Incentive regulation reform: Main changes

Start: Next regulatory period (gas 2018, electricity 2019)

Field of application: DSOs

Interim regulation:

Keeping in-period excess capital cost allowance ("Sockel") for 3rd regulatory period

Change from budgetary approach to **CAPEX true up**

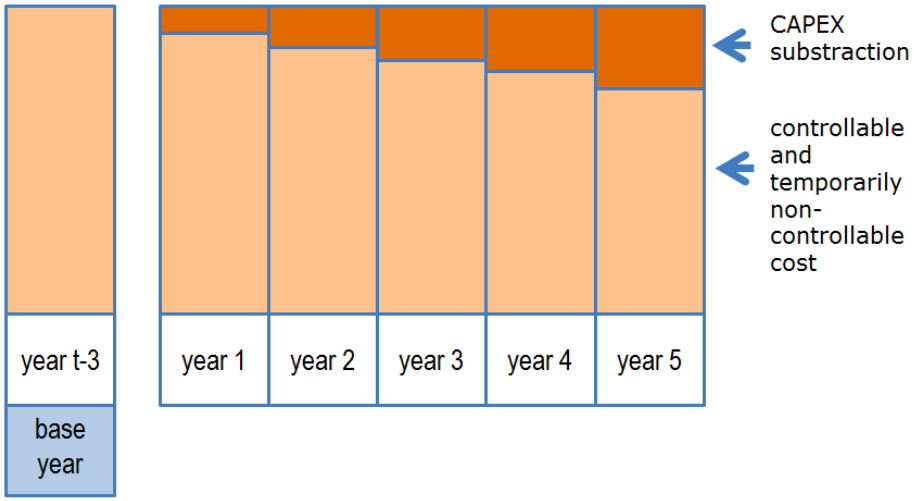
(based on actual investments and depreciation)

- ex-ante: **CAPEX substraction**
- in period: **CAPEX in period top up**
- **OPEX:** budgetary approach

Expected Result:

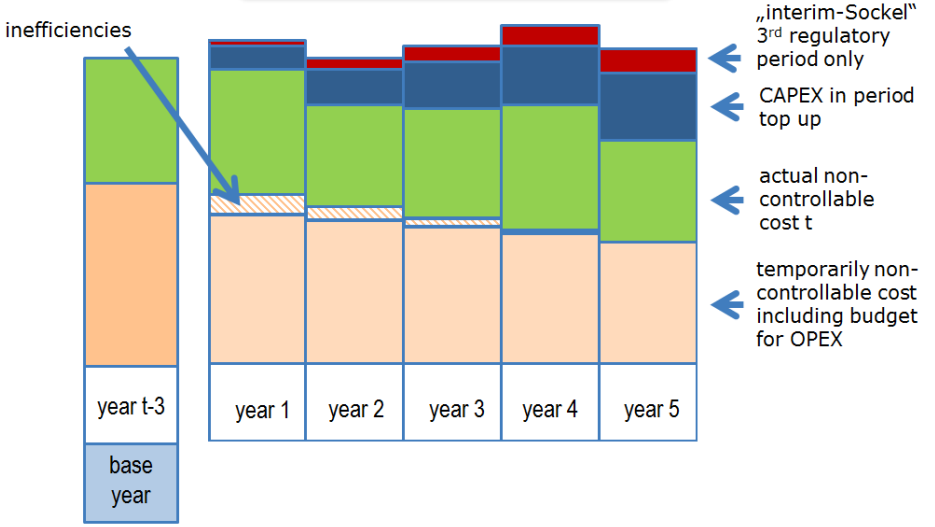
- Reduced inefficiencies within 5 years
- More transparency

CAPEX Substraction



Decreasing CAPEX are determined ex ante, prior to the regulatory period; actual reduction of CAPEX reflected in revenue cap.

CAPEX in period top-up



True up for investments, after the base year. No expansion factor and investment measure for DSOs.

Key elements – Clean Energy Package 2016

Functioning retail markets, active consumers and "*prosumers*" DSR (flex.+ stability)

Flexible energy system: EOM preferred – price signals, Capacity Mechan. only second best, i.e. no IEM distortion + open to XB participation

Security of Supply Risk Preparedness Regulation

Competition rules, State Aid rules, 2015 CM Sector Inq.

Clean Energy f. All Europeans
EMD, Recast, ACER-Regulation
RES + Energy Efficiency Dir.:
Fully integrated IEM and RES integration, energy effi.

More market-oriented RES support, nation. schemes open to XB participation

Internal Energy Market 3rd IEM Package 2009,
XB trade, Market Coupling, Network Codes/Guidelines

TEN-E Reg. 347/2013 (Proj. of Common Interest) Infrastructure Pack. 2013

Clean Energy Package – Reactions (1)

- First reaction of CEER/ACER in the Regulators' Overview Paper of 23 Jan. 2017 (ACER-CEER Conference): regulators welcome the *Clean Energy Package*, but also point out areas where improvement is needed

Key Regulatory Messages on Clean Energy Package in the CEER/ACER Overview Paper:

Flexible Regulation

Regulators must facilitate the entry of new suppliers into the retail market to ensure broader choice for consumers by removing entry barriers.

Securing Supplies

Greater transparency and regulatory involvement is needed to ensure that consumers, industry and politicians can trust that markets are functioning well.

Making Markets Work

The real-time value of energy should be the basis of the price signals that all participants face.

Smarter System Operation

We welcome a proportionate and focused approach to TSO cooperation and to the future cooperation between TSO and DSOs.

Regulatory Oversight

Regulators need to ensure that the roles and responsibilities at national and EU level are clear and proper checks and balances are in place. Regional governance needs robust stress testing.

Balancing Innovation and Regulation

Remove priority dispatch; to bring renewables into the market; and to ensure that all relevant market players are responsible for balancing.

Challenges and tasks (1)

Regulatory challenges

- The variety of the grid system operators in Germany is challenging for a regulatory system which is aimed to be tailor-made for all.
- Grid expansion is and will remain essential
- The energy transition involves large investments in transmission and distribution systems – even with the amended Renewable Energy Act.
- Ensure via incentive regulation that investments are made at efficient costs while ensuring investments can be made quickly and have an appropriate rate of return on equity
- Security of Supply in Germany is of high importance and requires a sufficient backup.
- The cost of grid and supply security measures will continue to increase

Challenges and tasks (2)

Regulatory targets

- Costs of security of supply and network expansion must be limited as far as possible. In the short run, congestion management at the German-Austrian Border could lower the need for network reserve capacities
- Innovation and technological openness is important at all levels of the energy system.
- The energy transition („*Energiewende*“) needs a modern economic regulation of the grids to ensure adequate investments in the transmission and distribution systems in the long run.
- Liberalization is a high achievement. Prior accomplishments in liberalization must not be compromised. Measures to restrict competition should be avoided.

Bundesnetzagentur considers itself a promoter of and a contributor to the energy transition.

Conclusions

- Stable and **predictable** regulatory framework is key to ensure investors‘ confidence and avoid disruption
- Renewables require a more **flexible** energy system, which is best achieved by a more **market-based approach** with the participation of all players
- All players must adapt their business models to this energy system and react to new **incentives**
- Keep hands-off, i.e. let the market work and abstain from interventions distorting the price signals as well as the incentives to **invest in new infrastructure**
- **EOM 2.0** is embarking on this approach, at the same time the RES Act is reformed too to ensure a more **synchronised expansion** of the grid and the renewables: **interplay** of both is key
- Develop the **Internal Energy Market** to realize cross-border benefits (market coupling) and overall security of supply
- Germany‘s ***Energiewende*** is a test bed for the transformation of the energy system enabling the integration of increasing shares of RES and hopefully lessons can be learnt to avoid our mistakes!

Thank you for your attention

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