

BNetzA (Federal Network Agency for Electricity, Gas, Telecommunications, Post and Railway)¹ and Its Role in Energy Infrastructure Regulation and Planning/Permitting

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Abstract: The following contribution aims at explaining BNetzA's role in energy infrastructure regulation and planning/permitting of high-voltage electricity nationwide and cross-border transmission lines. It shows the interplay of the two main regulatory instruments and the planning/permitting task as well as more generally the changing role of the regulator in the era of energy transition. The article is based on two presentations on the topic, one at the VIIth WFER in Mexico in March 2018 and one at a conference on "The Governance of Maintenance and Investment in Infrastructures" of the University of Paris-Dauphine in April 2018.

Key words: Energy regulation, "Energiewende", energy infrastructure, incentive regulation, rate of return on equity, grid expansion, planning/permitting, tendering of renewables.

1. BNetzA as a Multisector Regulator

BNetzA is the independent federal German multi-sector regulator responsible for the regulation of the following network industries:

1998	Telecommunications, Telecoms Act;
1998	Postal Sector, Postal Act;
2005	Energy (Electricity and Gas) Energy Industry Act; Railway
2006	General Railway Act, Railway Regulation Act;
2011	Grid Planning and Permitting Grid Expansion Acceleration Act.

The Regulatory Authority for Telecommunications

and Post started in 1998 and its headquarters are in Bonn, but it has a number of offices across Germany. When in 2005 the regulation of the energy sector was added to its responsibilities, the Authority had to be renamed into Bundesnetzagentur². Bundesnetzagentur is a higher federal authority in the scope of the Ministry for Economics, but separate and independent, i.e. the minister cannot overrule its decisions, which can solely be challenged before court. It is the national economic regulator charged with the regulation of the 5 sectors listed above and accordingly has the necessary ex-ante powers, i.e. can impose sector-specific obligations on operators (network access incl. cost-oriented tariff regulation, transparency, non-discrimination, separation of accounts and (functional) unbundling) as well as a range of further tasks (consumer protection measures, universal service obligations, spectrum assignment and management,

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¹ https://www.bundesnetzagentur.de/EN/Home/home_node.html;jsessionid=F57716020FCFD9EAF002947093286C71.

² Federal Network Agency for Electricity, Gas, Telecommunications, Post and Railway Act of 7 July 2005 covering the reorganization of the Regulatory Authority (umbrella law for the organization of BNetzA).

standardization (e.g. interoperability), monitoring of electromagnetic compatibility etc.) to promote effective competition for the benefit of users. It has no concurrent powers and the responsibility for competition law oversight lies with the Bundeskartellamt (Cartel Office, the German national competition authority). The two bodies work closely together and the respective laws foresee agreement in specific cases and consultation in cases affecting the other body's responsibilities.

BNetzA is tax funded and had a budget of 190 million € (2015, 214 million €; 2016, 208 million €; in 2017, planned 218 million € for 2018) and ar. 2,900 staff members (2017). The decisions are taken by independent ruling chambers. At the helmet of BNetzA sits a President and two Vice-Presidents with a term of 5 years renewable once.

BNetzA is a member of the following European regulators' bodies:

BEREC	Body of European Regulators for Electronic Communications;
IRG	Independent Regulators' Group (only regulators, not based on European law);
ACER	Agency for the Cooperation of Energy Regulators;
CEER	Council of European Energy Regulators (only regulators, not based on European law);
ERGP	European Regulators Group for Postal Services;
ENRRB	European Network of Rail Regulatory Bodies;
IRG-Rail	Independent Regulators' Group Rail (only regulators, not based on European law).

All European regulators' bodies aim to ensure a consistent application of the European regulatory framework by the national regulators to achieve the European internal market ensuring a wider market for providers and users thus increasing overall welfare due to realizing economies of scale (stemming among others from cross-border trade).

The legal basis for BNetzA's activities in the energy sector is provided by the Energy Industry Act (EnWG) and the Grid Expansion Acceleration Act (NABEG). Energy regulation means the supervision of energy network operators by the Bundesnetzagentur and the federal state regulatory bodies. BNetzA is responsible for all TSOs and DSOs with more than 100,000 customers or crossing more than one "Bundesland". Since 1998 customers have the right to choose their provider (liberalized retail markets).

Apart from its core competencies of regulating the sectors, it also has the responsibility for the implementation of the Regulation on wholesale energy market integrity and transparency (REMIT, European Regulation (EU) No. 1227/2011) as well as certain tasks ensuing from the Renewable Energy Act such as tendering of photovoltaic installations and wind farm capacity.

Furthermore since 2011 BNetzA is responsible for the Network Development Plan and as a consequence of the "*Energiewende*" (energy transition) has new tasks relating to the planning and permitting of the extra-high voltage (HV) electricity grid (as far as the transmission lines are nationwide, i.e. run across more than one "Bundesland" and the cross-border infrastructure) to ensure an accelerated grid expansion with efficient planning and speedy permitting procedures necessary to integrate an increasing share of renewables in the grid³. This new responsibility together with the traditional regulatory tools of tariff regulation and setting the rate of return on equity are the instruments that BNetzA can use to ensure an efficient roll-out and maintenance of the electricity grid. They define the role of BNetzA in the governance of the electricity infrastructure.

While the regulatory tools are traditional, the way they are used is not as the tariffs are based on the

³ End of 2017 1/3 of Germany's electricity was generated by renewables, the share of renewables of gross electricity consumption at the end of 2017 was 36%, cf. <https://www.bmwi.de/Redaktion/DE/Dossier/erneuerbare-energien.html>.

incentive regulation (not an “old-style” “cost-plus-regulation”) and the rate of return on equity is set for the capital operationally necessary, not a traditional style “rate-of-return” regulation in order to ensure an efficient outcome, i.e. the investment needed to satisfy the additional capacity needed to integrate an increasing share of more volatile renewables into the grid with an efficient financing. The task of planning/permitting of HV electricity transmission lines was completely new and not a regulatory task per se. However, as BNetzA had the experience of regulating the electricity grid since 2005, the new task was added.⁴ The following chapters outline the incentive regulation and the way the rate of return on equity is set (“modern regulation”) as well as the procedures related to the planning and permitting of the HV electricity transmission lines to speed up grid expansion.

All responsibilities in the area of energy regulation/network development can be seen in the Fig. 1.

2. Overview on Incentive Regulation

The aim of energy regulation is to create conditions for increased competition in the markets for energy generation, wholesale trade and supply by regulating the grid considered to be a natural monopoly effectively as shown in Fig. 2.

BNetzA’s main energy regulatory activities are:

- approving grid charges with an incentive regulation (since 2009),
- setting the rate of return on equity (on the capital operationally necessary),
- certification of unbundling of the transmission operators (ensure neutrality of the grid),
- preventing or removing obstacles in access to energy networks for suppliers and consumers,
- standardising processes for switching supplier (to facilitate switching for consumers), and
- improving the conditions for connecting new power plants to the grid.

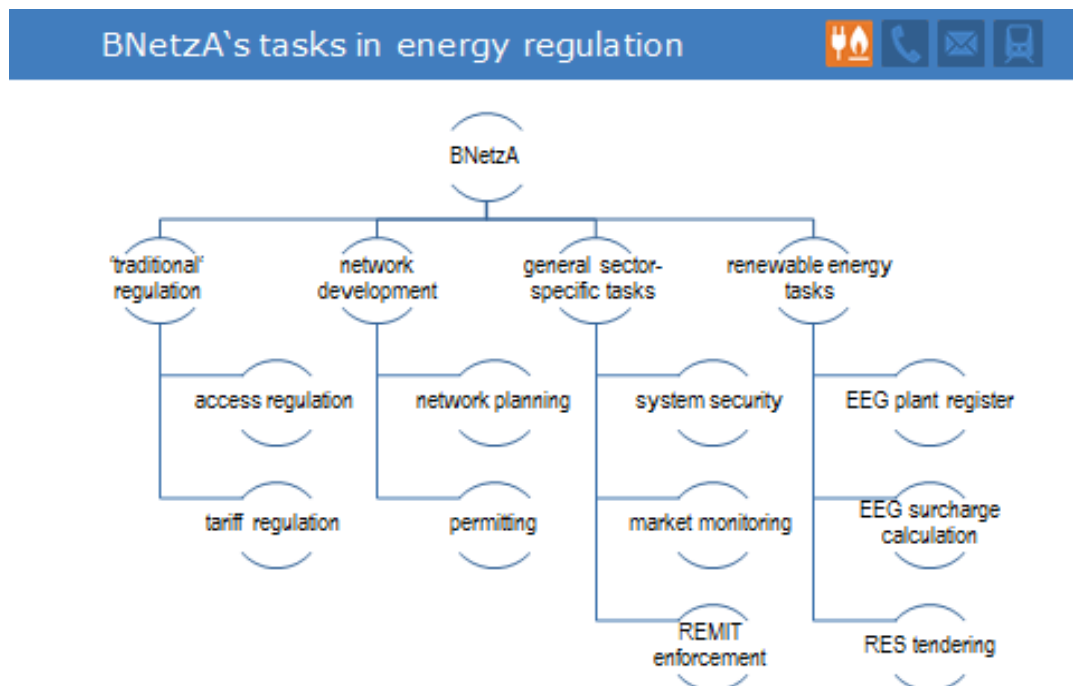


Fig. 1 BNetzA’s tasks in energy regulation.

⁴ For the first time a federal body became responsible for planning/permitting which is regularly a competence of the “Bundesländer”, but in order to ensure the acceleration of the grid expansion the legislator deemed it necessary to have only one responsible body.

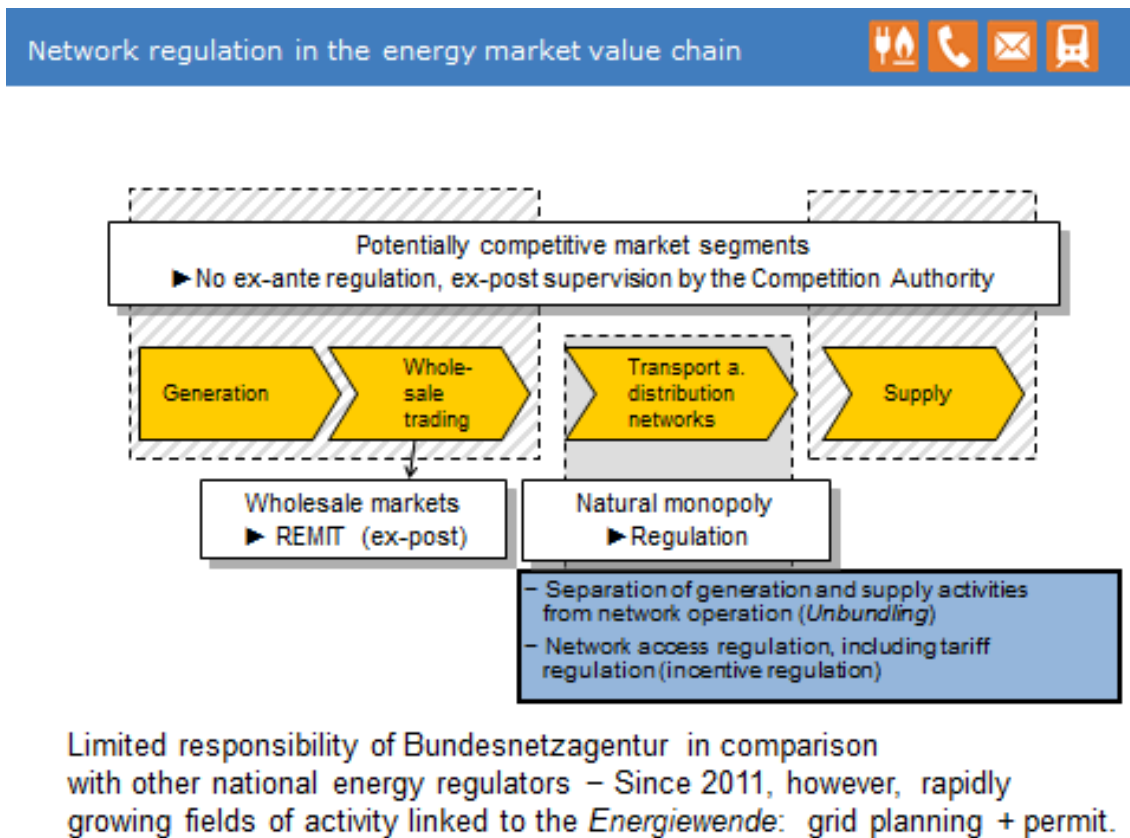


Fig. 2 Network regulation in the energy market value chain.

Germany's operators' landscape is characterized by a high number of both gas and electricity TSOs as well as by a high number of DSOs. Since the 3rd Internal Energy Market Package (IEM) was adopted in 2009 and transposed into national law by 2011, TSOs had to unbundle (choose one among 3 options: OU, ITO, ISO) and the national regulator had to certify the implementation of the unbundling (subject to comments of the European Commission).

Fig. 3 shows the forms of unbundling chosen and certified of the 4 German TSOs:

Given the high number of operators and the aim of incentivizing efficient grid operation as well as ensuring efficient grid investment BNetzA introduced in 2009 the incentive regulation as a dynamic and predictable form of regulation. Based on an efficiency benchmark (using DEA — Data Envelopment Analysis and SFA — Stochastic Frontier Analysis) it calculates for each operator a revenue cap setting the efficiency target (relative to the most efficient operator) to be

reached during the regulatory period ("individual revenue path").⁵ The incentive regulation includes all costs, i.e. CAPEX and OPEX (TOTEX approach) and splits the cost shares in the following three categories:

- non-controllable costs (not subject to efficiency requirements);
- temporarily non-controllable costs (subject to efficiency requirements);
- controllable costs (inefficiencies have to be eliminated during the regulatory period).⁶

Figs. 4-8 show the rationale of incentive regulation as well as the procedure and the efficiency benchmarking.

In order to ensure that investments made during the regulatory period are adequately dealt with (highly important for the success of the *Energiewende*, see below) TSOs have the possibility of applying for

⁵ Besides the individual efficiency target, a general sectoral productivity factor (X_{gen}) is applied.

⁶ The formula is shown in Fig. 10.

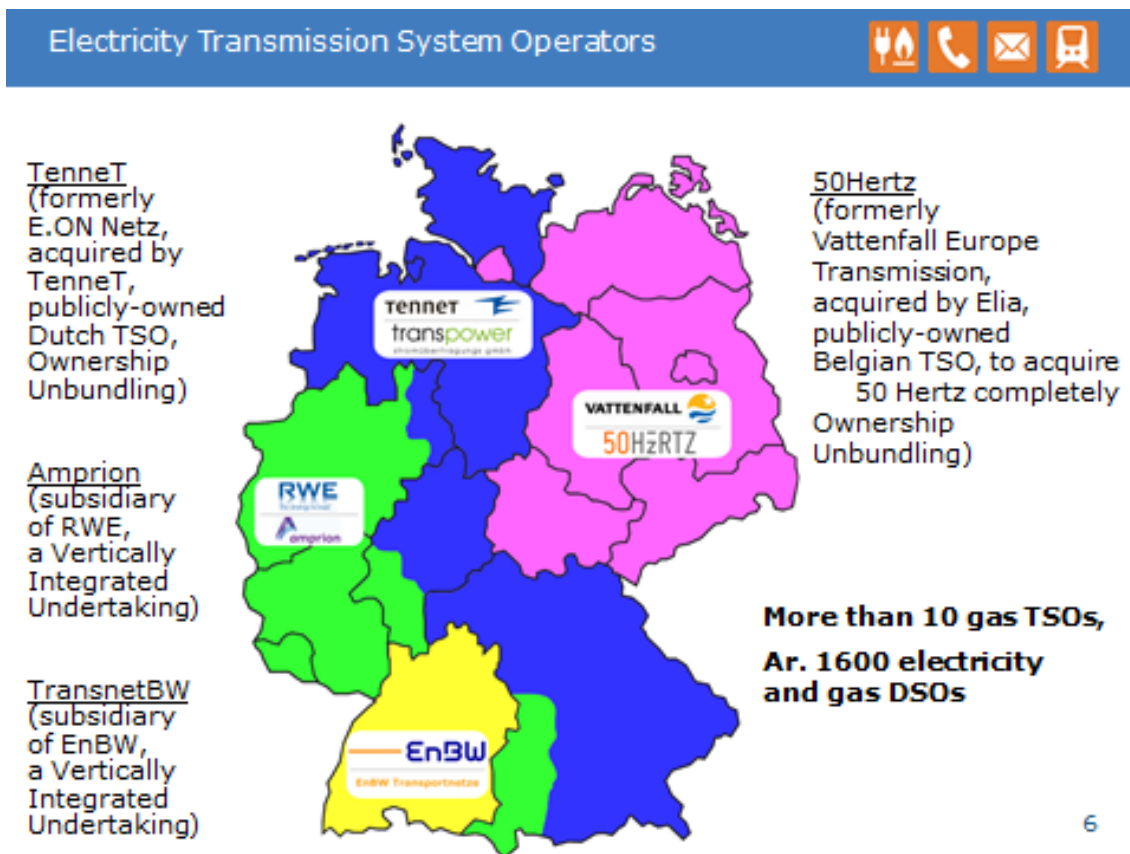


Fig. 3 Electricity transmission system operators.

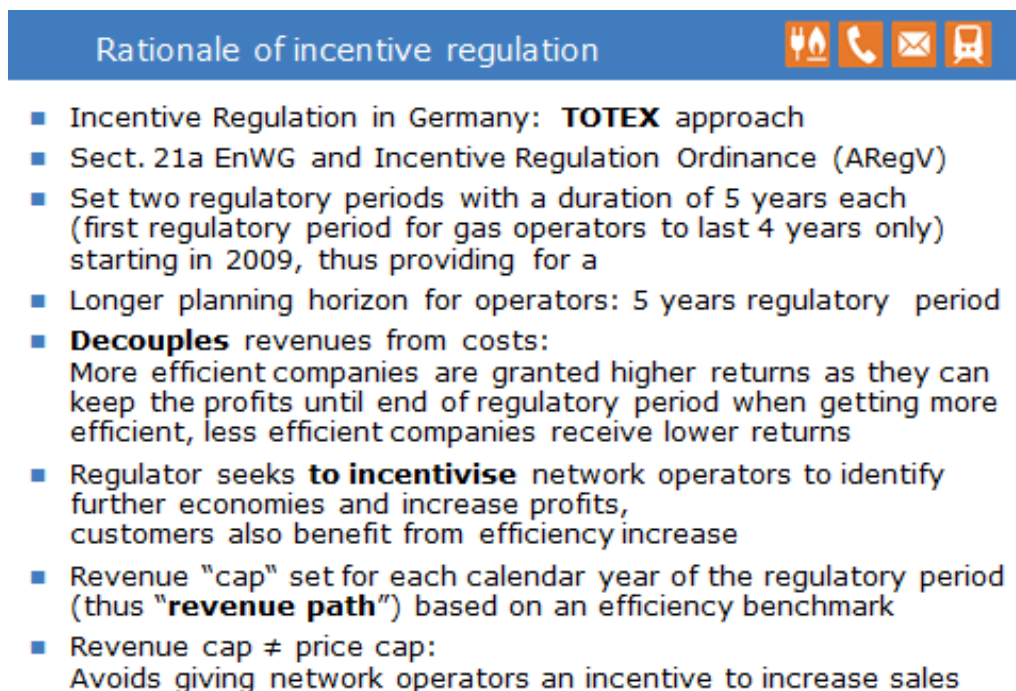
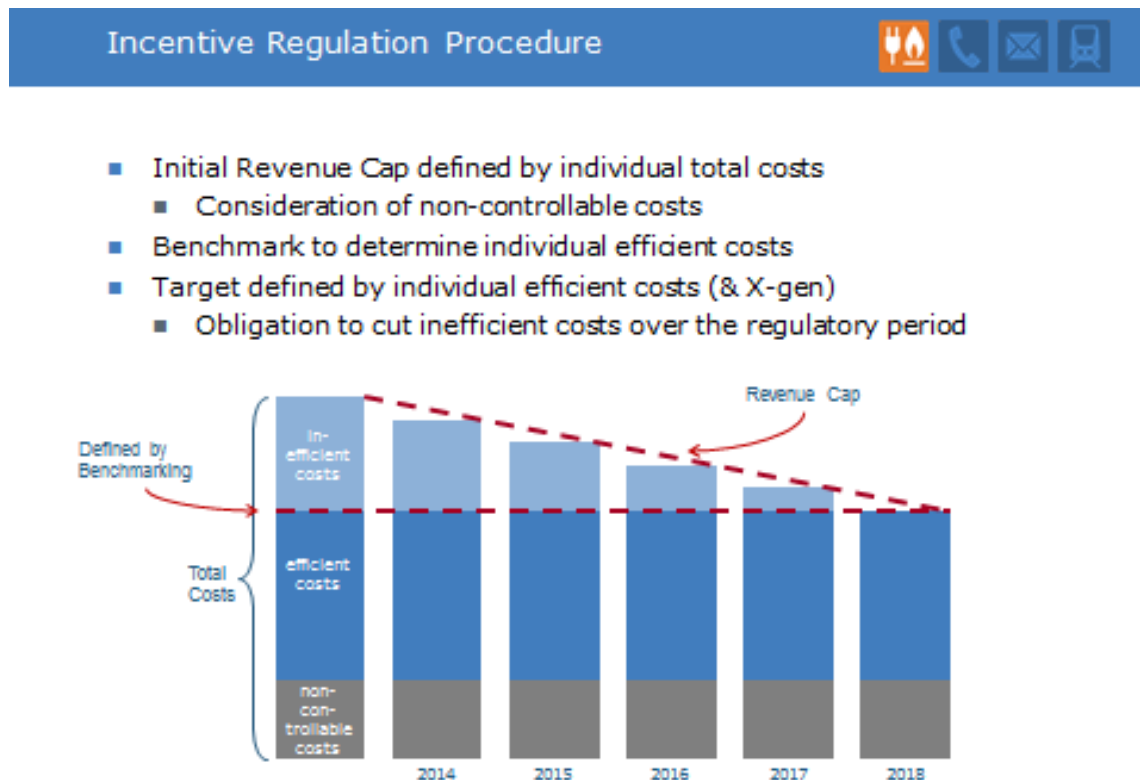
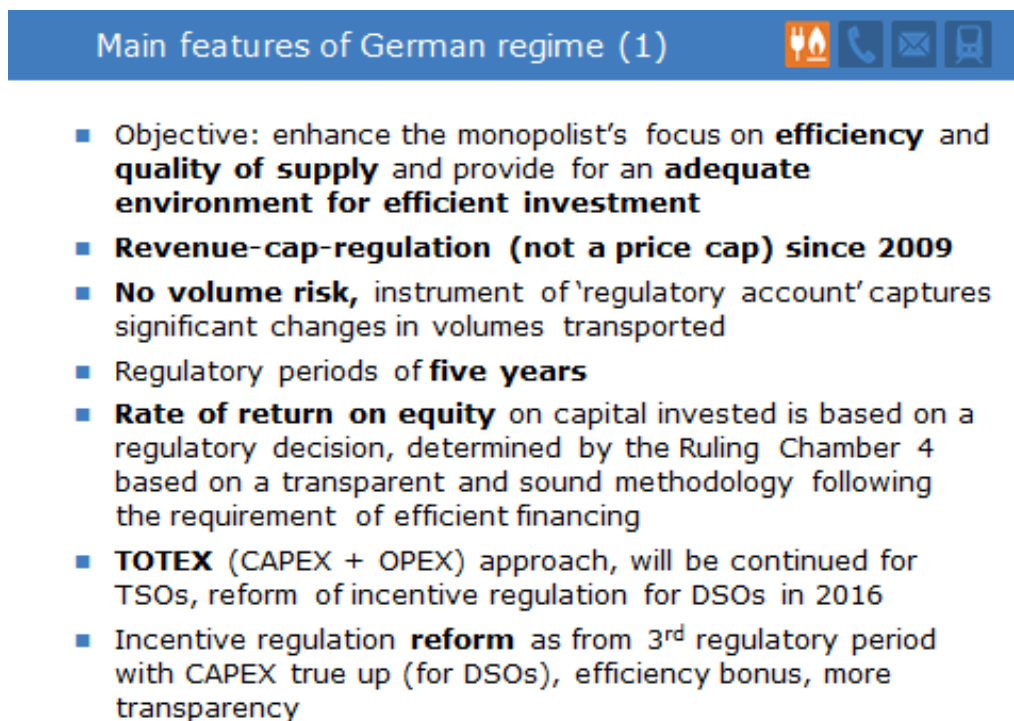


Fig. 4 Rationale of incentive regulation.



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Fig. 5 Incentive regulation procedure.



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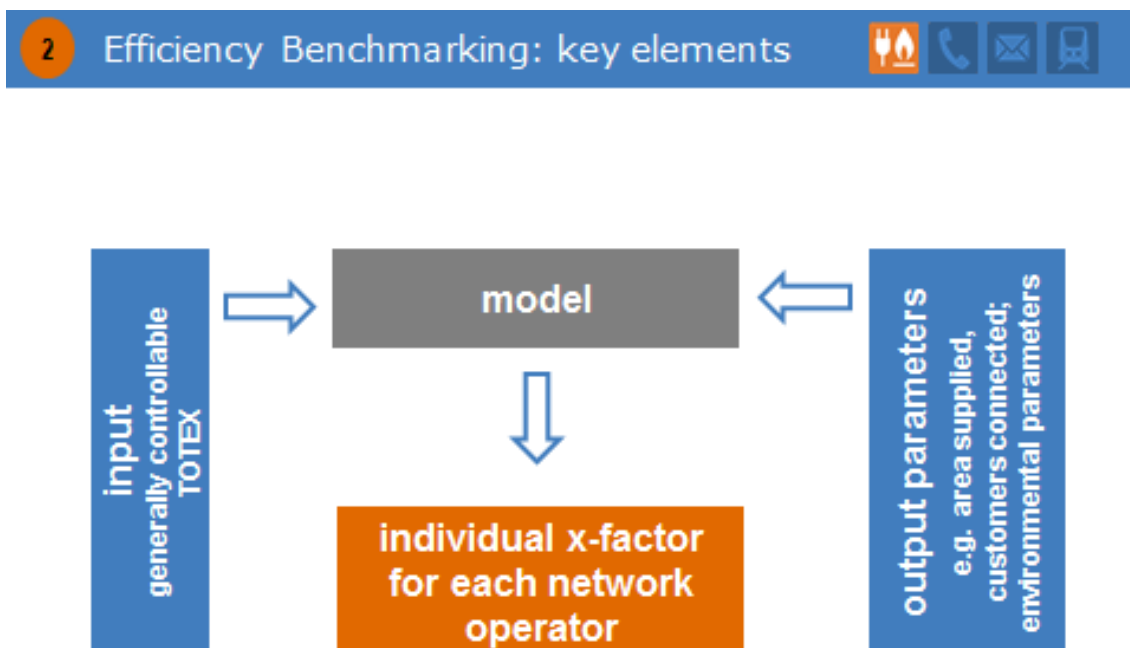
Fig. 6 Main features of German regime (1).

Main features of German regime (2)

- **Efficiency benchmarking**
 - **compare efficiency** among network operators
 - **mimic competition**
 - **"x ind" as individual efficiency target** (catch up to best in class = relative efficiency) for each operator
 - inefficiencies must be reduced within five years
- **"x gen" as general productivity factor** to reflect technological progress and sector specific price developments in the energy sector
- Efficiency benchmarking done by BNetzA using DEA and SFA as well as calculating with standardized and non-standardized capital costs in order to ensure a robust outcome (no methodological bias)

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Fig. 7 Main features of German regime (2).



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Fig. 8 Efficiency benchmarking: key elements.

Fig. 9 provides an overview of the German incentive regulation:

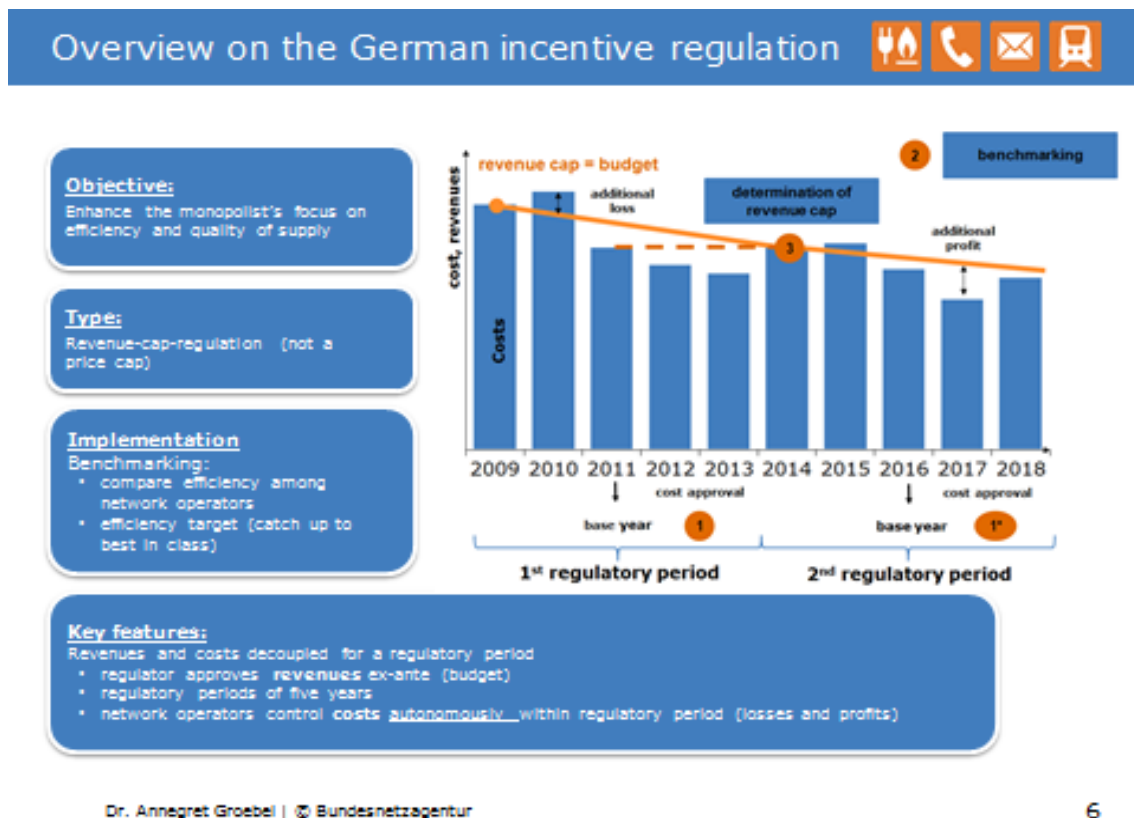


Fig. 9 Overview on the German incentive regulation.

Fig. 10 shows the revenue cap formula:

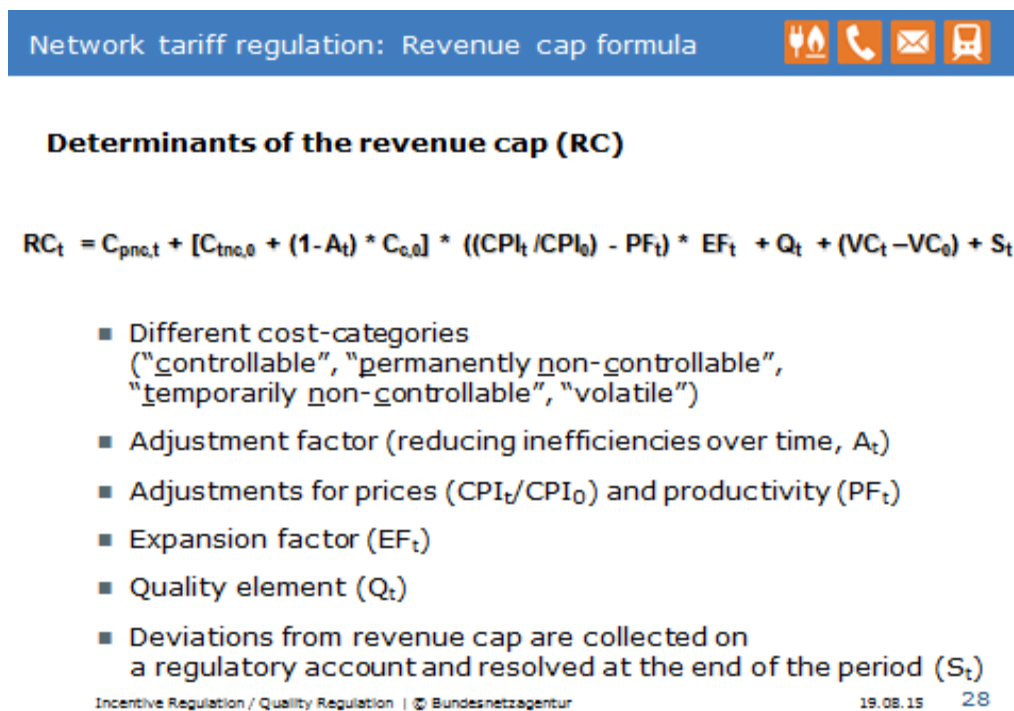


Fig. 10 Network tariff regulation: revenue cap formula.

so-called “investment measures” which basically means that these costs are treated as “non-controllable” costs for this period (included over and above the revenue cap in the year of activation) and are temporarily exempted from efficiency benchmarking, but will be subject to the efficiency requirement for the following regulatory period (see Figs. 11 and 12).

The corresponding tool for DSOs was the so-called “expansion factor” (to deal e.g. with more DER) which however will be replaced with a different treatment of capital costs (“annual CAPEX true-up”) in the 3rd regulatory period after the 2016 reform of the Incentive Regulation despite the results of BNetzA’s Evaluation Report as shown in Ref. [1]⁷. The changes with regard of the treatment of capital costs on the DSO level of the 2016 reform apply (for gas operators the 3rd regulatory period started 2018, for electricity operators in 2019), which basically means that the scheme (shown in Figs. 13 and 14) applies for DSOs.

The inclusion of an annual CAPEX true-up implies that the investment decision is distorted (incentive towards a more capital-intensive grid expansion strategy as is the case in a “cost-of-service” regulation), i.e. it may lead to over-investment.

There are no changes in the formula for TSOs (see Fig. 10), i.e. the budgetary approach is kept and for additional investments during the regulatory period investment measures can be used.⁸

As the 3rd regulatory period for gas operators started beginning of 2018, BNetzA had to fix the general sectoral productivity factor and finally took a decision on 21st February 2018 fixing the

productivity factor at 0.49%.

The 3rd regulatory period for electricity operators starts beginning in 2019 and BNetzA collected the relevant data to set the general sectoral productivity factor for the electricity operators. The decision was taken on 28th November 2018 and the general sectoral productivity factor fixed at 0.90%.

Fig. 15 sums up the incentive regulation in Germany.

3. Determination of the Rate of Return on Equity

In a capital-intensive industry, the rate of return on equity is a decisive parameter of network costs and its determination has a great impact on the level of grid tariffs. BNetzA sets the appropriate rate of return on equity using the CAP-Model as the most used model (Figs. 16 and 17). The rate of return on equity is applied only on capital considered operationally necessary and only up to a share of 40% equity in order to avoid over-capitalization (the famous *Averch-Johnson* effect of a rate-of-return regulation).

For the 3rd regulatory period (starting for gas operators in 2018 and for electricity operators in 2019) the decision was taken on 5th Oct. 16 (Fig. 18).

Following up on the decision regarding the return on equity: the first instance (Higher Regional Court of Duesseldorf) decided on 22 March 2018 against BNetzA’s decision (following their own expert witness). On April 25 2018 announced publicly that it complains against this decision at the Federal Court of Justice as BNetzA is still convinced that its decision is fair and provides a reasonable rate of return on equity for the grid operators. Table 1 shows a comparison of the rates of return on equity for the second and the third regulatory period for new and old assets.

Finally with regard to grid charges it is worth noting that on 17 July 2017 the so-called “*Grid charges modernization Act*” (amending the Energy Industry Act) was passed which aims at harmonizing grid charges of the four TSOs across Germany given the fact that the “*Energiewende*” had very different effects on the TSOs

⁷ The Evaluation Report of the incentive regulation scheme published by BNetzA beginning of 2015 showed no barriers to investment. Consequently it concluded that the incentives for a cost-optimal network provided by the Incentive Regulation were effective. Report available in German at https://www.bundesnetzagentur.de/SharedDocs/Downloads/DE/Allgemeines/Bundesnetzagentur/Publikationen/Berichte/2015/ARegV_Evaluierungsbericht_2015.pdf?__blob=publicationFile&v=3.

⁸ The Incentive Regulation Ordinance can be found at <https://www.gesetze-im-internet.de/bundesrecht/aregv/gesamt.pdf>.

Dealing with new investments

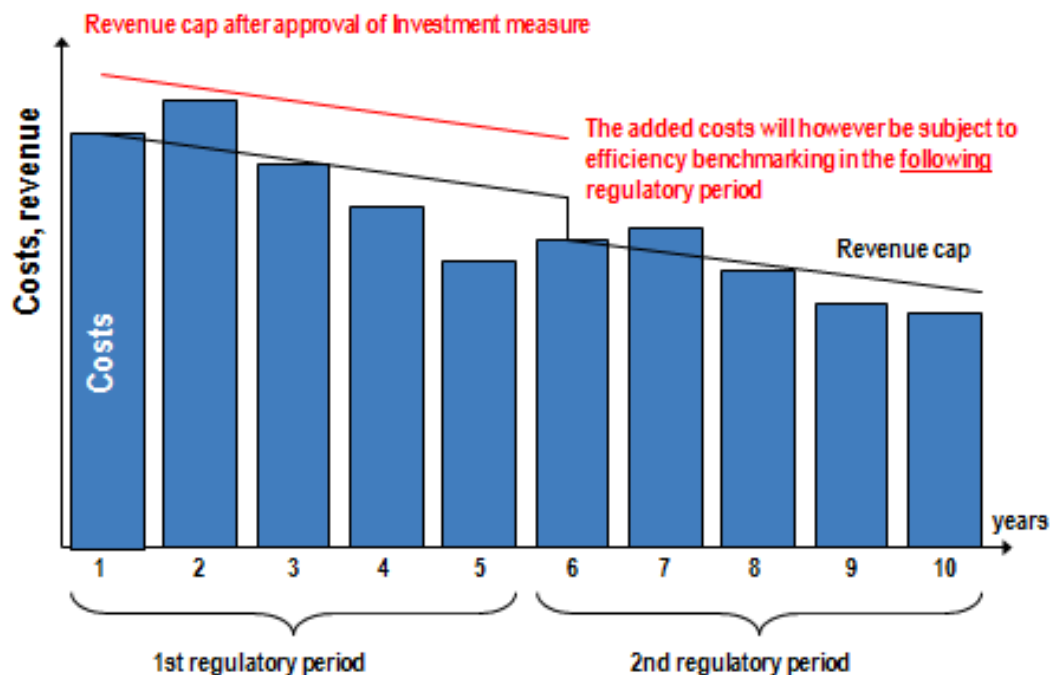


How to account for new investment during the regulatory period?

- 2 mechanisms:
 - “Investment measure” (TSOs)
 - Costs are included in revenue cap in the year of activation and are temporarily exempt from efficiency benchmarking
 - mostly used at TSO level
 - “Expansion factor” (DSOs)
 - Changes in the supply task (e.g. increase in connected customers or decentralised generation) raises the budget during the regulatory period;
 - used at DSO level

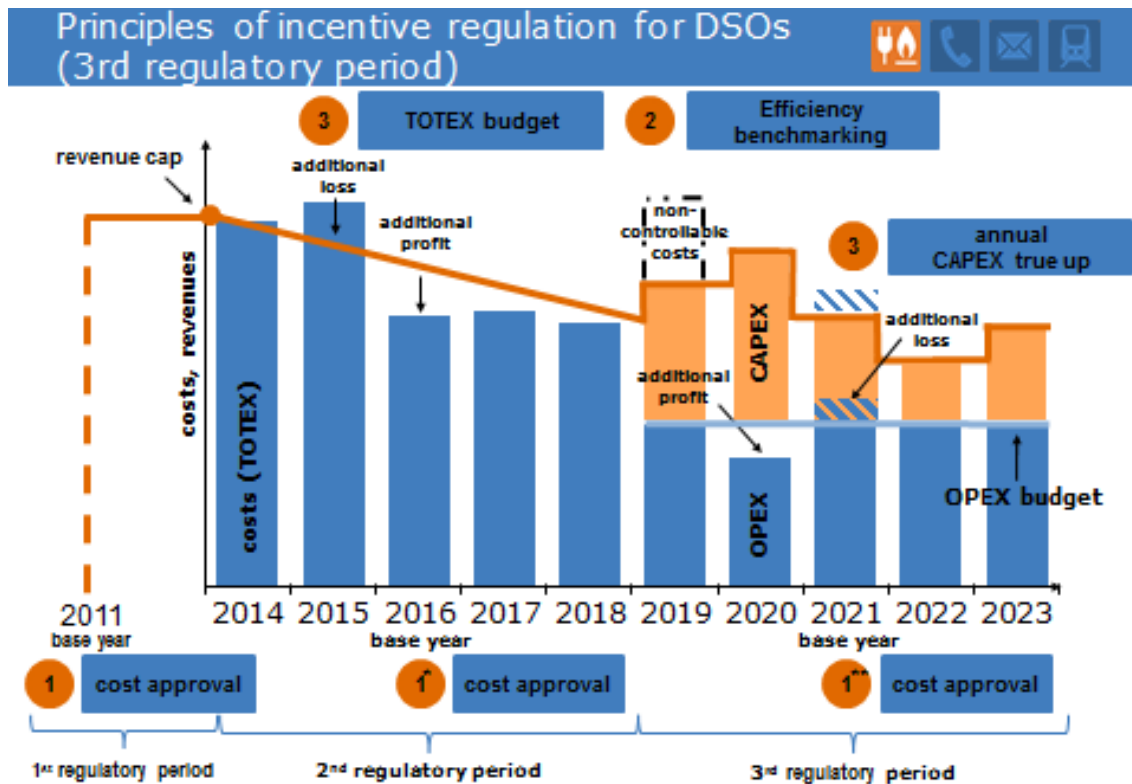
Fig. 11 Dealing with new investments.

Effect of Investment measures on revenue cap



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Fig. 12 Effect of investment measures on revenue cap.



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Fig. 13 Principles of incentive regulation for DSOs (3rd regulatory period).

The revenue formula for the DSOs looks as follows:

3 The revenue cap formula for DSOs (3rd period regulatory period)

$$EQ_t = KA_{\text{non},t} + (KA_{\text{var},t} + (1 - V_t) KA_{\text{b},t} + \frac{B_t}{T}) \left(\frac{VPI_t}{VPI_0} - PF_t \right) + KKA_t + Q_t + (VK_t - VK_0) + S_t$$

EQ_t revenue cap
 $KA_{\text{non},t}$ non-controllable costs
 $KA_{\text{var},t}$ generally controllable costs
 V_t inefficiency reduction per year
 $KA_{\text{b},t}$ inefficiencies
 B_t bonus
 T duration of regulatory period (in years)
 $VPI_{t/0}$ CPI
 PF_t Xgen
 KKA_t CAPEX in period top up (DSO only)
 Q_t bonus/malus for quality
 $VK_{t/0}$ volatile costs
 S_t regulatory account
 $t/0$ time index/base year

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Fig. 14 The revenue cap formula for DSOs (3rd regulatory period).

Summary



- Germany uses an incentive regulation regime with a **Revenue Cap**
 - Network operators decide about investment (level and costs) subject to efficiency benchmarking
 - Investments to quality (enhancement) is incentivized by quality element → but investment strategy is chosen by firms, SAIDI values remain high
 - Investment measures allow to take account of new investment during the regulatory period, included in the efficiency benchmarking only in the next period
 - Expansion of the network is considered by expansion factor → factor does not consider the quality element for one regulatory period
 - All investments are cost- and quality benchmarked at least in the next regulatory period

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Fig. 15 Summary of incentive regulation.

Planning certainty for the rate of return on equity



Return on equity for new assets as per section 7(4) StromNEV and GasNEV:

"The allowed rate of return on equity needed for new installations may not exceed the average **current yield** for the last ten full calendar years **on fixed interest securities of domestic issuers** as published by the Deutsche Bundesbank, plus an **appropriate mark-up to cover entrepreneurial risk specific to network operation.**"



Capital Asset Pricing Model (CAP-M)

Required return on equity = risk-free rate +
beta factor * market risk premium

$$R_E = R_F + \beta_E * P_M$$

Fig. 16 Planning certainty for the rate of return on equity.

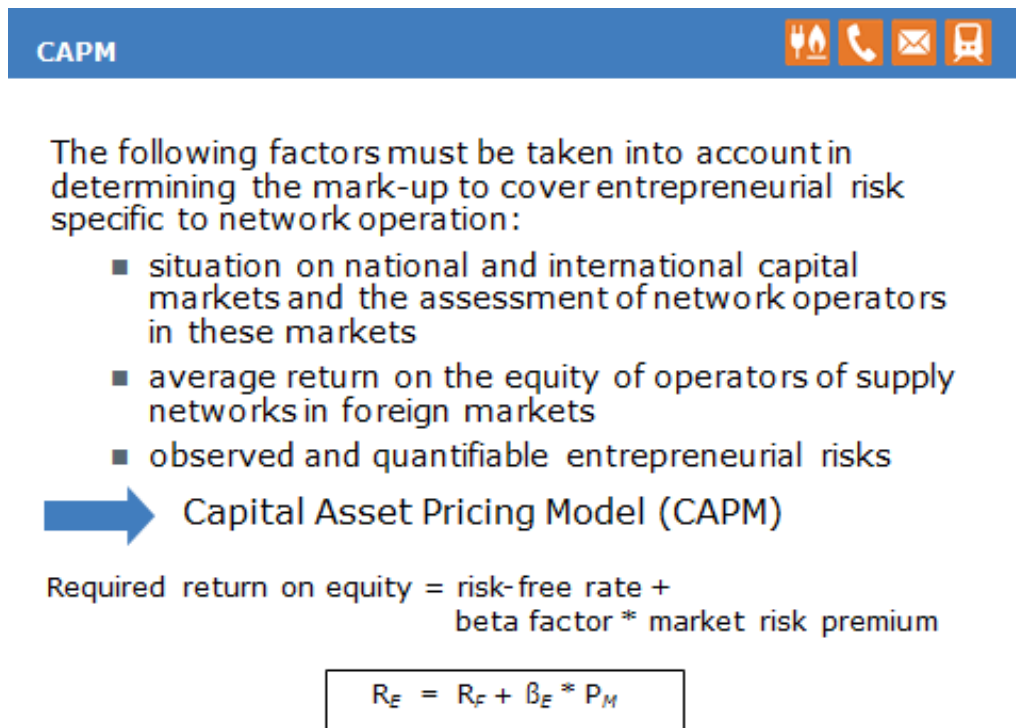
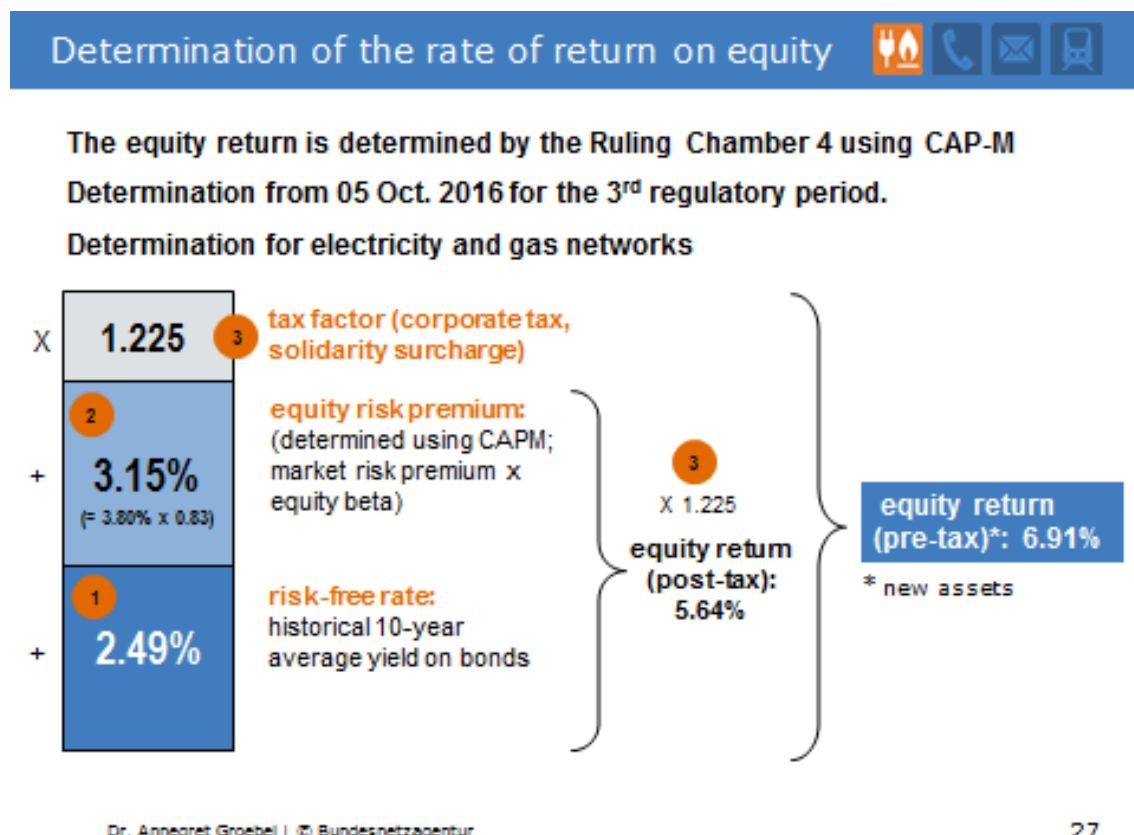


Fig. 17 CAPM.



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Fig. 18 Determination of the rate of return on equity.

Table 1 Rate of return on equity for the 2nd and 3rd regulatory period.

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%

(i.e. different costs depending on decentralized RES, cross-border flows/costs etc.) and thus the grid charges needed to be adjusted and harmonized. However the principle of cost-orientation is maintained, but a mechanism of “compensation” of the different costs will be introduced. On 17th December 2018 the relevant Ordinance of Grid Fees for Electricity was amended by introducing new provisions to reach partially harmonized charges of the TSOs as of 1st Jan. 2019 (start of the 3rd regulatory period for electricity operators) and completely harmonized charges as of 1st January 2023.

As can be seen from Fig. 19 (taken from the Ref. [2] Monitoring Report 2017) grid charges tend to increase which is due to the fact that speeding up grid expansion comes at a cost (see also next chapter on the update on the grid expansion)⁹.

4. The “Energiewende” and BNetzA’s Role in Planning and Permitting of High-Voltage Electricity Nationwide and Cross-Border Transmission Lines

After the catastrophe in Fukushima the German government decided to exit nuclear power by 2022, i.e. sooner than planned and rely on renewables (RES). The legislative package of the *Energiewende* was adopted by the German Parliament in July 2011. The following laws were newly adopted and existing laws amended:

- Legislative measures — 8 new laws or amendments to existing laws adopted in July 2011
- Atomic Energy Act — phase-out of German NPPs,

- Act to Accelerate the Expansion of the Grid — including acceleration of spatial planning (NABEG) giving BNetzA planning/permitting powers,

- Energy Industry Act (EnWG) — transposition of 3rd Internal Market Directives,

- Renewable Energy Act (EEG) — cost-efficient expansion of renewables,

- Energy and Climate Fund Act — from 2013 all revenues from auctioning emission allowances will be a contribution to this fund,

- Energy efficiency — i.e. tax concessions for renovation of buildings; climate-friendly development of cities and municipalities; public procurement.

A range of new powers to implement the *Energiewende* was given to BNetzA!

The objectives regarding the share of renewables (RES) in gross electricity consumption were laid down in the “*Energy Concept*” of the German Government (2010), but adjusted in the course of time. The path for the increase of the RES share is shown in Tables 2 and 3.

As the share of RES grew rapidly, the Government (Cabinet) set more precise expansion corridors for the growth of RES with an upper and lower boundary (Table 3 and Fig. 20).

In 2016 the Government (Cabinet) confirmed the RES expansion corridors, but steadying it and setting a cap for the growth of wind energy in so called “bottleneck” areas as the mismatch between RES growth — which grew faster than expected — and grid expansion — which grew slower than expected — increased and measures to synchronize both were taken in July 2016 with the adoption of the second legislative package adjusting the development in order to ensure that the *Energiewende* continues successfully (see below). As the RES growth continued and reached the target of 2020 already at the end of 2018, the Coalition

⁹ The BNetzA/BKartA Monitoring Report 2018 shows a decrease for household customers from 7.3 €-ct/kWh to 7.17 €-ct/kWh, which is attributed to the Grid charges modernization act.

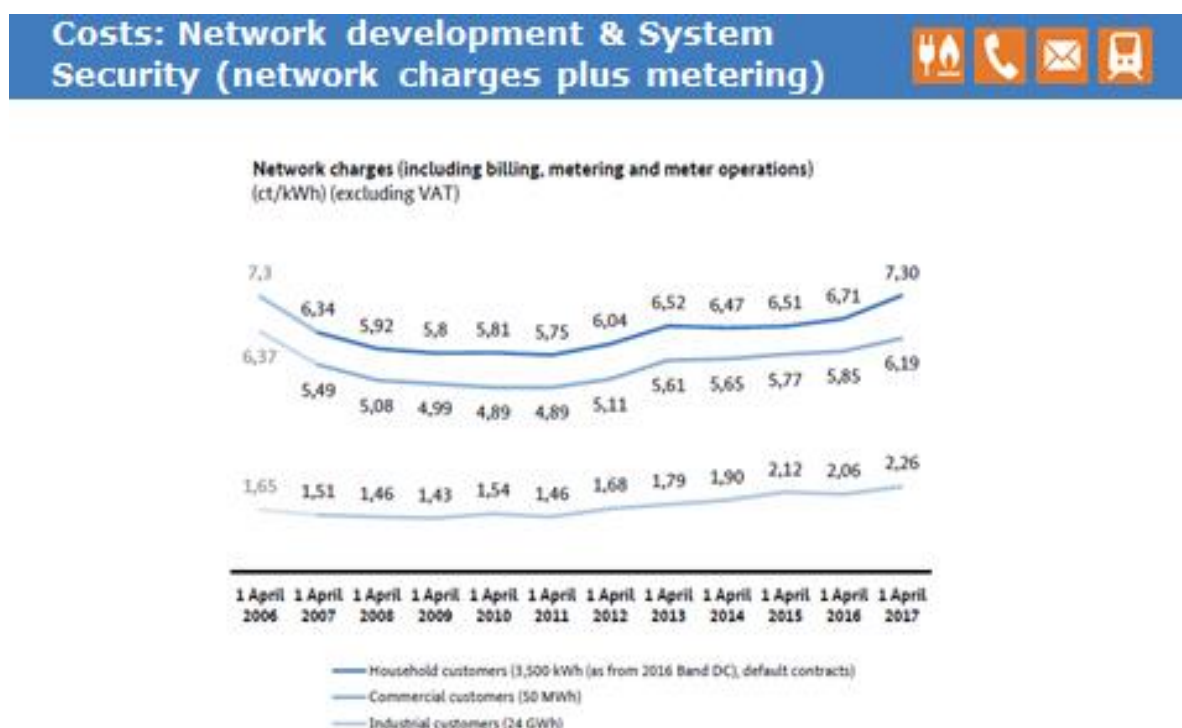


Figure 44: Network charges: 2006 -2017

Source: Monitoringreport 2017

Fig. 19 Costs: Network development & system security (network charges plus metering).

Table 2 RES objectives 2010/2011.

Year	RES share
2020	35%
2030	50%
2040	65%
2050	80%

Table 3 RES objectives 2014.

Year	RES share
2025	40-45%
2035	55-60%

Agreement of the current Government foresees an increase in the RES objective for 2030 to 65%, i.e. the objective of 2040 is advanced by 10 years. This is a challenge as the grid expansion is still slow (see below).

The transition towards RES implies that the grid must also be adapted and expanded as the volatility of RES requires more capacity and the distance between the generation and the load increases. In Germany this mainly means that three new HV DC transmission lines have to be built from the north to the south of Germany

as the main sources of RES are located in the north (offshore wind energy) and the main industrial load centres are located in the south and southwest of Germany as Figs. 21-23 show.

In order to speed up the planning and permitting process for new HV transmission lines, BNetzA was given new powers with the Grid Expansion Acceleration Act in 2011 (Fig. 24). Again the role of BNetzA is to ensure an efficient grid expansion (only where it is necessary).

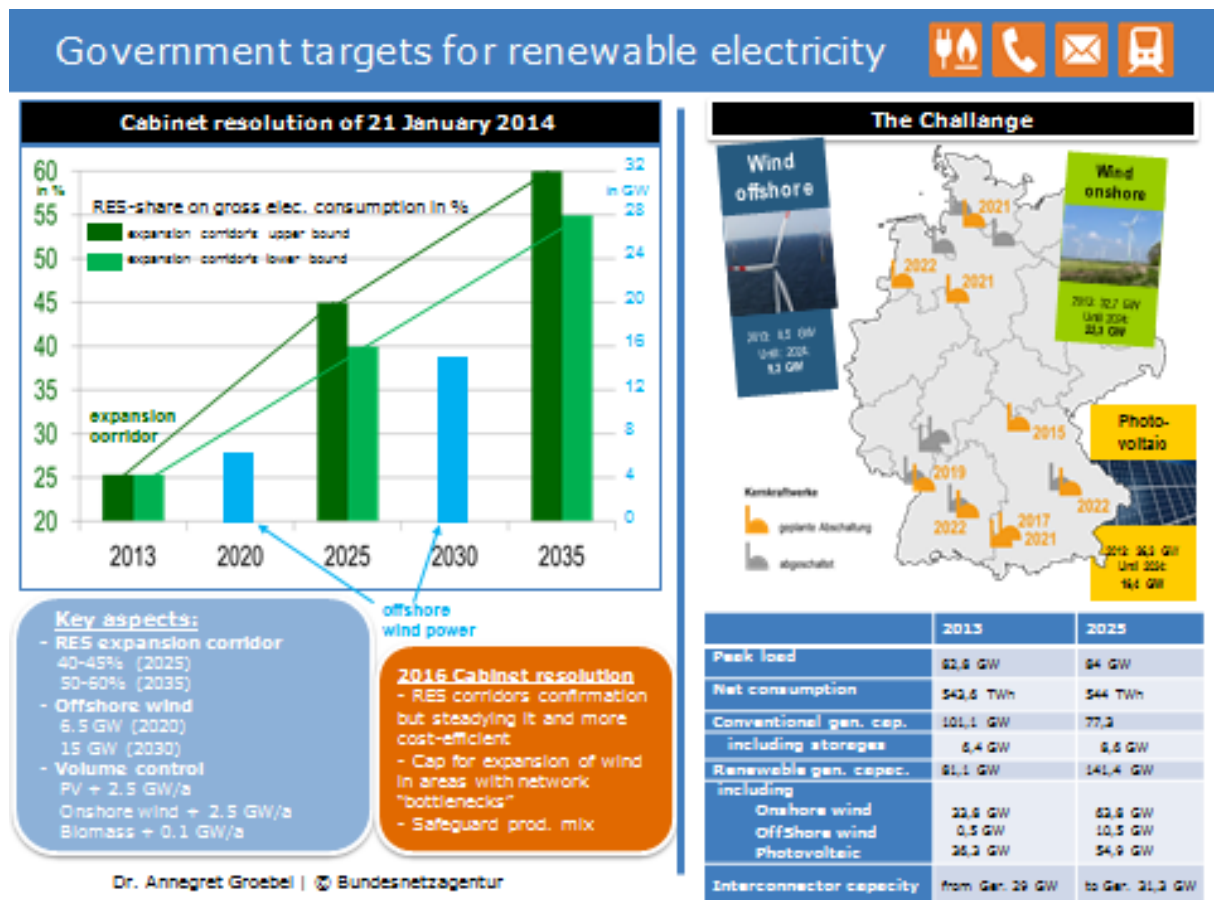


Fig. 20 Government targets for renewable electricity.

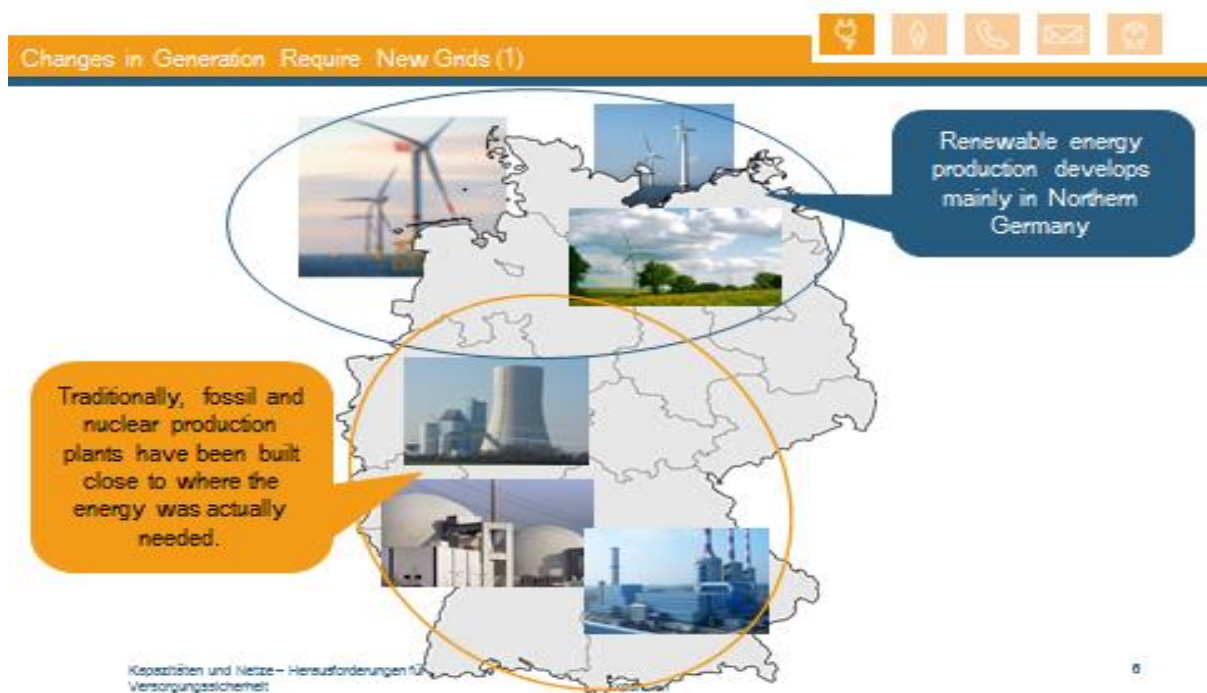


Fig. 21 Changes in generation require new grids (1).

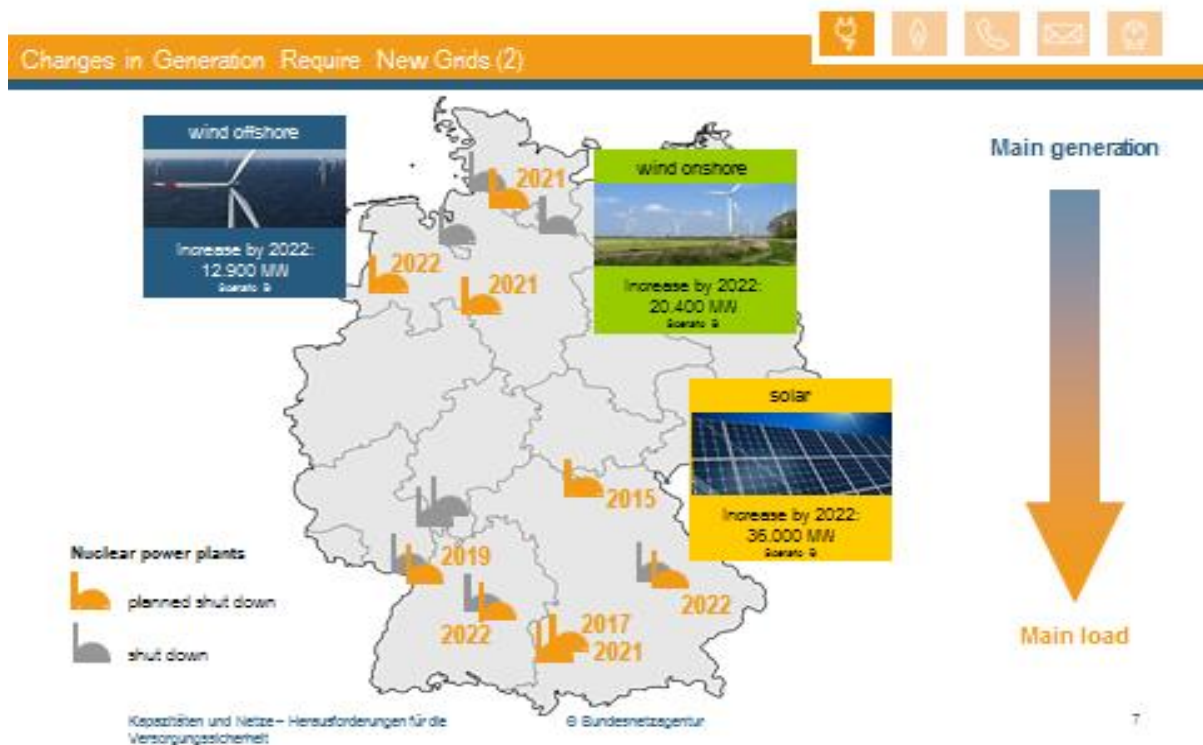


Fig. 22 Changes in generation require new grids (2).

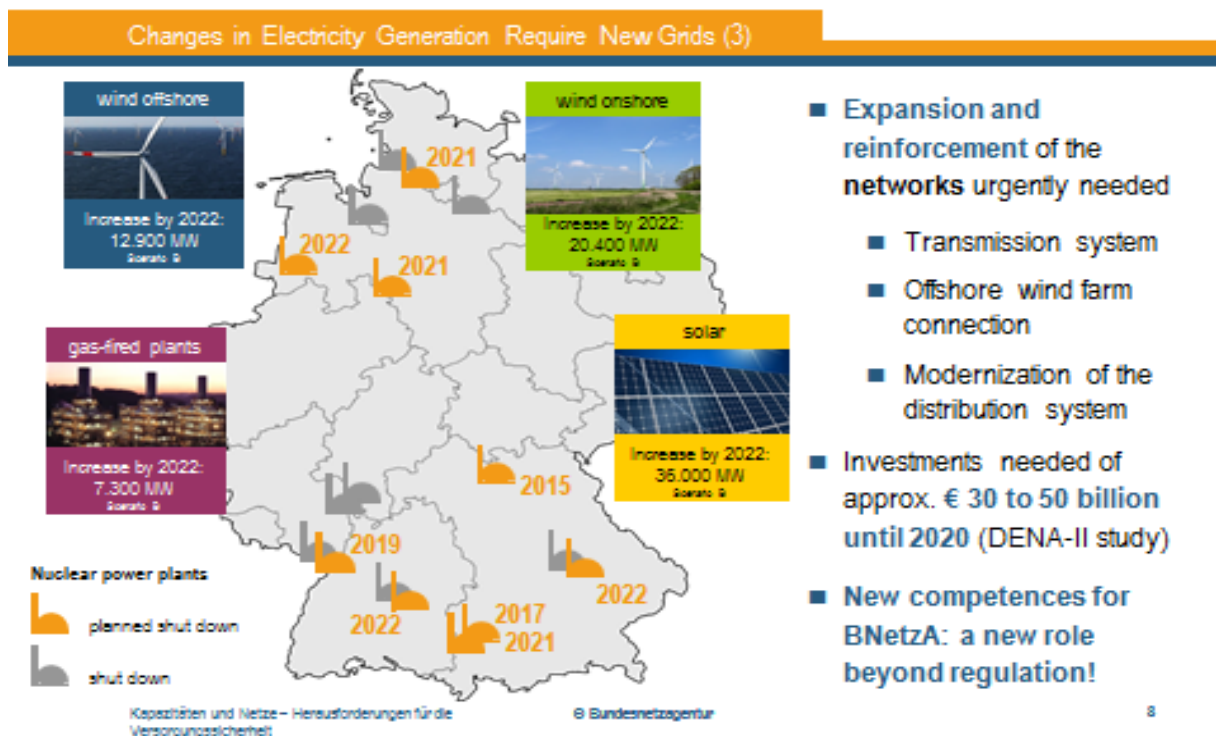


Fig. 23 Changes in generation require new grids (3).

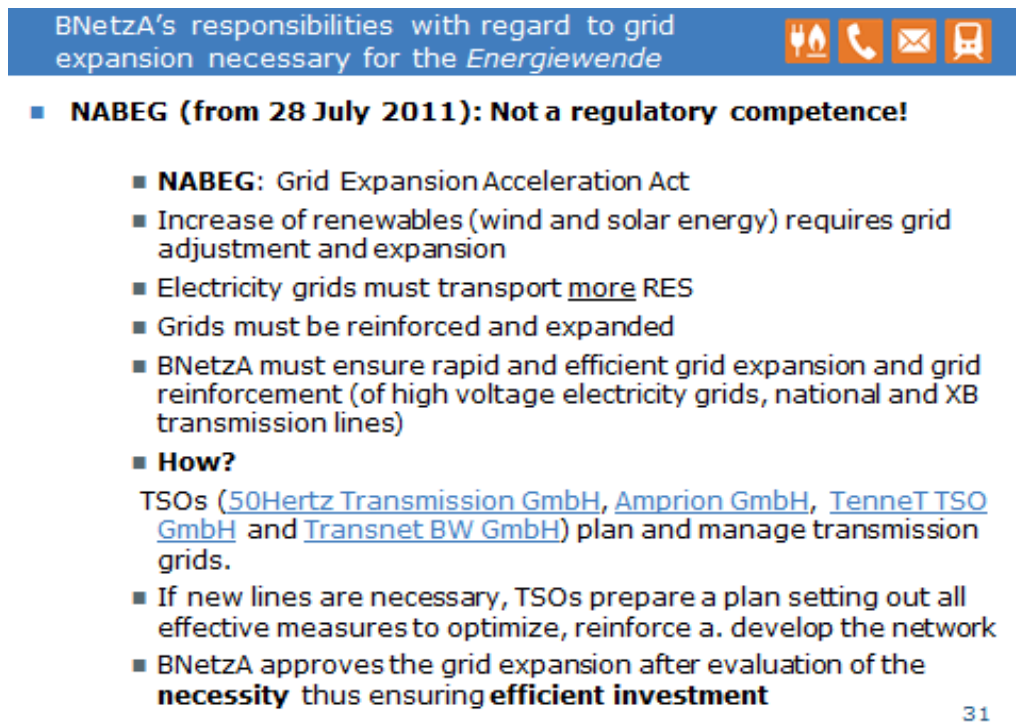


Fig. 24 BNetzA's responsibilities with regard to grid expansion necessary for the *Energiewende*.

Figs. 25-28 show the process of planning and permitting for high-voltage electricity transmission lines according to the Grid Expansion Acceleration Act.

The latest development to report is that the grid expansion is ongoing and that BNetzA approved on 3rd April 2018 for the first time a concrete corridor for an HV transmission line (running from Bertikow to Pasewalk). BNetzA publicly consulted with all relevant stakeholders to ensure acceptance of the transmission lines by citizens as much as possible (acc. to the procedure described above). On 21st December 2018 BNetzA announced that it had fixed the corridor for the first part of the 380 kV transmission line between Roehrsdorf-Weida-Remptendorf using where possible the existing transmission line between Weida and Remptendorf in order to minimize the impacts for the environment and the population. Furthermore the documents regarding the planning for one of the major lines — so called Sued-Ost-Link — were submitted by the operators (TenneT, 50 Hertz) on 3rd and 27th December 2018. BNetzA will make available the documents to the public during the proceedings.

Figs. 29 and 30 show the state of the grid expansion by Q3/2017 and Q3/2018 respectively.

As mentioned above, five years after the first *Energiewende* package the second legislative *Energiewende* package was adopted in July 2016 in order to align both the RES growth with the grid expansion speed (Fig. 31). The main change of the Renewable Energy Act 2017 was to introduce tendering as this reduces the cost for the RES support (increase of the RES surcharge [difference between the RES support and the wholesale market price] until 2018). The results of the tendering organized by BNetzA since the beginning of 2017 show that RESs are competitive and strike prices are considerably below the administratively fixed FIT and continue to drop.

Both developments — RES tendering and speeding up grid expansion — are meant to synchronize the grid expansion with the RES growth in order to ensure that RESs are integrated into the grid (as well as into the market). Both measures are important to ensure that the *Energiewende* will be a success. While the population still widely agrees with the *Energiewende* we also saw

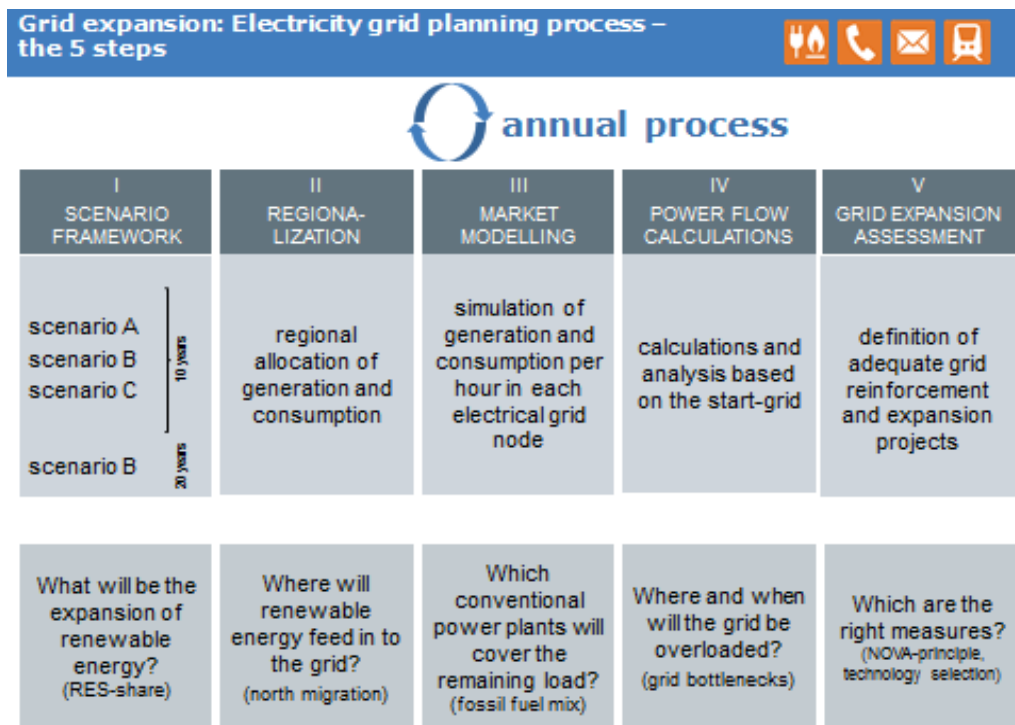


Fig. 25 Grid expansion: electricity grid planning process — the 5 steps.

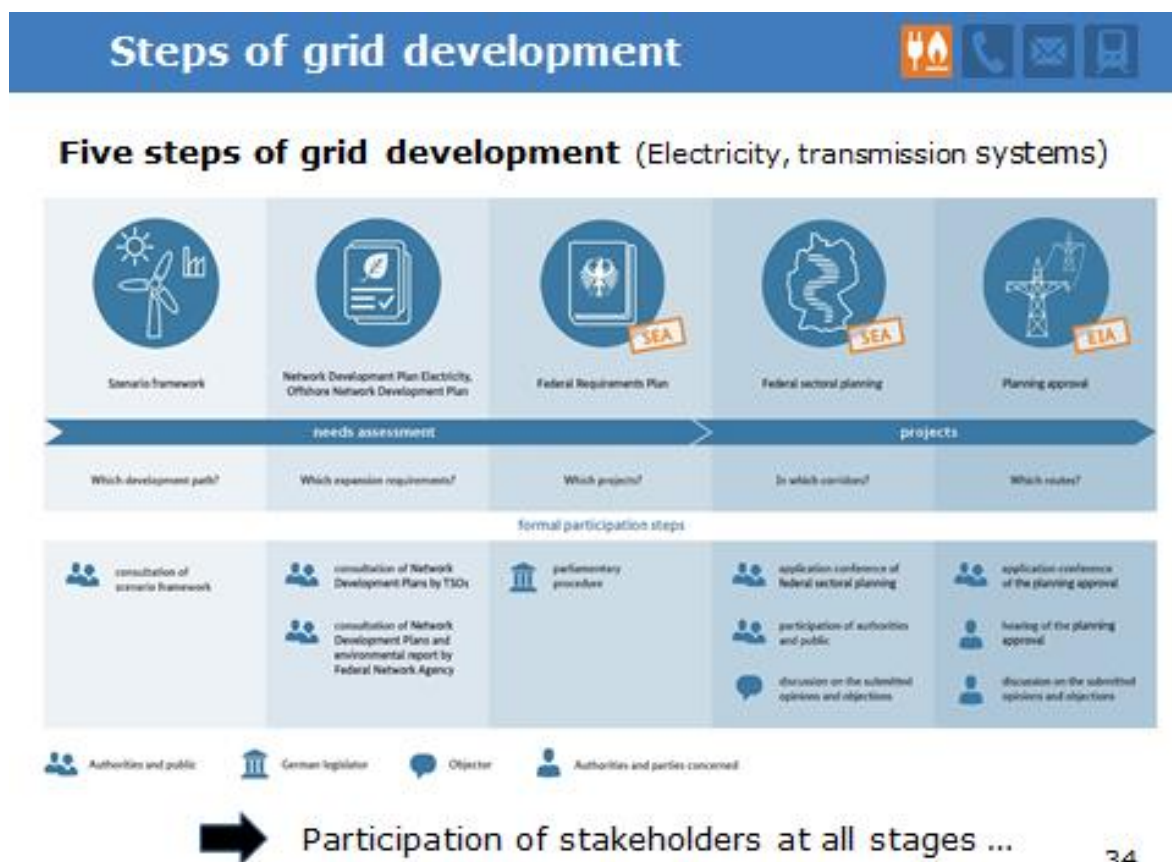


Fig. 26 Steps of grid development.



Fig. 27 Confirmation of network development plan.



Fig. 28 Steps of grid development.

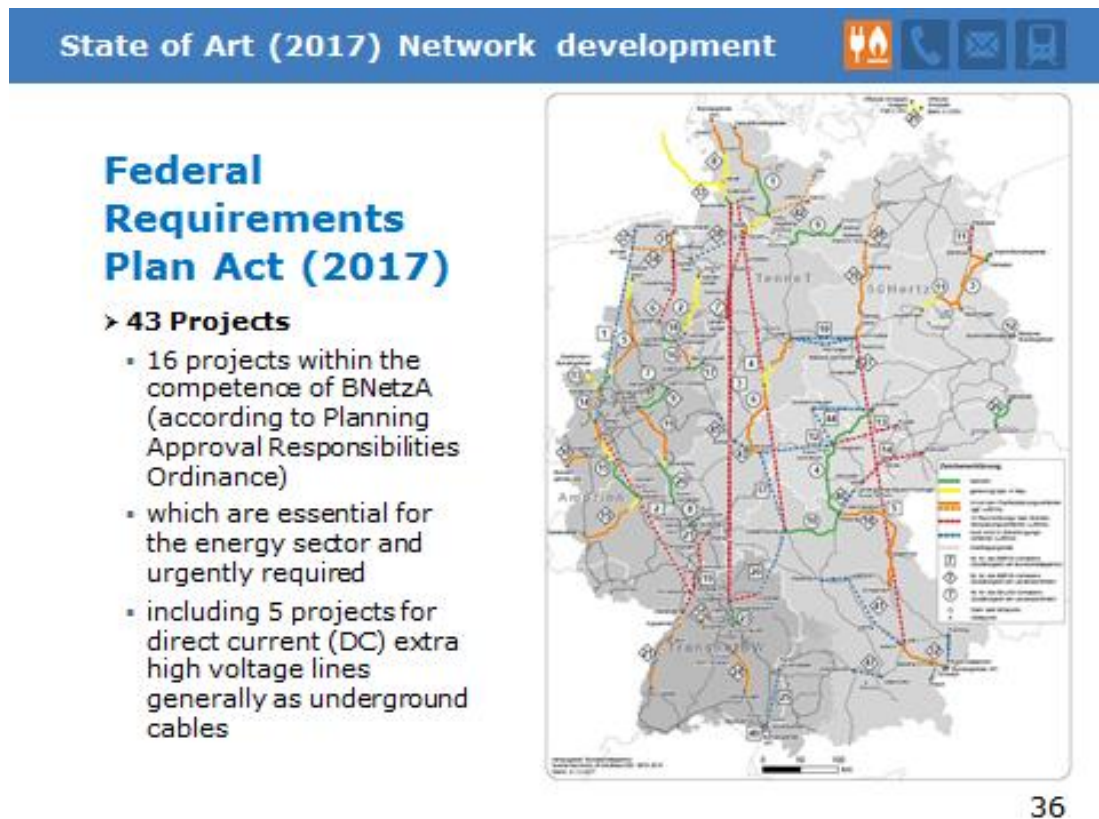


Fig. 29 State of Art (2017) network development.

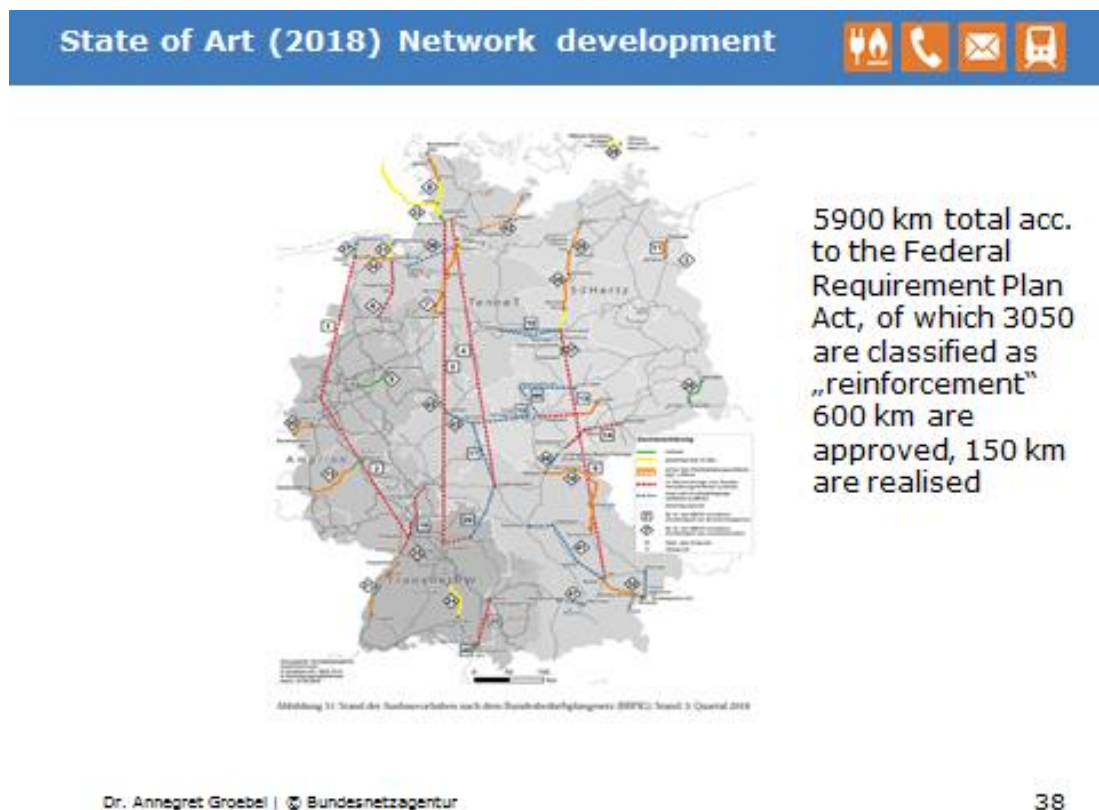


Fig. 30 State of Art (2018) network development.

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

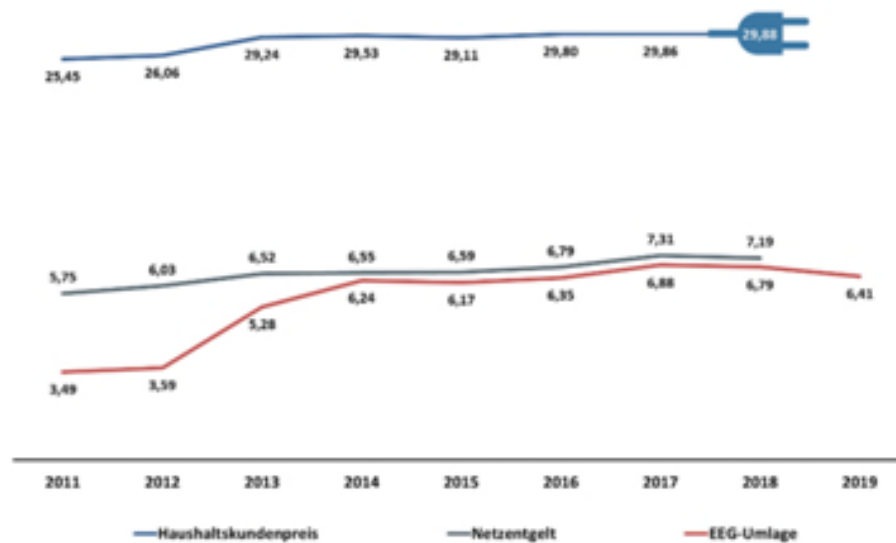
Main Amendments (as adopted on 8 July 2016):

- **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”

Fig. 31 2016 Energy legislation/regulation in Germany.

Household prices, RES surcharge, grid charges

Netzentgelte, EEG-Umlage und Haushaltskundenpreis Strom in ct/kWh



Source: Monitoringreport 2018

Fig. 32 Household prices, RES surcharge, grid charges.

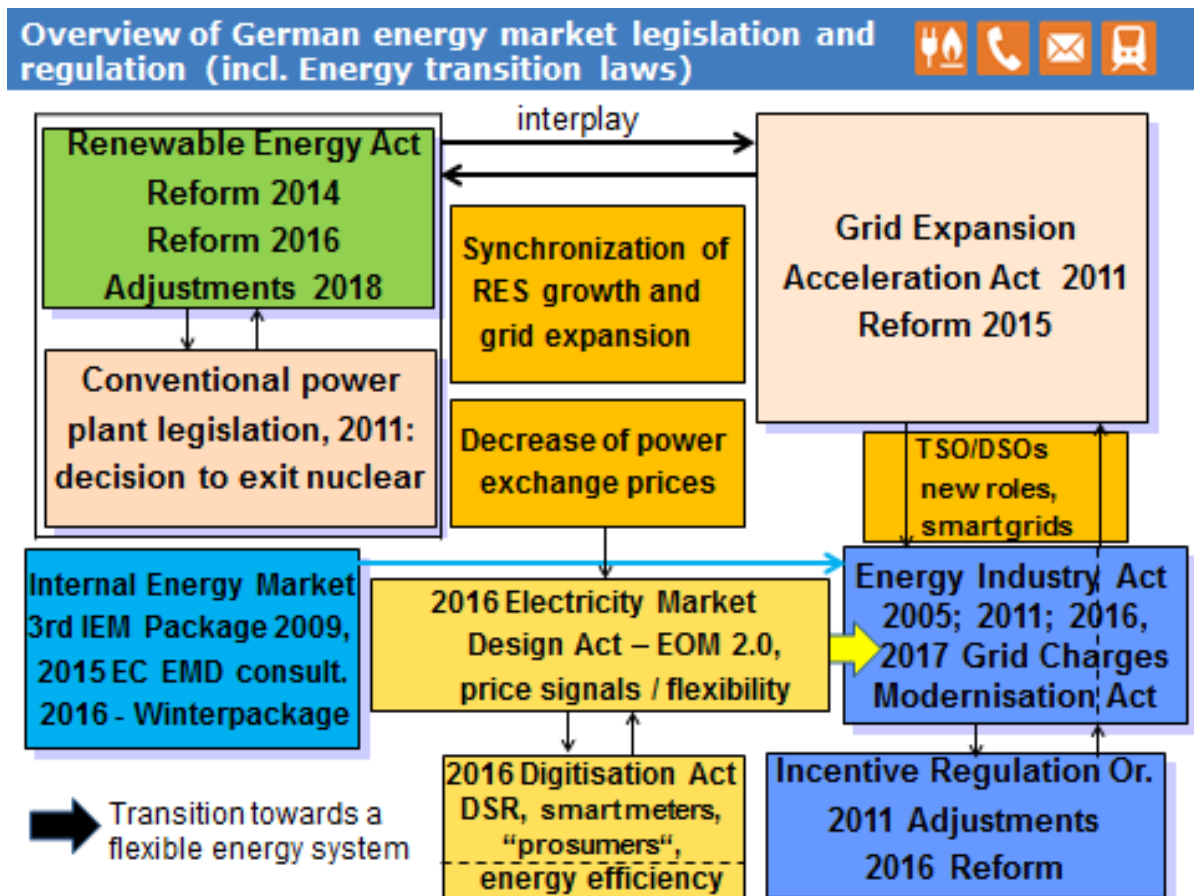


Fig. 33 Overview of German energy market legislation and regulation (incl. energy transition laws).

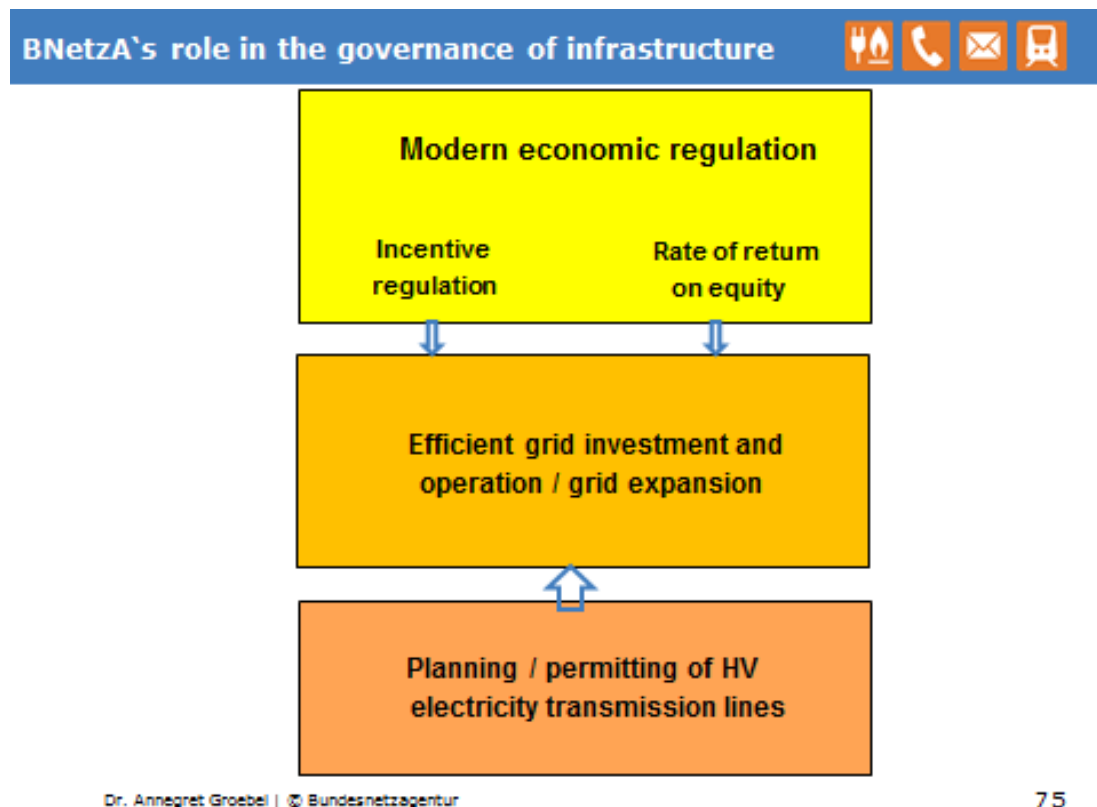
some resistance of citizens stemming mainly from issues of public acceptance of grid expansion (mainly HV transmission lines), but also higher than expected costs (increasing RES surcharge until 2018, cf. Ref. [3] Monitoring Report 2018, Fig. 32).

So while the changes to the Energy Industry Act and the Renewable Energy Act of July 2016 started to have the intended effects, i.e. synchronization of (the speed of) grid expansion which was slowed down by the 2015 amendment of the Grid Expansion Acceleration Act foreseeing that underground cabling was the default solution (thus reversing the burden of proof) and RES growth, we still have a long way to go. It can be said that the *Energiewende* is at a critical point in the sense that the perception seems less positive than the actual progress. For this reason, the Government adopted on 12th December 2018 an amended Grid Expansion Acceleration Act (NABEG 2.0) which is intended to

reduce the bureaucracy and simplify the planning and approval procedure (to be adopted in the first half of 2019). Fig. 33 provides an overview of the German *Energiewende* legislation and regulation.

5. Conclusions

In the chapters 2 to 4 the main responsibilities of BNetzA in the governance of electricity infrastructure were described. BNetzA has the traditional regulatory instruments of setting grid charges and the rate of return on equity which it uses in a modern way, i.e. the grid charges are based on the incentive regulation and equally the rate of return on equity is set following the requirement of ensuring an efficient investment financed efficiently. Since 2011 BNetzA is also responsible for the planning and permitting of HV electricity transmission lines in order to ensure a speedy and efficient grid expansion to integrate an




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Fig. 34 BNetzA's role in the governance of infrastructure.

The *Energiewende* – Key Messages


- **No change of direction** – the “*Energiewende*” is the project of the Government who committed in the coalition agreement 2013/2017 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**

Fig. 35 The *Energiewende* — key messages.

State of play – 2018


- RES grew faster than expected (in 2017 already around one third of gross electricity production stems from RES), but high costs for subsidies led to an increase in the RES surcharge (cov. diff. betw. RES support – wholesale price)
- Grid expansion is lagging behind causing congestion, thus costs increase: costs for redispatch and feed-in management increase to manage grid congestion, (faster) investment for grid expansion increases network charges (inspite of incentive regulation with a revenue cap)
- Mismatch between RES growth and grid expansion requires action to **synchronise** both and manage costs
- Reform of the Renewable Energy Act 2016: change towards tendering: successful, strike price of RES auctions run by BNetzA in 2017 significantly lower than administratively set price (shows that RES are competitive)
- Regulation of Grid Expansion Areas, i.e. allow RES growth only where the grid is ready (already or soon) 30.12.2018 2


Fig. 36 State of play — 2018.

Considerations regarding future regulation


- Increasing share of **RES** to reach **climate targets** is inevitable, but creates new challenges both for the grid (new dimensioning/restructuring due to decentralised / distant generation) and **RES grid and market integration**
- more interaction between the generation level and the grid requires a more **flexible** energy system
- More **flexibility** requires **adaptive/dynamic regulation** using a **market-based approach** to reflect the **closer interaction** between the generation level and the grid as well as the supply/retail side (DSR, prosumers etc.)
- Define roles of all players and rules **ex-ante** to ensure a level playing field so that market mechanisms can work and send the efficient price signal (**EOM**) so that the right mixture of technologies and flexibility solutions can develop instead of acting ex-post as „repair regulation (over-steering)“
- Conclusion: „**smart**“ **regulatory oversight** needed with a **market-based holistic customer-centric approach** 16

Fig. 37 Considerations regarding future regulation.

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

Fig. 38 Challenges and tasks (1).

Challenges and tasks (2)




Regulatory targets and tasks of the regulator

- 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 to cope with an increasing share of RES!
- This comes at a price, but it should still be done in an efficient manner, thus BNetzA uses the 3 instruments:
 - incentive regulation (prevent over-/underinvestment),
 - determination of the rate of return on equity (prevent over-capitalization and
 - its role in planning/permitting of the HV electricity grid to ensure they best serve the purpose and fit with each other
- **Liberalization** is a high achievement. Prior accomplishments in liberalization must not be compromised. Measures to restrict competition should be avoided: **market based approach!**


Bundesnetzagentur considers itself a promoter of and a contributor to the energy transition and has a broader role!

Fig. 39 Challenges and tasks (2).

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





Fig. 40 Changing role of the regulator.

Conclusions (1)


- 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 **EU Internal Energy Market** to realize cross-border benefits (market coupling, NC) and overall security of supply: **CEP**
- Develop **smart markets** providing the right price signals to cope with **increased complexity** of the energy system based on **competition** developing towards a **customer-centric model**

Fig. 41 Conclusions (1).

Conclusions (2)

- Renewables require a more **flexible** energy system, which is best achieved by a more **market-based** approach as achieved with the reform of the RES Act: more **tendering**!
- Define roles of all players and rules **ex-ante** to ensure a level playing field so that market mechanisms can work and send the efficient price signal (EOM)
- In the short run no capacity mechanism is needed, there are only regional imbalances but overall overcapacities, thus the security of supply is not in danger (no market failure), development unclear for the middle and long term
- The short term issues can be dealt with by contracting reserve capacity and blocking retiring of power plants considered system-relevant
- Germany's *Energiewende* is a test bed for t. transformation of the energy system enabling the integration of increasing shares of RES and hopefully lessons can be learnt to avoid our mistakes!

Fig. 42 Conclusions (2).

increasing share of RES into the grid and the market. BNetzA uses these three instruments to ensure an efficient roll-out of the additional grid capacity necessary to integrate an increasing share of RES. This is shown in Fig. 34.

The *Energiewende* changed the energy policy of Germany tremendously. In July 2011 the decision was taken to exit nuclear energy by 2022 and to reach a share of RES of the gross electricity consumption of 80% by 2050. As a consequence of the *Energiewende* BNetzA got new responsibilities and thus the scope of its activities was enlarged. In a flexible energy system the role of the regulator becomes broader.

In July 2016 a second legislative package to set the *Energiewende* on track was adopted. This package foresaw among other things a change with regard to the support of RES which grew faster than expected — BNetzA was given the task to tender RES which reduced the costs of support of RES considerably. At the same time the grid expansion was slower than expected and thus several measures were taken to align and synchronise the grid expansion with the

RES growth. Also, the so called “*Energy-only-market*” (EOM) was confirmed as the best way to deal with volatile RES is a market based approach. Consequently the energy system is changing and more flexibility needs to be inserted in the system. BNetzA has published a discussion paper entitled “Flexibility in the electricity system” [4] dealing with all aspects of flexibility in April 2017.¹⁰ The key messages as well as the state of play and considerations for a future regulation are shown in Figs. 35-37.

Summing up we can say that the challenges for the regulator remain (Figs. 38 and 39) and that we see a changing role of the regulator (Fig. 40).

The two figures (Figs. 41 and 42) show the overall conclusions.

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- [1] BNetzA. 2015. *Evaluation Report on the Incentive Regulation Scheme*, available at

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- [4] BNetzA. 2017. Flexibility in the Electricity System, available at https://www.bundesnetzagentur.de/EN/Areas/Energy/Companies/GridDevelopment/Flexibility/Flexibility_node.html.