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BNetzA's role in energy infrastructure regulation and planning/permitting

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Club des Régulateurs – Université Paris-Dauphine, 10th April 2018

Agenda

- Overview on incentive regulation
- Determination of the rate of return on equity
- BNetzA‘s role in planning and permitting of high-voltage grids
- Conclusions

Incentive regulation in Germany

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 were made to the current scheme for DSOs as of the 3rd regulatory period**

   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)

Rationale of incentive regulation

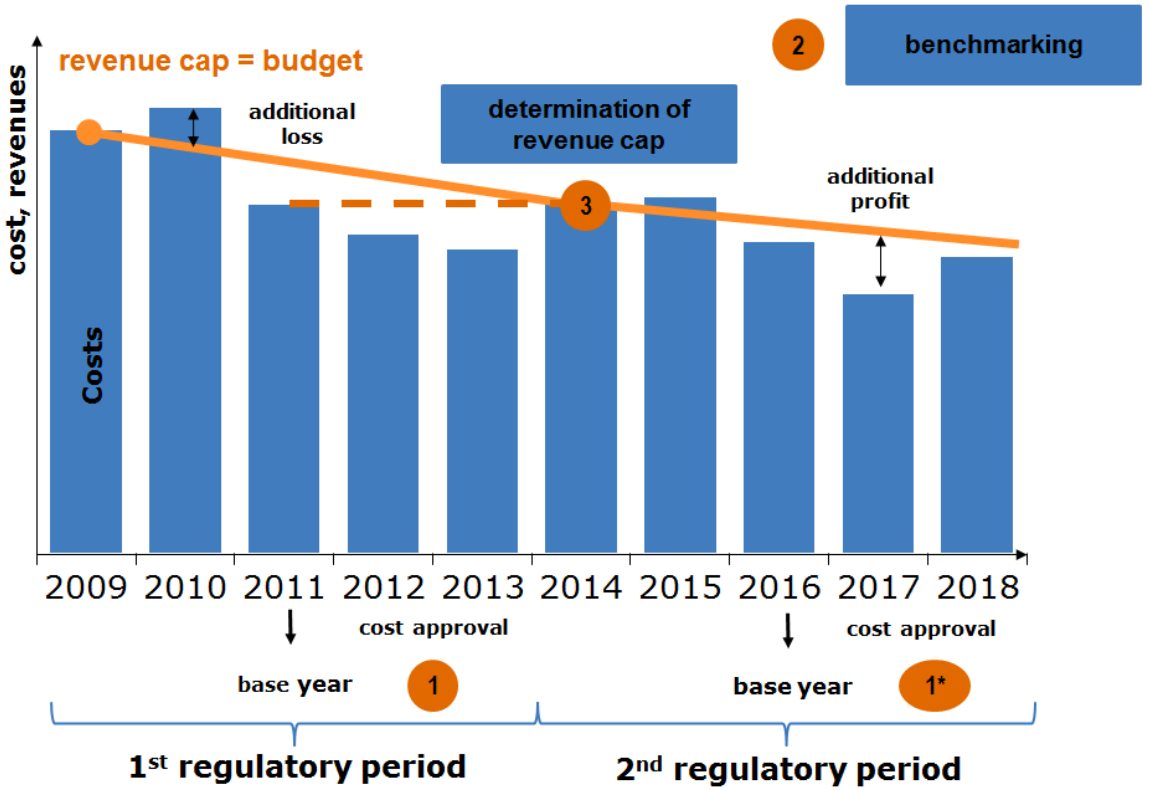
- Incentive Regulation in Germany: **TOTEX** approach
- Sect. 21a EnWG and Incentive Regulation Ordinance (ARegV)
- Set two regulatory periods with a duration of 5 years each (first regulatory period for gas operators to last 4 years only) starting in 2009, thus providing for a
- Longer planning horizon for operators: 5 years regulatory period
- Decouples revenues from costs:
  More efficient companies are granted higher returns as they can keep the profits until end of regulatory period when getting more efficient, less efficient companies receive lower returns
- Regulator seeks to incentivise network operators to identify further economies and increase profits,
  customers also benefit from efficiency increase
- Revenue "cap" set for each calendar year of the regulatory period (thus "**revenue path**") based on an efficiency benchmark
- Revenue cap ≠ price cap:
  Avoids giving network operators an incentive to increase sales

Overview on the German incentive regulation

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

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

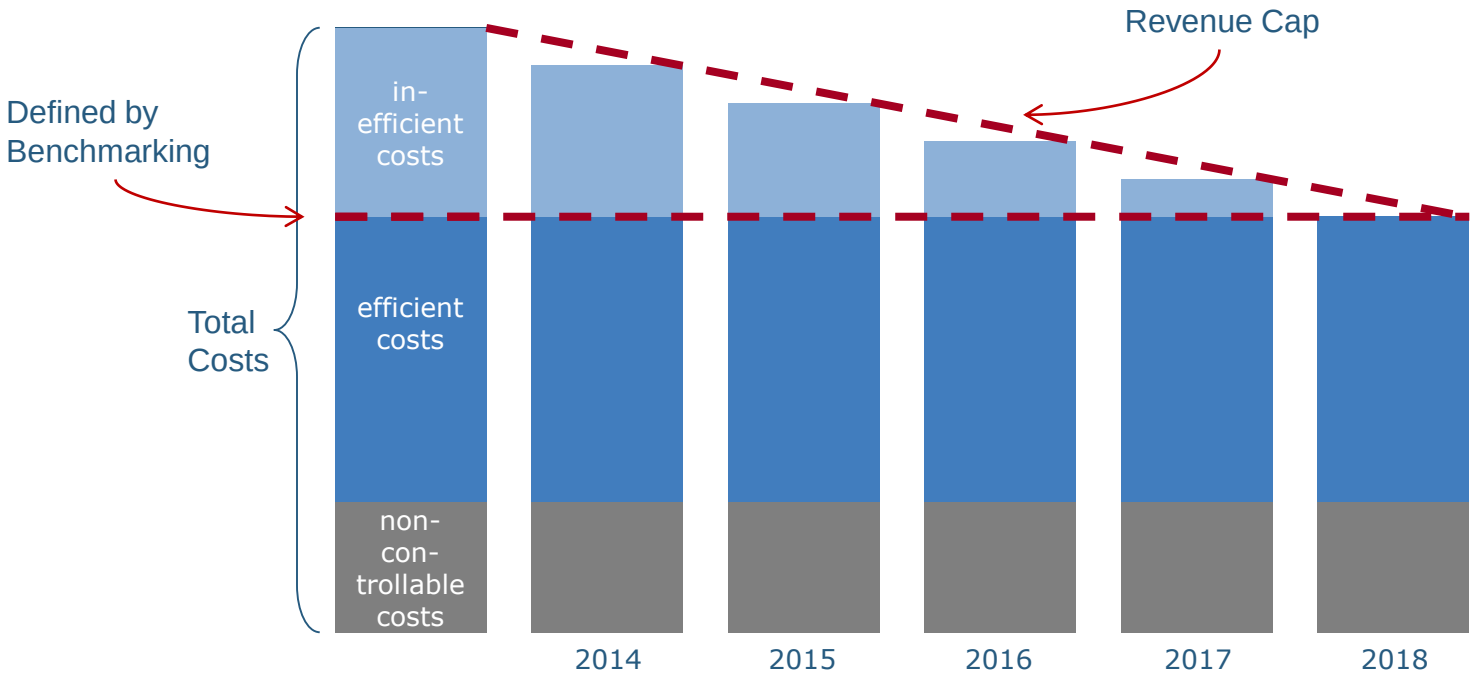
Implementation
Benchmarking:
- compare efficiency among network operators
- efficiency target (catch up to best in class)



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)

Incentive Regulation Procedure

- Initial Revenue Cap defined by individual total costs
  - Consideration of non-controllable costs
- Benchmark to determine individual efficient costs
- Target defined by individual efficient costs (& X-gen)
  - Obligation to cut inefficient costs over the regulatory period



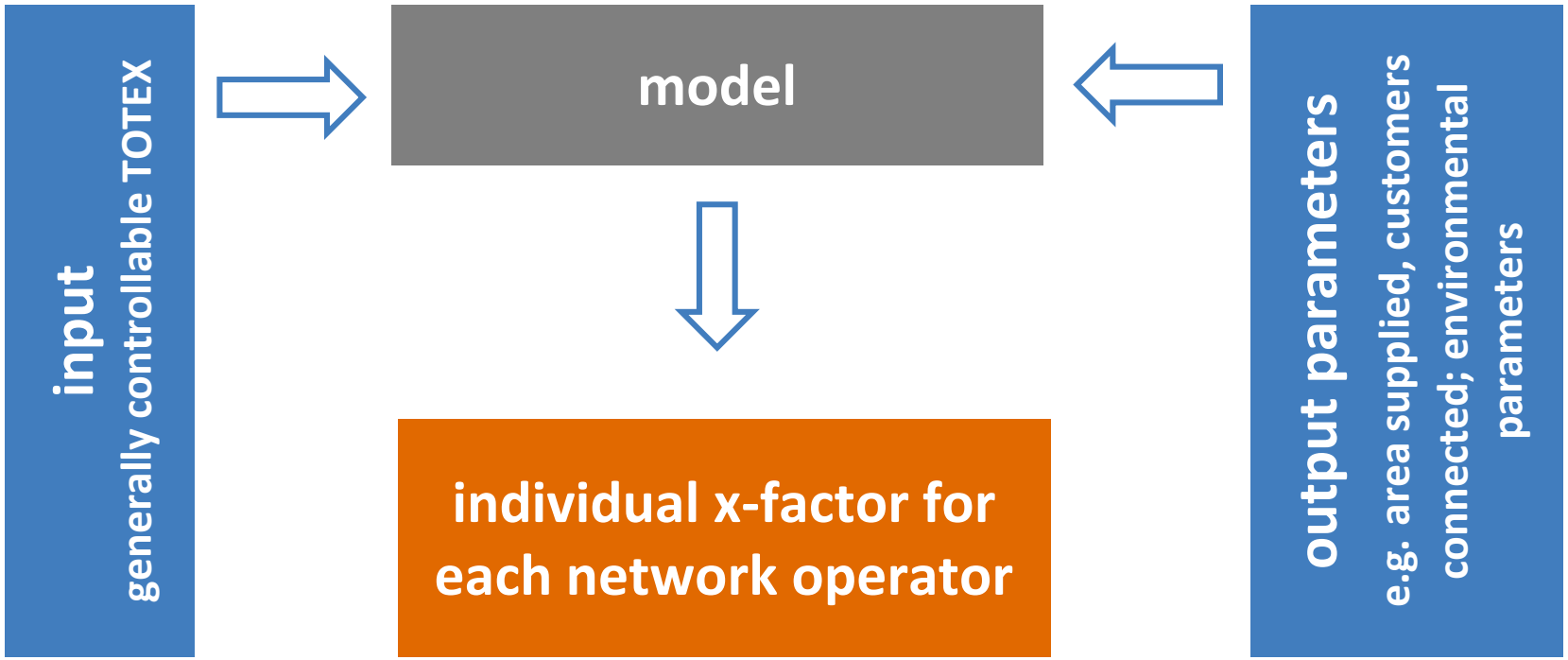
Main features of German regime (1)

- Objective: enhance the monopolist's focus on **efficiency** and **quality of supply** and provide for an **adequate environment for efficient investment**
- **Revenue-cap-regulation (not a price cap) since 2009**
- **No volume risk,** instrument of 'regulatory account' captures significant changes in volumes transported
- Regulatory periods of **five years**
- **Rate of return on equity** on capital invested is based on a regulatory decision, determined by the Ruling Chamber 4 based on a transparent and sound methodology following the requirement of efficient financing
- **TOTEX** (CAPEX + OPEX) approach, will be continued for TSOs, reform of incentive regulation for DSOs in 2016
- Incentive regulation **reform** as from 3rd regulatory period with CAPEX true up, efficiency bonus, more transparency

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)

Efficiency Benchmarking: key elements

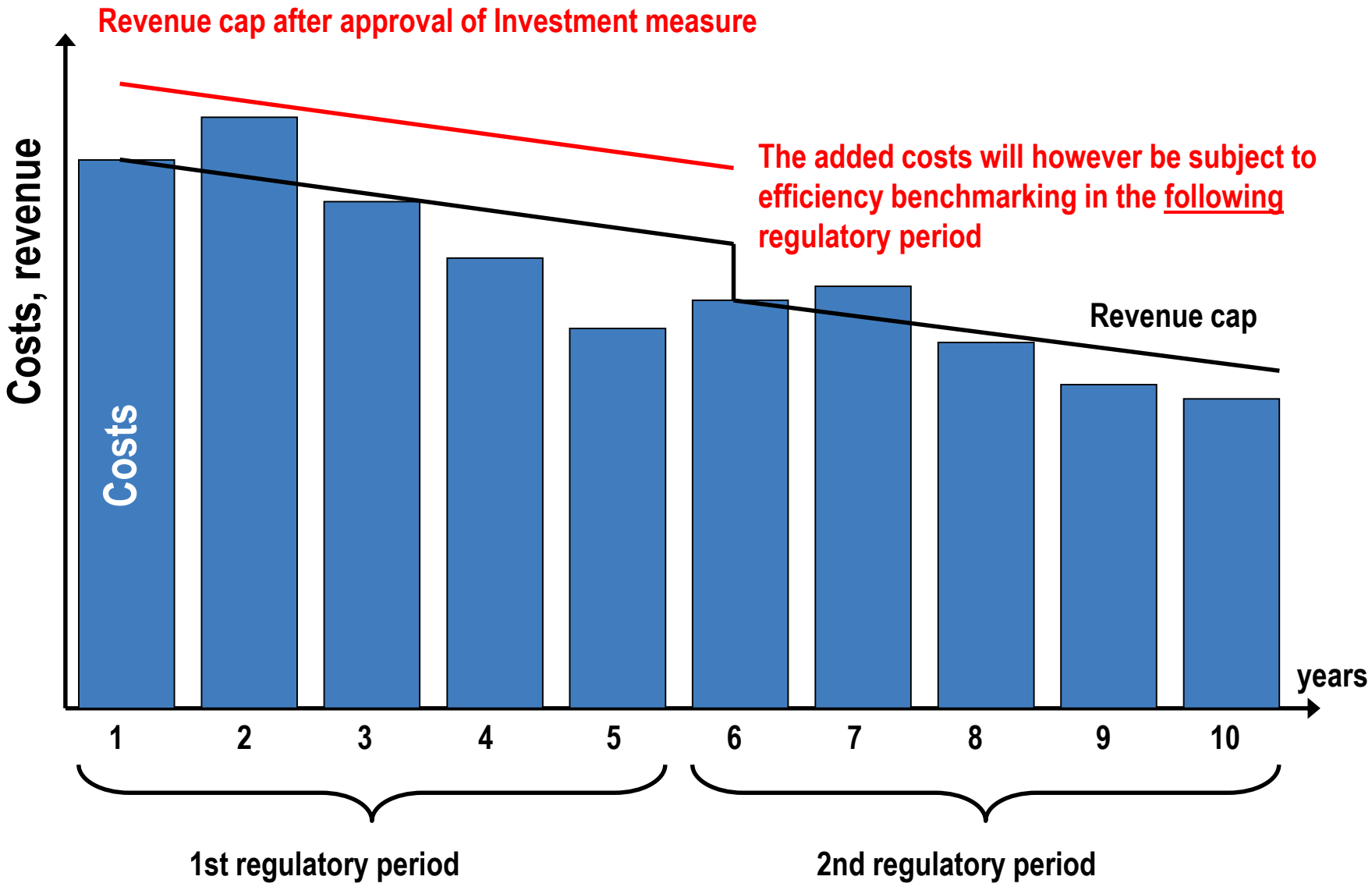


Dealing with new investments

How to account for new investment <u>during</u> 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

Effect of Investment measures on revenue cap



BNetzA evaluation of incentive regulation (1)

Main findings in BNetzA‘s Evaluation Report of the German incentive regulation:

- Report (acc. to sect. 33) published in January 2015
- Regulation has not had any negative impact on the investment activity of network operators
- The incentive regulation provides network operators with incentives to operate the network efficiently
- The quality of supply remains high despite the gains achieved in efficiency
- Some adjustments will have to be made to the current scheme:
  - Additional incentives that incentivise network operators to invest in intelligent solutions through an “efficiency-carry-over” or “bonus” for very efficient network operators (DSOs)
  - Making investment conditions more compatible with the *Energiewende*
- Annual adaption of the cost of capital dismissed as it would give a wrong incentive towards capital-intensive grid expansion strategies

Incentive Regulation – Evaluation (2)

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

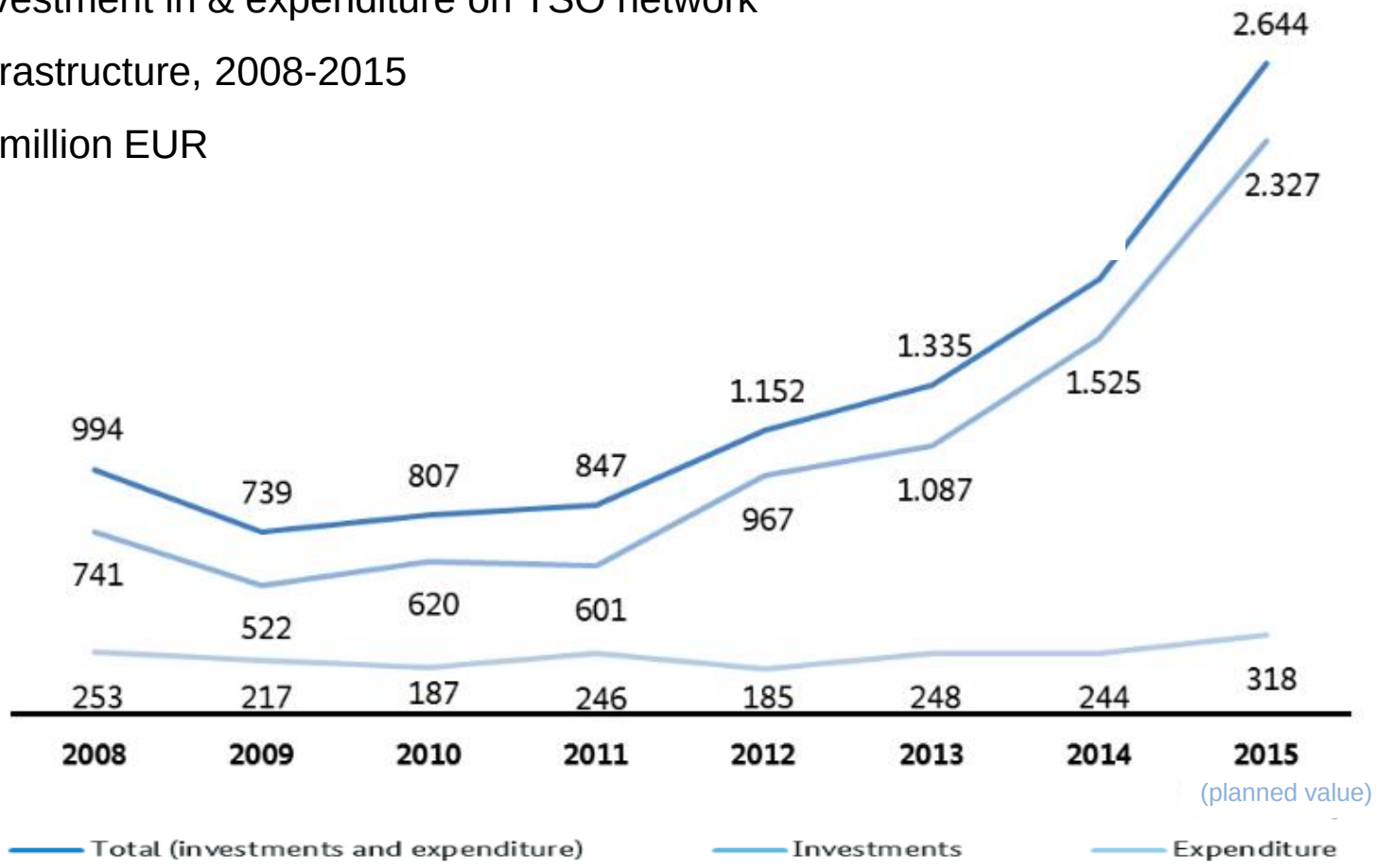
- An optimal combination of innovative planning concepts and using intelligent technologies can half the investment necessary and reduce average annual supplementary costs by up to 20%.

- Political discussion focused nevertheless on the re-introduction of a cost-of-service regulation for capital costs, at least for DSOs
- However, the energy transition („*Energiewende*“) requires incentives for a **cost-optimal network development** as the incentive regulation so far was able to provide

Important increase in investments and expenditures for TSO network

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

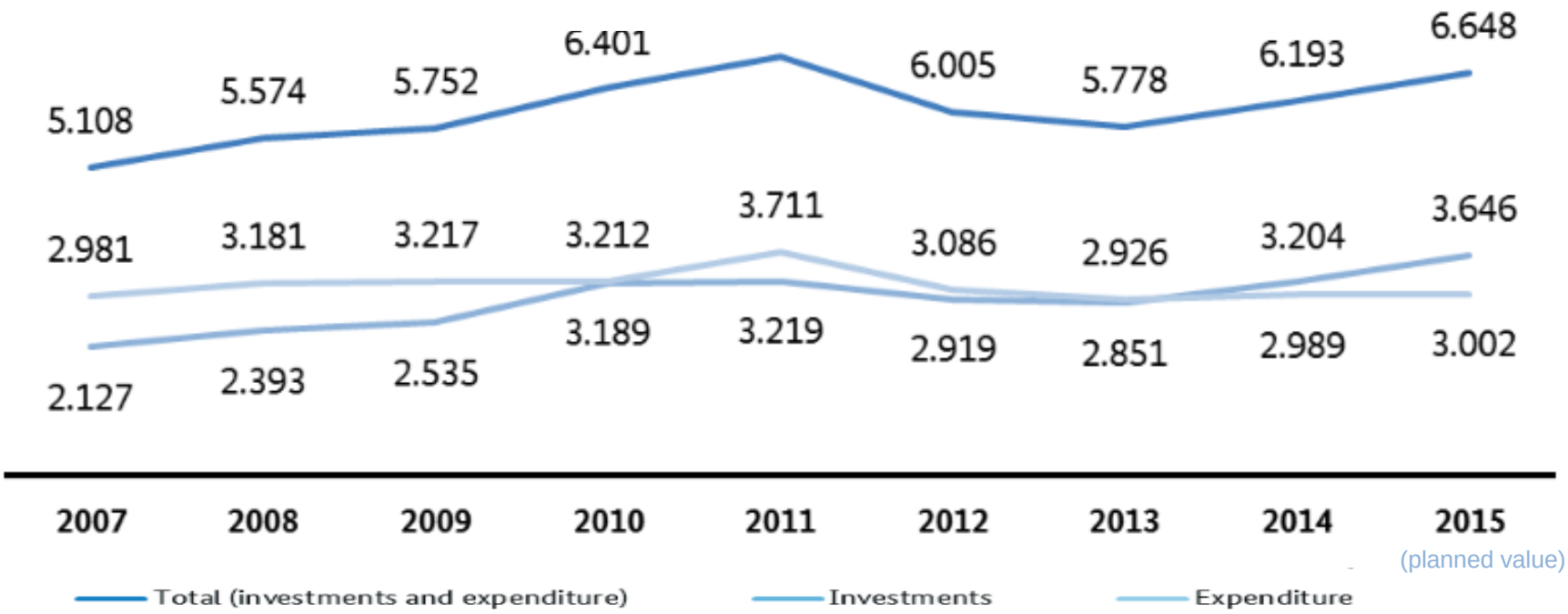
in million EUR



Slight increase in investments a. expenditures for DSO network infrastructure

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

in million EUR



Incentive regulation reform 2016: Main changes for DSOs as of 3rd regulatory period

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

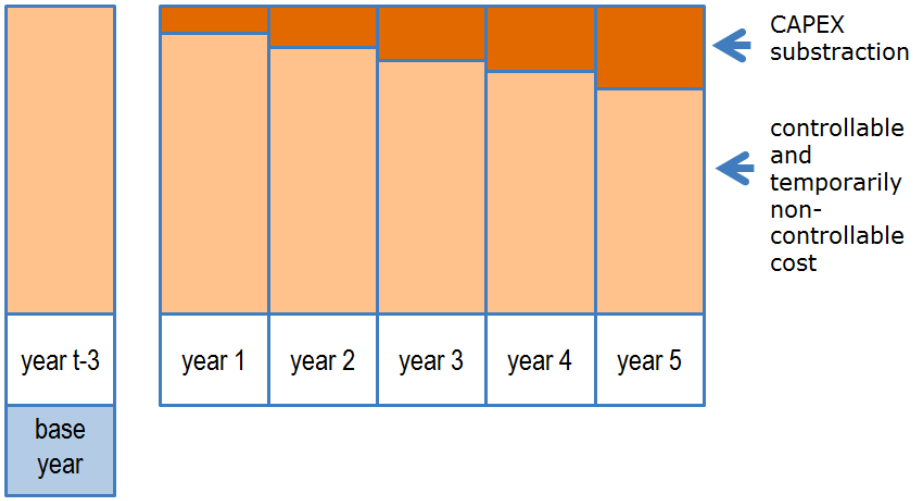
Change from budgetary approach to **CAPEX true up** (based on actual investments and depreciation)

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

Expected Result:

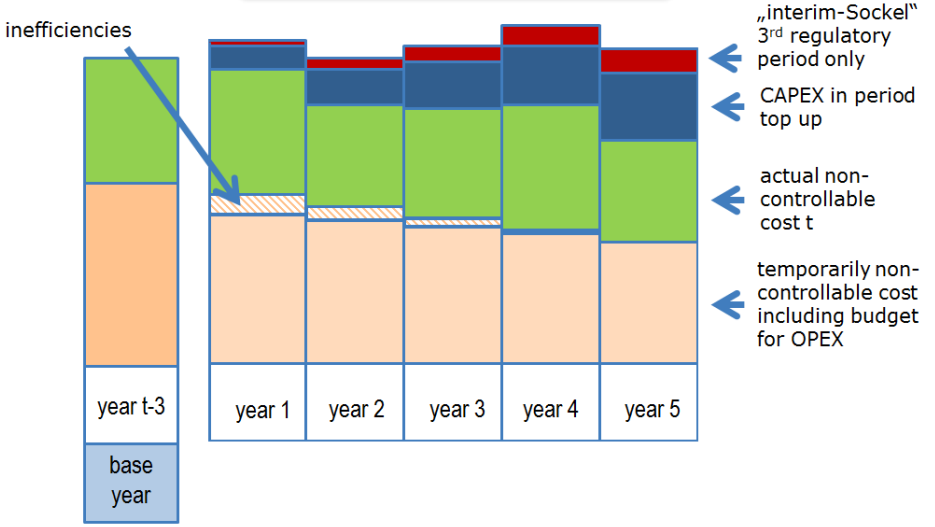
- Reduced inefficiencies within 5 years
- More transparency

CAPEX Substraction



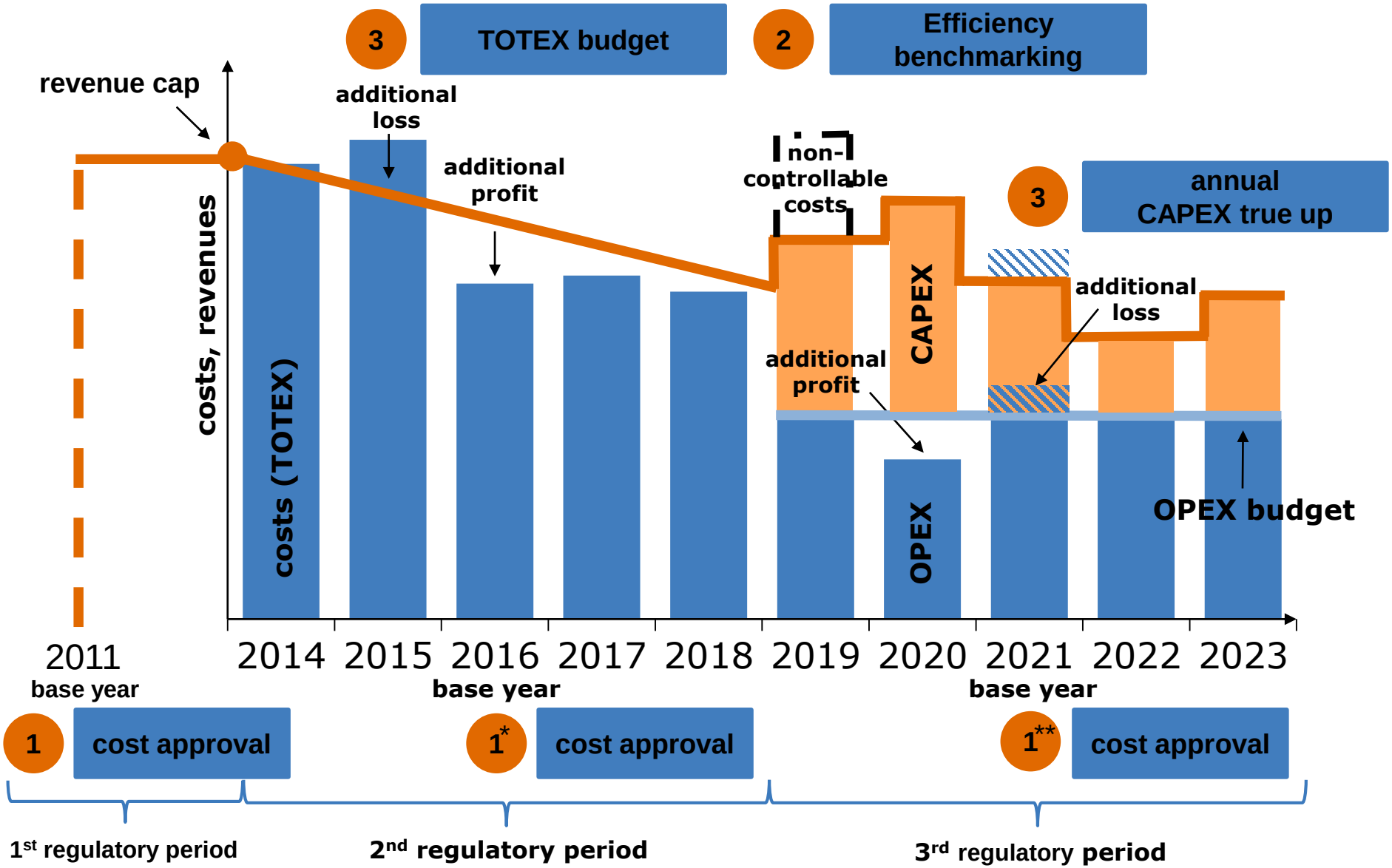
Decreasing CAPEX are determined ex ante, prior to the regulatory period; actual reduction of CAPEX reflected in revenue cap.

CAPEX in period top-up



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

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



Investments in electricity transmission: Stable regulatory framework

- No changes in the incentive regulation scheme for TSOs (electricity/gas):
  - keeping budgetary approach (and inherent benefits) and investment measure to deal with investments during the regulatory period (IM)
  - IM: costs are included in the revenue cap in the year of activation and are temporarily exempted from efficiency benchmarking
  - only adjustment regarding IM: deduction of project specific share for replacement from allowed IM;
  - no adjustments for IM already approved

Assessment of 2016 Reform

- TOTEX benchmarking is an established and accepted regulatory tool.
- TOTEX benchmarking and bonus are technologically neutral, but OPEX-CAPEX bias through annual CAPEX true up and certain OPEX classified as non-controllable costs.
- Bias in parameters may disincentivize alternatives to copper (importance of cost driver analysis). Issue increases with increasing smartness and heterogeneity of network operators.
- Methodology is complex and provokes lawsuits.
- Increased transparency is a pivotal asset for all parties involved.

Summary

- Germany uses an incentive regulation regime with a **Revenue Cap**
  - Network operators decide about investment (level and costs)
  - 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

Determination of the rate of return on equity

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

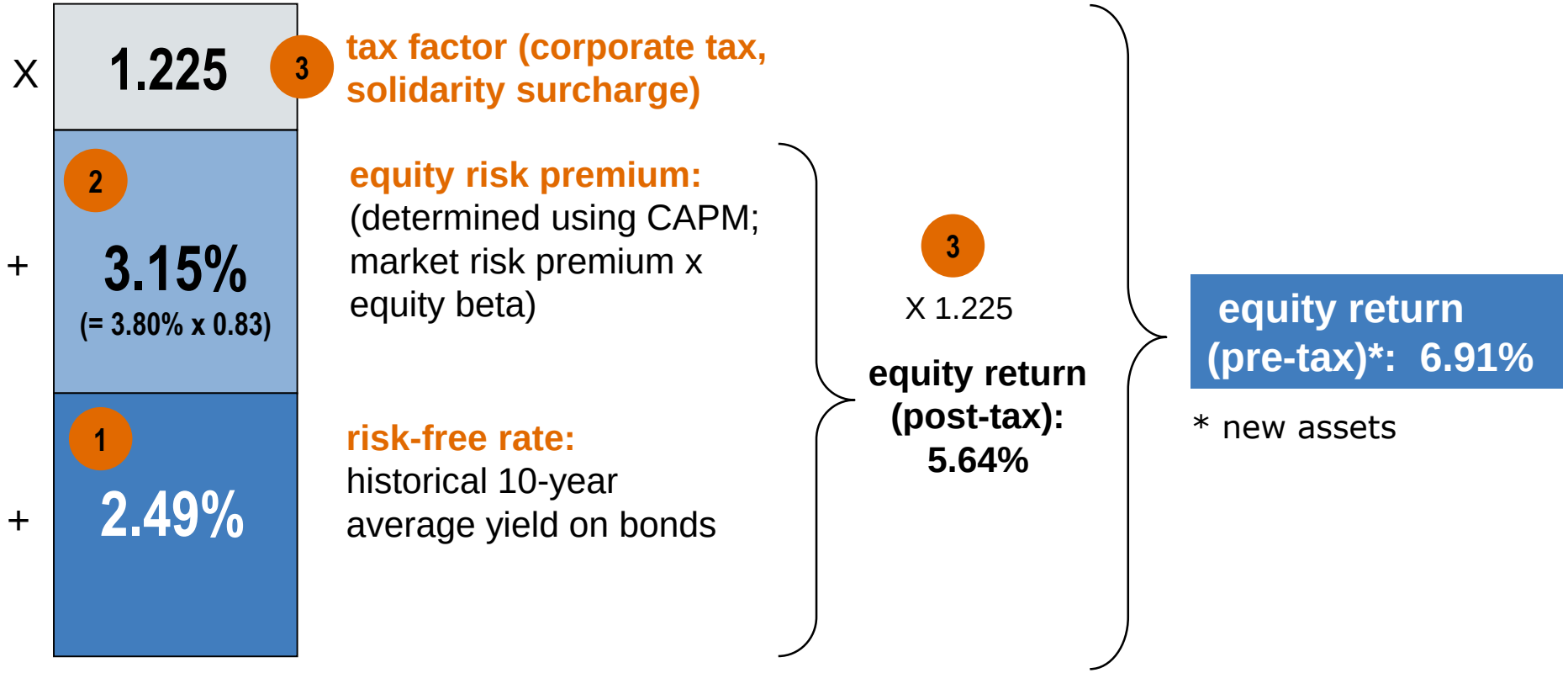
$$R_E = R_F + ß_E * P_M$$

Determination of the rate of return on equity

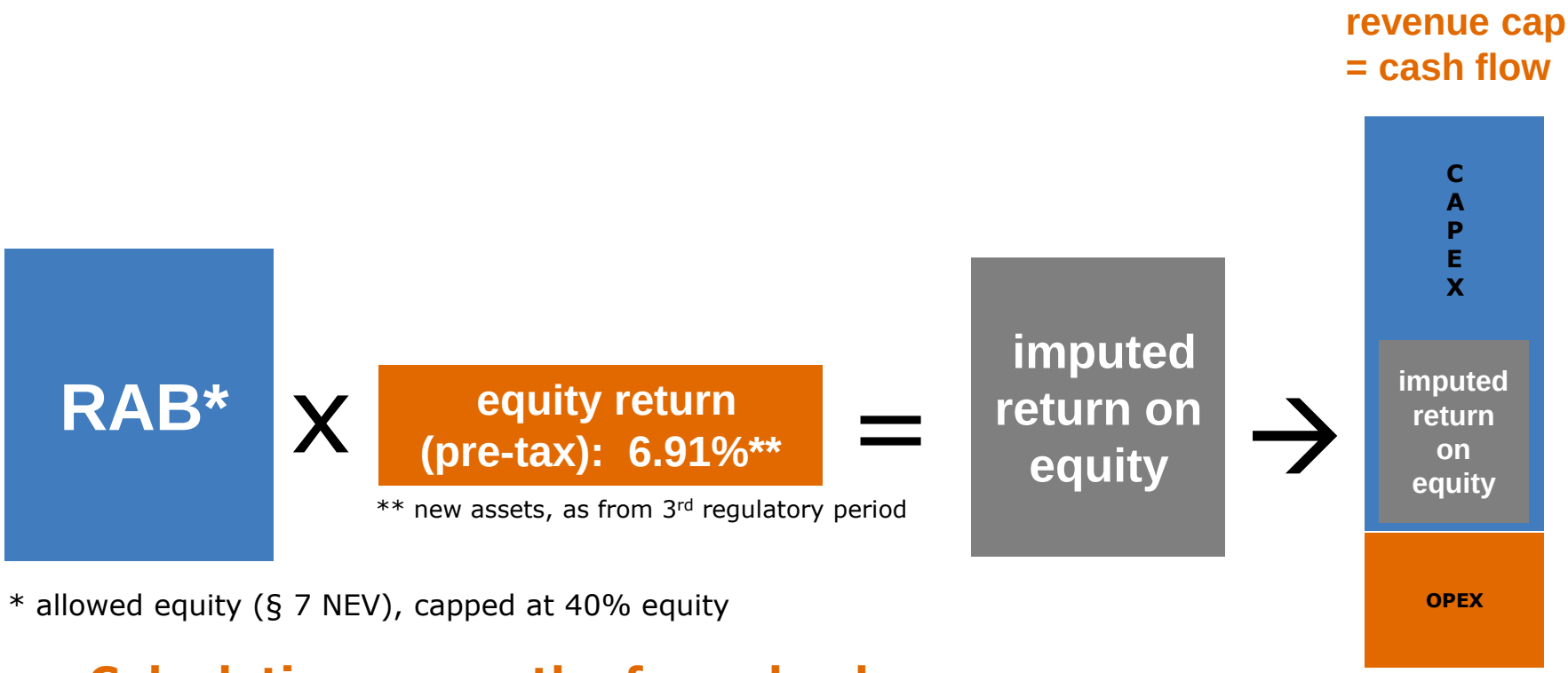
The equity return is determined by the Ruling Chamber 4 using CAP-M

Determination from 05 Oct. 2016 for the 3rd regulatory period.

Determination for electricity and gas networks



What is important to understand?



* allowed equity (§ 7 NEV), capped at 40% equity

Calculation as per the formula above.

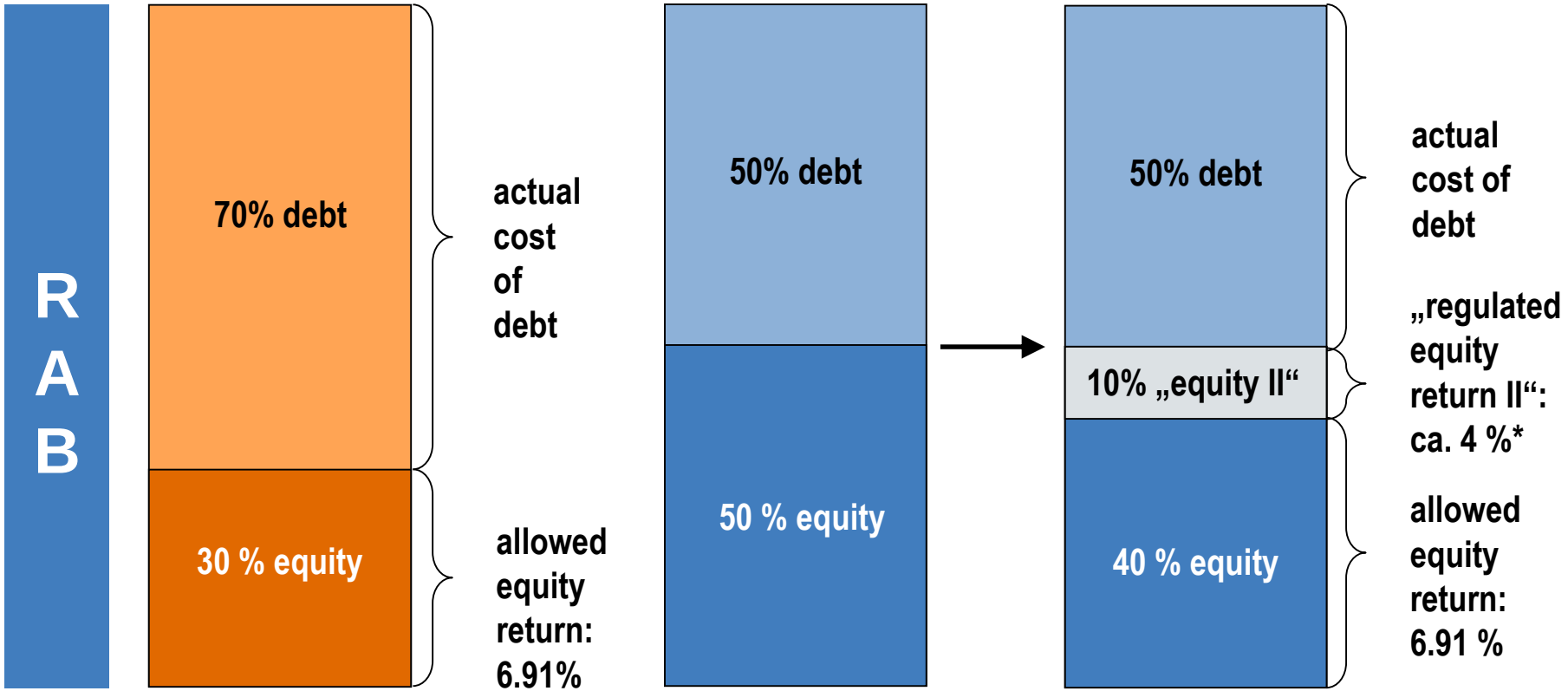
Imputed return on equity is <u>part of the cash flow</u> (revenue cap).

Imputed return on equity does <u>not</u> reflect the actual return on investment! ROI may deviate from equity return (6.91%)!

Treatment of different capital structures (RAB)

Case 1:
RAB with equity ≤ 40 %

Case 2:
RAB with equity > 40 %



* 2nd regulatory period

BNetzA‘s role in planning and permitting of high-voltage grids

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

- **NABEG (from 28 July 2011): Not a regulatory competence!**
  - **NABEG**: Grid Expansion Acceleration Act
  - Increase of renewables (wind and solar energy) requires grid adjustment and expansion
  - Electricity grids must transport more RES
  - Grids must be reinforced and expanded
  - BNetzA must ensure rapid and efficient grid expansion and grid reinforcement (of high voltage electricity grids, national and XB transmission lines)
  - **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 a. develop the network
  - BNetzA approves the grid expansion after evaluation of the necessity thus ensuring efficient investment

Grid expansion: Electricity grid planning process – the 5 steps

annual process

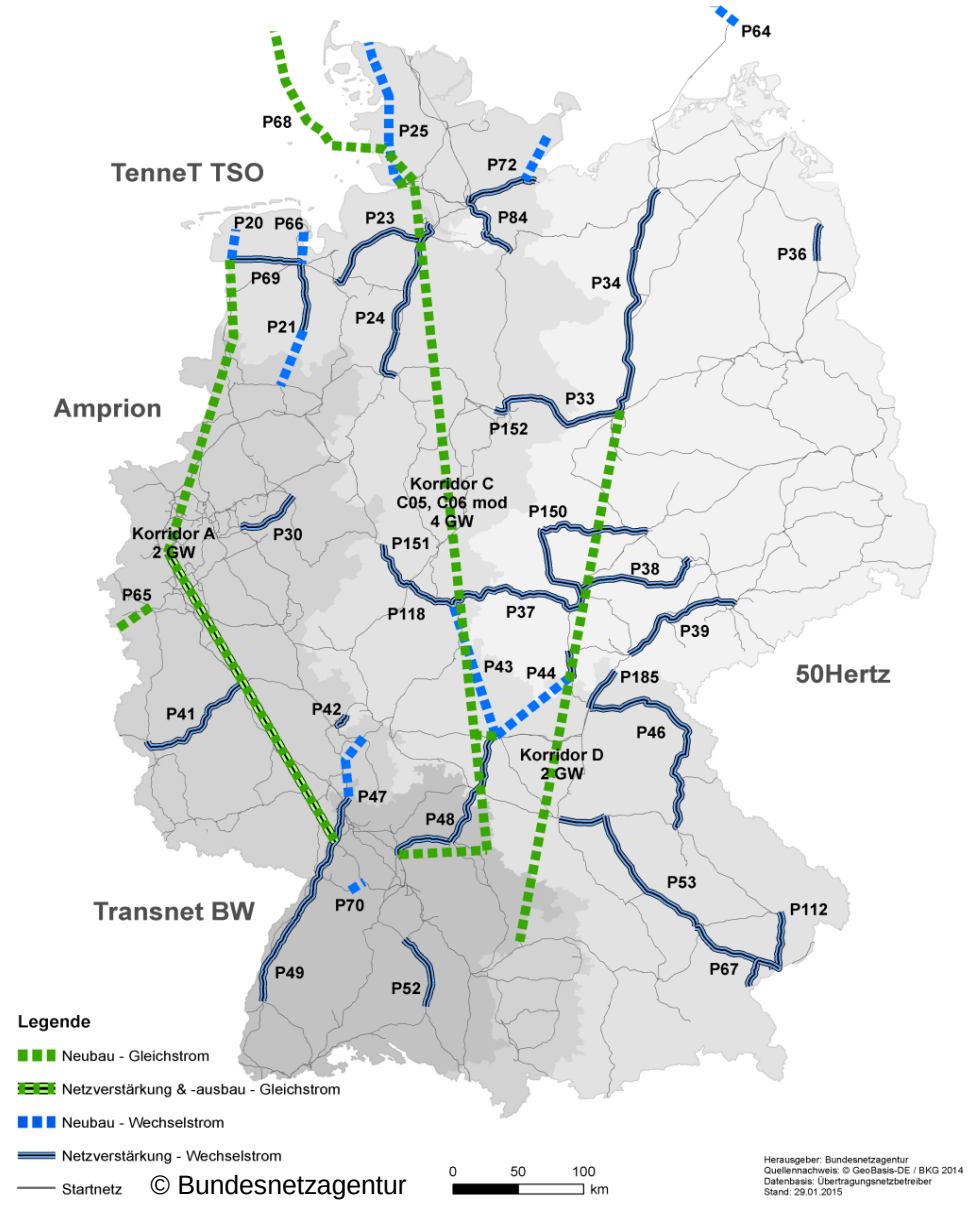
I SCENARIO FRAMEWORK	II REGIONA-LIZATION	III MARKET MODELLING	IV POWER FLOW CALCULATIONS	V GRID EXPANSION ASSESSMENT
scenario A scenario B scenario C (10 years) scenario B (20 years)	regional allocation of generation and consumption	simulation of generation and consumption per hour in each electrical 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

Participation of stakeholders at all stages …

Confirmation of Network Development Plan

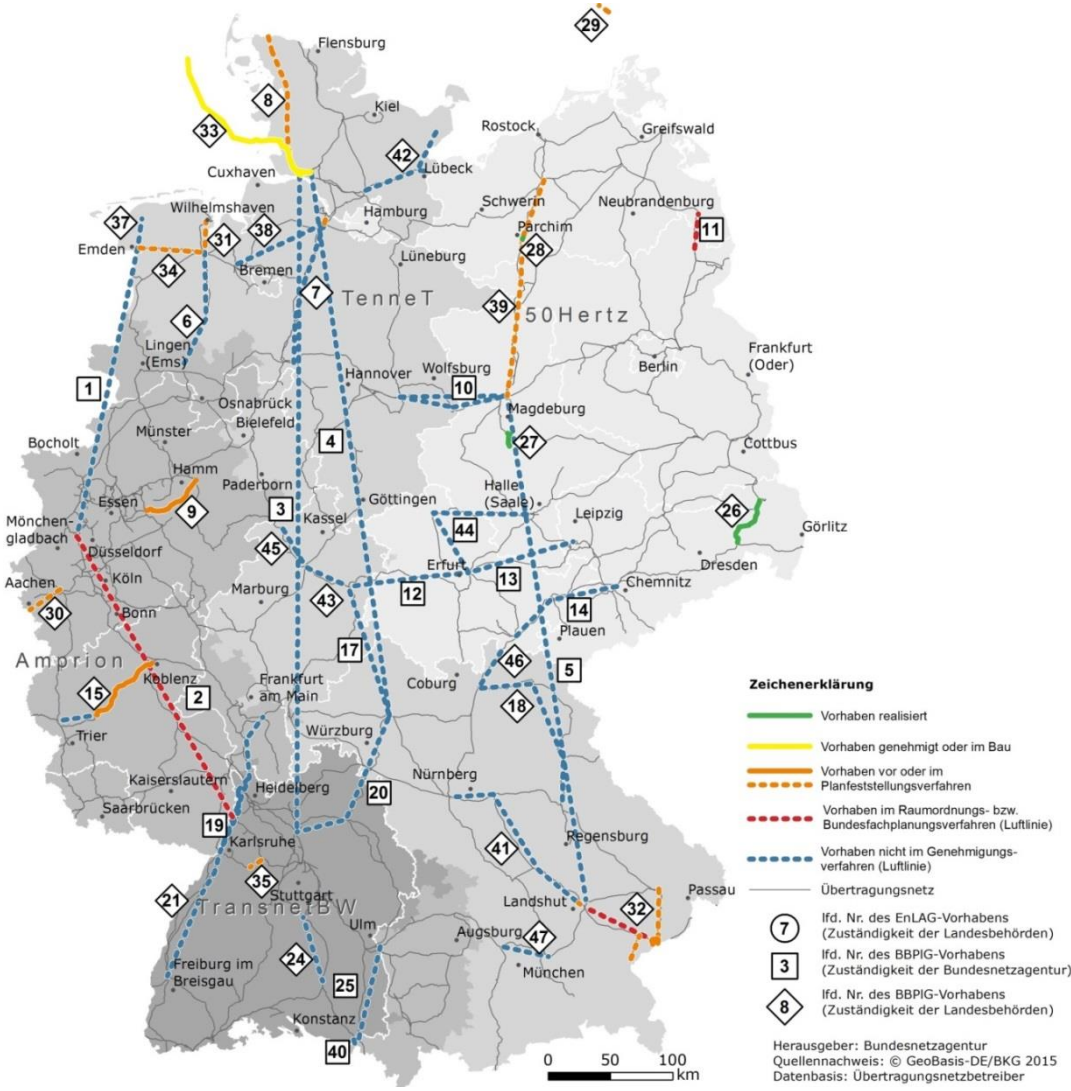
Confirmed NEP 2024 (Scenario B 2024)



- 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

Step 3 – Federal Requirements Plan Act (2015)

- **43 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



Conclusions

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
- Costs of security of supply and network expansion must be limited as far as possible.

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 into 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

Bundesnetzagentur

Questions?
Thank you for your attention!

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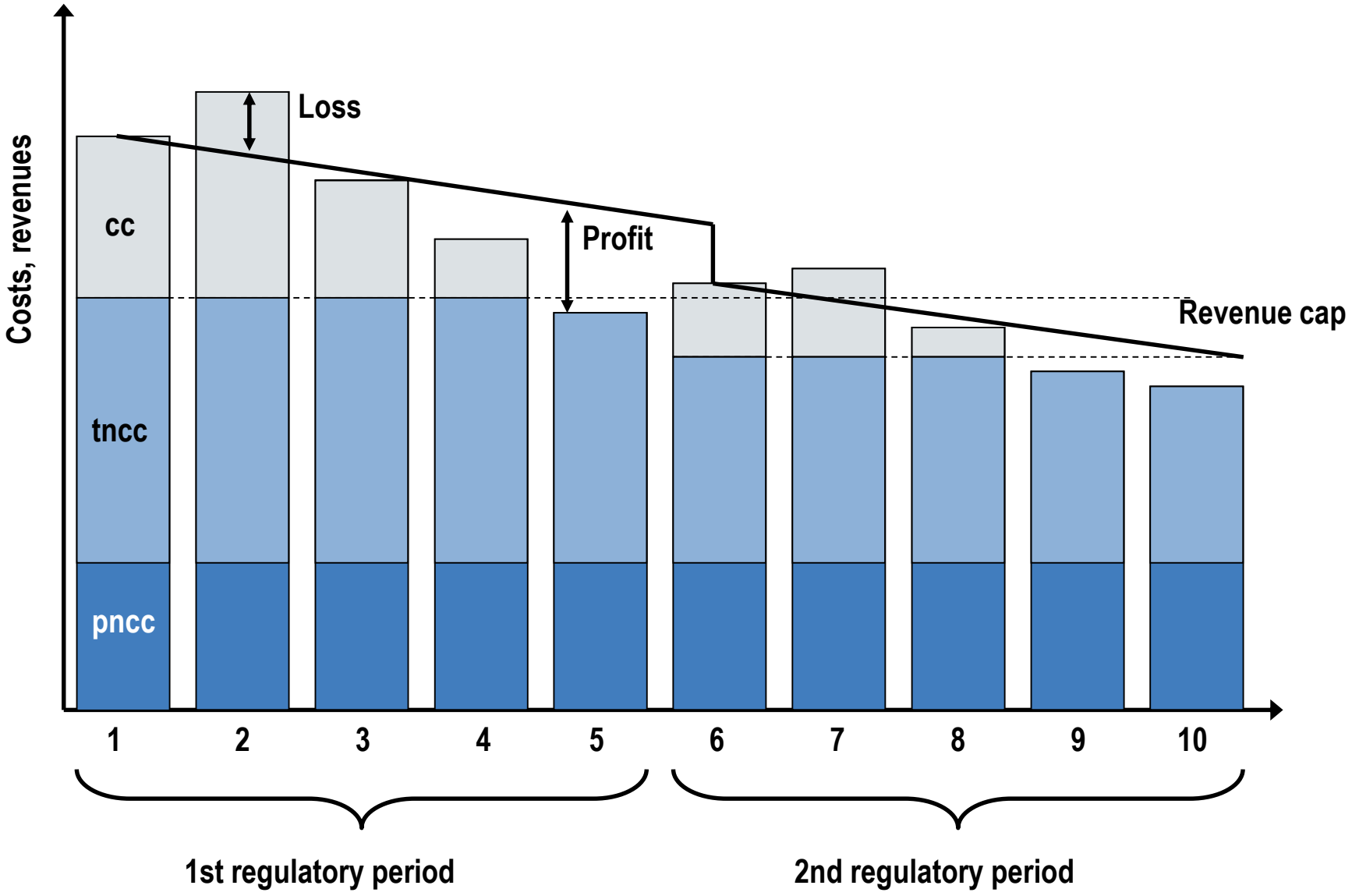
Annex

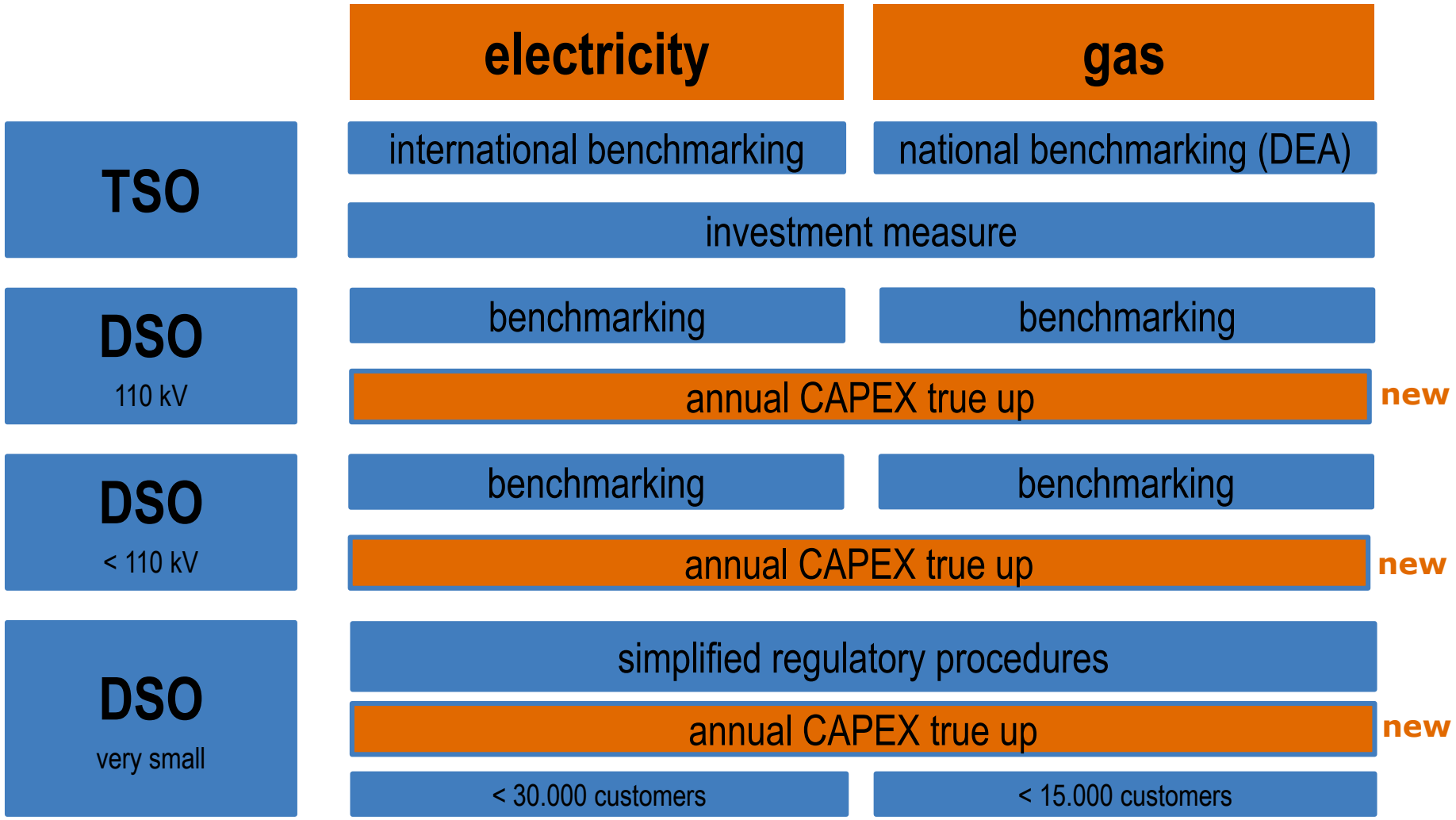
Efficiency targets in incentive regulation (2)



cc: Controllable cost
tncc: Temporarily non-controllable costs
pncc: Permanently non-controllable costs

Sub-types of incentive regulation (changes)

Regulatory provisions for all network operators are the same, with some exceptions:



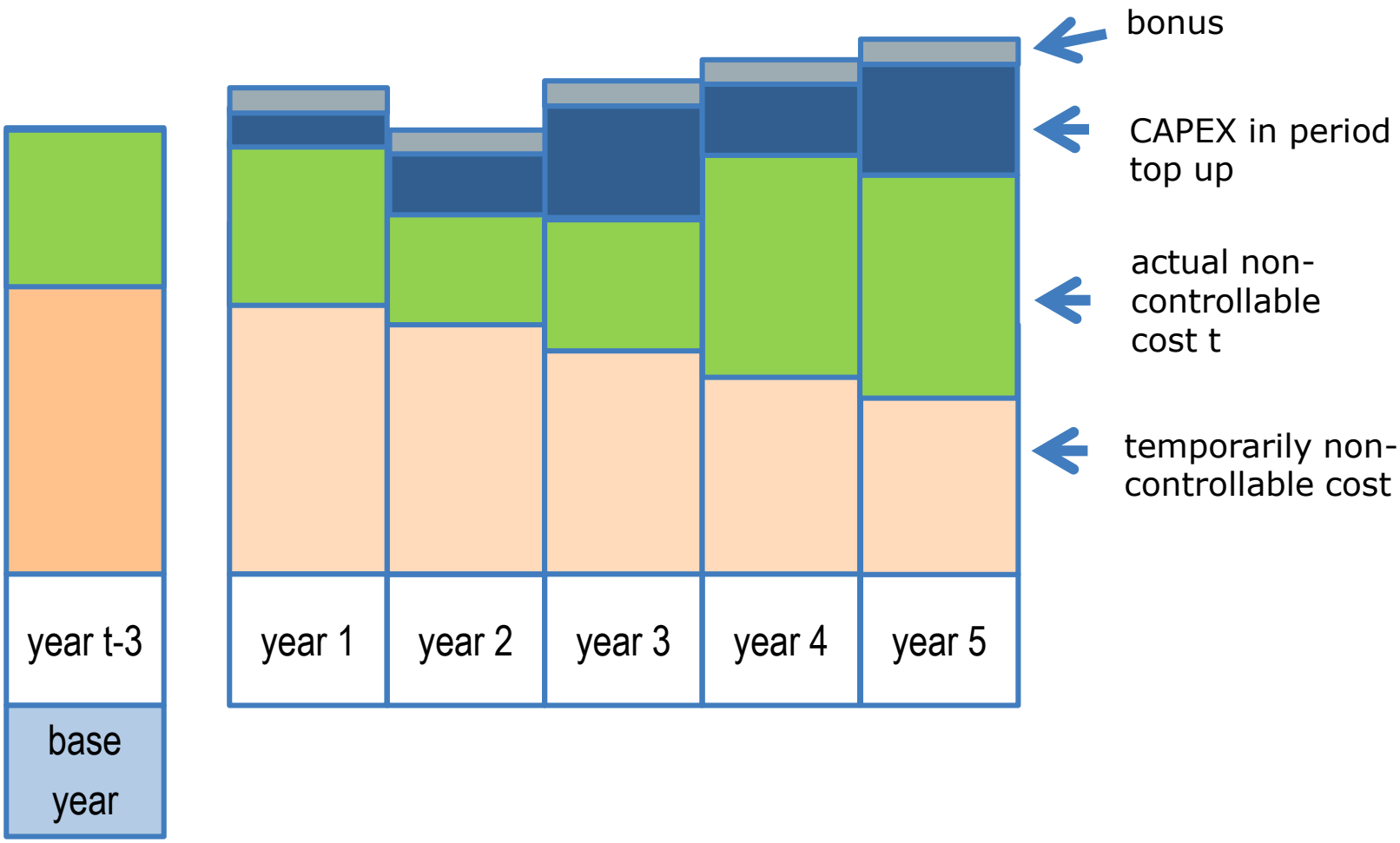
Further changes

- determination of the x-factor
  - no compulsory parameters (cf. § 13)
  - keeping best-of-four (cf. § 12)
  - constant returns to scale (cf. appendix 3)
- efficiency bonus (cf. § 12a)
- more publications/more transparency (cf. § 31)
- changes to effective date for non-wage labour costs (cf. § 11 section 2 sentence 1 number 9)
- changes to regulatory account (cf. § 5)

Link Incentive Regulation Ordinance:
https://www.gesetze-im-internet.de/bundesrecht/aregv/gesamt.pdf

Efficiency bonus

Efficient DSOs my be granted a bonus on the revenue cap. The bonus is distributed equally over the regulatory period.



Transparency

Publication requirements encompass, amongst others:

- yearly revenue cap incl. adjustments (e.g. due to CAPEX true up)
- x-factor, benchmarking parameters
- efficiency bonus
- CAPEX true up (lump sum)
- permanently non controllable costs
- volatile costs
- balance of regulatory account
- KPI on quality of supply

Monitoring and reporting (by BNetzA)

- New monitoring and reportig tasks for BNetzA (cf. § 33)
  - KPI based investment monitoring
  - report on outages < 3 min
  - report and proposals für q-element
  - report on network operators in simplified procedure
  - new evaluation report (2023)

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!

CAPM

The following factors must be taken into account in determining the mark-up to cover entrepreneurial risk specific to network operation:

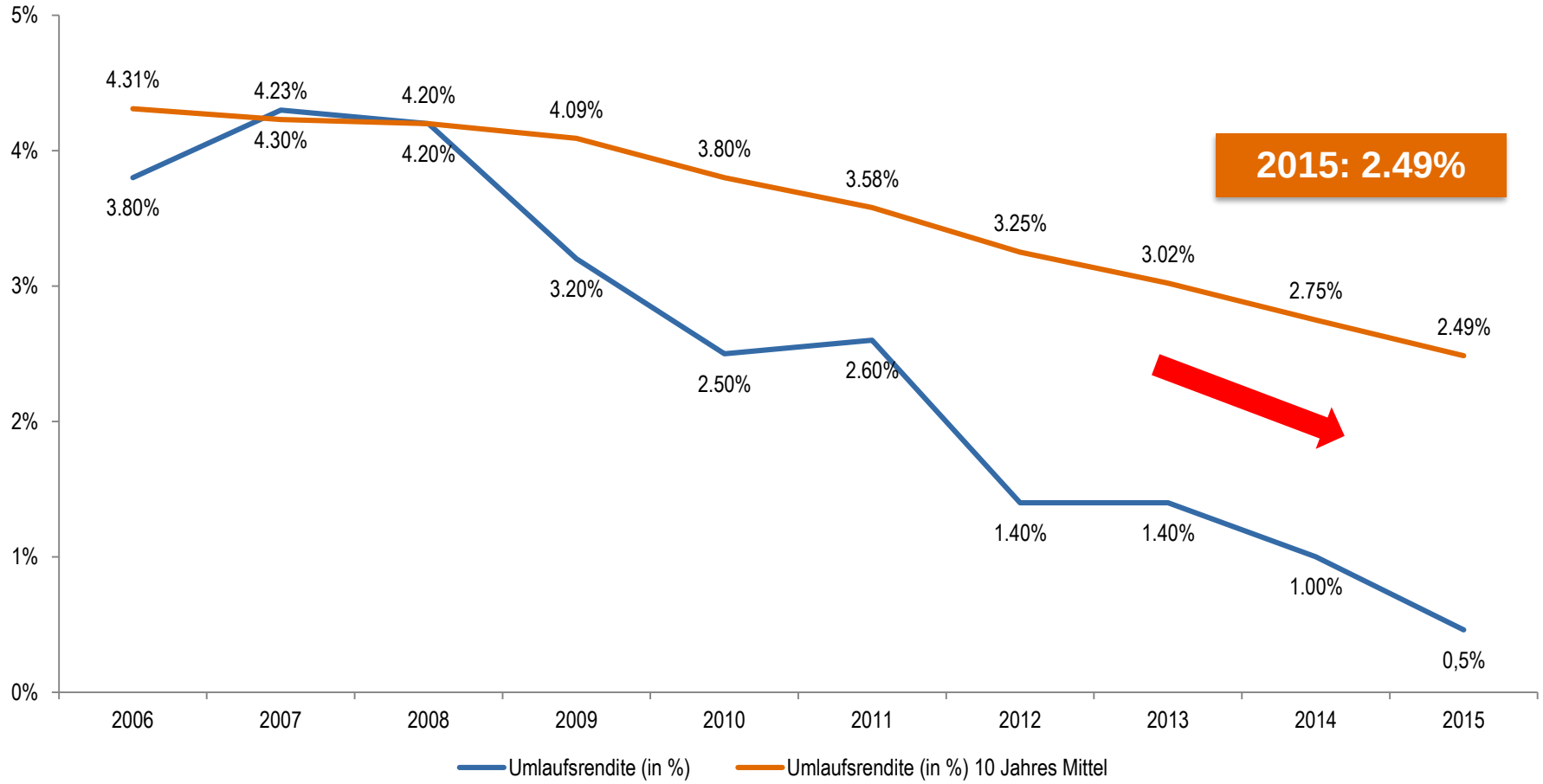
- situation on national and international capital markets and the assessment of network operators in these markets
- average return on the equity of operators of supply networks in foreign markets
- observed and quantifiable entrepreneurial risks

→ Capital Asset Pricing Model (CAPM)

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

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

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