

Power Quality and the Need for Grid Codes - The situation in Germany

Konstantin Staschus, Ph.D., Managing Director
Association of Network Operators, Berlin
(Verband der Netzbetreiber - VDN - e.V. beim VDEW)

PSCC Panel Session August 2005



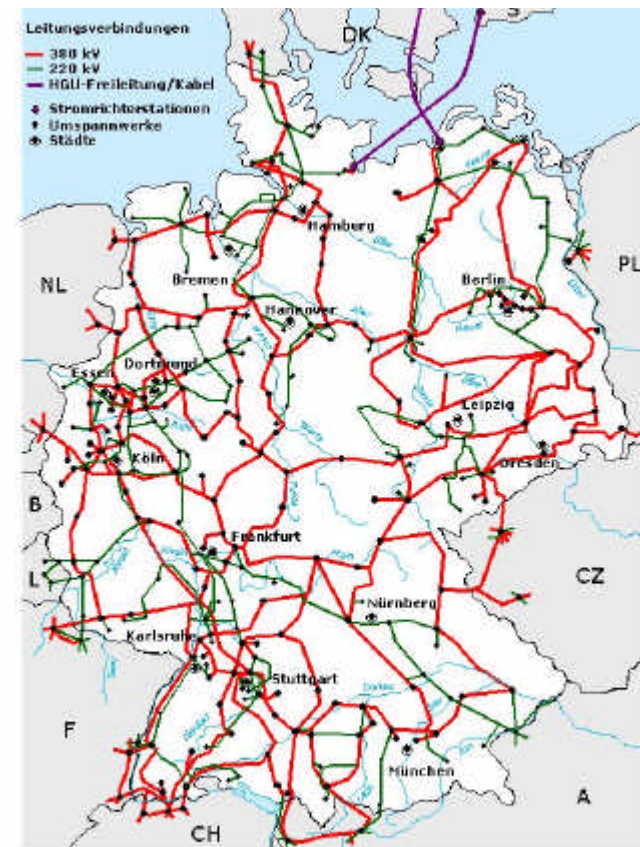
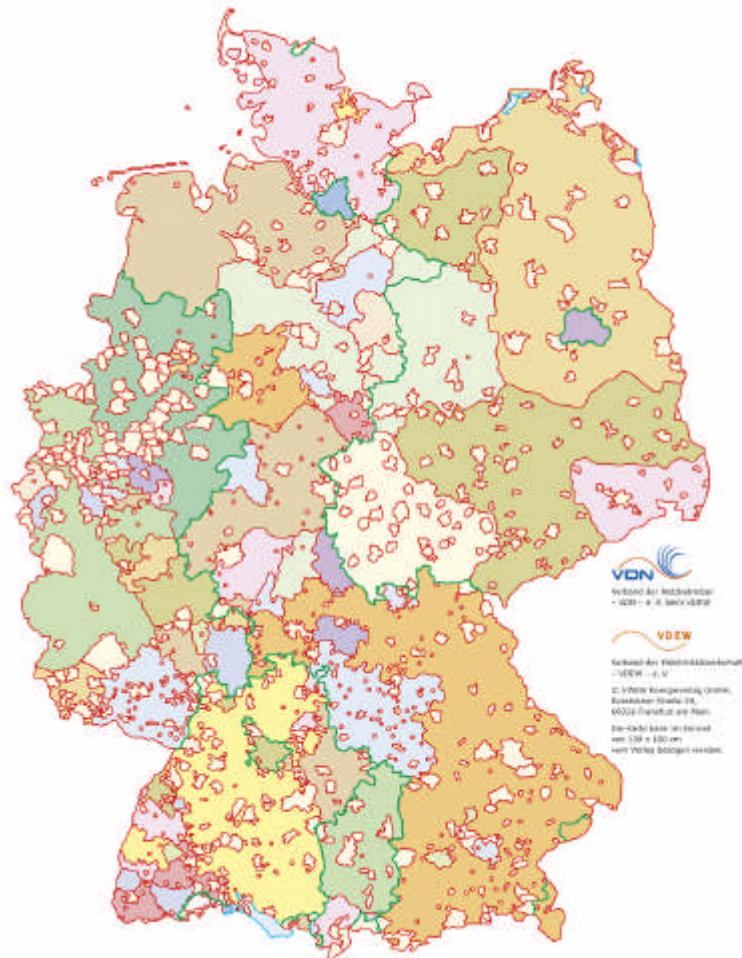
Contents



- **Germany's federal system**
- **A Paradigm shift**
- **Network Regulation**
- **Secure electric energy supply**
- **Conclusions** concerning needed Software
- Summary

Germany's federal system: diverse and strongly interconnected

- **4 TSOs (control areas), ~ 50 regional and 850 municipal DSOs**
- **Mixed ownership, partly foreign**



Deutsches Höchstspannungsnetz 2005

A Paradigm shift

- **A largely stable network access regime since 2000 based on Associations Agreements (VV)**
- **World-class reliability**
- **Non-discriminatory, well functioning network access rules**
 - Harmonised, simplified network fee calculation rules
 - Network fees decreased nominally (MV/LV about –4%) since 2002 despite increasing extra-costs for the integration of wind power in the system
- **No problems in customer switching (BMWA Best Practice, VDN-Data Exchange Guidelines); Numbers switching as in neighbouring countries**
- **Well functioning platform for international trade**

A Paradigm shift

- **Regulation instead of VV**
 - Especially network fees, but also many other technical, business, legal and unbundling aspects (access rules, reliability monitoring, europ. Trade...)
 - Cost Control – Regulator can check just about everything
- **> 50 §§ for regulation details in EnWG**
 - Danger of bureaucratisation and micro-management
- **Incentive Regulation**
 - Fees no longer based on costs
 - A gov't regulation (with Bundesrat concurrence) before application
 - Quality depends on structural differences – in similar ways as fees
 - Discussion on best selection of structural criteria – population density vs. load density vs. settlement categories – shows that appropriate formulations of the important input and output parameters for statistical comparisons of efficiency (and quality) is difficult

Secure electric energy supply

Security of supply (generation capacity; generators)

System security (stable system condition; TSO)

Quality of supply (network planning; TSO, DSO)

service
Quality ¹⁾

reliability
of supply ¹⁾

voltage
quality ¹⁾

1) Also
influenced by
third
parties

System responsibility (network operation; TSO, DSO)

Secure electric energy supply

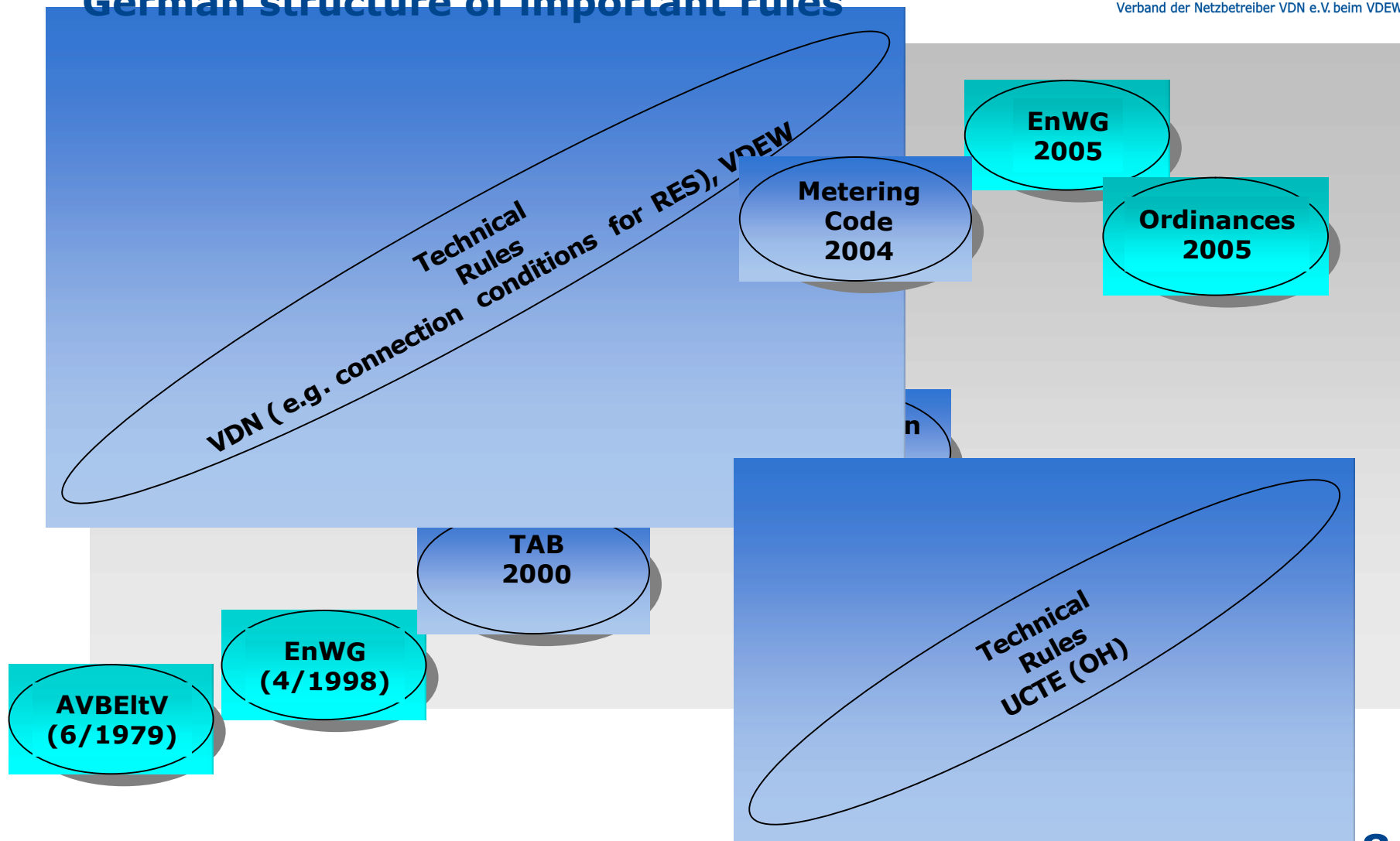
European situation – system responsibility



- UCTE – Association of synchronously interconnected TSOs (transmission system operators) in Europe
- coordinates cooperation among TSOs
- UCTE Operation Handbook (OH) 2005: Rules on operation within the common interconnected power system (MLA)
 - system responsibility of TSOs for their own network
 - cooperation in normal operation
 - reduction of risks in the event of disturbances (through principle of solidarity)
 - adjusted to new market requirements
- ERGEG: the UCTE-OH represents a first important step towards a more reliable European electricity market

Secure electric energy supply

German structure of important rules



Secure electric energy supply German situation – system responsibility



According to article 13 (1) of the German Energy Industry Act,

operators of transmission systems are entitled or required to remove the danger or the disturbance ... if the security or reliability of the power system in their respective control area should be endangered.

- system responsibility associated with system operation
- instructions for action to TSOs
- obligation to cooperate imposed on DSOs (distribution system operators) according to article 12 (2) and (4)

Secure electric energy supply

German situation – system responsibility



- TSOs bear responsibility for the system in their control areas
- Each network operator (TSO and DSO) is responsible for the network under his system operation management
- Definition of measures in article 13 (1) which can be applied or ordered by TSOs
- Adjustments of generation in the event of hazards and disturbances according to article 13 (2)
- Duty of distribution network operators to cooperate, article 14 (1a)
- Information to be made available by producers, suppliers and DSOs
- Obligation of mutual information (TSOs, DSOs, Federal Network Agency - BNetzA)

Secure electric energy supply

German situation – quality of supply



- **Differentiate frequency of service interruptions, duration, non-availability** (for interruptions longer than 3 minutes)
- **Differentiate voltage levels**
- **Differentiate planned vs. Unplanned**
- **Differentiate different supply conditions, e.g. city / countryside / suburb**
- **Data collection different in past / today's VDN outage and disturbance statistic / future BNA statistic**
- **Small networks need many years of data for meaningful sample size**

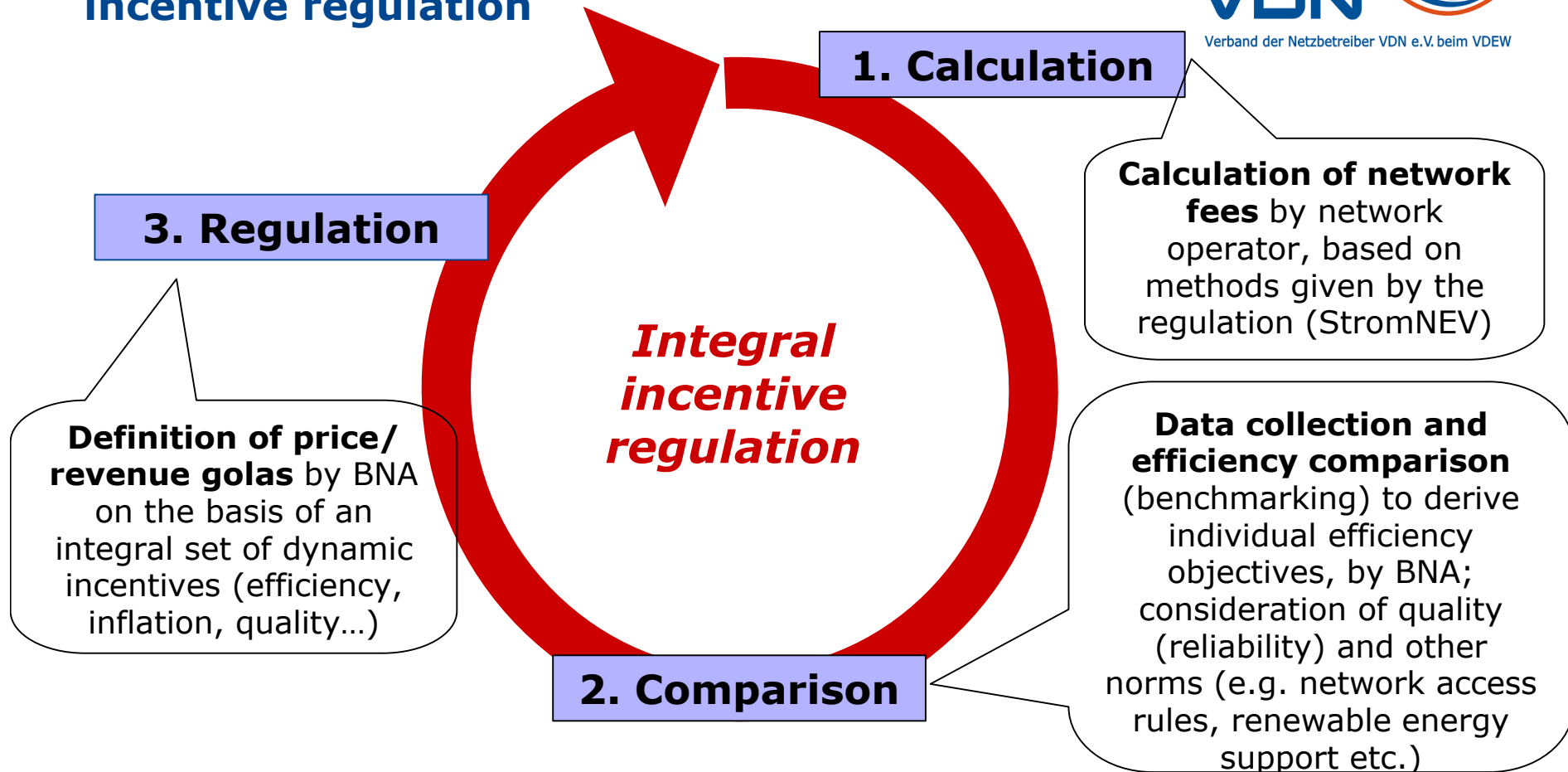
Secure electric energy supply German situation – quality of supply



- A statistical basis and theoretical approaches need to be set up prior to a discussion about the cost relevance of reliability of supply and therefore before a possible use in the incentive regulation scheme to be developed
- The correlation between reliability of supply and its technical and economic factors of influence is so complex that there are no simple methods available for its description; analyses in this respect can be realized only on the basis of reliable, multi-annual Germany-wide data collections.
- Due to stochastic influences (weather, underground work), a significant description of the actual condition of reliability of supply for the different network operators can only be made on the basis of an evaluation carried out over a period of 3 - 5 years.

Secure electric energy supply

German situation – integral model concerning incentive regulation



We need a stable system where above-average companies can earn above-average returns for enough years to make investments worthwhile.

Secure electric energy supply

German situation – Quality of supply



Increasing wind energy feed-in gives rise to additional network costs:

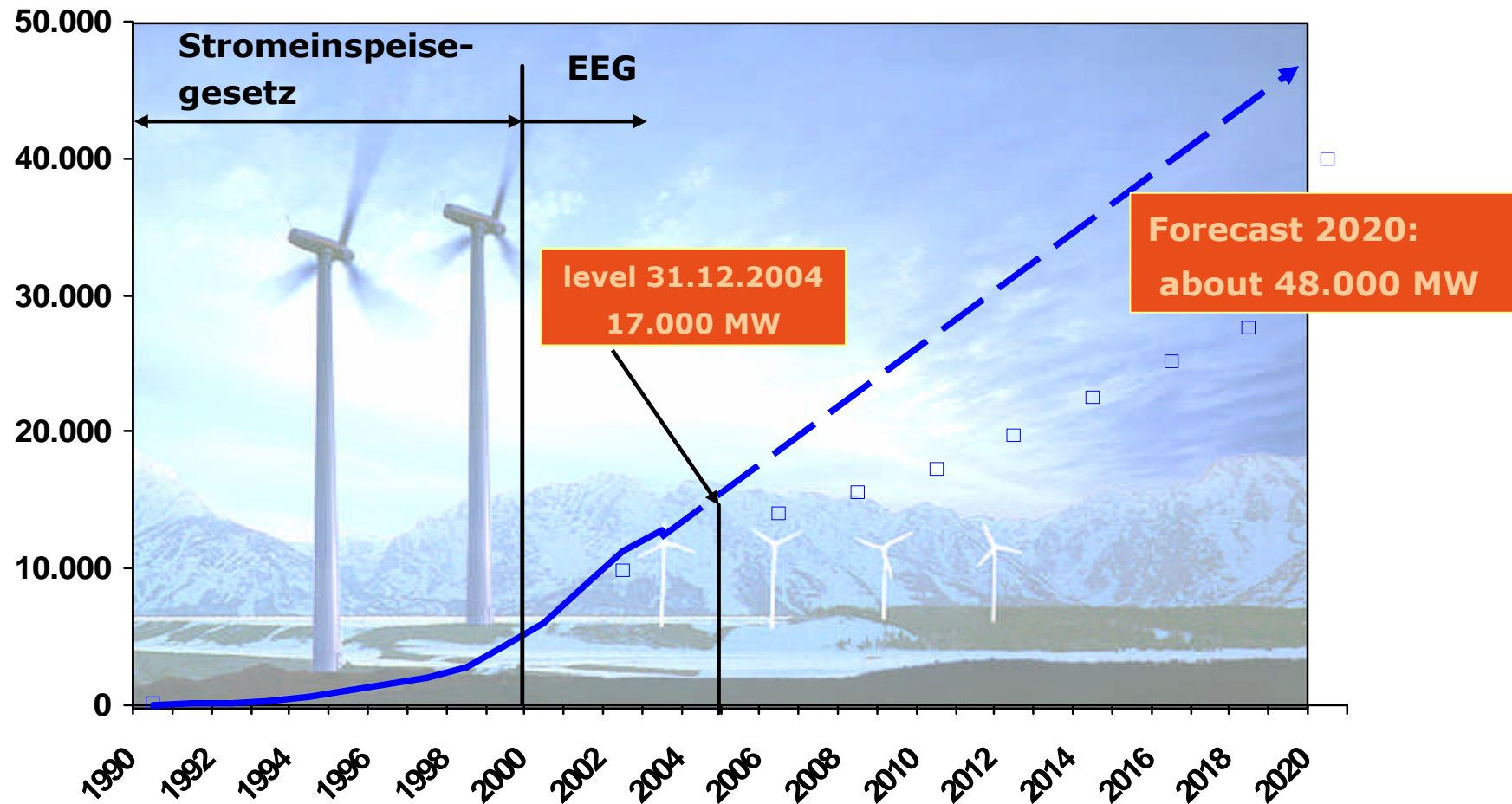
- increase in control and balancing energy costs
- extension of extra-high voltage lines for the transport of wind energy to consumers

Requirements to be met by the electricity industry:

- congestion issues made more difficult by 17.000 MW installed wind power concentrated largely in Northern Germany and perhaps soon off-shore
- connection of wind energy to the extra-high voltage network
- up to 2016: construction of EHV line routes of a length of 1000 km
- investments by 2020 of more than ten billions €

Secure electric energy supply e.g. wind energy in Germany

P[MW]



Conclusions concerning needed Software

State of the art software is needed for many studies that underlie constraints, thresholds etc. in the different types of „GridCodes“

- TransmissionCode, DistributionCode
(e.g. generation connection conditions, system services, network development, operational planning and management)
S/w: e.g. stationary and dynamic load-flow-programms, including protection and reliability tools
- MeteringCode/data exchange guidelines
(e.g. customer switching, metering and billing)
S/w : e.g. Communications and system data management, market modelling and simulation, interface definitions
- Connection conditions for RES (e.g. voltage stability)
S/w : e.g. simulation tools with appropriate models, as for TC, DC
- System operation under emergency conditions
(e.g. congestion management, redispatch measures)
S/w : e.g. power flows / online security assessment, congestion forecasts

Summary

- Power quality and security of supply are based on two pillars: adequate generation, and an adequate transmission and distribution system
- Therefore a stable framework is important to network operators for planning, investments, and legal issues as a basis for effective action
- An incentive regulation scheme can be realized only on the basis of reliable, multi-annual Germany-wide data collections
- Additional to the legal framework, there is still a need for “GridCodes” published by the grid operators, for the practical details
- The construction of RES have to be synchronised with the extension of the grid
- A harmonized European promotion scheme taking into account infrastructural conditions would be of greatest interests for a high degree of security of electrical supply

Thank you for your attention !

Dr. Konstantin Staschus
Verband der Netzbetreiber
Robert-Koch-Platz 4
10115 Berlin
+49 (0)30 726148 100
Konstantin.Staschus@vdn-berlin.de
www.vdn-berlin.de

