Implementation of Intelligent Energy Network Systems – Bandwidth Demand and Implications for Regulation and Competition

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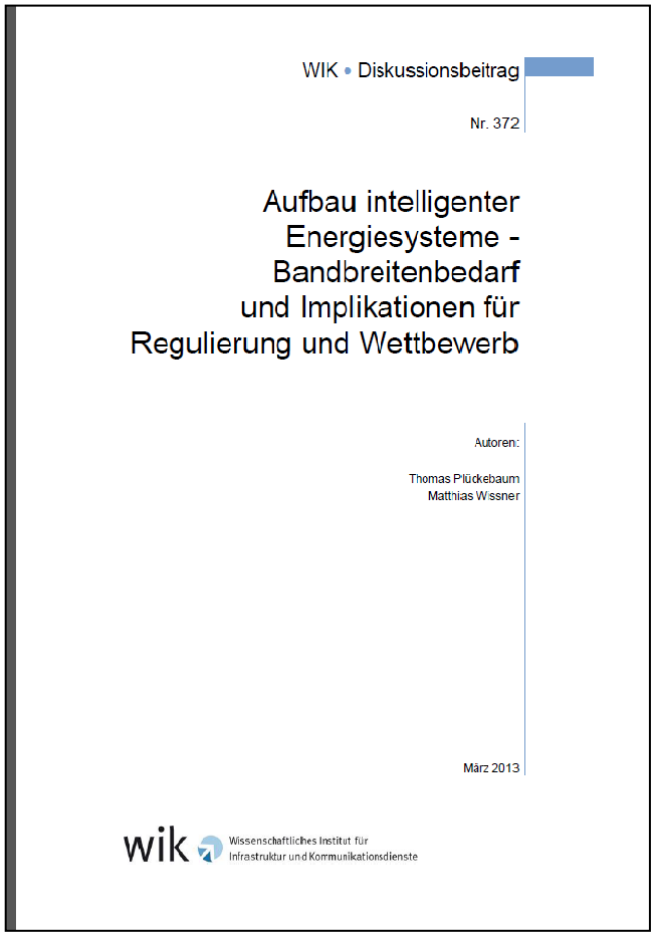

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Aufbau intelligenter Energiesysteme - Bandbreitenbedarf und Implikationen für Regulierung und Wettbewerb

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Agenda

- Background
- Use cases and their bandwidth demand
- Comparison of bandwidth demand and existing infrastructure
- Implications for regulation and competition
- Conclusions

Background

- Transformation of the energy system
- Increase of stochastic feed-in of renewables and decentralised generation
- Merging of generation, infrastructure and consumption
- Requirement of communication and data flow between producers, network operators and consumers
- ICT-Infrastructure is essential, especially telecommunication networks and smart metering infrastructure

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Use Cases

Overview

Data transmission for electrical power accounting

Data transmission for consumer information

New products

Data transmission for control and balancing

Maintenance of network applications

Electro mobility

Estimation of bandwidth demand considering data security requirements

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Use Cases (1)

Bandwidth Demand

Use Case	Data volume per message
Data transmission for consumer information	50 Kbyte/ 400 kbit/s
Data transmission for accounting a) Consumption - Standard Load Profile - Consumption Metering b) Feed-in - selective (monthly) - continuous (daily)	 200 Byte/ 1,6 kbit/s 5.500 Byte/ 44 kbit/s or 200 Byte/ 1,6 kbit/s 200 Byte/ 1,6 kbit/s 5.500 Byte/ 44 kbit/s
New products a) New tariffs b) Smart Home	 600 Byte/ 4,8 kbit/s (new tariff or control)

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Use Cases (2)

Bandwidth Demand

Use Case	Data volume per message
Data transmission for control and balancing	
a) Control of feed-in	
- Switching Command	200 Byte / 1,6 kbit/s
- Performance control	300 Byte / 2,4 Kbit/s
- virtual power plant	200 Byte / 1,6 kbit/s or 300 Byte / 2,4 Kbit/s
b) Control of consumption	
- Switching Command	200 Byte / 1,6 kbit/s
- Confirmation of execution	200 Byte / 1,6 kbit/s
c) Control of transformer stations	1100 Byte / 8,8 kbit/s
Maintenance of network applications	10 Mbyte / 1- 2 Mbit/s
Electro mobility	300 Byte / 2,4 kbit/s up to 2500 Byte / 20 kbit/s

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Comparison of bandwidth demand and existing infrastructure

Bandwidth demand of the use cases is relatively low

Continuous load is more challenging than transmission peaks

DSL connection speed of 256 Kbit/s up to 16 Mbit/s

Typical load profile during busy hour ca. 80 Kbit/s

No challenge to transmit the necessary communication of a smart grid

Software updates (smart grid devices) might cause bottlenecks in rural areas

Perspective of capacity growth (50- 100 Mbit/s)

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Implications for regulation and competition (1)

Build-up of communication infrastructure for an intelligent energy network

Approaches

- Dedicated approach
  - Actors of the energy market build up their own infrastructure (network operator, supplier, meter operator)
- Shared approach
  - Shared use of the public telecommunication network
- Mixture

- Cost savings
  - Simultaneous extension of power and telecommunication infrastructure with cost sharing
  - Lower costs per unit
- Attractiveness of build-up of fibre cables increases (power operators burden some parts of the costs) and vice versa

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Implications for regulation and competition (2)

Build-up of communication infrastructure for an intelligent energy network

Open Questions

- Priority of technical required communication (control and balancing)
- Costs of telecommunication in the case of a shared approach
- Consequences of changing the provider (telecommunication/electricity)
- Voice only and mobile only
- In-house cabling
- etc.

- Danger of cross-subsidisation if fibre cables are installed for the power grid (and not necessarily needed)
  - German Law (§7 TKG) is far reaching and seems to be appropriate to prevent cross-subsidisation effectively
- Danger of monopolisation

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Conclusions

- Several use cases generate different bandwidth demand
- No challenge to transmit the necessary communication traffic of a smart grid
- Build-up of infrastructure dedicated or shared – both have advantages and disadvantages
- Convergence of the sectors involves the potential of cost saving and the danger of cross-subsidisation

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