



# Storages between flexibility options, capacity contributions and customer trends

**Matthias Müller-Mienack**  
**Consultant to the Chief Market and Operation Officer**  
**50Hertz Transmission GmbH**

ERA-NET SMART GRIDS PLUS SCOPING WORKSHOP 2015  
Malmö, 28<sup>th</sup> October 2015

## Professional steps:

- 2005-2006: Grid planner at Vattenfall Europe Transmission GmbH (VE-T)
- 2007: Project leader for offshore windfarm grid connection at VE-T
- 2007-2011: Head of European Grid Concepts at VE-T → 50Hertz
- 2009-2011: Convenor of ENTSO-E Working Group 2050 Electricity Highways
- 2011-2012: Head of Corporate Strategy at 50Hertz, Elia Group
- As of 2013: Technical Head at GridLab GmbH, Elia Group

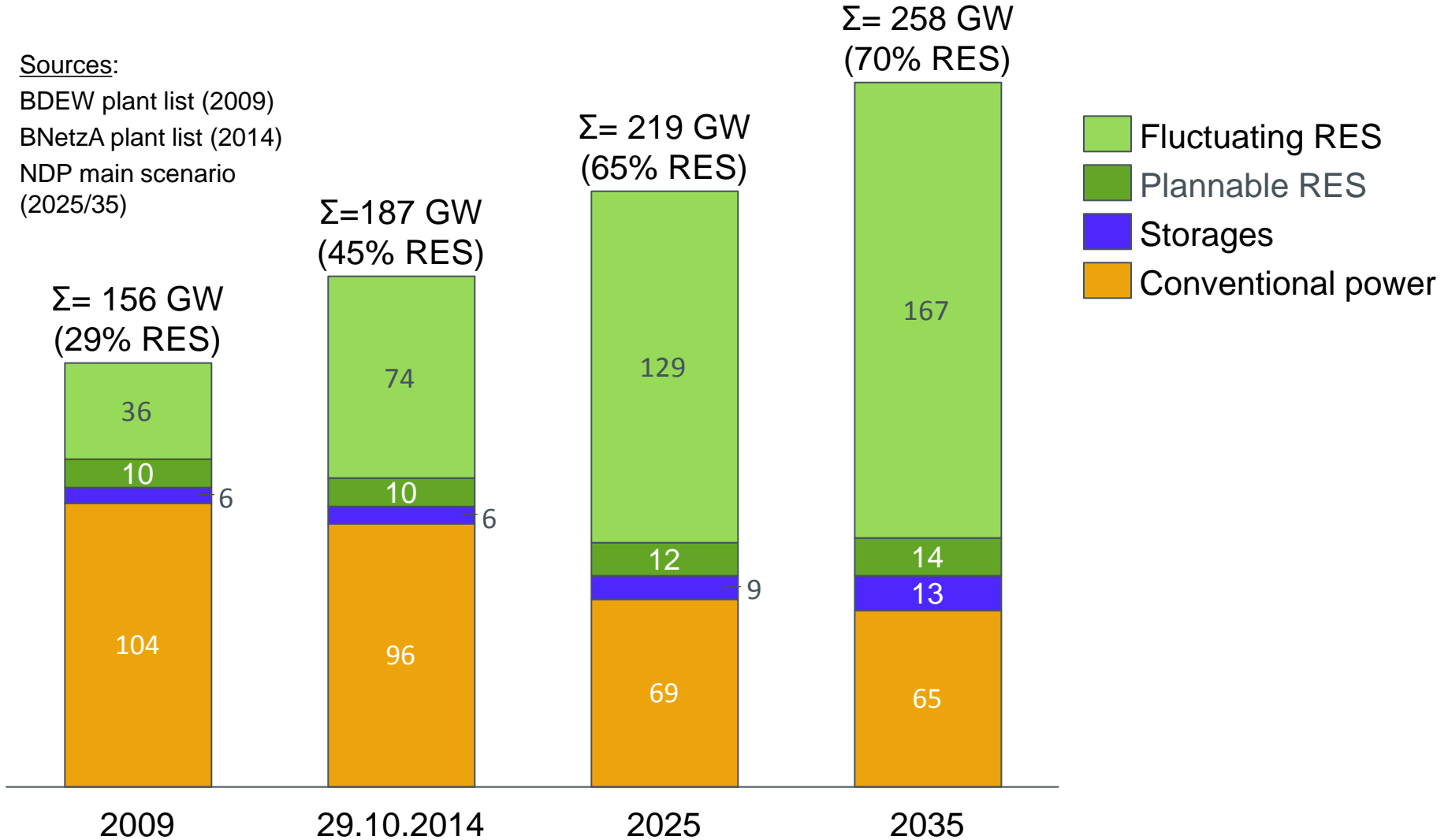
## Involvement in European projects:

- FP 7 projects TWENTIES, eHighways2050
- Strategic Research Agenda from 2008 to 2030, European Wind Energy Technology Platform, EWEA
- European Electricity Grid Initiative (SET plan)
- Ten-Year Network Development Plan (TYNDP), ENTSO-E
- Study Roadmap towards Modular Development Plan on pan-European Electricity System 2050 (ModPEHS 2050), ENTSO-E

# German Decarbonization Pathway

Sources:

BDEW plant list (2009)  
 BNetzA plant list (2014)  
 NDP main scenario  
 (2025/35)



# Drivers for storage application in electricity system (1/2)

## driver for storage requirement

A

Flexibility requirement in the electricity system

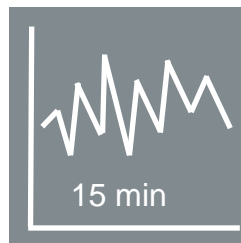
Flexibility requirement in the electricity market

B

Capacity contribution

## applications

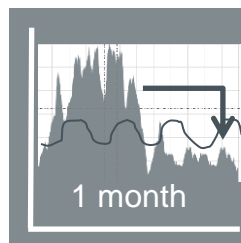
- System services
- Control power



- Generation optimization
- Market optimization (balancing group coordination)
- arbitrage



- Reduction of RES curtailment
- Capacity contribution through storages



## user

- Transmission System Operator
- Distribution System Operator

- Wholesale market
- Generators (conventional and renewable)

- Wholesale market

## observation

- Potentially rising demand
- But: various new technologies & player result in strong competition
- Price spreads get significantly lower and will stay low in the next years
- Economic efficiency of existing storages is difficult to reach
- The demand of usage of the surplus of renewable energy will increase in order to further enhance the degree of decarbonization

# Drivers for storage application in electricity system (2/2)

## driver for storage requirement

## applications

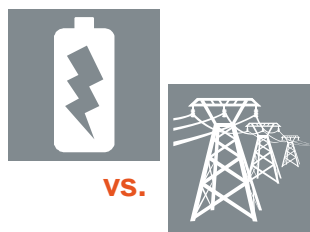
## user

## observation

C

Avoidance of grid investments

- Less line extensions because of peak shaving



- Distribution System Operator

- Less extensions in the < 30 kV line because of storage
- No effect on the >110 kV line

D

Optimization of personal consumption (prosumer)

- Batteries as addition to power generation system
- Incentive mechanism: direct or indirect subsidies
- Lifestyle?



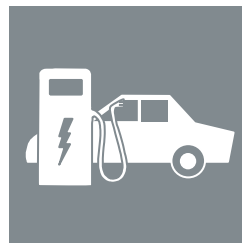
- Industrial, trade and household clients

- Positive Business Case by implementation of distributed storage systems
- Dependent on grid tariff structure and cost allocation

E

New transportation models especially e-mobility

- Batteries for e-mobility
- Power-to-Gas for gas mobility
- Dependent on lifestyle



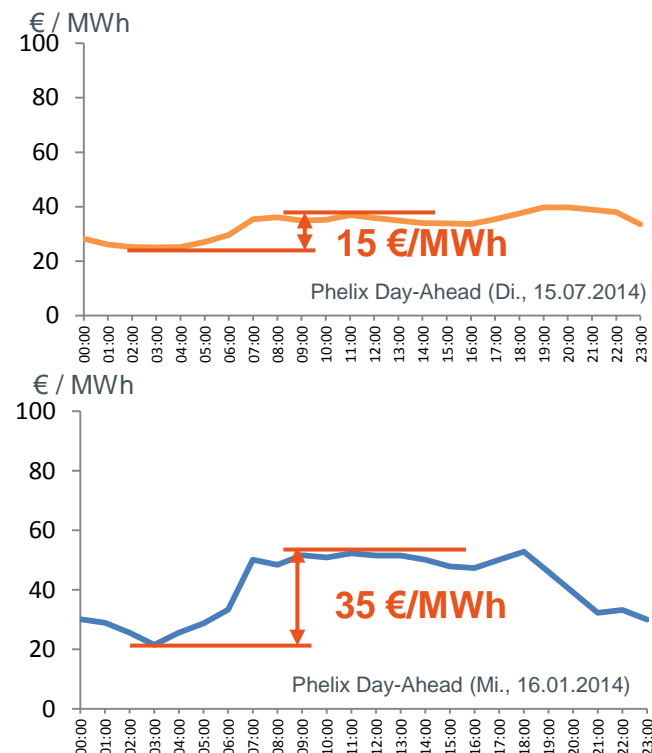
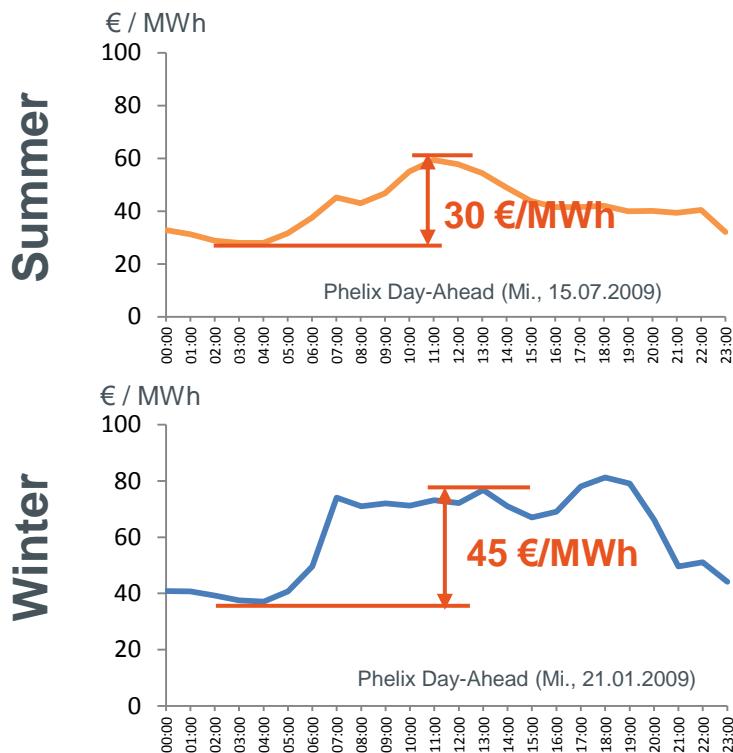
- consumer

- Breakthrough is not yet visible
- Dependent on fuel prices and subsidy regimes

# Flexibility requirement: Price spreads of the energy market became significant lower in Germany (matter of market design)

### Day/night margin 2009

### Day/night margin 2014

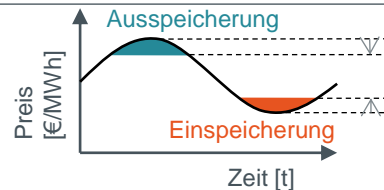


Presently, pure arbitrage activity isn't efficient for pumped storage - Revenues from system services can't compensate for decreasing margins

# Pumped storage: Currently no Business Case in Germany despite varied market and grid applications

## Market applications / products

Arbitrage activity



Flexibilization of generation



Control power market



## Regulated grid applications

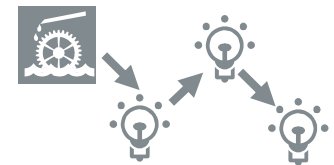
Preventive measures (redispatch)



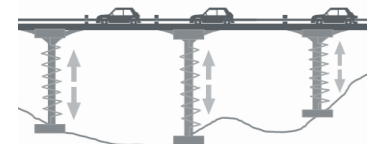
Emergency measures



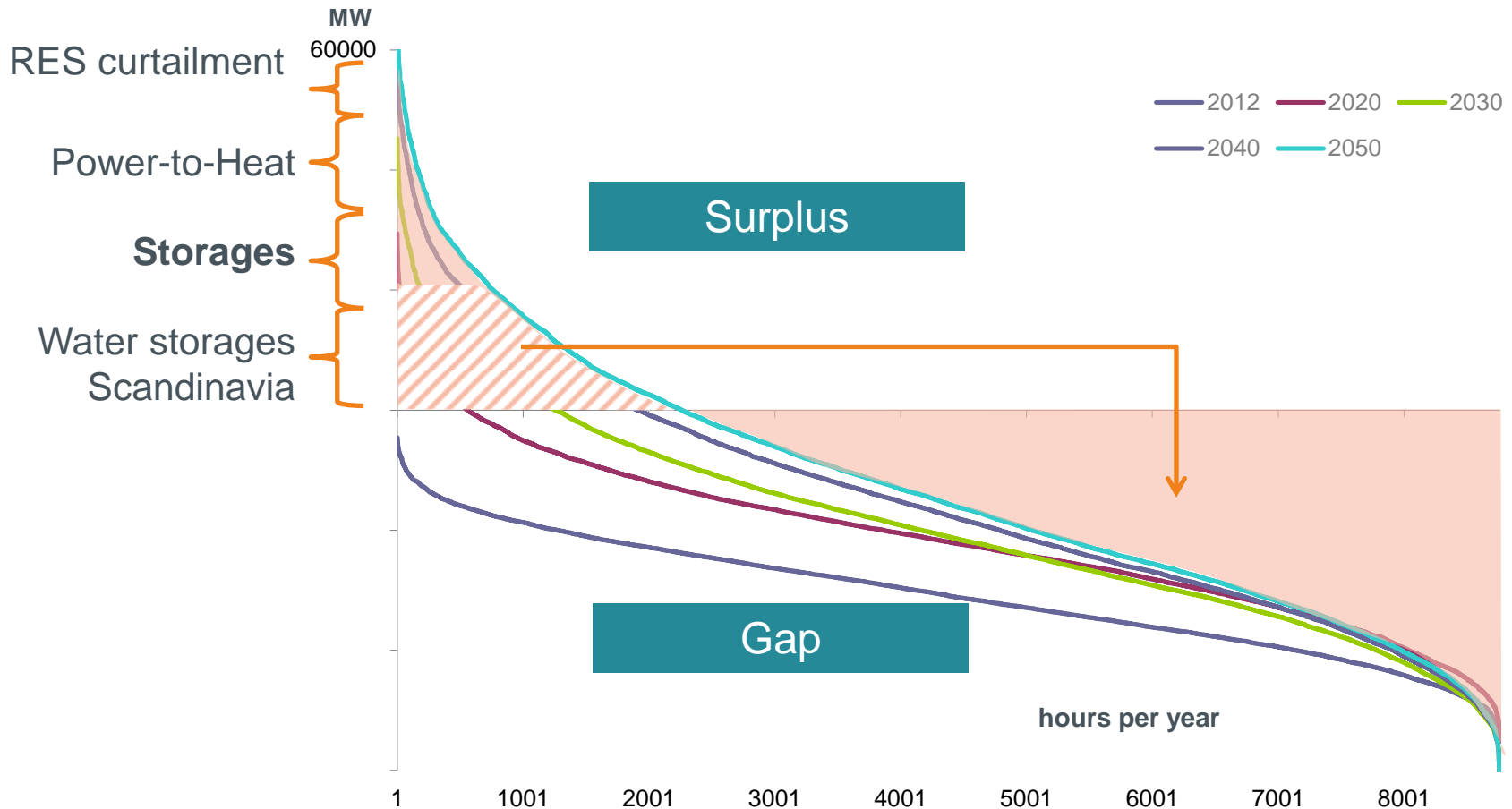
Black start / Grid restoration



Voltage stability



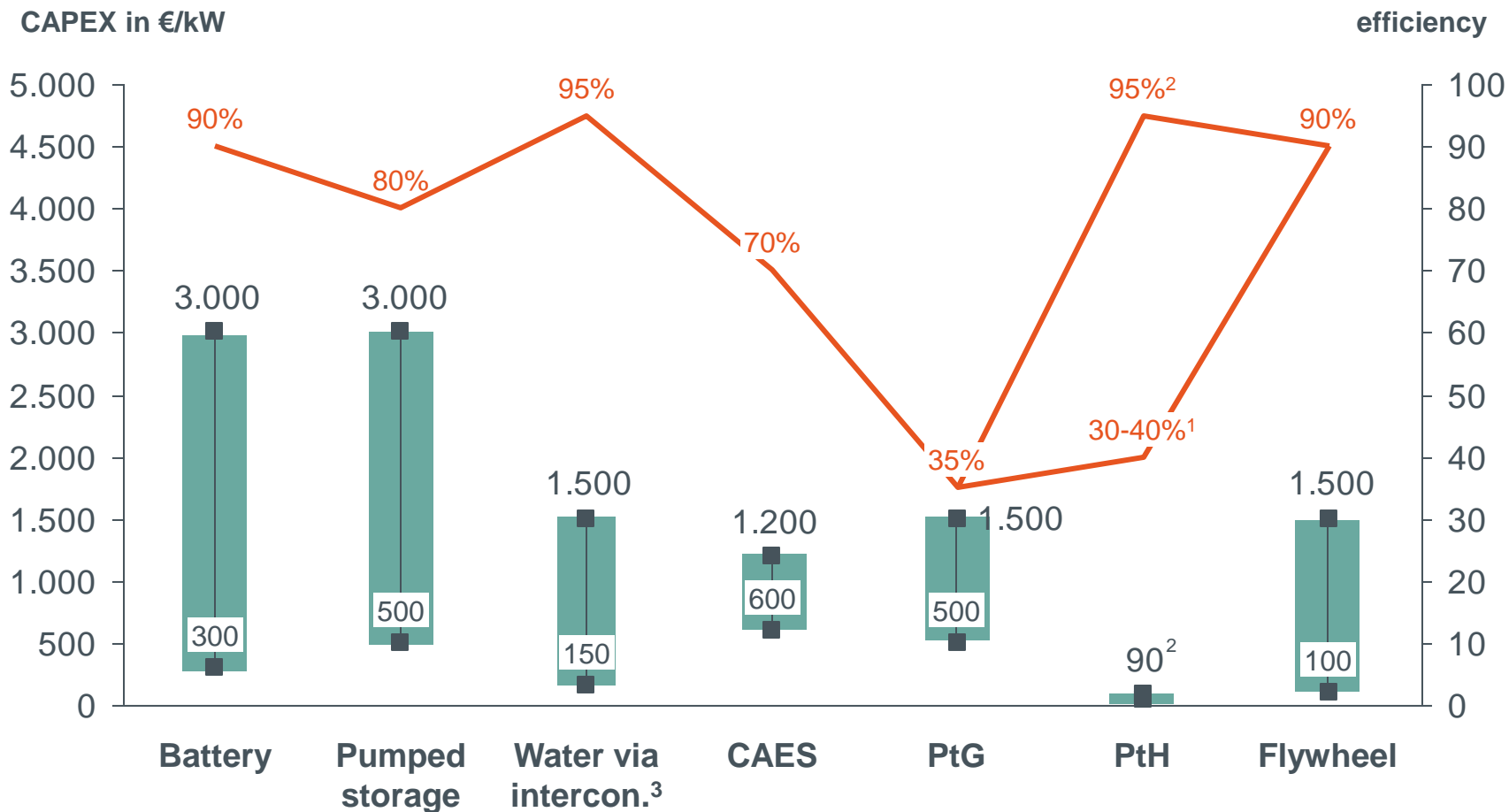
# New storages in competition with various flexibility options



Because of the high CAPEX and the limited storage capacity the indirect storage through interconnectors is more efficient



# Trade-off between CAPEX amount and efficiency is significant for the storage assessment



<sup>1</sup>including reconversion into electricity; <sup>2</sup>heat-only generation; <sup>3</sup> costs for interconnector (range 200 to 400km, AC and DC)

## Summary



→ Because of the increasing competition with various cost-effective alternatives, new storage technologies for performance of control power are more a niche application



→ In the medium and long term, the classical arbitrage activity of hourly/daily storages offers no business perspective for consisting and new storages



→ From today's perspective, grid development and exploitation of indirect water storages in Scandinavia and in the Alpine region is a cost-effective solution for the next 10 – 20 years

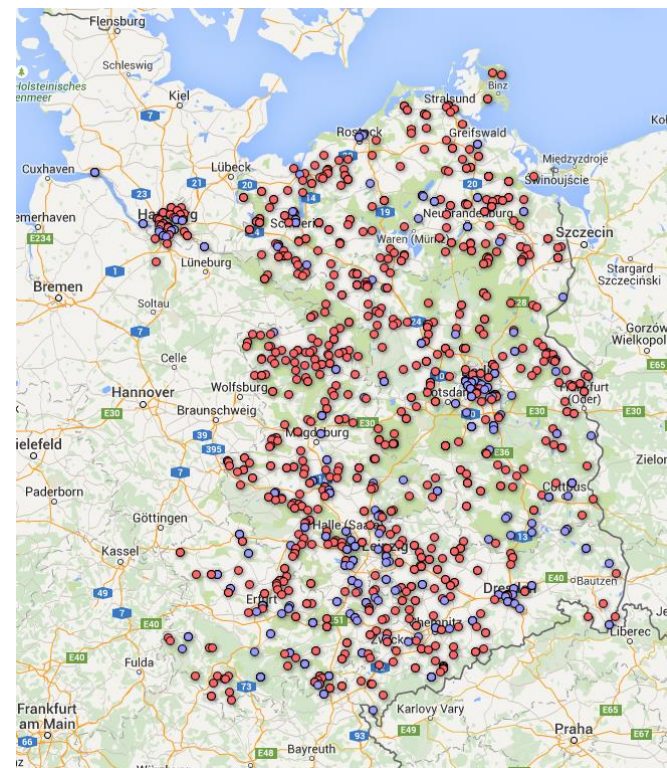


→ Through e-mobility expected cost degression for batteries. This could also result in applications in the electricity market (optimization of personal consumption, avoidance of grid development, lifestyle product)

# Special research attention not necessarily on storage technologies but on pooling concepts for control power push into the market

Market entry of new players with mainly low opportunity costs for control power:

- Biomass:
  - currently installed 8000 MW potentially applicable for control power
  - e. g. permitted short-time operation > 120%
- Aggregators for control power
  - Load management for industrial customer
  - Control power pool for small systems



# Thank you for your attention!

**Dr.-Ing. Matthias Müller-Mienack**  
Consultant to the  
Chief Market and Operation Officer

**50Hertz Transmission GmbH**  
Eichenstraße 3A  
12435 Berlin  
Germany

**+49 30 - 5150 – 2701**  
**matthias.mueller-mienack@50hertz.com**

**[www.50hertz.com](http://www.50hertz.com)**

**Dr.-Ing. Matthias Müller-Mienack**  
Technical Head

**GridLab GmbH**  
Hubertstraße 24  
03044 Cottbus  
Germany



**+49 355 - 5 299 - 68 01**  
**matthias.mueller-mienack@gridlab.de**

**[www.gridlab.de](http://www.gridlab.de)**