POTENTIALS FOR OPTIMIZING EXISTING CAPACITIES ON TRANSMISSION LEVEL

Stefan Mischinger, November 22nd, 2017, Berlin
GENERATION BECOMES MORE INTERMITTENT AND DECENTRAL

Energy transmission objectives until 2050: e.g. 80-95% reduction of greenhouse gases; 80% share of renewables in generation

The current installed capacity of renewables is around 90 GW. To meet energy transition objectives increase is necessary

Development of renewable capacity in scenario B of the grid development plan (Source: Netzentwicklungsplan 2017-2030)

Development of renewable capacity in scenario 2011A of BMWi long term scenarios (Quelle: Langfristszenarien, 2017)
ELECTRIC GRIDS NEED TO ADAPT TO THE CHANGE IN GENERATION AND LOADS

To laws address construction projects for transmission grid development
- Energieleitungsausbaugesetz (ENLAG)
- Bundesbedarfsplangesetz (BBPIG)

Status of ENLAG (End of 3rd quarter 2017)
- Since 2009, 750 km of 1,800 km have been realized
- 23 km realized in the 3rd quarter of 2017

Status of BBPIG (End of 3rd quarter 2017)
- 5,900 km expansion need (thereof 3,050 km grid reinforcement):
  - around 3,000 km in approval procedures
  - 450 km approved and 150 km realized

Expansion need transmission grid
- 45% RES
- 7,200 km until 2025
- 80% RES
- ??? km until 2050

Expansion need distribution grid
- > 135,000 km until 2030 due to RES expansion
- ??? km until 2030 due to new loads (e.g. electric vehicles)

Grid expansion need to be complemented with intelligent operational solutions

Source: NEP 2030 and dena-VNS
HIGH COSTS FOR GRID AND SYSTEM SECURITY

Increased technical and economical challenges due to existing grid congestions
- Congestions on transmission level in particular between the North and South of Germany
- Grid expansion delayed to acceptance problems
- In consequence: High costs for redispatch and congestion management

90% of the year
16 TWh: comparable of yearly consumption of 4.5 mio house holds

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Quelle: Monitoringbericht BNetzA

Kosten für Netz- und Systemsicherheit
davon Kosten für Redispatch
zum Vergleich: Kosten für Regelleistung (noch keine Daten für 2016 verfügbar)

1.1 billion €
850 million €
2013 2014 2015 2016

yearly costs in mio. EUR

800
700
600
500
400
300
200
100
0

costs for grid and system security
theif of costs for redispatch
to compare: costs for balancing power (no data available for 2016)

Quelle: Monitoringbericht BNetzA
GRID EXPANSION AND OPTIMIZATION WORK TOGETHER

Objective: decreasing costs for grid and system security

Higher utilization of existing transmission capacity

Increase of transport capacity

Process optimization for redispatch and grid planning

No alternative for grid expansion but supplement
DIFFERENT OPTIONS FOR HIGHER GRID UTILIZATION

- Operational measures such as monitoring of overhead lines
- Conversion of existing operation resources with the objective of having a higher capacity, such as high temperature power lines
- Power flow management with special operating resources in order to control power flows
- Expansion of grid monitoring and Introduction of automatic assistance systems with the aim to operate the grid closer to the stability limit
OPERATIONAL MEASURES

MONITORING OF OVERHEAD LINES

- Higher utilization between 105% and 150% possible depending on the weather
- Technical adaption also in substation (especially protection) needed
- Duration of realization about 2 years
- Main challenges
  - Violation of law (BImSchV)
  - Interaction with parallel infrastructure (e.g. Gas)
CONVERSION OF EXISTING GRID OPERATION RESOURCES

HIGH TEMPERATURE POWER LINES

- Higher transmission capacity of cables with similar weight and dimensions
- Increase of transmission capacity by conversion of power lines
  - without larger power poles and
  - without considerable changes in the static of power poles
- Challenges due to laws and parallel infrastructures (Gas, oil)
- In general, planning and approval phase of several years
POWER FLOW MANAGEMENT

EFFECT
- Higher utilization of less utilized power lines

MAIN TECHNOLOGIES FOR POWER FLOE MANAGEMENT
- phase shifting transformers
- flexible AC transmission systems (FACTS)
- DC coupling

REALIZATION
- In general without long approval processes since realization in substations possible
AUTOMATIC ASSISTANCE SYSTEMS

DYNAMIC SECURITY ASSESSMENT (DSA)

- enables optimized grid utilization regarding stability
  - Today: thermal limits are main challenge, not stability limits
- DSA has the following elements
  - dynamic network calculation
  - dynamic grid protection
  - optimized monitoring of grid dynamics
- DSA is currently under development
LIST OF MEASURES FOR HIGHER GRID UTILIZATION

In 2017, the ministry of economics and energy initiated a stakeholder process controlled by dena and BET in order to identify short term measures for higher grid utilization:

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Download unter: www.dena.de
LIST OF MEASURES FOR HIGHER GRID UTILIZATION

1. Introduction of NOVA-Monitoring

2. Extensive realization of overhead power line monitoring

3. Construction measures under the current grid development plan

4. Further optimization of grid development plan process

5. Further optimization of redispatch process

6. Simplification and acceleration of approval processes

7. Accelerate introduction of new system operation concepts

Estimated yearly saving potential: > 200 Mio. €
THANK YOU

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