**Introduction**

With growing shares of variable, renewable electricity generation in power systems, the supply of sufficient flexibility will most likely increase. This amount might be highly dependent on the scenario assumptions and a review of its robustness with regard to different cost assumptions yet has to be carried out. We therefore analyze model-endogenously derived storage- and gas turbine-expansion for the year 2050, varying the fuel- and emission costs as well as the underlying grid scenario.

**Methodology**

- Linear bottom-up optimization model REMix [1-4]
- Least cost dispatch and investment optimization for energy systems (electricity, heat, H2, transport)
- High spatial and hourly temporal resolution
- Around 20 technology modules which enable different applications; e.g. short term capacity expansion, validation of balancing options, RE-integration
- 9 European and 20 German model regions
- 2 grid expansion scenarios (AC, DC): G+ and G-
- 3 curtailment scenarios: 100%, 10%, 3% shedding of annual electr. generation allowed (cur.100, cur.10, cur.3)
- 5 storages: adiabatic compressed air storage, hydrogen storage, lithium-ion battery, pumped storage, redox-flow battery
- Expansion options: storages and gas turbines

**Results**

**I. Influence of cost assumptions**

- **Fuel costs (FC)**: low-med-high [€/MWh]
  - Coal: 14 - 21, 35
  - Lignite: 8 - 9, 10
  - Nat. Gas: 33 - 48, 73
- **Emission costs (EC)**: low-med-high [€/t CO2]
  - Low: 4 - 47
  - Med: 88

**II. Storage expansion**

- **50 GW**
  - Gas turbine
  - Coal
  - Biomass
  - Wind on.: PV
  - Wind off.: Hydro

**III. Storage utilisation**

- **10 GW**
  - G+ cur.3
  - G+ cur.10
  - G+ cur.100
  - G- cur.100

**References**