Enhanced method to specify location and size of reactive power sources (RPS) in electrical transmission

UNIVERSITÄT DUISBURG ESSEN
Offen im Denken

Bader Sager and Hendrik Vennegeerts

Challenges:
- More RES, P=f(weather, time, place)
- Volatile power flows, highly loaded networks

→ Increasing need for stationary and controllable RPS
→ Many NUC (network use cases) to be considered
→ Many critical contingencies

- Starting point power-flow often non-converging due to lack of RPS
- Complex optimization task
  - Min(cost)
  - Technical constraints including voltage stability

Solution:
- Use of **QV-node** inside **optimization**
  → Converging power flows
  → Fast determination of distance to voltage stability limit

Optimization:
- Fixed and variable cost of additional RPS
- RPS location, size and type in each region
- Consider the network technical limits
- Remaining margin to voltage collapse point
- Flexible consideration of multiple NUC and contingencies

Conclusions:
- Best location, size & type of extra RPS possible:
  - Without interim placement of fiction sources
  - Converged AC power flow with distance to collapse point
  - Multiple NUCs and contingencies
- Robust results even at application of heuristic optimization methods