

Future Energy Systems:

More resilience for power and communication networks in Germany

How do we deal with increasing interdependencies?

Key findings of the VDE ETG ITG discussion paper

45 Zukunft am Mittag

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Key Trends for Power Grids and Communication Networks



Power grids

- Growing demand for electrical power
- Transition to renewables. Decentralization
- Digitalization, need for reliable comms

Public communication networks

- Exponential traffic growth
- Broadband, small cells, optics, all IP, cloud
- Reliable power supply needed

Digitalization, Electrification, Energy Transition

- Reliable communication networks and electrical power grids are paramount for our life
- Increasing complexity and interdependency between communication networks and power grids

Climate change, cyber crime, geo-political challenges

- Natural disasters, cyber attacks, sabotage, (war)
- More “intertwined” critical infrastructures, power and communications are essential for all

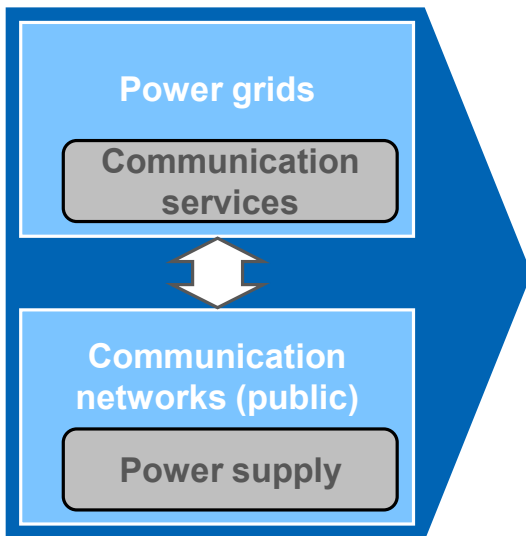
Is mutual interdependency an issue for network resilience?



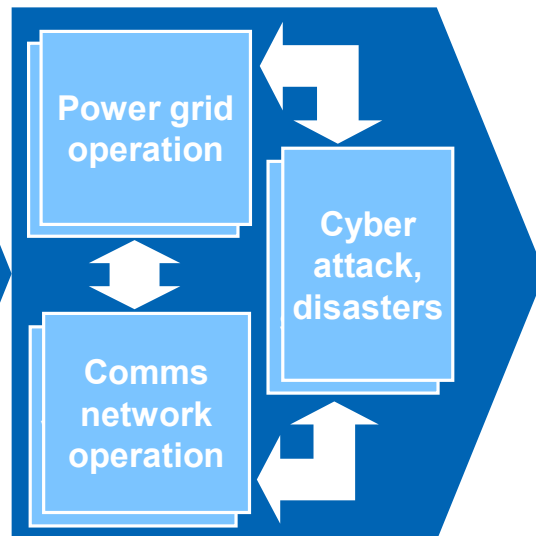
From Technology Progress to Call for Action



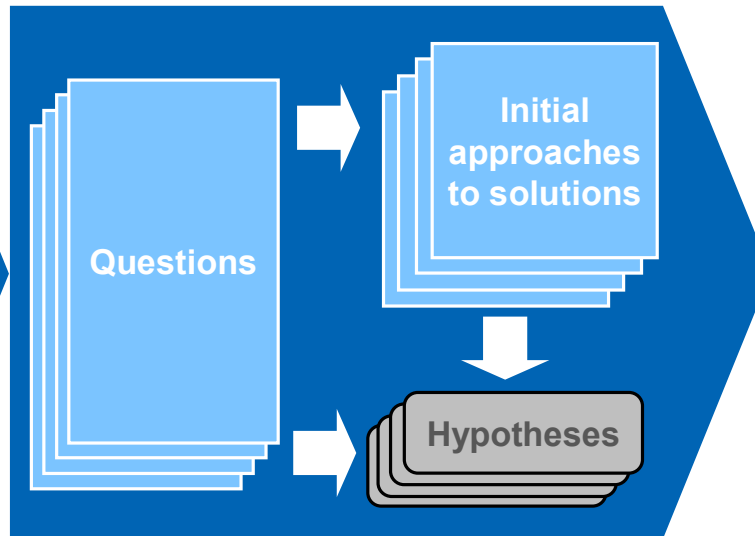
Technology evolution



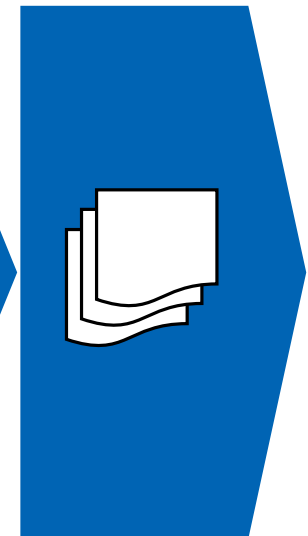
Operating scenarios



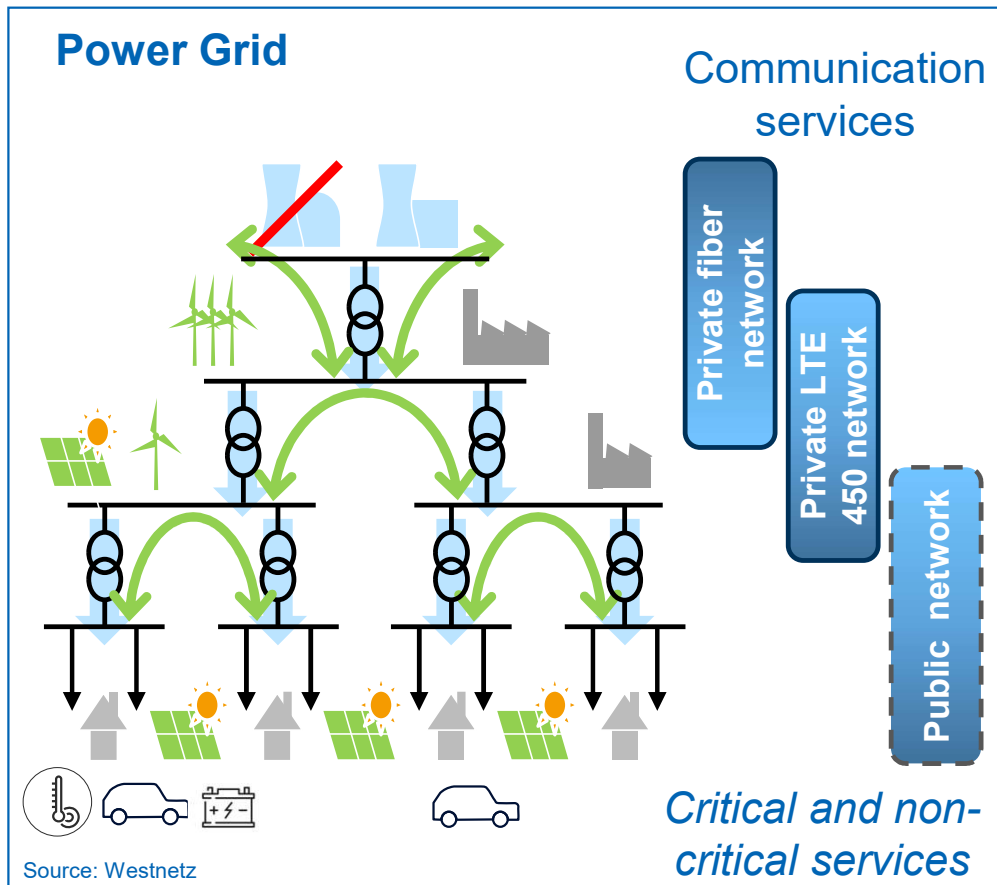
Questions, approaches to solutions, and hypotheses



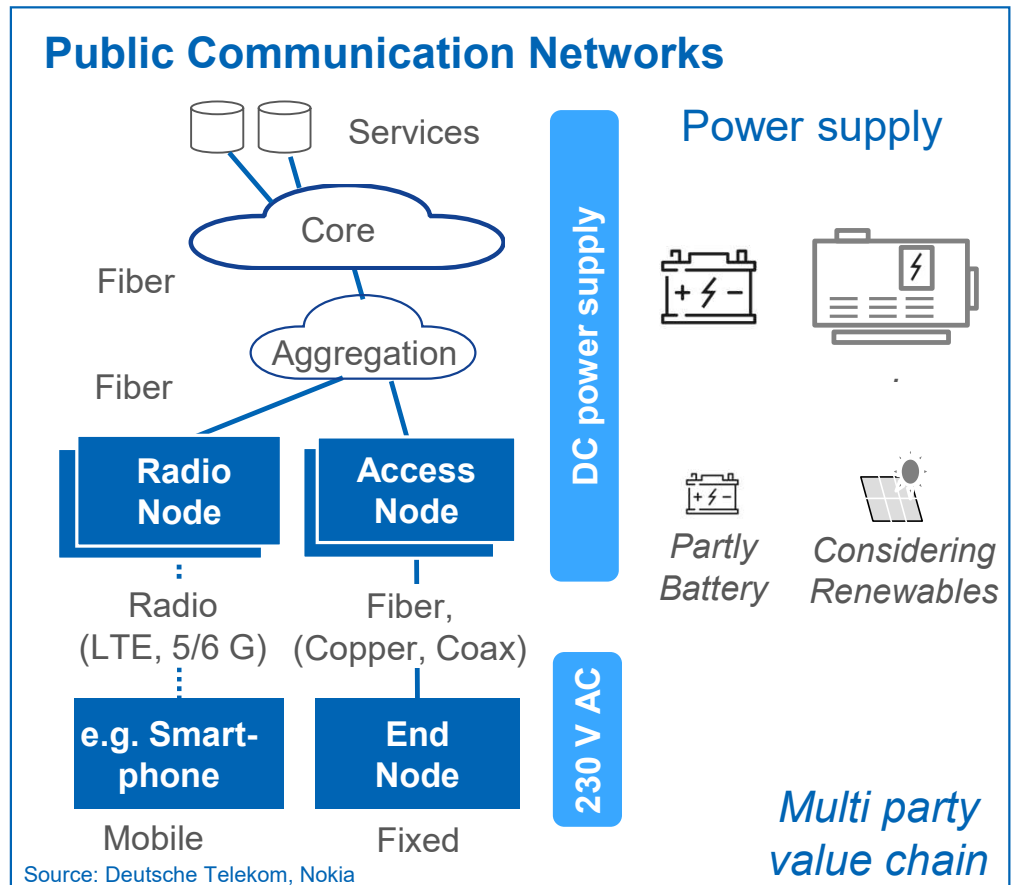
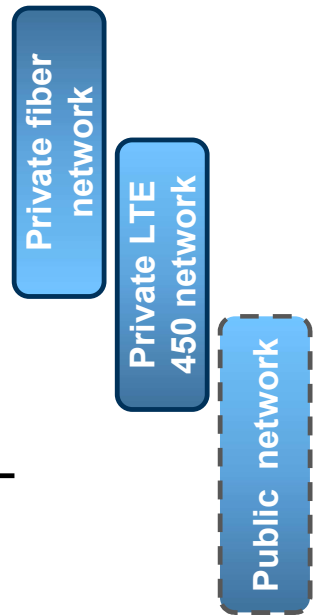
VDE recommendations



Evolution of Power Grids and (Public) Communication Networks



Communication services

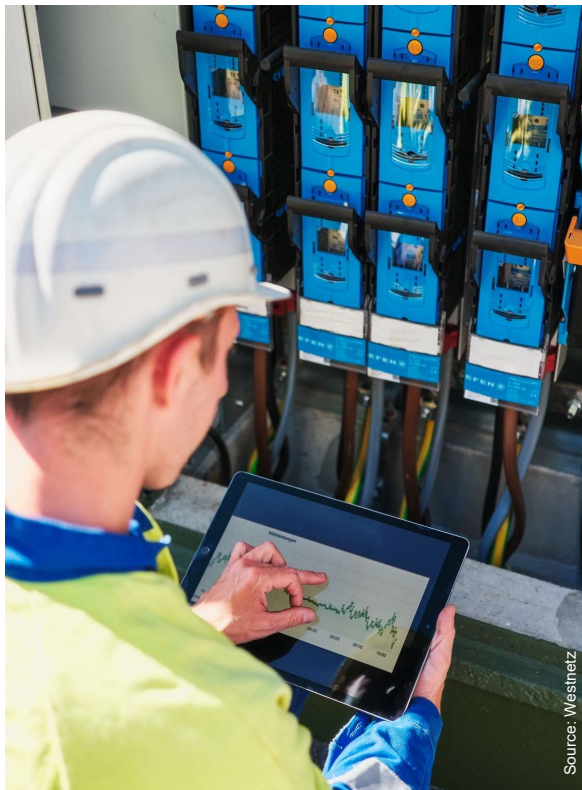


Relevant Operating Scenarios



- **Power grids:**
 - Future normal operation incl. technical disruptions
 - Operation in disaster events
- **Public communication networks:**
 - Future normal operation incl. power outages
 - Operation in disaster events
- **Disaster:**
 - Large scale cyber attack on power networks (→ widespread outage of communication networks)
 - Major physical destruction (e.g. massive flooding)

Conclusion (1): Hypotheses



- Evolution towards converter-dominated power grids will allow for increased availability (island operation), also benefitting communication networks
- Power grids' private networks (fiber and LTE 450) allow for stable grid operation also if public comms network is down
- Power grids' dependency on public communications will increase ($n \times 10E6$ elements on low voltage level, for noncritical and critical functions requiring increased availability)
- Resilience of public communication networks will be enhanced e.g. by topology, selectively additional power backup, E2E inclusion of all parties in the value chain
- Increased resilience of power grids and comms networks offers synergies for other critical infrastructures

Conclusion (2): VDE Recommendations



- Build **awareness** for increasing mutual dependencies
- Think and act **across sectors** and industries („think together“ power grids and communication networks)
- Consider potential **disasters** (man made and natural)
- Systematically **plan and implement measures** to address potential risks
 - Short term: clarify requirements (grid and comms), build selected quick fixes, create X-sector O&M interfaces
 - Mid term: establish joint planning for systemic resilience, create synergies, plan and exercise for disaster cases
 - Long term: Prepare for power grids‘ island operation, research on future interdependencies, risks, opportunities

... looks as if there is a lot to do yes, it is!



Thank you very much
for your attention.

<https://www.vde.com/de/etg/arbeitsgebiete/v2/mehr-resilienz-fuer-die-strom--und-kommunikationsnetze-in-deutschland>

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