The power grid: bottleneck or enabler of the energy transition?

#clisciety

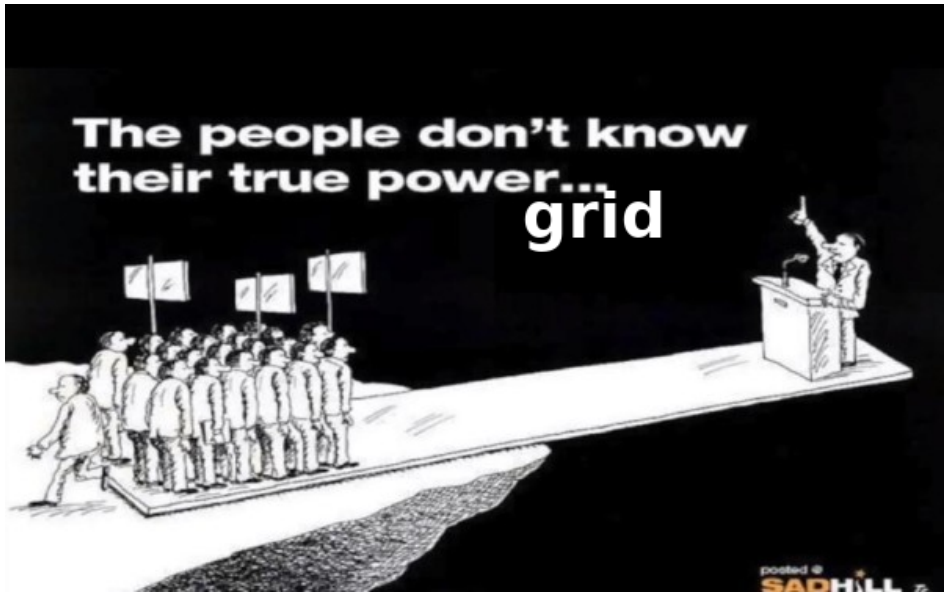
presented by Lia Strenge [1]

[1]Technische Universität Berlin

Part I: Intro, our work and our questions

Assumption: We all want the power grid to become an enabler of the energy transition.

Who does not? History and the current regulatory framework

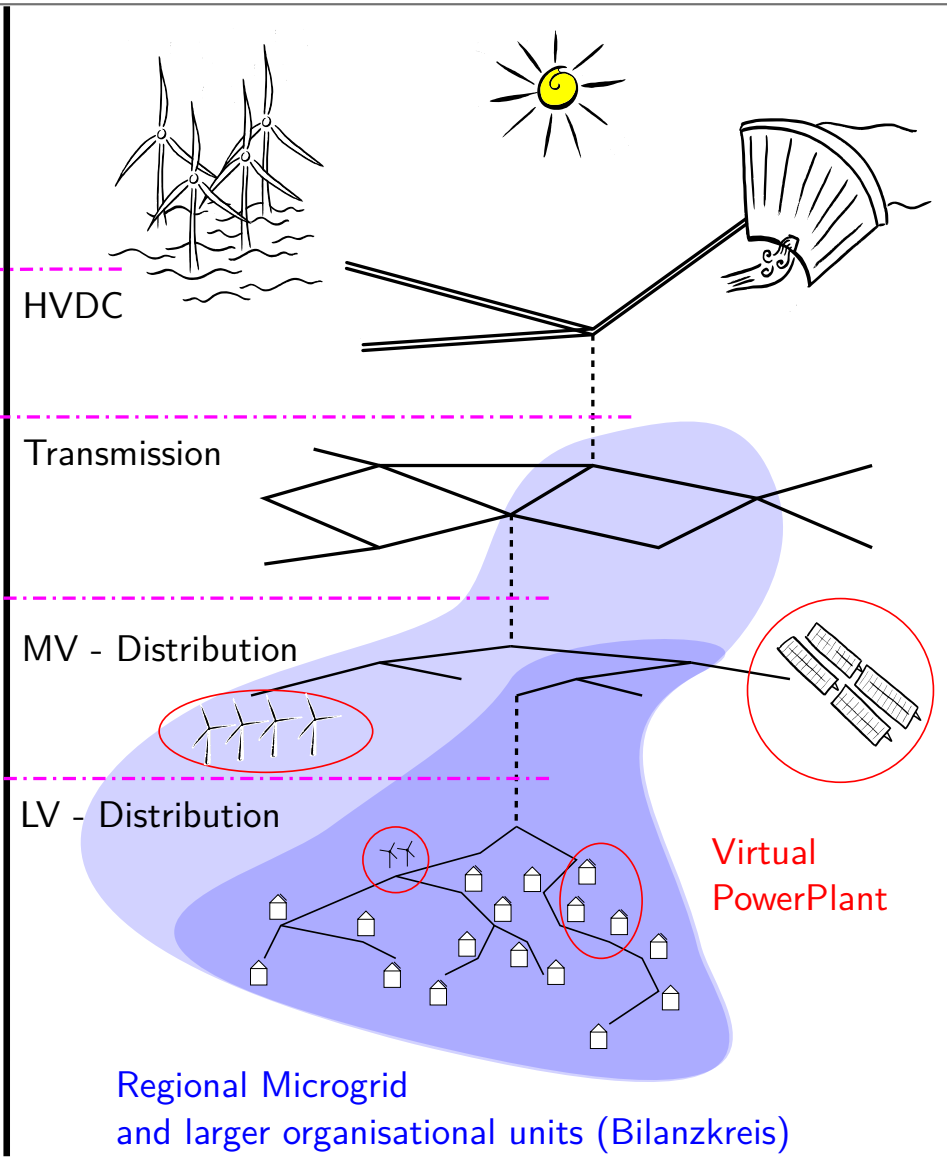


http://a398.idata.over-blog.com/600x375/3/27/09/71/aout-2013/Janvier-2014/Mars-2014/aout-2014/Les-gens-ne-connaissent-pas-leur-vrai-pouvoir.JPG

Our goal: Avoiding that myths about the power grid become an obstacle to the energy transition.

Current power grid operation in the energy transition

Separation of concerns according to network layer. Driven by physics, and central provision of power balancing. Limited inter-layer communication and coordination. Every operator assumed that the others could achieve their goals.

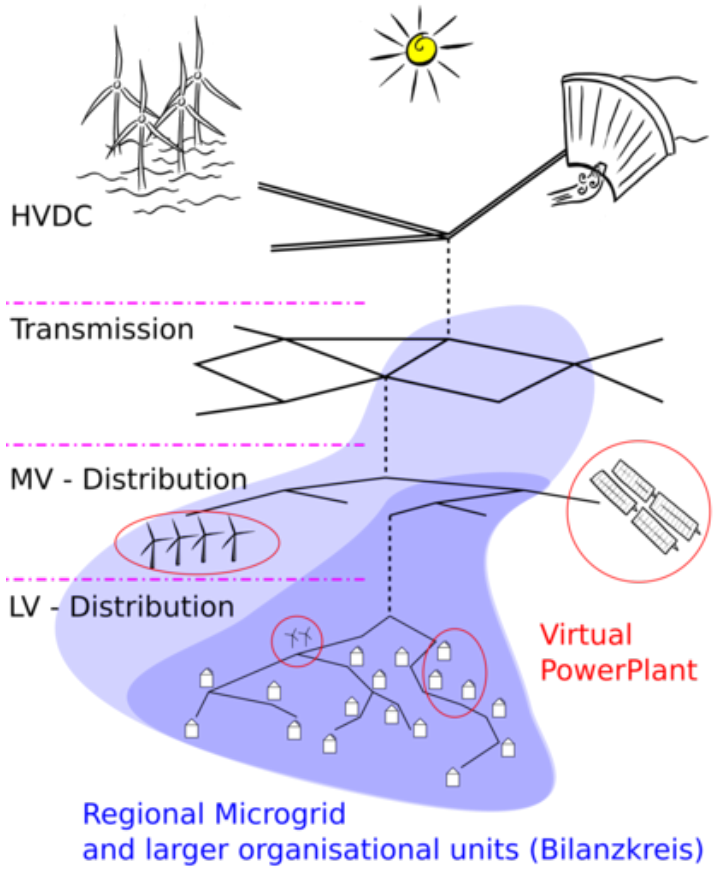


Cocohype project motivation (research)

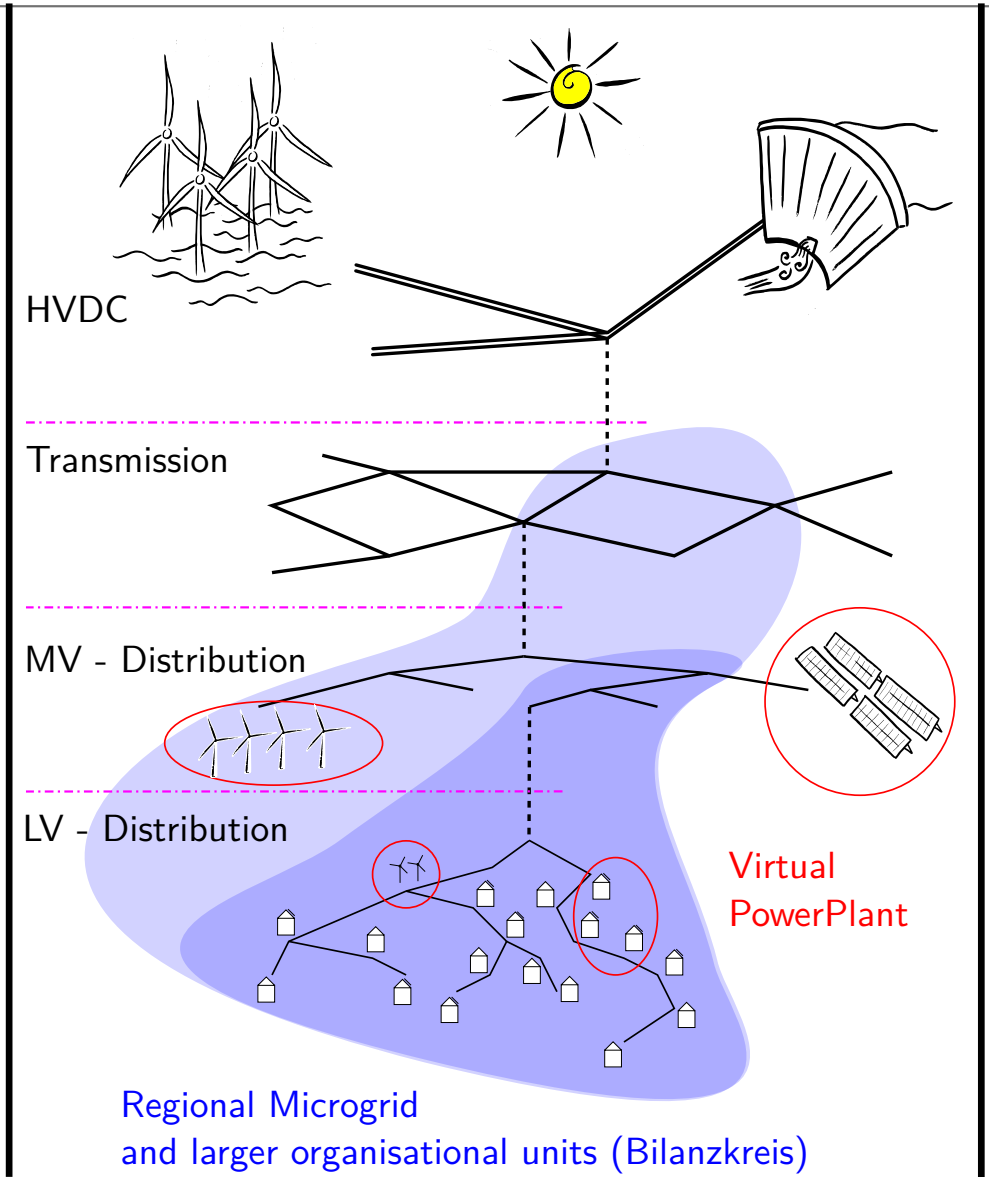
What are the adequate principles for the operation and design of multi-layered hybrid power systems with distributed actors?

Inspiration, e.g., specific questions:

- How to coordinate and aggregate control (e.g., ancillary services) from lower grid levels?
- How to use distributed generation to ensure resilience (e.g., by islanding)?
- What is the appropriate size of the organisational units (microgrids, virtual power plants)?
- How to structure and minimise communication needs?

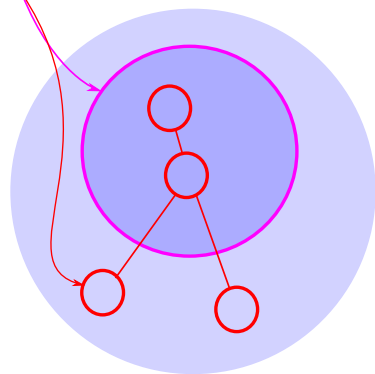


The power grid tranformation in the energy transition (research)



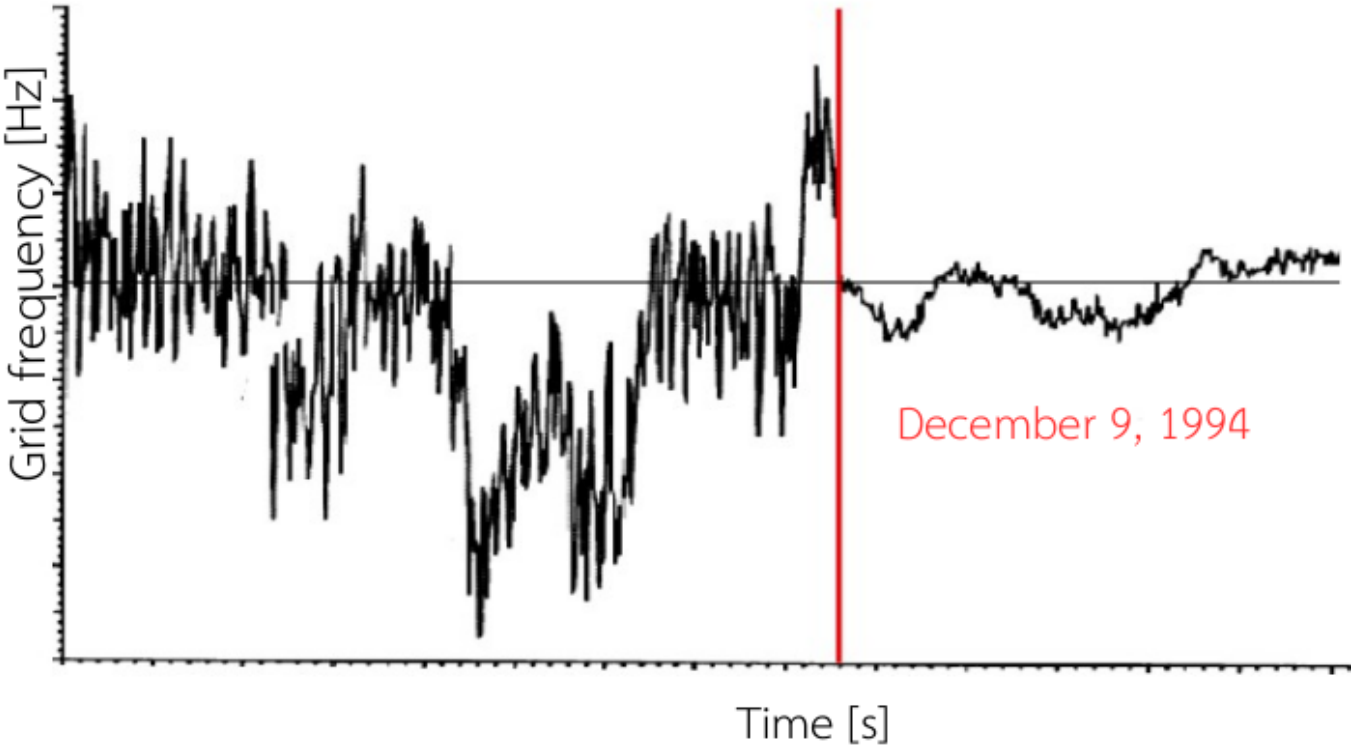
Dynamics driven by inverters and weather, not just synchronous machines and demand. Control distributed, balancing locally.

We derive new virtual boundaries and control objectives within them, validate that distributed, low communication control can achieve them, and prove that they consistently combine to achieve the overall systems voltage, frequency and safety objectives.



elena international (research transfer)

elena
international



Source: Energiemuseum Berlin

Open Source Software for frequency modeling: PowerDynamics.jl on github: https://github.com/JuliaEnergy/PowerDynamics.jl

The role of the civil society in the power grid transformation? #clisciety

`http://clisciety.blogsport.de/`

We believe that the power grid can only become an enabler of the energy transition if there is an (informed) public attention to its transformation!

1. Energy distribution as service or participative entity?
2. Where do local and global meet? Centralized solutions vs. decentralized solutions
3. How can the sustainability movement develop a position for the power grid transformation? Solutions/protest forms!

Part II: Your questions

Part III: Interactive exercise

Please write down 3 charac teristics a "sustainable power grid" would have for you and discuss it with your neighbor(s) - here and at home.

References

[1] T. Kittel, S. Auer, and C. Horn. Sneak preview: Powerdynamics.jl – an open-source library for analyzing dynamic stability in power grids with high shares of renewable energy. *Wind Integration Workshop 2018*, 2018.

[2] T. Kittel and S. Auer. Modeling the dynamics and control of power systems with high share of renewable energies. *Wind Integration Workshop 2018*, 2018.

[3] L. Strenge, H. Kirchhoff, G. L. Ndow, and F. Hellmann. Stability in meshed DC microgrids using probabilistic analysis. In *IEEE International Conference on DC Microgrids*, 2017.

[4] J. Schiffer, D. Zonetti, R. Ortega, A. Stanković, T. Sezi, and J. Raisch. A survey on modeling of microgrids—from fundamental physics to phasors and voltage sources. *Automatica*, 74:135 – 150, 2016. ISSN 0005-1098. doi: http://dx.doi.org/10.1016/j.automatica.2016.07.036.

[5] P. Schultz, J. Heitzig, and J. Kurths. A random growth model for power grids and other spatially embedded infrastructure networks. *European Physical Journal: Special Topics*, 223(12):2593–2610, 2014.