

Lucerne University of
Applied Sciences and Arts

**HOCHSCHULE
LUZERN**

Technik & Architektur

Energy Hub – Decentralized Energy Supply and Storage

Institute for Building Technology and Energy

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Austin & San Antonio, Texas

October 6-9, 2019



FH Zentralschweiz









AGENDA

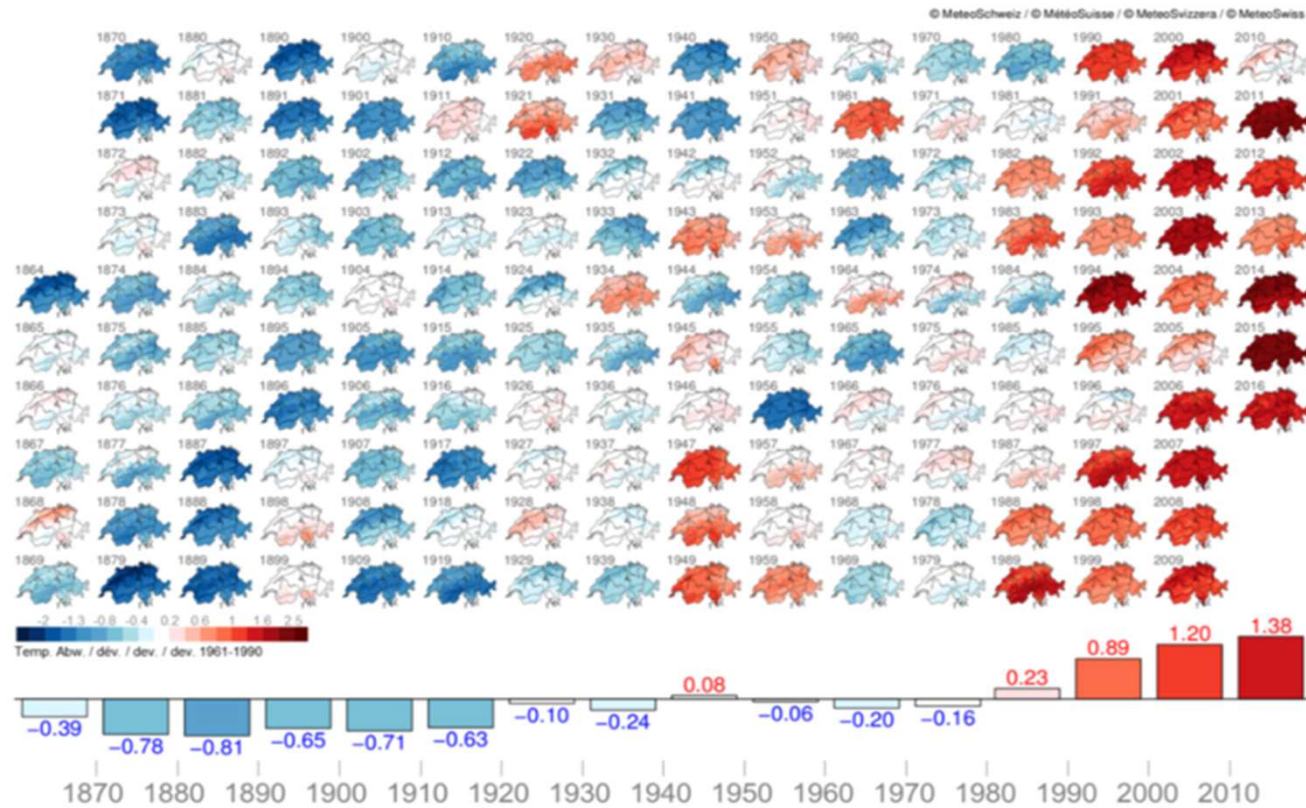
- Trends – Decarbonization, Decentralization and Digitization
- Conditions – Changing and Challenging
- Solutions and Example – Storage and Systems Engineering
- Conclusion



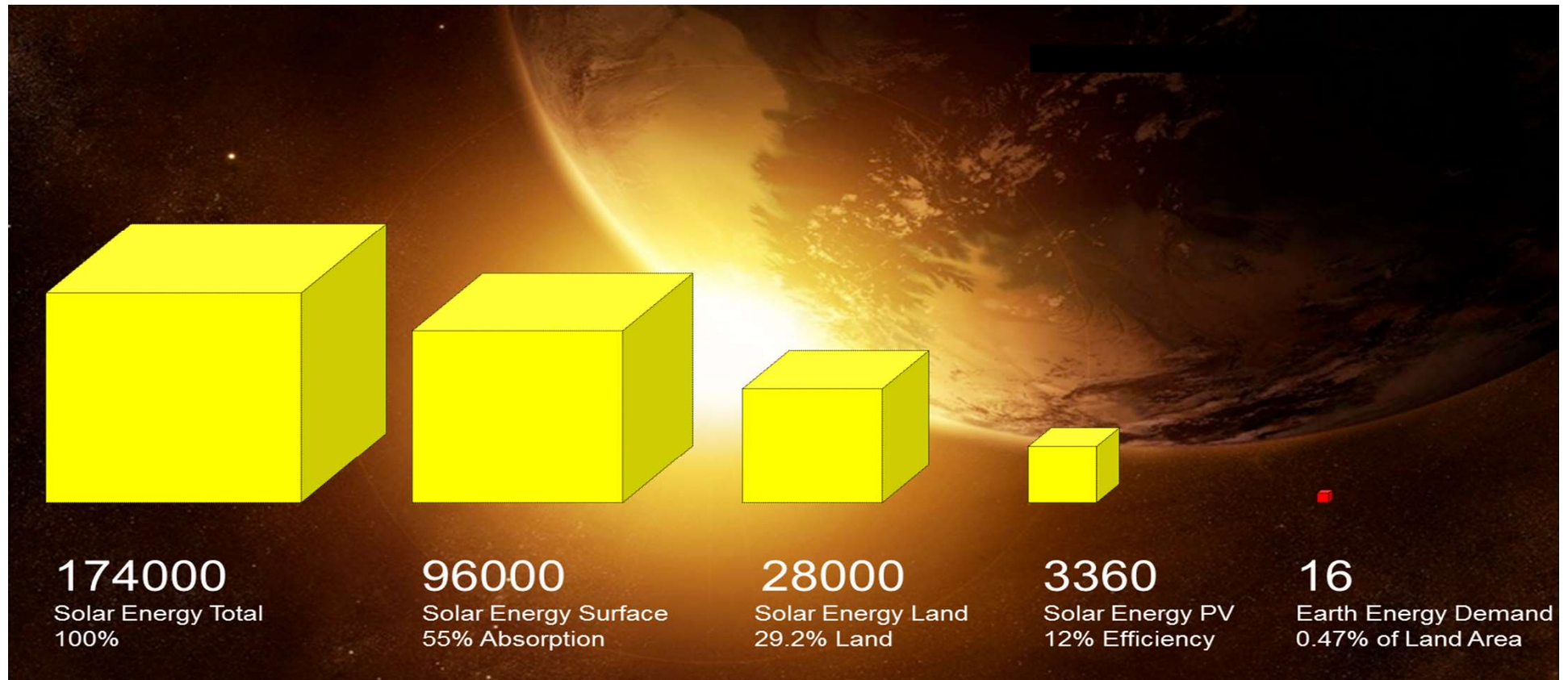
Trends – Decarbonization, Decentralization and Digitization



Conditions – Increasing Average Ambient Temperature (Switzerland 1864-2016)

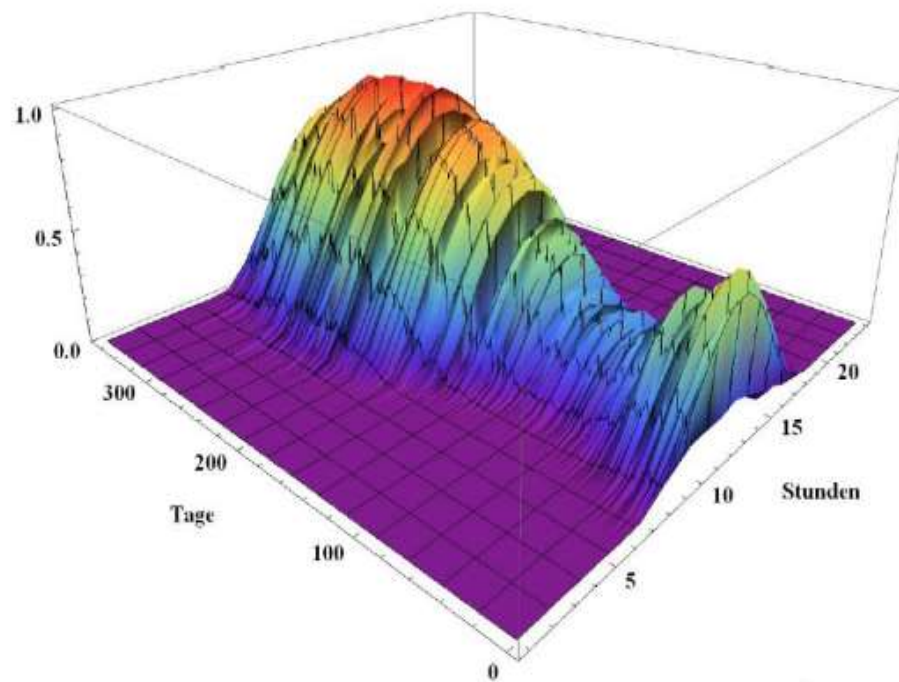


Conditions – Stable Global Yearly Solar Energy Supply (Factor 10'000)

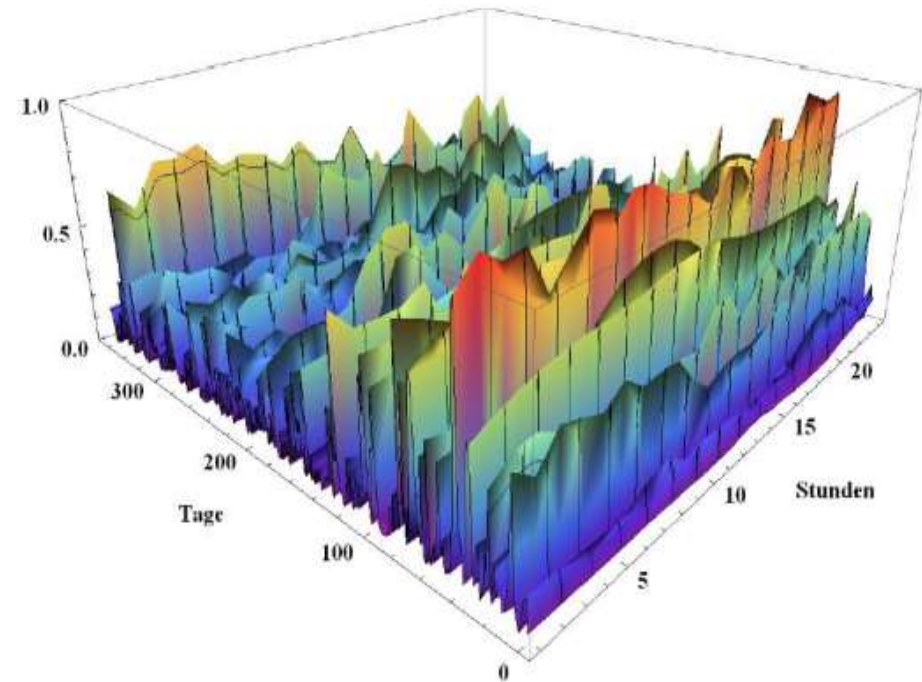


Conditions – Unstable Local and Stochastic Energy Supply (24h and Seasonal)

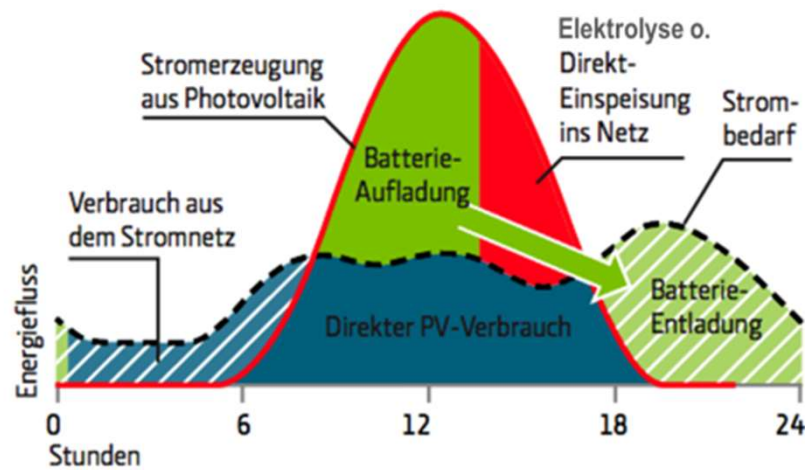
Sonne



Wind

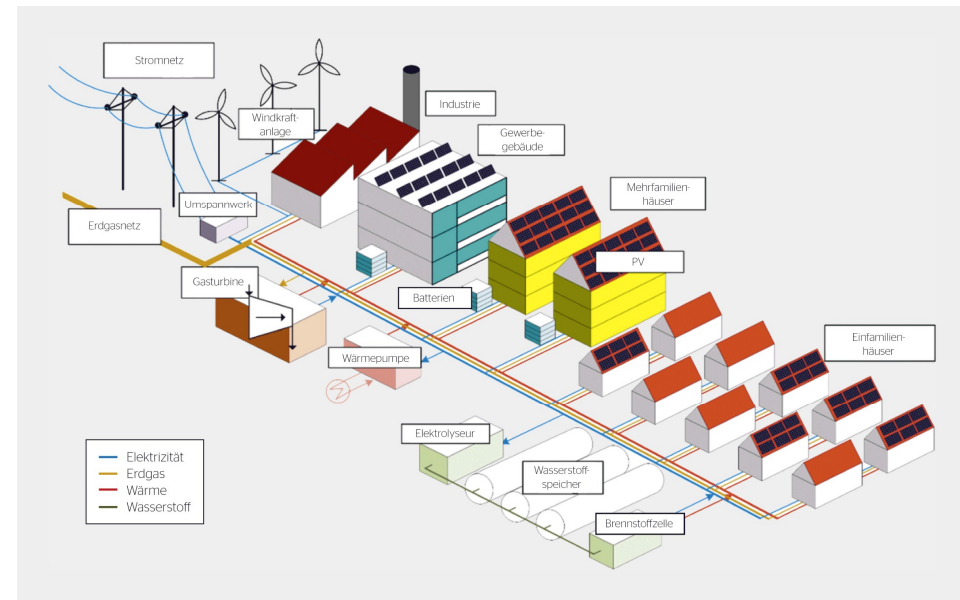


Solutions – Phase-Compatible Storage and Level-Adjustable Energy Hubs



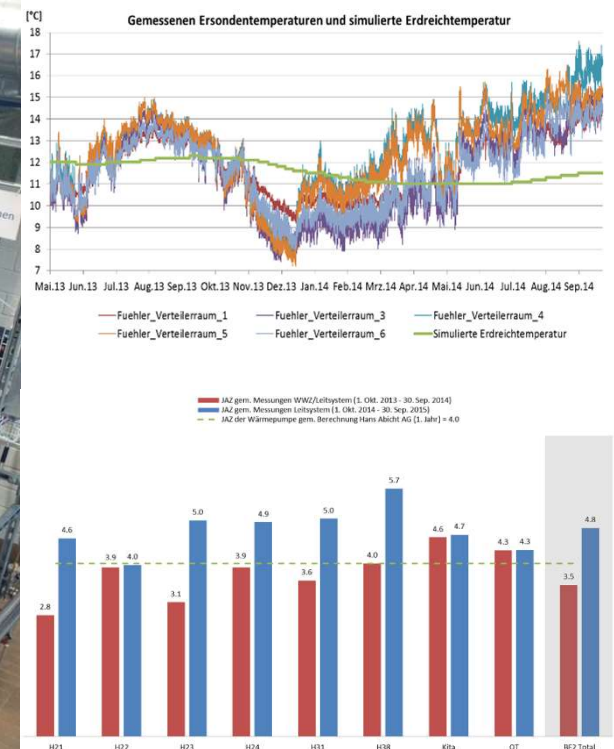
24h Phase and Building Level:
PV Energy Supply, HP and Short Time Storage (e.g. Lithium-Ion Battery)

Folie 10, 22.09.2019

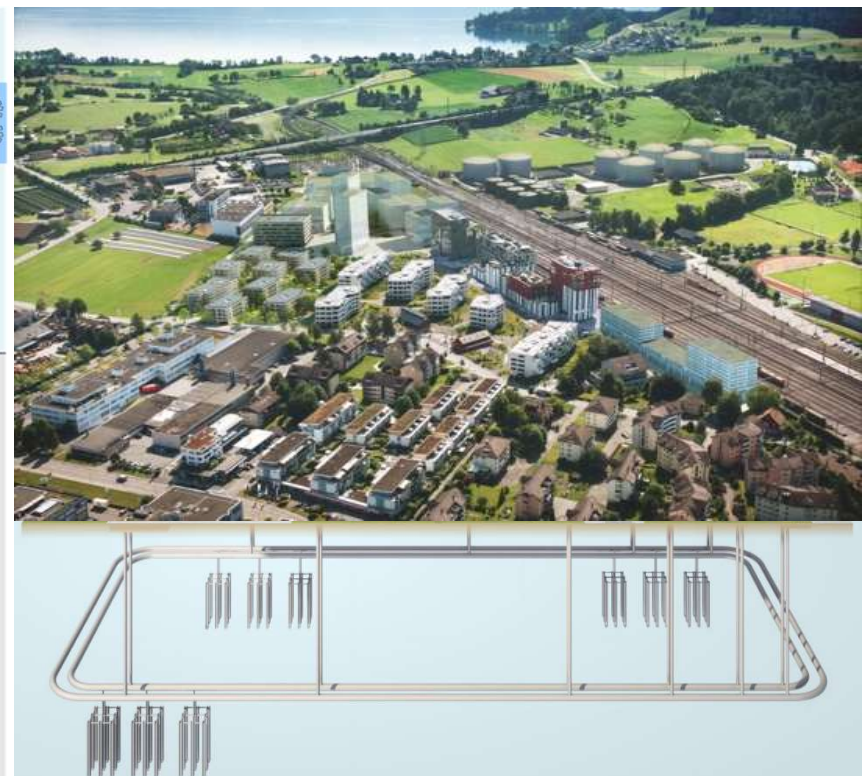
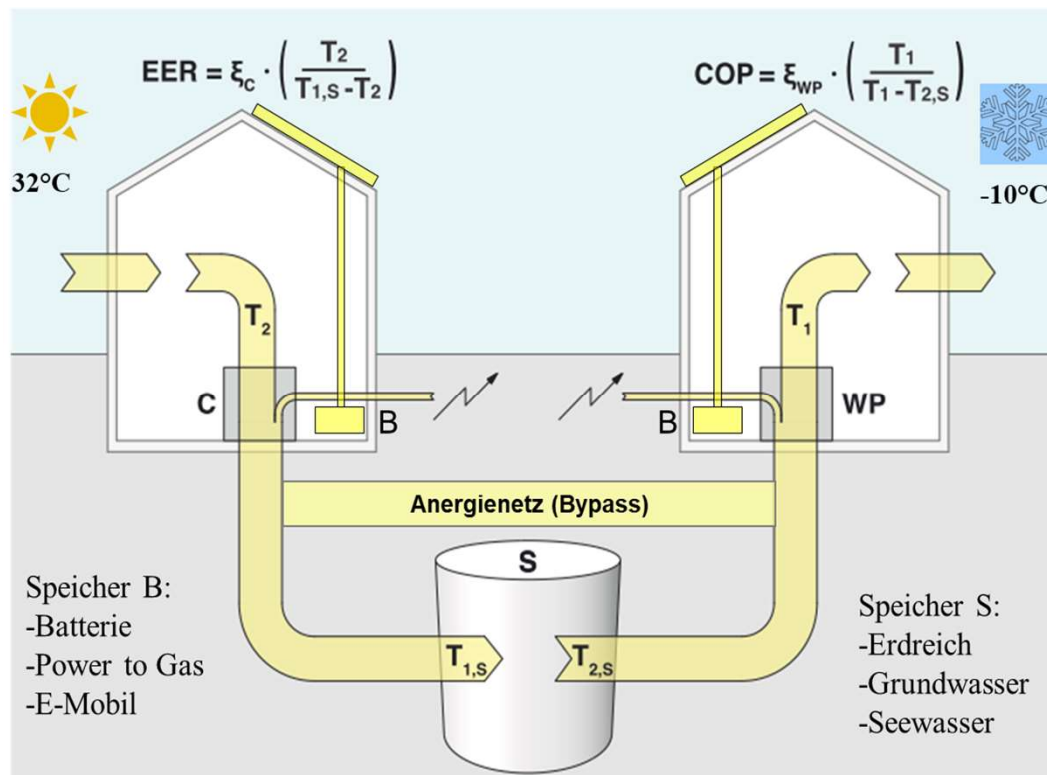


Seasonal Phase and District Level:
PV and Wind Energy Supply, HP and Seasonal Storage (e.g. Hydrogen)

Solutions – NODES Lab at Lucerne University and Monitoring of Buildings and Districts



Example – Building and District Level at «Suurstoffi» District Rotkreuz, Switzerland



Conclusion

- We have **no energy problem** but a **toxic substance flow problem** (CO₂ emissions, nuclear waste etc)
- The global trends of **decarbonisation, decentralization and digitization** create the **economic framework** for a **sustainable building stock**
- **Decentralized structures** do not abolish key elements, but complement them to form an economically stable overall system with an **enhanced performance** standard



“The electric light did not come from the continuous improvement of candles”

(Oren Harari)



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