Verbundkraftwerk – Stromversorgung der Zukunft

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Forum Solarpraxis 2015

Parabel GmbH – a pioneer in solar power projects

- On the market since 1992
- Development of innovative solar power systems as well as state-of-the-art techniques for economic energy input
  - Established partner for investors, industry and public sector for projecting PV parks
  - Established partner for private sector and Property Management companies for solar heat projects
- Grid infrastructure
  - Development, engineering and construction of feeding infrastructure
- **Combined Power Plant**

Political Background

- Lowering of CO_2 by 40% until 2020
- Increase energy efficiency (primary energy demand) by 50% until 2050
- RE goals:
  - Solar power: 2,500 MW p.a.
  - Wind power onshore: 2,500 MW p.a.
  - Wind power offshore: 6,500 MW p.a. until 2020
15,000 MW p.a. until 2030
  - Bio energy: 100 MW p.a.

  - Geothermal / Water energy not an issue

Extension of Transmission Grid (based on German acts)

- EnLAG 2009 (Development of Supply Grid)
- NABEG 2011 (Grid extension acceleration)
- BBPIG 2013 (Federal Plan on Energy Demand)
  - 36 projects
  - 3,400 km to be newly built
  - 1,500 km reinforcement
  - 22 billion € until 2023

Extension of Distribution Grid

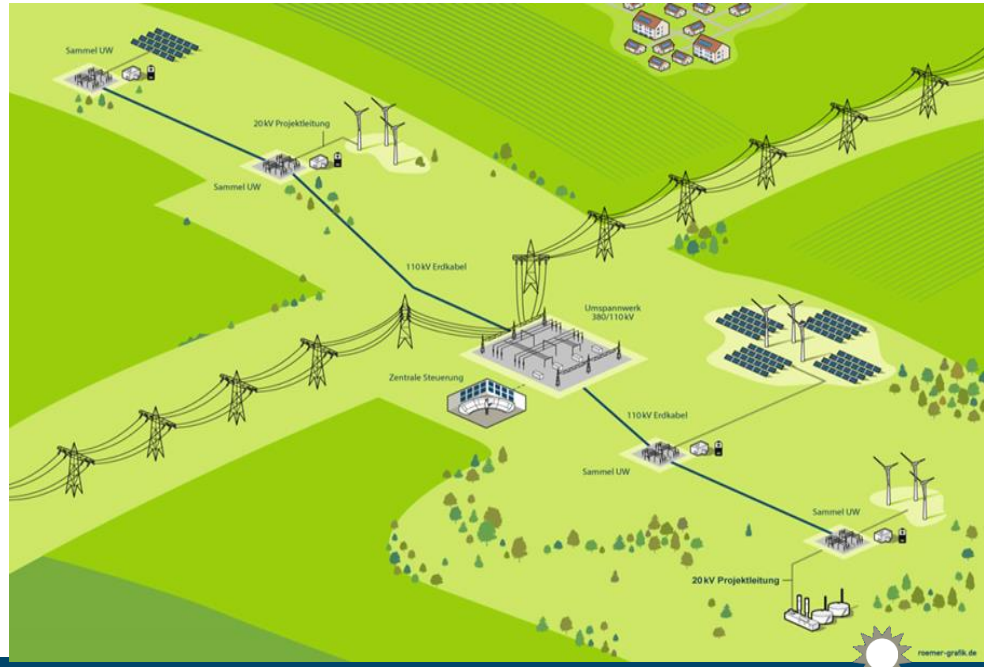
- 90% of all RE-power already connected
- Up to 49 billion € construction costs until 2032,
  up to 70% within next ten years

- “Innovative concepts in combination with intelligent technology lead to a dramatic decrease of the projected expansion volume”

  - Production Management
  - Reactive Power Management
  - Load Management

Challenges

- To find alternatives for fossil and nuclear power plants
- To integrate RE plants into existing grid infrastructure
- To guarantee system stability and continuous power supply



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Combined Power Plant

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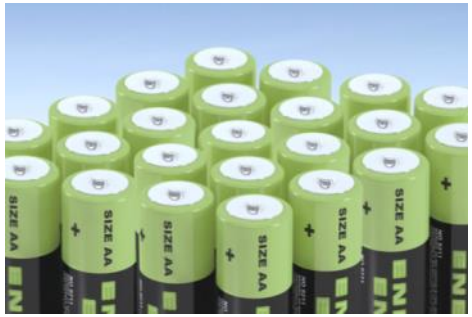
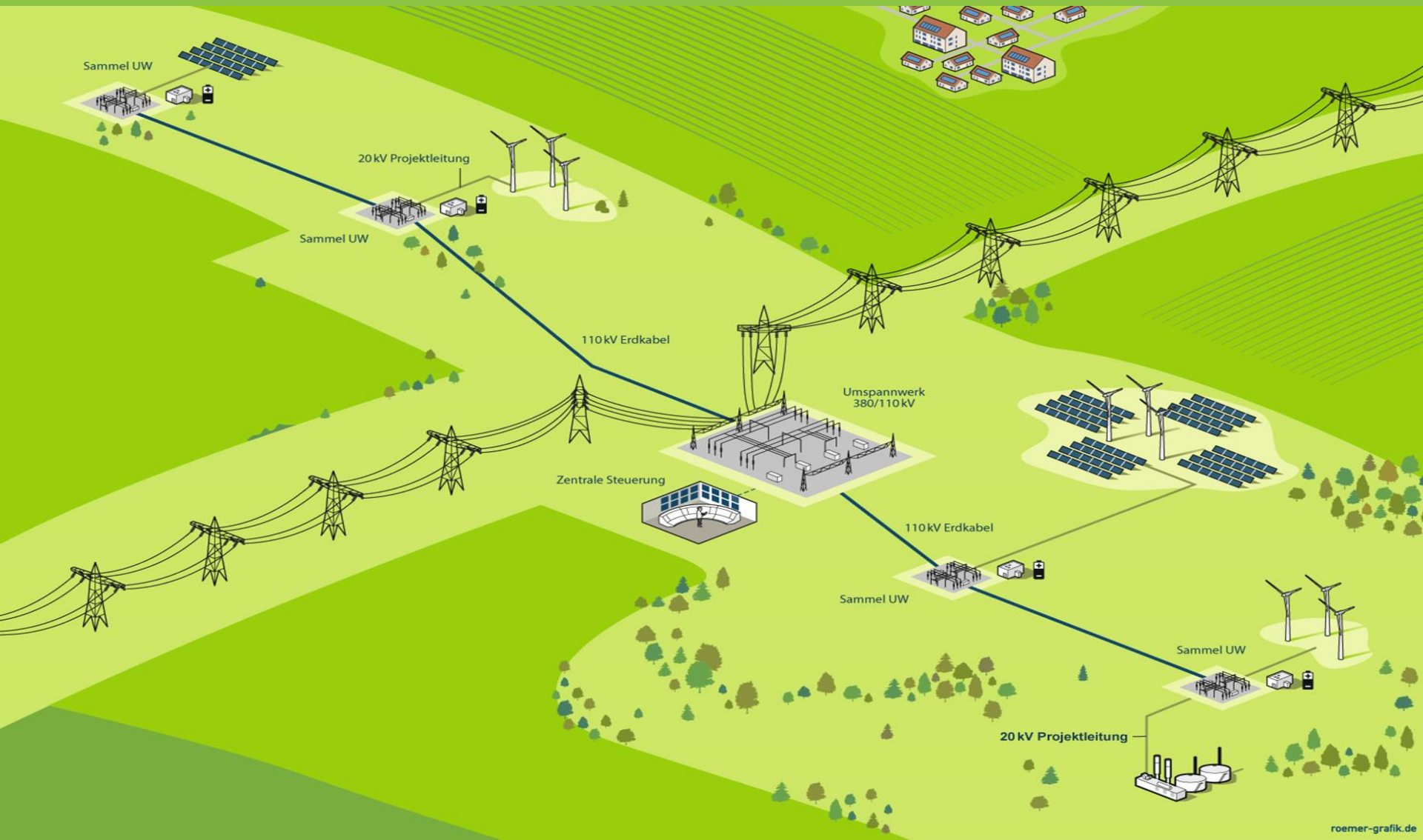
The Future of Electricity Supply



Verbundkraftwerk Prignitz: How it works



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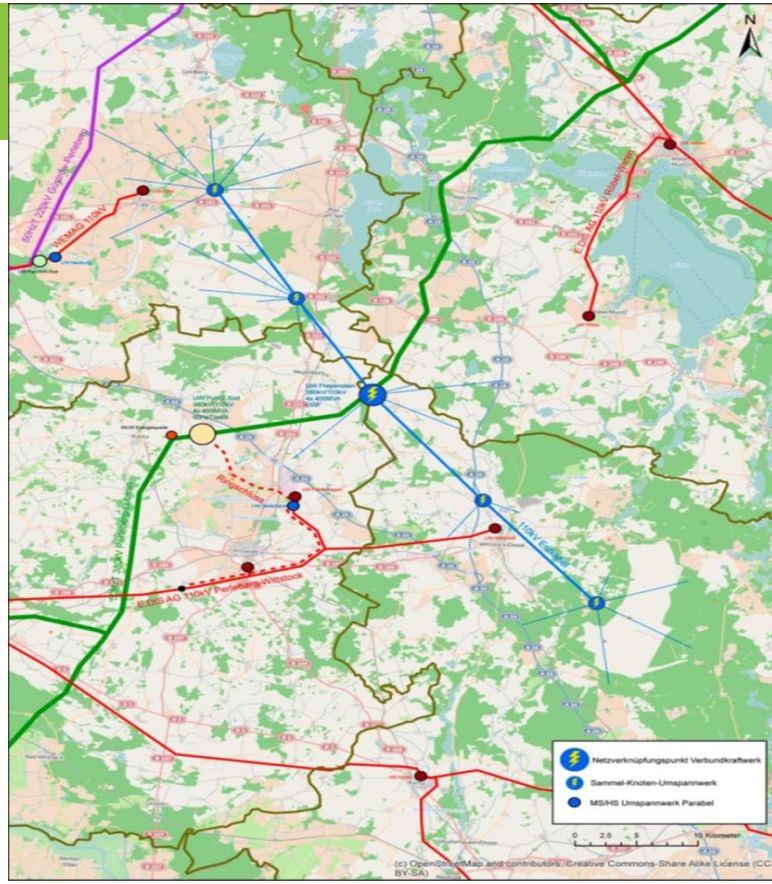
Grid integration

- An advantage for
  - RE operators: easier access to the grid
  - The region: less visible environmental impact (earth cable vs. HV lines)
  - The consumer: lower grid fees
  - The system operator: easier data exchange
- Supported by /in cooperation with
  - HTW Berlin and Fraunhofer ISE
  - Cluster Energietechnik Berlin-Brandenburg SINTEG (WindNODE)



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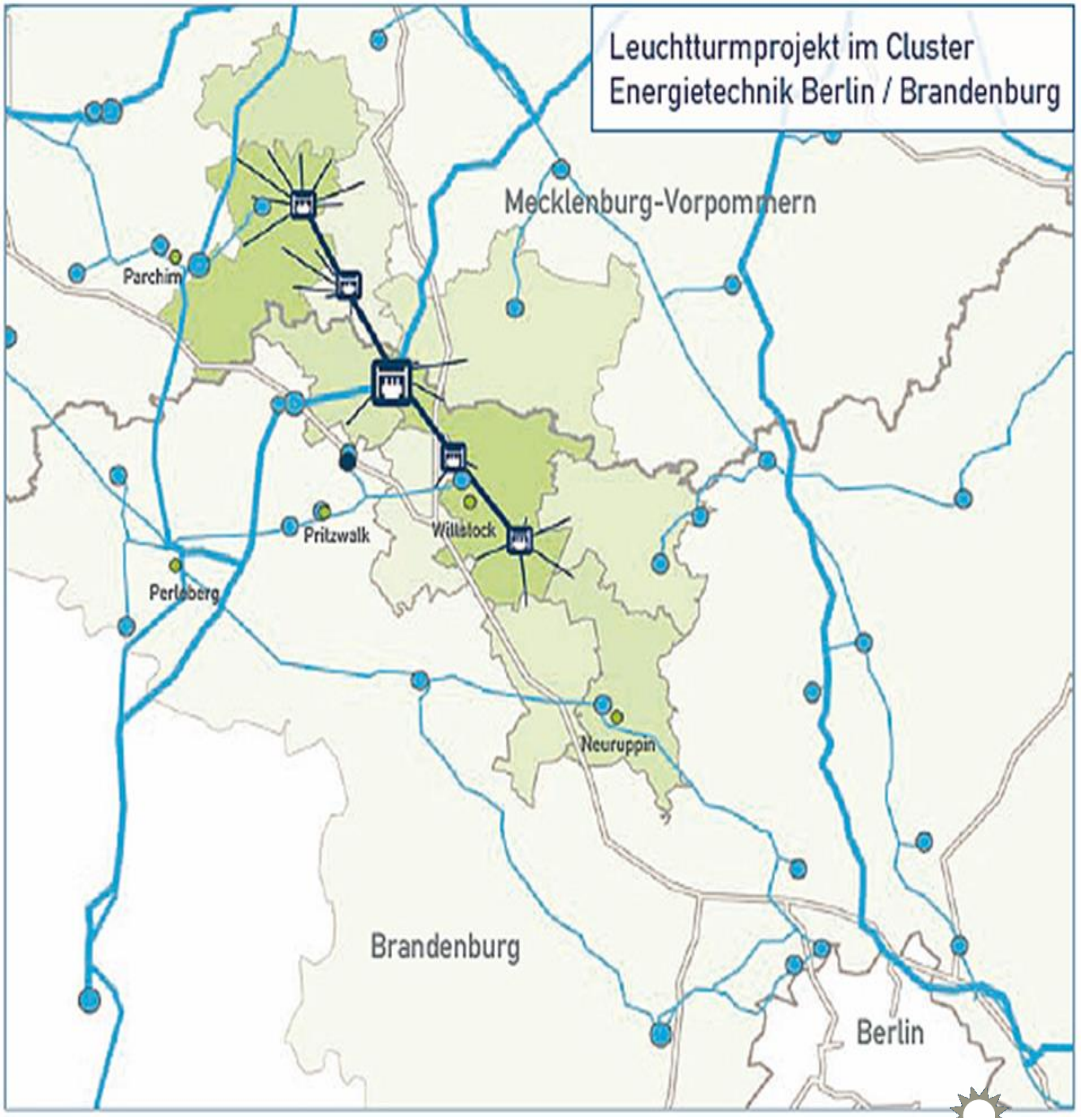
Power Plant Integration

- Complementarity of PV and wind energy
- Same level standard of large scale power plant
- Ancillary services and base load capacity
- Conformity with energy market
- Ensures high availability (4,500 hours peak power p.a.)



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Market Integration

- In line with EEG 2014
  - Obligatory direct marketing
  - Additional revenues for each operator
  - Harmonized power production
- Part of regulatory Energy Markets
  - Stabilizing changes in Trade- and Service-Markets
  - Responsible assignment of costs and earnings
- A look into the future: EisMan-Rule, §95 EEG 2014

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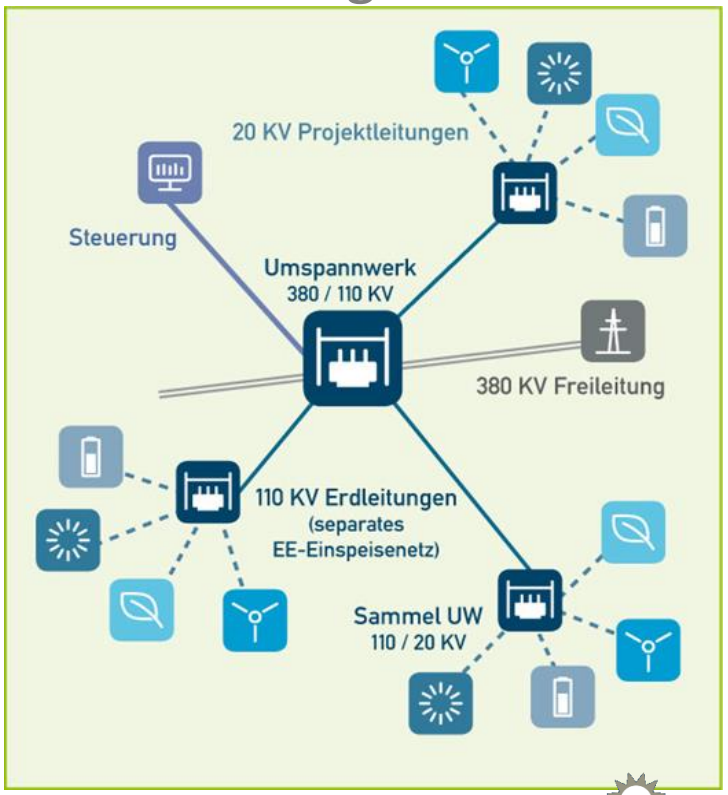
- A new type of Power Plant
- Integration of pv, wind, (bio-) gas turbines and storage
- Integration through independent Supply Grid
- Direct connection to Transmission Grid
- Super ordinate Power Plant control
- Harmonized cooperation of all producers (following the joint roadmap)



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