WindNODE as a blueprint for a transition towards 100% renewables

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Markus Graebig (formerly: Project Director WindNODE)
markus.graebig@50hertz.com

www.windnode.de/en

Germany Land of Ideas Landmark 2018

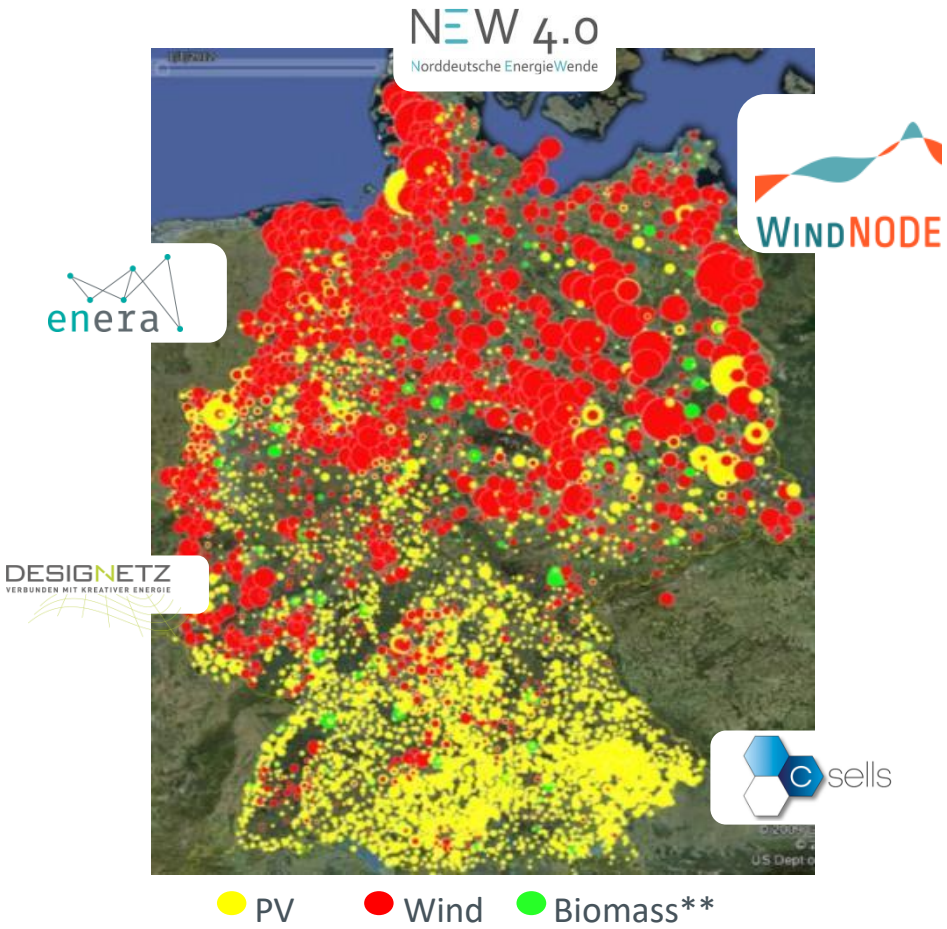
SINTEG SMART ENERGY SHOWCASES

Supported by: Federal Ministry for Economic Affairs and Energy on the basis of a decision by the German Bundestag

WindNODE in a nutshell

Field tests for the next phase of the energy transition

Overview of 5 smart energy showcases (SINTEG program*)



Challenge & Targets

Scalable solutions for efficient, eco-friendly and safe integration of large amounts (100% +) of renewables

Government Funding*, 2017-2021

230 mio. € for five SINTEG consortia,
37 mio. € for WindNODE

(plus equal amount of private funding)

WindNODE: Renewables frontrunner

- 6 states in East Germany
- > 60% renewables in electricity mix (2019), taget: 100% (2032)
- Wind energy prevails
- Energy transition challenges: grid extension, lignite phase-out, …

* "Smart energy showcases (SINTEG), funded by the German Federal Ministry for Economic Affairs & Energy (BMWi)

** as of 2018, > 1,600,000 plants, 49.628 GW wind, 41.687 GW PV [50Hertz]

Source: BMWi, 50Hertz, C/sells, Designetz, enera, NEW 4.0, WindNODE

More than 70 distinguished partners from industry & academia

WindNODE

WindNODE partners

TSO 50Hertz as manager of the consortium

Steering Group

Partners

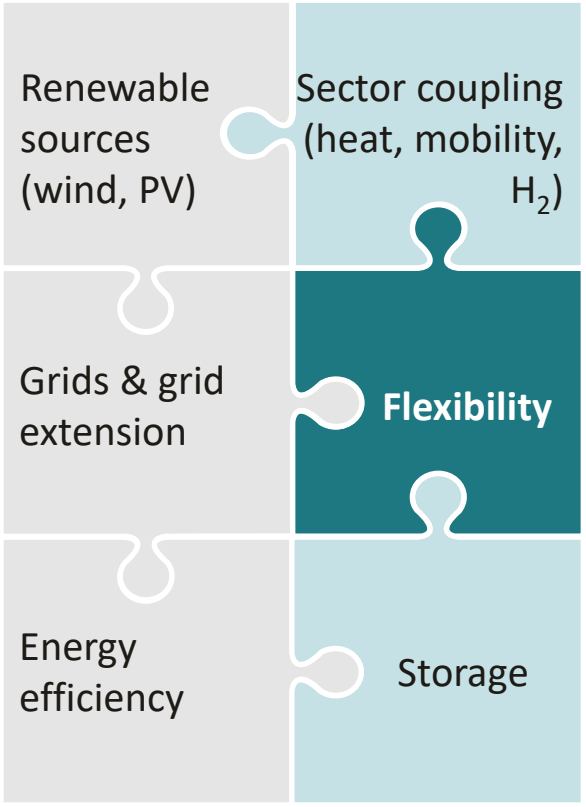
Associated Partners

Subcontractors

Source: www.windnode.de/en/partners

Utilizing flexibility to cope with intermittence

How to reach 100% renewables?



The WindNODE approach

- ✓ **Identifying demand-side flexibility options**
  > 200 MW exemplary flexibility in industry, businesses, neighbourhoods
- ✓ **Developing use cases for flexibility**
  Flexibility platform for grid congestion management
- ✓ **Creating value from energy data**
  Smart distribution grid; control centers for sector coupling; AI-based forecasting
- ✓ **Living lab**
  > 30 real-life demonstrators; application of regulatory sandbox

Source: WindNODE

Abundance of technical flexibility options

Fields of action and results (1/4)

- ✓ **Identifying flexibility options** (technical potential)
- ✓ **Developing use cases for flexibility** (economic potential)
- ✓ **Creating value from energy data** (digitalisation in the energy space)
- ✓ **Living lab** (blueprints, narrative, dissemination)

- 4 Siemens factories, Berlin
- Flexibility in water & sewage treatment, BWB
- Model supermarkets at Lidl & Kaufland
- PtH/PtC at GASAG Solution Plus
- Germany‘s biggest PtH (120 MW) at Vattenfall
- High temperature heat storage (650 °C) by Lumenion, GEWOBAG, Vattenfall
- Fluid ice storage unit, ILK Dresden
- …

Source: WindNODE

Flexibility platform for grid congestion management

Fields of action and results (2/4)

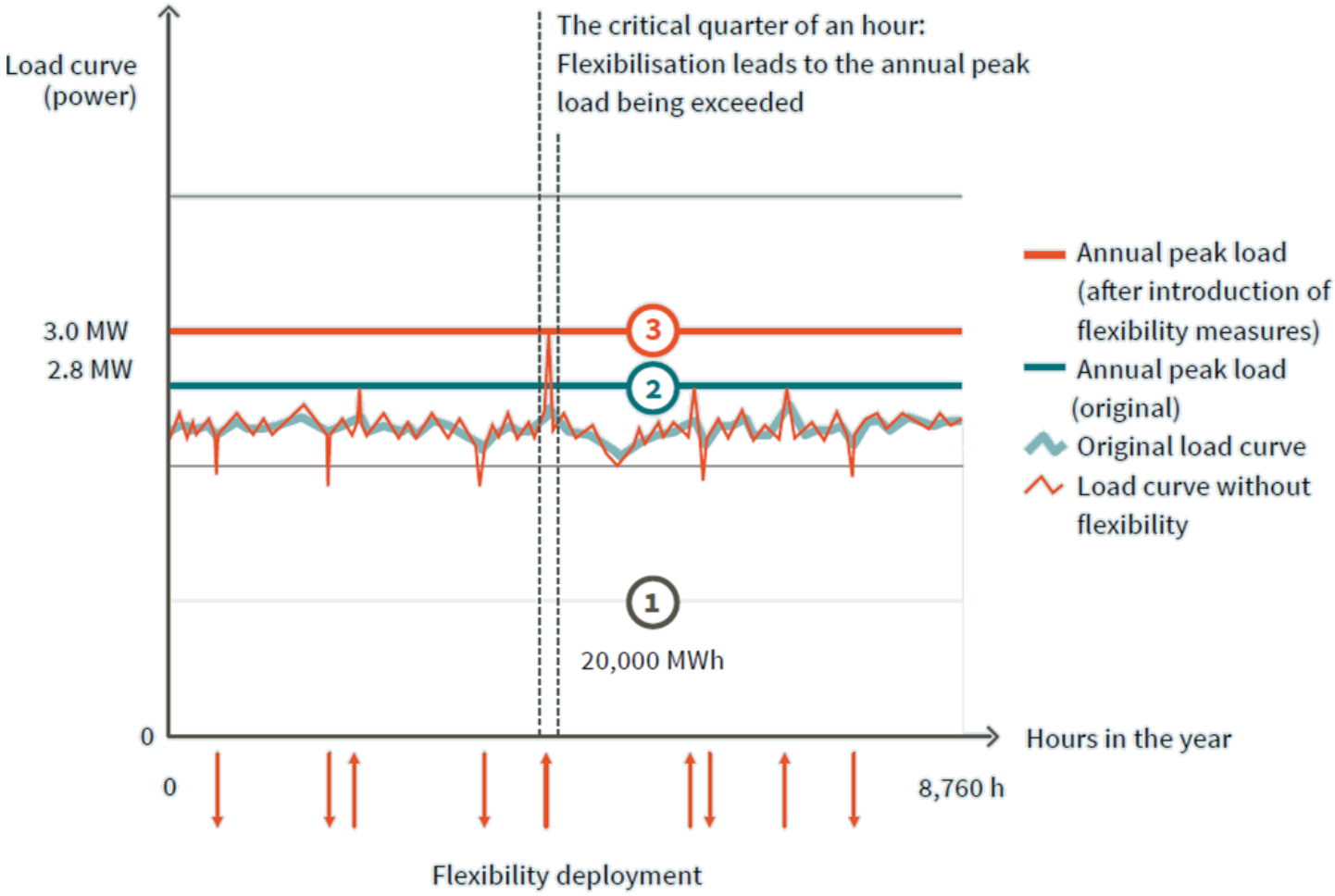
- ✓ **Identifying flexibility options** (technical potential)
- ✓ **Developing use cases for flexibility** (economic potential)
- ✓ **Creating value from energy data** (digitalisation in the energy space)
- ✓ **Living lab** (blueprints, narrative, dissemination)

- WindNODE flexibility platform starts test operation, 11 Nov 2018, by 50Hertz, Stromnetz Berlin and various DSOs
- First real trade at the flexibility platform, 14 March 2019, with offers by Lidl, Siemens and Vattenfall
- Continuation of test operation

Source: WindNODE

Regulatory sandboxes – exploring the right rules of the game

Effects of § 19 (2) 2 StromNEV and the *regulatory sandbox* SINTEG-V (§ 119 EnWG)



Source: WindNODE

Digitalisation in the energy industry

Fields of action and results (3/4)

- ✓ **Identifying flexibility options** (technical potential)
- ✓ **Developing use cases for flexibility** (economic potential)
- ✓ **Creating value from energy data** (digitalisation in the energy space)
- ✓ **Living lab** (blueprints, narrative, dissemination)

- Hackathon „Energyhack² – enery for a smart city“ at Stromnetz Berlin
- Demonstrator „KEMS – Community energy management system“ at IBAR, Cottbus
- Energy data market place at Fraunhofer FOKUS
- High-resolution forecasting of RES generation, by Solandeo
- …

Source: WindNODE

Living lab („Reallabor“): making energy transition tangible

Fields of action and results (4/4)

- ✓ **Identifying flexibility options** (technical potential)
- ✓ **Developing use cases for flexibility** (economic potential)
- ✓ **Creating value from energy data** (digitalisation in the energy space)
- ✓ **Living lab** (blueprints, narrative, dissemination)

- 30 “visitor sites“
- “energy & art“
- Solar Punk Festival SPF2018
- e-stories
- WindNODE Academy
- WindNODE Challenge
- Various international visits and delegations
- …

Source: WindNODE

More than 30 “visitor sites“ have been opened

Here: Siemens showroom for industrial flexibility

Experience Demand Side Management
@ Siemens Showroom (Berlin, Nonnendammallee)

Source: Siemens, WindNODE

Energy meets Art

Source: Maria Reinisch Marketing Kommunikation / Andrei Krioukov

Making energy transition exciting

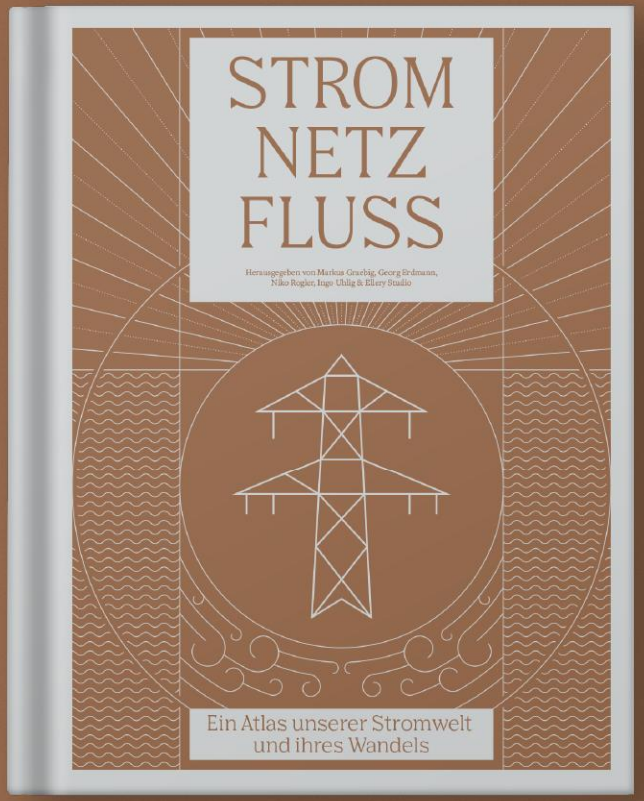
STROM, NETZ, FLUSS

Ein Atlas unserer Stromwelt und ihres Wandels

stromnetzfluss.de

WINDNODE

ellery studio



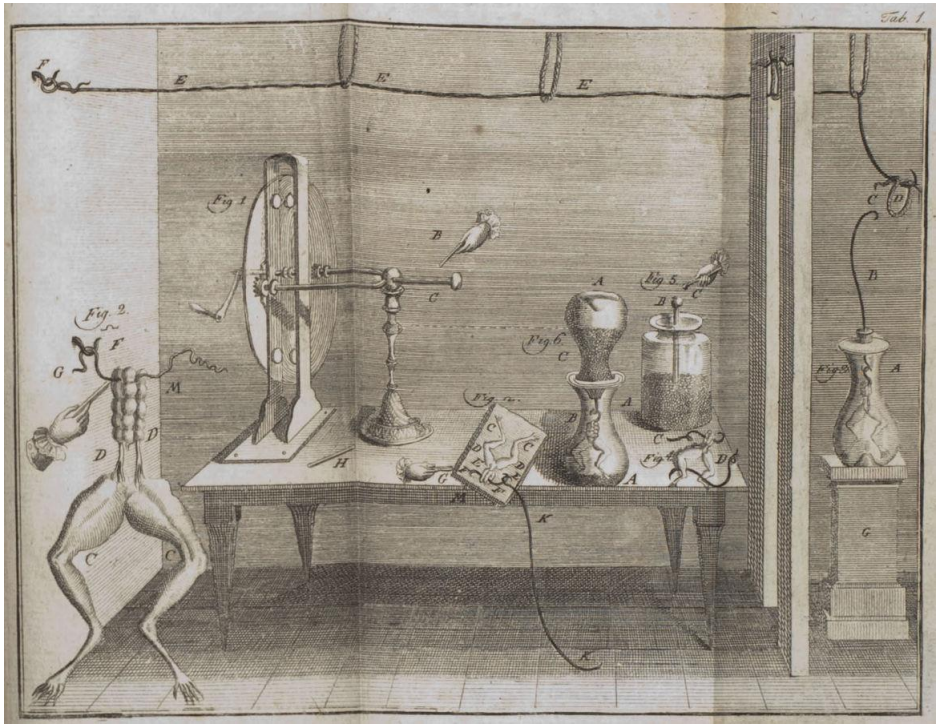
Source: Ellery Studio, WindNODE

Steps towards a “new narrative” for the energy transition

Since 1780

Excitement

Electricity as universal “lifeblood“, Steampunk

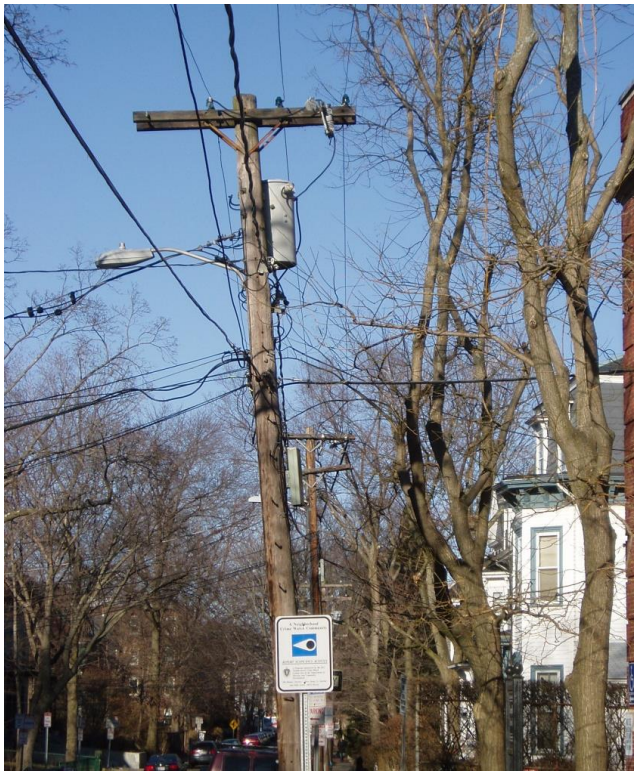


Source: Markus Graebig; Wikipedia, from Luigi Galvani‘s „*De viribus electricitatis in motu musculari*“, provided by Dr. Manuel; WindNODE E-Storys (Ingo Uhlig): https://www.windnode.de/ergebnisse/energie-und-gesellschaft/e-storys/

Steps towards a “new narrative” for the energy transition

Since 1780 — **Excitement** — *Electricity as universal “lifeblood“, Steampunk*

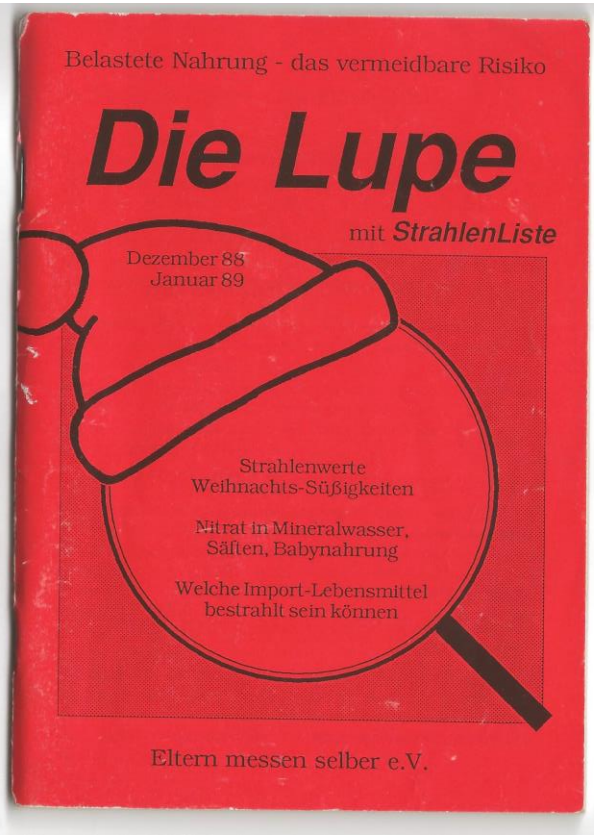
Until 1980s — **Commodity** — *„Strom kommt aus der Steckdose“*



Source: Markus Graebig: distribution grid in Cambridge, MA, 2012

Steps towards a “new narrative” for the energy transition

Since 1780	*Until 1980s*	*Since ~ 1986*
Excitement	**Commodity**	**Fear**
Electricity as universal “lifeblood“, Steampunk	*„Strom kommt aus der Steckdose“*	*Chernobyl, Fukushima, Climate change*



Source: Markus Graebig; Eltern messen selber e.V.

Steps towards a “new narrative” for the energy transition

Since 1780	Until 1980s	Since ~ 1986	The time starts now
Excitement	**Commodity**	**Fear**	**Opportunity**
Electricity as universal “lifeblood“, Steampunk	*„Strom kommt aus der Steckdose“*	*Chernobyl, Fukushima, Climate change*	*“Moon landing“?*

Bundesumweltminister
Peter Altmaier, 2012-10-30

*“(…) In the course of its history, every country needs a project every few decades that is fascinating and captivating. That was the **Americans' moon landing**. That was the reconstruction, it was the German unity. And now comes **the energy transition: take risks seriously, but embrace the opportunities even more** (...)"*

Source: Markus Graebig; Altmaier interviewed by WELT (2012-10-30), photo by M. Lengemann

Speaking of the moon landing …

Kennedy‘s *“We choose to go to the moon“* speech

President John F. Kennedy, 1962-09-12

“(…) But why, some say, the moon? Why choose this as our goal? And they may well ask why climb the highest mountain? Why, 35 years ago, fly the Atlantic? Why does Rice play Texas?

We choose to go to the moon. *We choose to go to the moon in this decade and do the other things,* ***not because they are easy, but because they are hard, because that goal will serve to organize and measure the best of our energies and skills,*** *because that challenge is one that we are willing to accept, one we are unwilling to postpone, and one which we intend to win (…)”*

Source: Kennedy‘s address at Rice University on the Nation's space effort, 12.09.1962, text downloaded from NASA (https://er.jsc.nasa.gov/seh/ricetalk.htm), photo from Wikipedia and the NASA archive

What is a *living lab* („Reallabor“)?

What are the management insights?

Much more than just another research grant: narrative & network – and regulation as part of the experiment

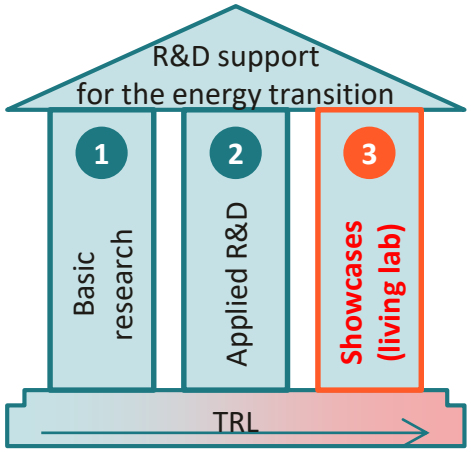
Why did partners participate in WindNODE?

Traditional research grant

€

Grant

F&E-Ziele



Living lab („Reallabor“)

Network

§

Regulatory sandbox

Narrative, visibility, reputation

Source: WindNODE

About *moving targets* and *carrots without sticks*

Experience from the WindNODE management

(1) Research grants are no speedboats

(2) Coordination by a strong, neutral trustee

(3) Multi-stakeholder management: *carrots without sticks*

(4) Mind the synthesis of results

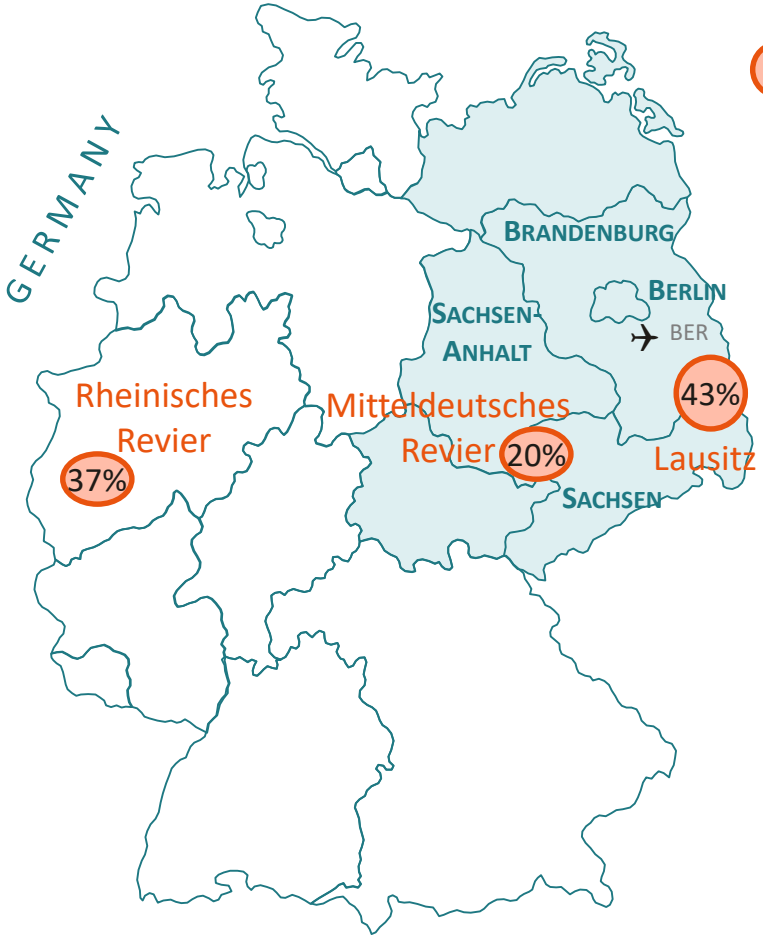
(5) Keep the network alive

Source: WindNODE

What‘s next –
on the way towards 100% renewables?

Coal phase-out by 2038: opportunity for future model regions?

Germany's coal phase-out



Share of total structural aid per lignite mining region

Lignite will be phased out by 2038 …

- … currently mined in open pits in 3 active regions
- … contributed 28.7% to German electricity mix and 54.3% of the sector's CO_2 emissions (2018)

~ EUR 50 bn. total support for coal phase-out:

- EUR 14 bn. for major investment in the regions
- EUR 26 bn. of projects of common interest (e.g., infrastructure)
- ~ EUR 10 bn. compensation payments

Source: Abschlussbericht der Kommission „Wachstum, Strukturwandel, Beschäftigung"; Eckpunkte für ein „Strukturstärkungsgesetz Kohleregionen" (22.05.2019); energate (16.01.2020)

Concerns about the decarbonized future

Protests at the 1st Lausitz Conference (09 Nov 2019) in Schwarze Pumpe

Source: Markus Graebig (photo)

How can coal regions master the transition?

Results of the 1st Lausitz Conference* (09 Nov 2019) in Schwarze Pumpe

Convention of leading incumbents, innovative start-ups & entrepreneurs led to concrete proposals, e.g.:

- **BASF Schwarzheide:** energy transformation of the chemical industry with “Power-to-Chemistry”
- **E-Shelter** (part of the NTT group): large data center
- **ENERTRAG** & Partners: Lausitz hydrogen region
- **IBAR Systemtechnik**: municipal energy management systems as a core of “smart city“ solutions
- **Lumenion** & **KSC**: establish the manufacturing of heavy steel cores for high-temperature storage units

What we need:

(1) Ambitious targets and management for a “transition model region“
(2) “Regulatory sandboxes“ for transition regions
(3) International networks for best practices of structural change

* On inivitation of the Brandenburg Prime Minister together with IKEM and WindNODE

Source: WindNODE, Lausitz Memorandum (09 Nov 2019), photo: F. Woelffing

WINDNODE

For more information visit:

WWW.WINDNODE.DE/EN

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