Sector coupling, flexibility, and outlook on the 2nd phase of energy transition – experience from the WindNODE project

16th IAEE European Conference, Ljubljana, 26 August 2019

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www.windnode.de/en

SINTEG
SMART ENERGY SHOWCASES

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

Content

Source: WindNODE

Energy transition has been an “electricity transition”

Government’s assessment report on energy transition, 2018*

	Base year	Status 2016	Assess-ment**	Target 2020	Target 2050
Greenhouse gas emissions	1990	- 27.3%	R	- 40%	≤ - 80%
Nuclear power phase-out				by 2022	
Renewables … share of gross final energy consumpt.		14.8%		18%	60%
… share of gross electricity consumption		31.6%		35%	≥ 80%
Energy efficiency … primary energy demand	2008	- 6.5%	R	- 20%	- 50%
… heat demand of building stock	2008	- 6.3%		- 20%	
… final energy consumption in transportation	2005	4.2%	R	- 10%	- 40%
Security of supply … transmission grid expansion			R		
… redispatch					
… system average interruption duration index (SAIDI)					
Prices					
Acceptance					

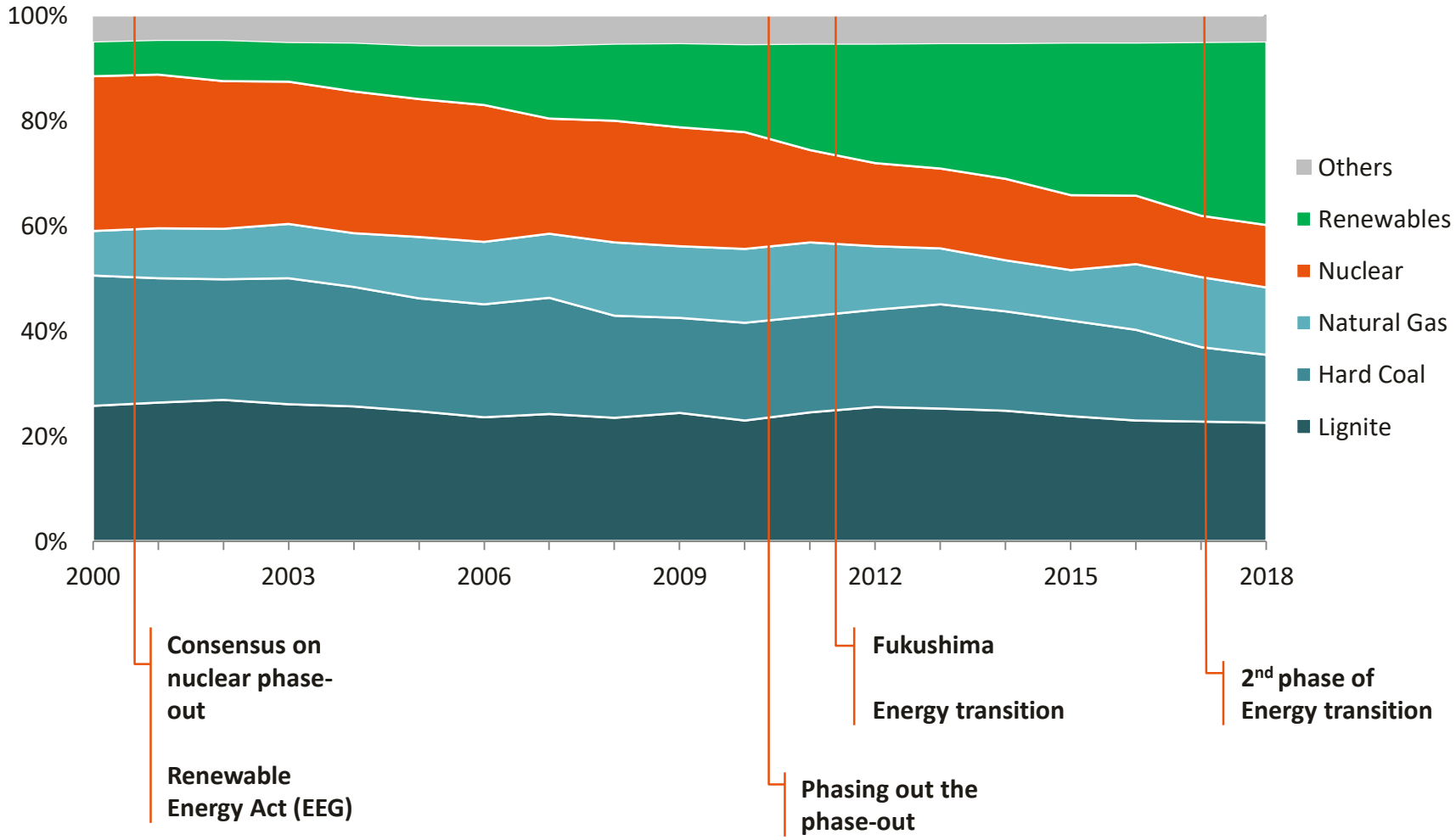
* Selected indicators in 7 major assessment dimensions

** Assessment by independent expert commission – qualitative assessment if no performance indicator is shown

Source: 6th Monitoring Report for the Energy Transition (Sechster Monitoring-Bericht zur Energiewende), 2018; Assessment Report of the Independent Expert Commission “Monitoring-Prozess Energie der Zukunft”, 2018

> 1/3 of German electricity mix is renewable – and intermittent

Gross electricity generation in Germany, percentage of total generation (2018)



Source: AG Energiebilanzen, 2019

Narratives of fear

Rationale for energy transition

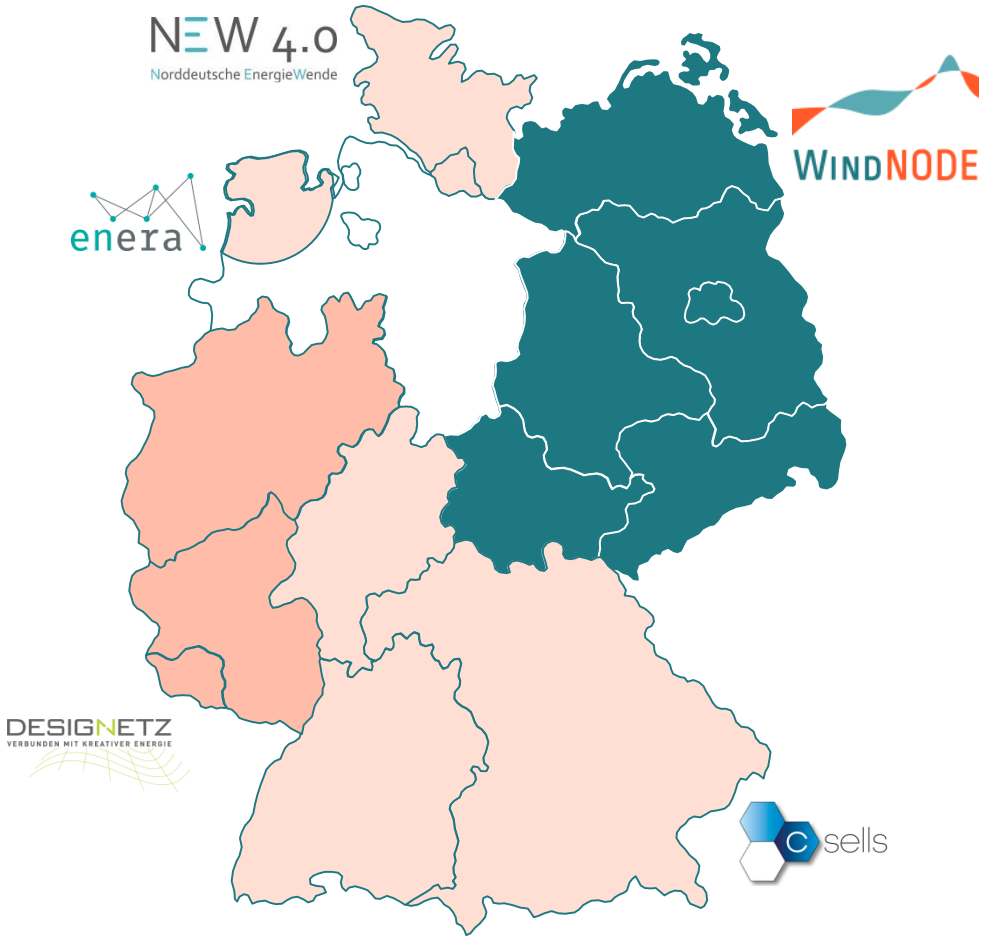
Source: Eltern messen selber e.V.

Content

Source: WindNODE

Field tests for 2nd phase of energy transition

Overview of 5 smart energy showcases (SINTEG program*)



Challenge & Targets

Scalable solutions for efficient, eco-friendly and safe integration of large amounts of renewables:

(1) Coping with intermittency

(2) Decarbonizing other sectors

(3) Utilizing digital technology

(4) Renewing energy transition narrative

Government Funding*, 2017-2020

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

WindNODE – entire East Germany

- 6 federal states, 16 mio. people
- 1 control area (50Hertz)
- Renewables frontrunner (> 56%)
- Energy transition challenges

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

Source: BMWi, c/sells, designetz, enera, NEW 4.0, WindNODE

WindNODE: more than 70 partners from industry & academia

WindNODE partners

Steering Group

Partners

Associated Partners

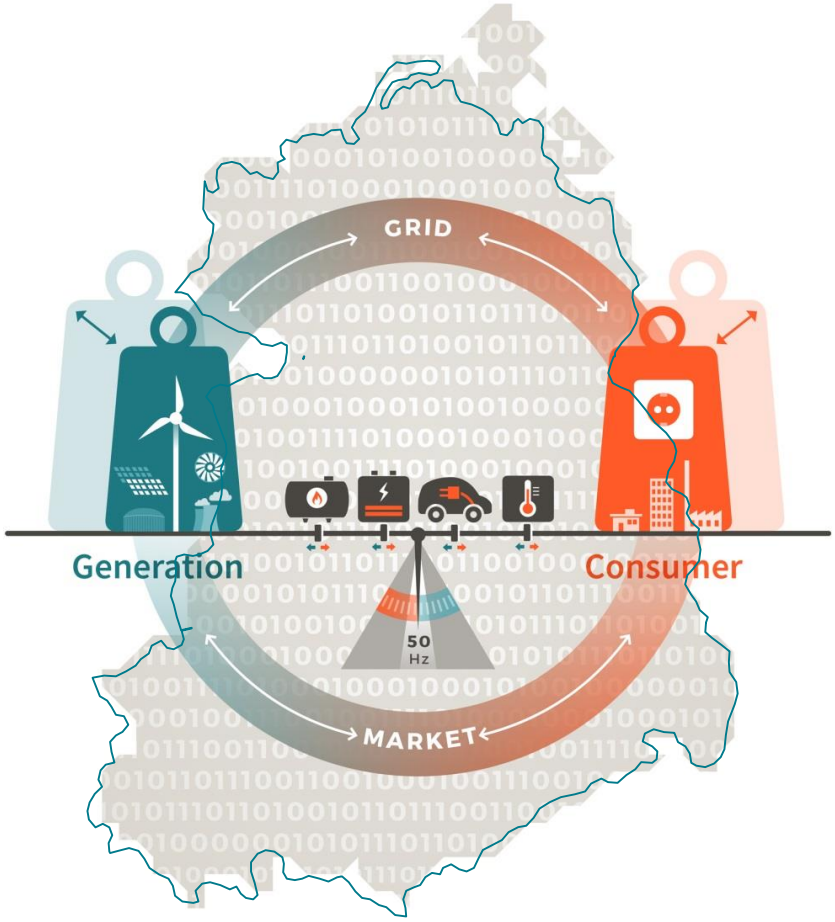
Subcontractors

Source: www.windnode.de/en/partners

Utilizing flexibility to cope with intermittency

WindNODE approach

- ✓ **Identifying flexibility options** (technical potential)
- ✓ **Developing use cases for flexibility** (new markets)
- ✓ **Creating value from energy data** (digitalisation)



Source: WindNODE

Abundance of technical flexibility options

Intermediate results of selected WindNODE partners (1/3)

- ✓ **Identifying flexibility options** (technical potential)
- ✓ **Developing use cases for flexibility** (new markets)
- ✓ **Creating value from energy data** (digitalisation)

- 4 Siemens factories, Berlin
- Flexibility in water & sewage treatment, BWB
- Model supermarkets at Lidl & Kaufland
- PtH/PtC* at GASAG Solution Plus
- BMW 12 MW second life battery farm, Leipzig
- Germany‘s biggest PtH (120 MW) at Vattenfall
- High temperature heat storage (600 °C) by Lumenion, GEWOBAG, Vattenfall
- Fluid ice storage unit, ILK Dresden
- …

* Power-to-Heat (PtH) / Power-to-Cold (PtC)

Source: WindNODE

Flexibility platform for grid congestion management

Intermediate results of selected WindNODE partners (2/3)

- ✓ **Identifying flexibility options** (technical potential)
- ✓ **Developing use cases for flexibility** (new markets)
- ✓ **Creating value from energy data** (digitalisation)

- Market based grid congestion management
- 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

* Distribution System Operators (DSOs)

Source: WindNODE

Digitalisation in the energy industry – enabler vs. value creator

Intermediate results of selected WindNODE partners (3/3)

- ✓ **Identifying flexibility options** (technical potential)
- ✓ **Developing use cases for flexibility** (new markets)
- ✓ **Creating value from energy data** (digitalisation)

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

Source: WindNODE

New narratives about energy transition opportunities

Interdisciplinary perspectives on energy transition: “Energy & Art“ and literature

One example out of 50 artworks which have been jointly created in groups of energy experts together with artists.

The vision: “Joint responsibility for a successful energy transition“

Source: Maria Reinisch Marketing Kommunikation | Artist: Fion-Jasper Hoppmann

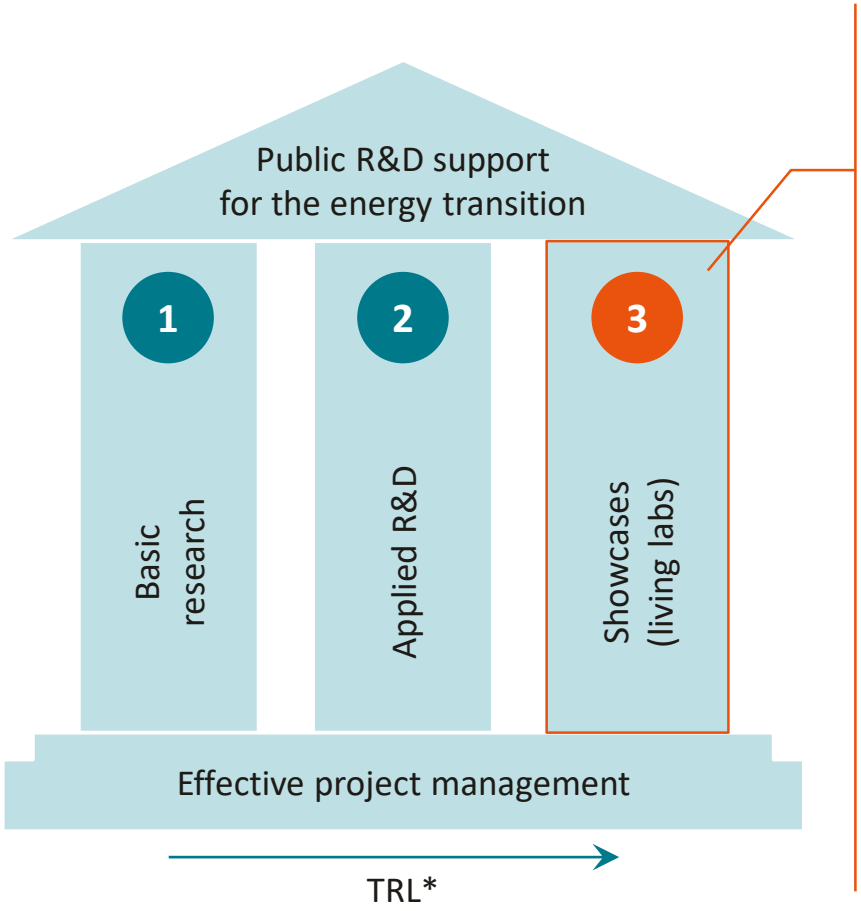
Content

- Status quo: German energy transition
- Next phase: the WindNODE project
- **Outlook: regulatory sandboxes**

Source: WindNODE

Living labs and regulatory sandboxes

Methodological lessons learnt from WindNODE



High visibility

for comprehensive energy transition ecosystems with collaborative research (in a precompetitive phase)

Regulatory sandbox

for the alignment of an energy systems perspective with viable business models

New narratives

with a focus on participation and innovation opportunities in the energy transition

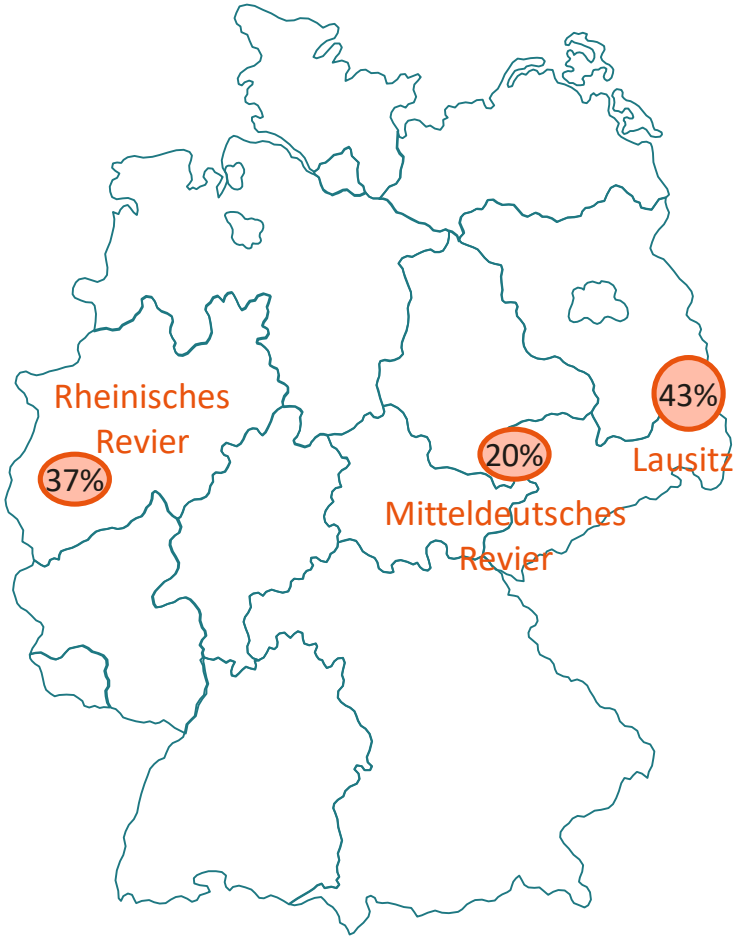
* TRL = Technology Readiness Level

Source: WindNODE

Phasing out coal by 2038 – model regions for (energy) transition?

WINDNODE

Key facts for the intended coal phase-out in Germany



- **3** major lignite-mining regions
- Phase-out by **2038**
- Total financial support: **EUR 40 bn.**,
  - EUR 14 bn. for major investment in the regions
  - EUR 26 bn. of federal measures in support of the coal regions

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

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For more information visit:

WWW.WINDNODE.DE/EN

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