BEE
German Renewable Energy Federation

An electricity market design for renewable energies

Presentation of the study
„New electricity market design for the integration of fluctuating renewable energies“

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The relevance of the expansion of renewable energies

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Expansion of renewable energies (RE)

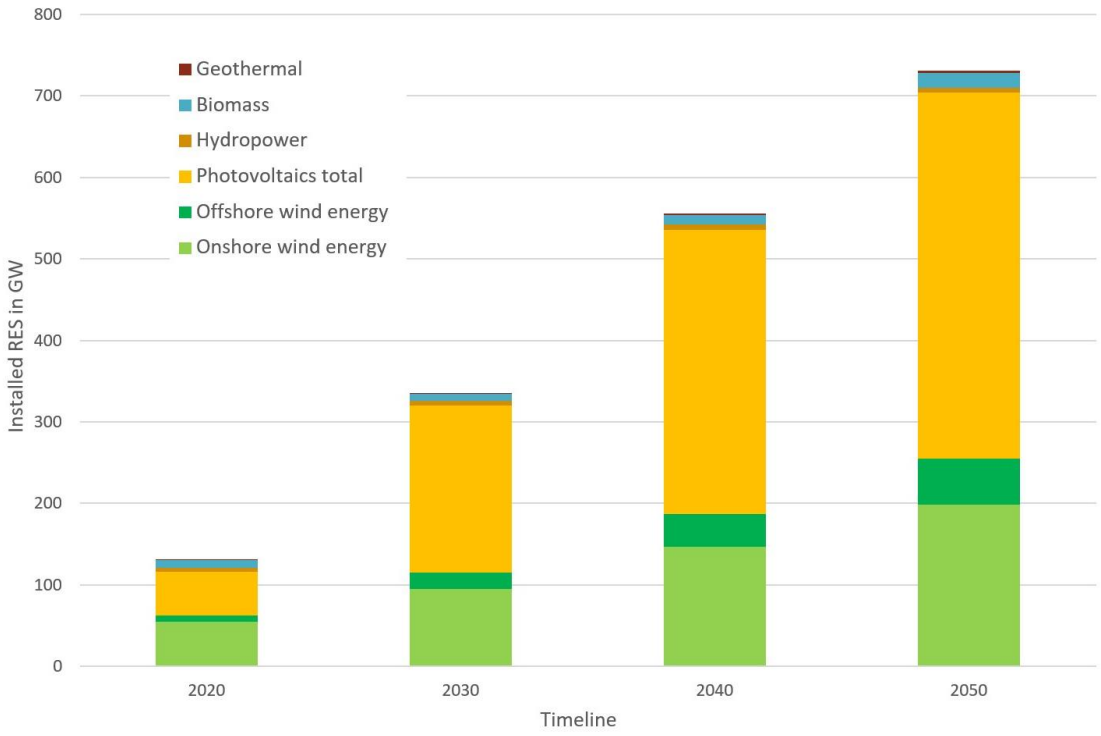
- In order to achieve the climate targets, an accelerated expansion of renewable energies is imperative.
- Above all, the expansion of photovoltaics and wind energy must be multiplied.
- In total, Germany needs more than 700 GW of renewable capacity.

Challenge

- The expansion of renewable energies requires an economic basis.

Result

- Climate neutrality by 2045 is achievable with the right ambition.



Who contributed to the study?

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The two Fraunhofer Institutes ISE and IEE have been commissioned with the **technical processing** of the study.

Technical implementation

Fraunhofer IEE

Fraunhofer ISE

The **legal assessment** of the planned measures was carried out by the law firm BBH.

Legal implementation

BBH BECKER BÜTTNER HELD

In over 10 workshops, issues and solutions were discussed with **stakeholders** from across the breadth of the energy industry.

Advisory boards Stakeholders

Over 70 supporters from all areas of the energy industry

Specific topics on power grids and market design issues were discussed with the **4 TSOs** as well as with **the power exchanges**.

TSO + Power Exchange

eex

epexspot

The BEE electricity market design study was developed with the support of a broad range of technical expertise.

Agenda

1	Background to the electricity market design study
2	Key findings of the electricity market design study

Economic basis for renewable energies

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An economic basis is necessary for the expansion of renewable energies.

RE Expansion

epexspot

Proceeds on the stock exchange

"**Market values**"

Promotion EEG

Receipt of market premium

"§51 EEG time window"

(no market premium in case of negative electricity prices)

Development of the market values of renewable energies at the power exchange

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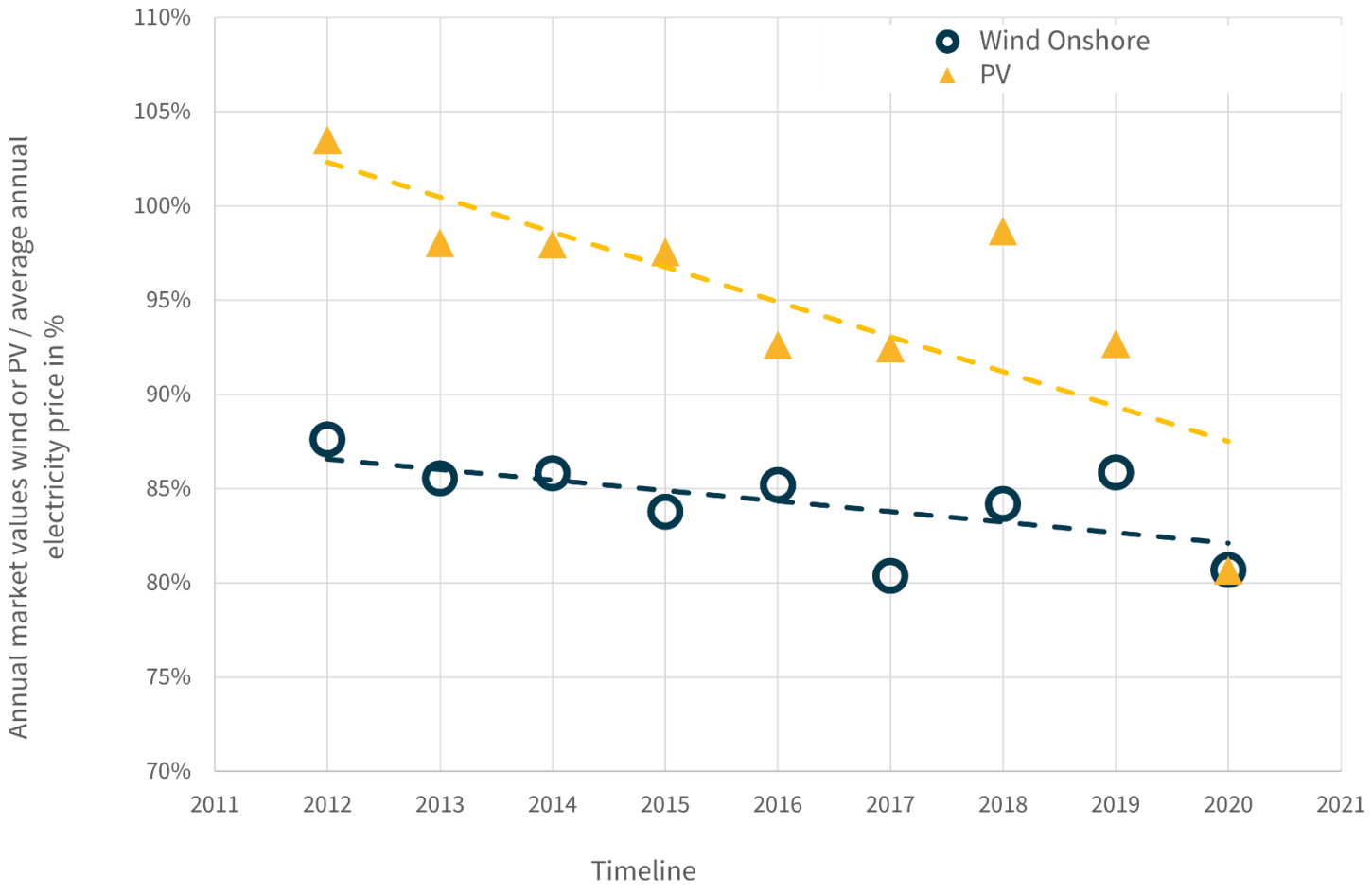
Challenges

- The market value of wind and PV has been falling for years compared to the average market level.
- If the market level is low, neither continued operation nor new plants outside of the subsidy are economical.

Solutions

- Creating sufficient flexibilities to stabilise the market values of renewable energies.



Development of electricity shares without remuneration from EEG

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During periods* of negative electricity prices, new installations do not receive support under the EEG. (see §51 EEG 2021).

Development §51 Quantities

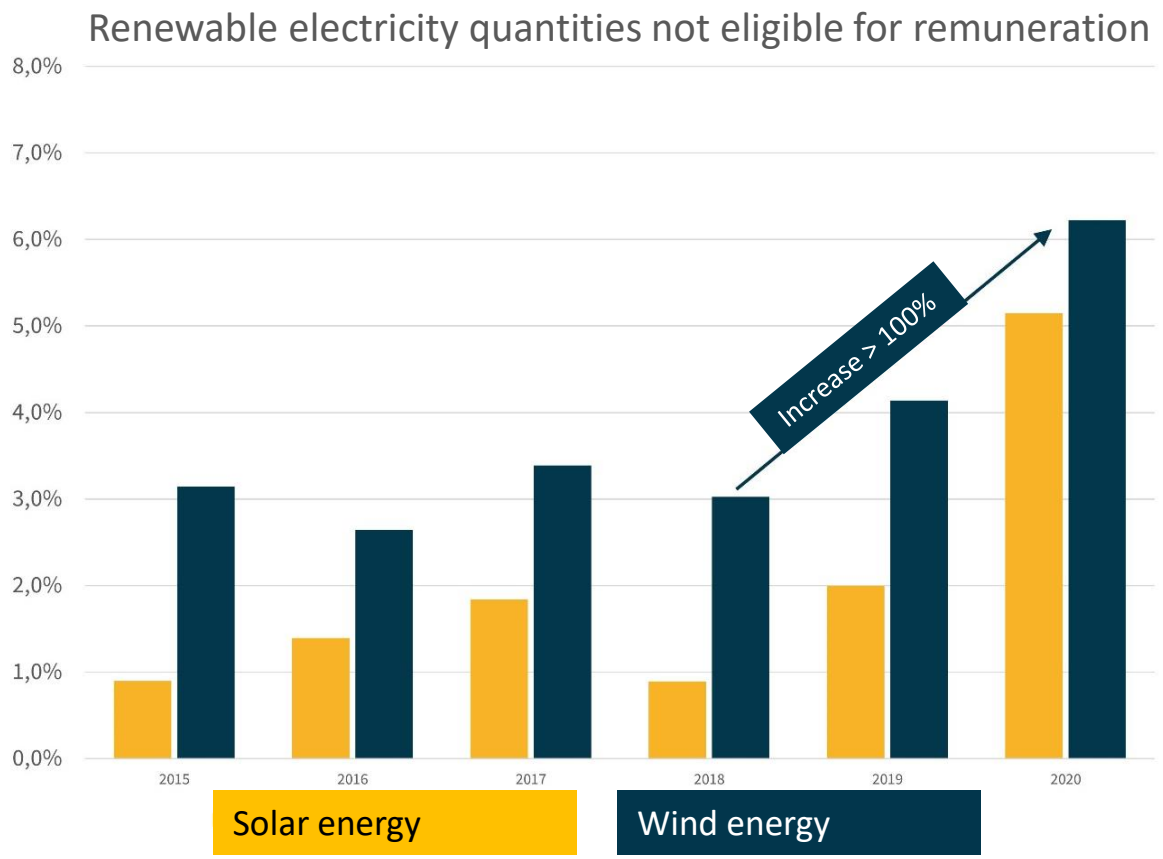
- Sharp increase in the amount of non-paid §51 EEG energy in the last few years.

Challenge

- Due to the climate policy necessity of RE expansion, without the creation of sufficient flexibilities, the §51 EEG framework would jeopardise the economic viability of renewable energies.

Solution

- Creation of sufficient flexibilities to prevent negative electricity prices.



Implementation of the energy transition requires realignment of the markets

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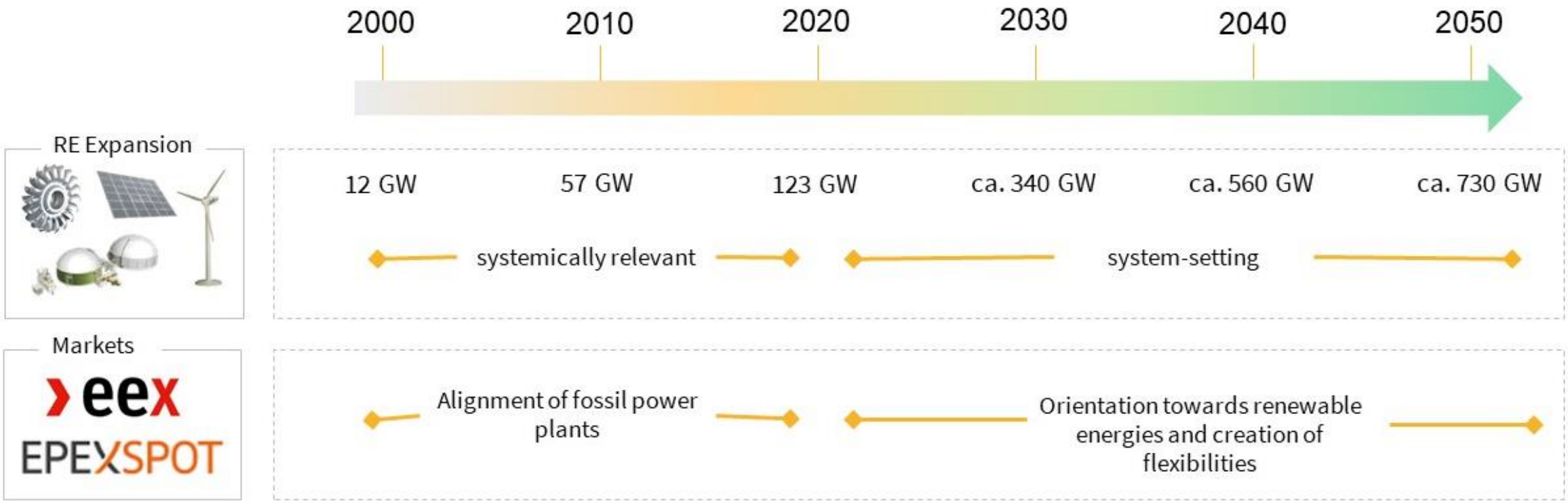


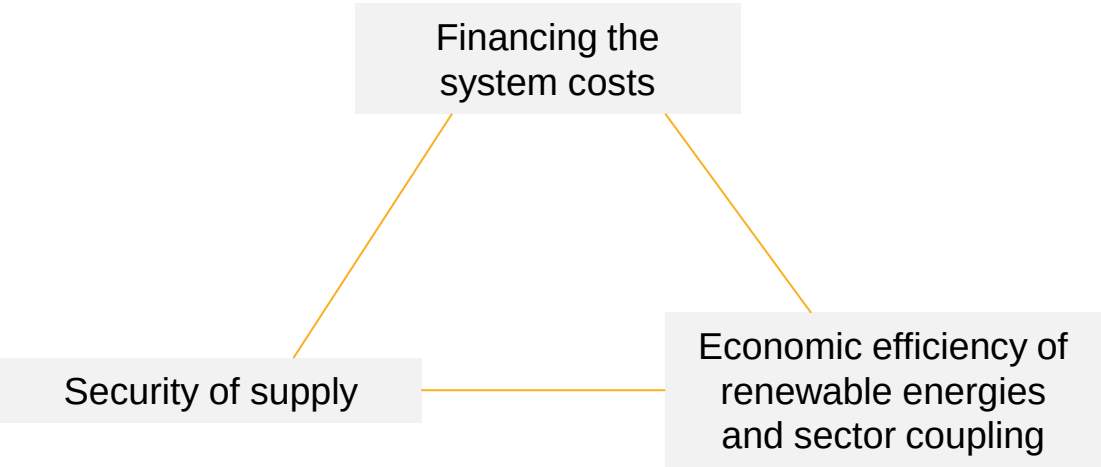
Renewable energies have become system-setting in the course of the energy transition.
The markets must align themselves with renewable energies and the financing of flexibilities.

Overview of the central guiding themes of the BEE electricity market design study

The electricity market design study deals with the topic of the **operational efficiency and economic basis of renewable energies and flexibilities.**

The study looks at the central issues of **supply security**. In addition to hourly load coverage and **grid expansion**, the focus is on load gradients and the takeover of **grid services by renewables**.

In addition, the **financing of system costs** is analysed and general questions about the new market design are answered. These include what the design of a **futures market with only renewable energies** would look like, or how a splitting of the **German electricity price zone would affect the energy transition.**



Agenda

1	Background to the electricity market design study
2	Key findings of the electricity market design study

Exogenous and endogenous flexibility services

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Baseline scenario

Technology/Year of scenario	2030	2040	2050
Model endogenous:			
Residential area battery storage	0 GW, 0 GWh	4,6 GW, 18,2 GWh	46,5 GW, 224,8 GWh
Electrolysis	14,4 GW_{el}	48,9 GW_{el}	86,4 GW_{el}
Power-to-Methane	0,5 GW_{el}	0,5 GW_{el}	0,5 GW_{el}
Power-to-Heat (district heating, industry)	9,6 GW_{el}	27,8 GW_{el}	36,3 GW_{el}
Gas turbine (hydrogen, newly built)	0 GW_{el}	0 GW_{el}	9,7 GW_{el}
CHP plants (no biomass and geothermal, newly built (synth. methane))	12,1 GW_{el}	8,8 GW_{el}	8,6 GW_{el}
Model exogenous:			
Home batteries for PV self-power optimization	18,7 GW, 55,4 GWh	30,7 GW, 90,1 GWh	39,1 GW, 112,8 GWh
Gas turbine (CH4, stock)	0,9 GW_{el}	0,5 GW_{el}	0 GW_{el}
Condensing power stations (stock)	8,1 GW_{el}	6,9 GW_{el}	0 GW_{el}
CHP plants (no biomass and geothermal, stock (natural gas))	9,8 GW_{el}	9,7 GW_{el}	0 GW_{el}
Bioenergy (biogas (including power increase, solid biomass, waste, slurry)	11,0 GW_{el}	13,3 GW_{el}	18,3 GW_{el}

Reform scenario

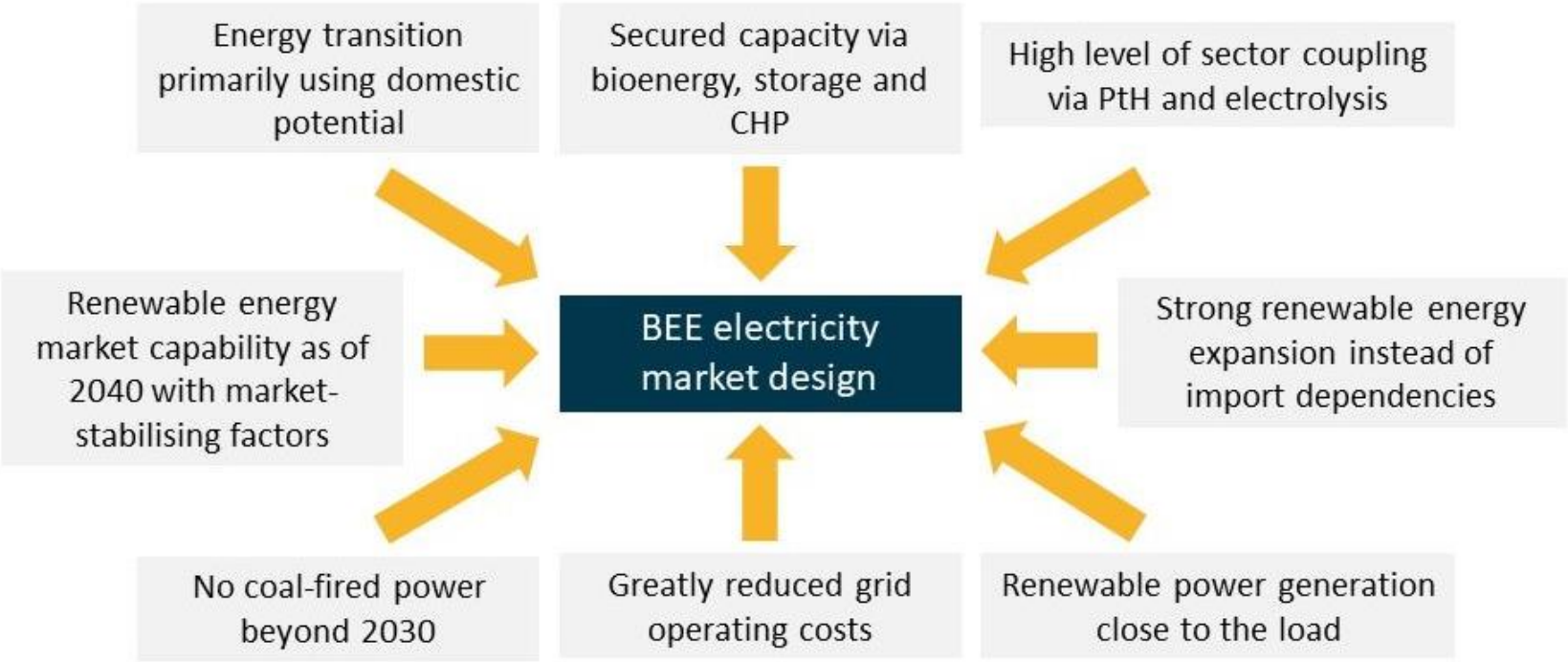
Technology/Year of scenario	2030	2040	2050
Model endogenous:			
Residential area battery storage	0 GW, 0 GWh	0 GW, 0 GWh	32 GW, 116,8 GWh
Electrolysis	5 GW_{el}	42,5 GW_{el}	99,4 GW_{el}
Power-to-Methane	0,5 GW_{el}	0,5 GW_{el}	0,5 GW_{el}
Power-to-Heat (district heating, industry)	25,2 GW_{el}	29 GW_{el}	36,4 GW_{el}
Gas turbine (hydrogen, newly built)	0 GW_{el}	0 GW_{el}	0,1 GW_{el}
CHP plants (no biomass and geothermal, newly built (synth. methane))	8,7 GW_{el}	8,2 GW_{el}	8,7 GW_{el}
Model exogenous:			
Home batteries for PV self-power optimization	18,7 GW, 55,4 GWh	30,7 GW, 90,1 GWh	39,1 GW, 112,8 GWh
Gas turbine (CH4, stock)	0,9 GW_{el}	0,5 GW_{el}	0 GW_{el}
Condensing power stations (stock)	8,1 GW_{el}	6,9 GW_{el}	0 GW_{el}
CHP plants (no biomass and geothermal, stock (natural gas))	9,8 GW_{el}	9,7 GW_{el}	0 GW_{el}
Bioenergy (biogas (including power increase, solid biomass, waste, slurry)	12,5 GW_{el}	16,8 GW_{el}	26,7 GW_{el}

Due to the exogenous specification of greater flexibilisation of bioenergy* in the reform scenario, the need for additional **H2 gas turbines can be reduced to 0.1 GW in the reform scenario.**

Both scenarios are characterised by a high flexibility potential that can be activated. In the area of electrolysis, almost 100 GW can be created operationally **by 2050 and thus cover the H2 demand completely domestically**.

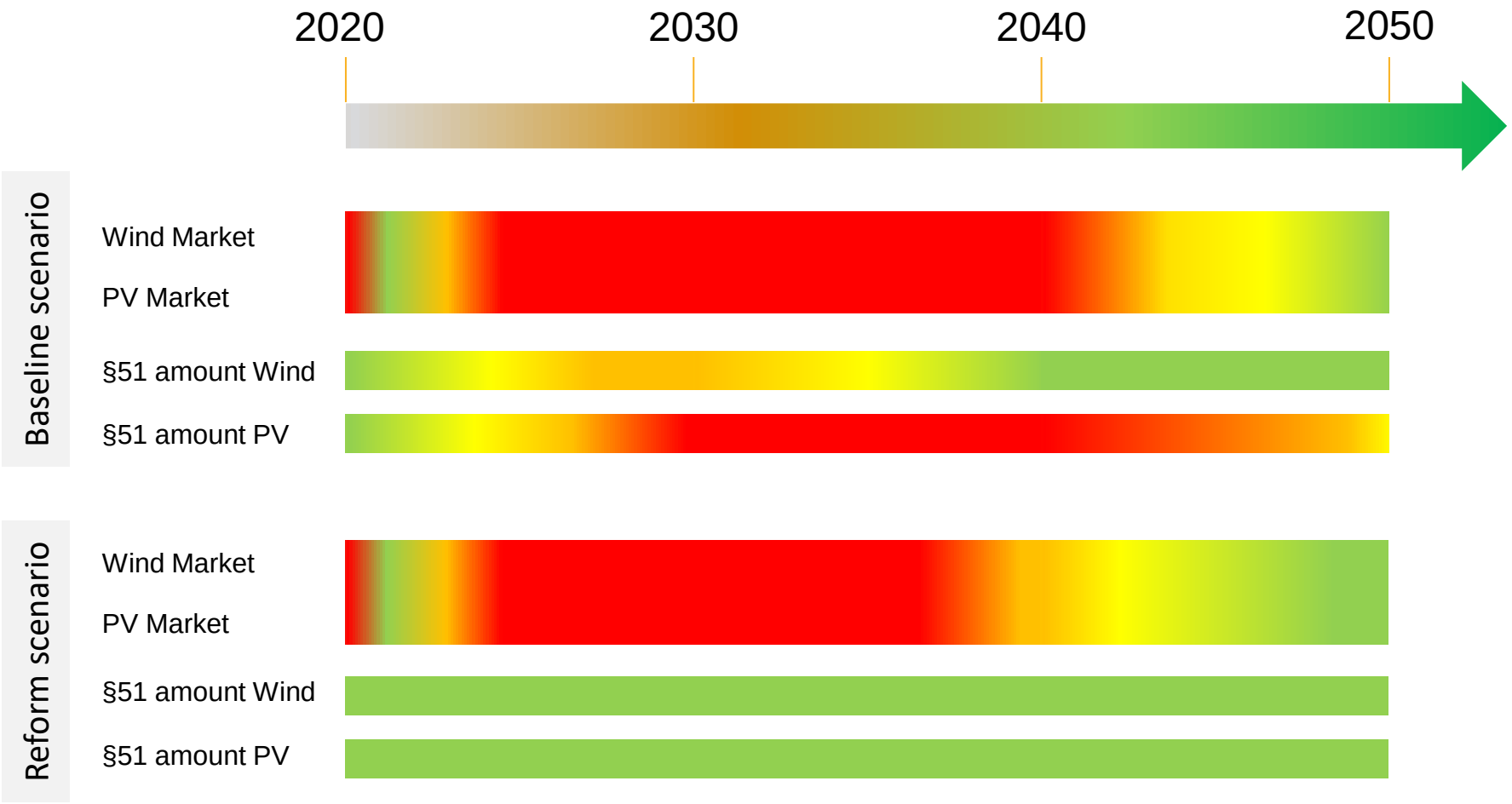
* The annual amount of energy generated from bioenergy remains at the same level..

Key findings of the BEE electricity market design study



The BEE electricity market design study provides proof for a nationally realizable energy transition with an increased value creation in Germany.

Results baseline and reform scenario focus Economic basis variable RE



Reform measures are necessary to realise RE expansion.

Overview of the measures taken in the reform scenario

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Aim of the measures

- Increase flexible driving from consumer, storage and generator levels.

Consumer level

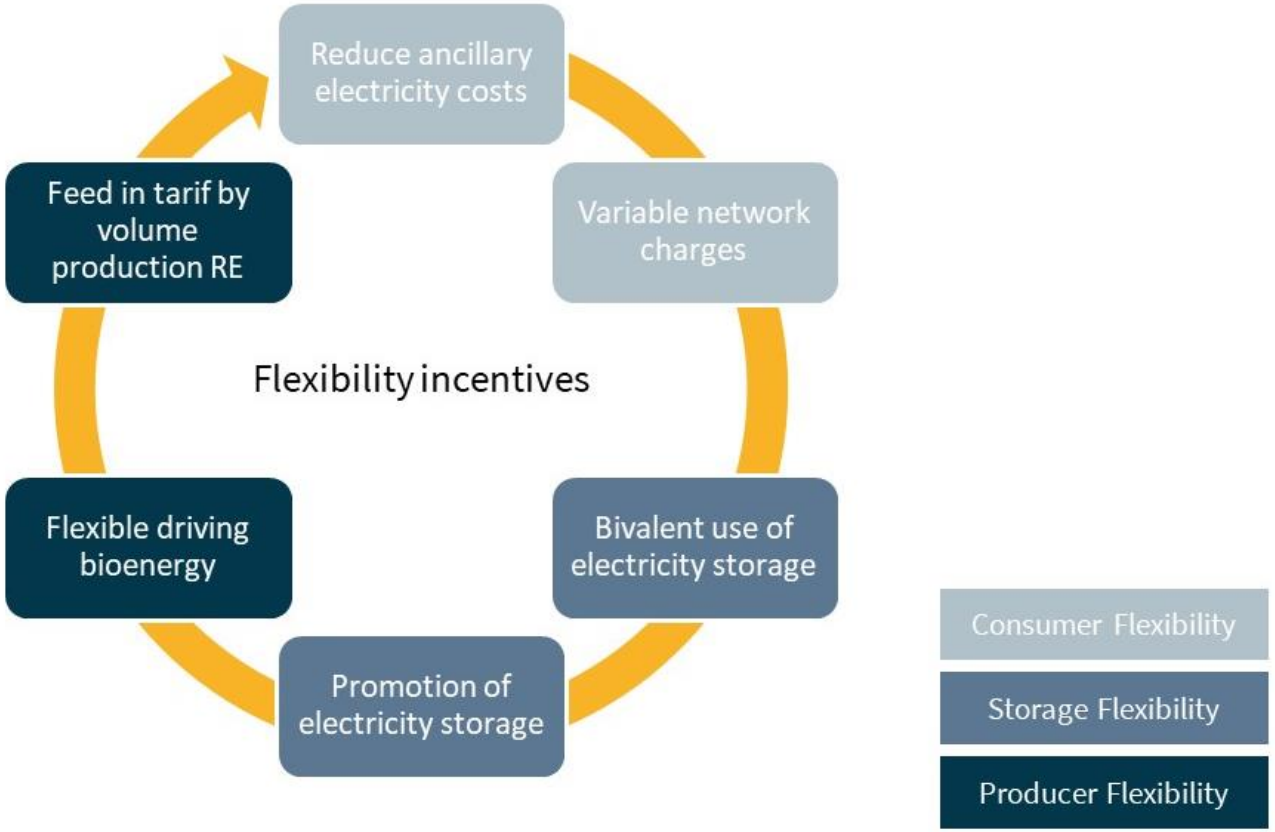
- Incentive to align electricity consumption with renewable feed-in via greater influence of the electricity price on the end customer price.

Storage level

- Incentive via subsidy or via bivalent use of PV electricity storage.

Producer level

- Incentive via flexibility promotion of bioenergy or via conversion of the promotion framework to quantity instead of time promotion.



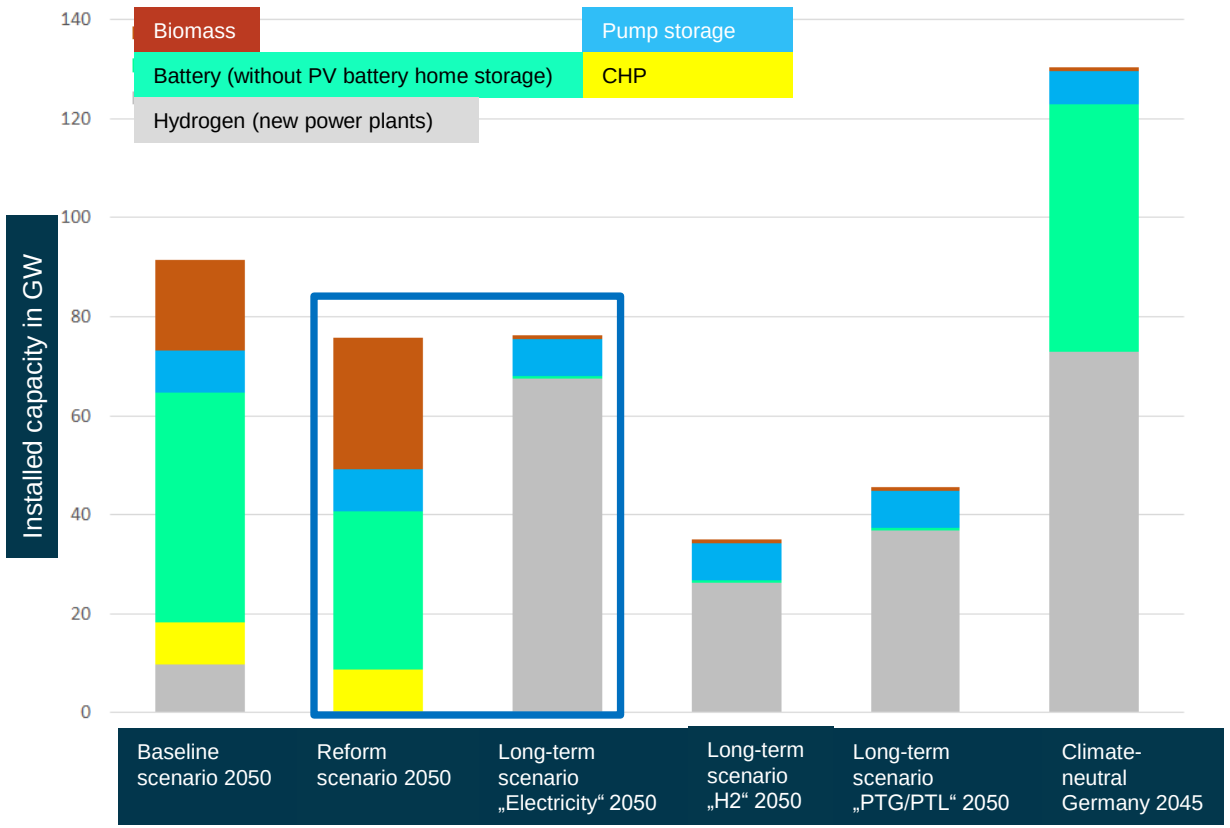
Dispatchable power for security of supply

Result

- Dispatchable generation capacity is necessary to cover the electricity load during windows of low renewable feed-in.
- In 2050, **dispatchable bioenergy, CHP plants (green gas) and storage facilities** will be used to cover the required dispatchable power.
- New H2 gas power plants (grey bar) are virtually not needed in the reform scenario.

Context to other studies

- Compared e.g. with the long-term scenarios of the BMWI (TN Electricity), both studies come to approximately the same required dispatchable power.
- The main difference is that within the BEE electricity market design study, the meaningful inclusion of bioenergy and battery storage to ensure security of supply is realised.



Grid expansion and integration of renewable energies compared to other studies

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Comparison 2030 with the network development plan

BEE study

- Significantly more RE (+25 to 35%)

➔ Grid expansion is necessary on a similar scale as in the 2019 grid development plan.

Comparison 2050 with the BMWi scenario

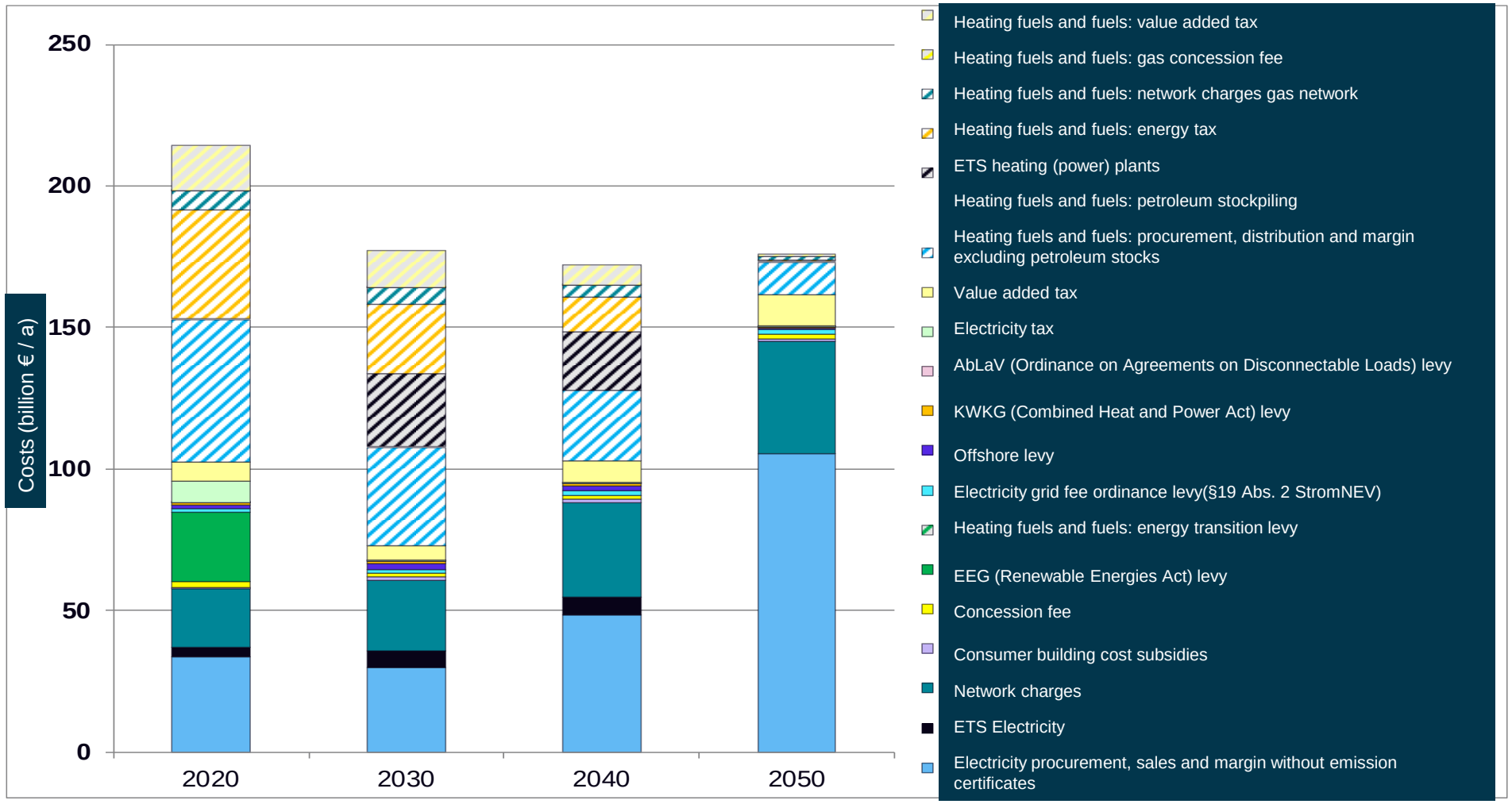
BEE study

- Significantly more RE (+214 GW)
- Fewer interconnection points (-54 GW)
- Significantly more electrolysers (+62 GW)

➔ Grid expansion is necessary on a similar scale as in the BMWi long-term scenario TN Electricity.

The BEE electricity market design study shows a better ability to integrate renewable energies. This underlines the sensible use of decentralised renewable energies close to consumption decentralised renewable energies, which makes sense from an acceptance point of view.

The system costs of the German energy system are falling due to the energy transition



Summary

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1. Due to the lack of an appropriate economic basis the current regulatory framework in the electricity market prevents further expansion of renewable energies, which are necessary for climate protection.
2. Changes to the current electricity market are therefore necessary. In order to make the future expansion of renewable energies economically viable, the flexibility options needed for this must and can be sufficiently expanded at the same time.
3. An early coal phase-out by 2030 is possible.
4. Bioenergy, hydro power, CHP plants and storage can provide sufficient dispatchable capacity for security of supply, while at the same time reducing the need for the expansion of hydrogen power plant capacity.
5. Up to 100 GW of electrolysis capacity can be built in Germany in a financially rewarding way and with high regional value creation, so that imports of green hydrogen is not necessary for the implementation of the energy transition in Germany.
6. The currently fixed support period of 20 years should be converted into a quantity support to enable renewable energies to react to electricity prices themselves. This will ensure the economic viability of renewable energy installations.
7. With increasing sector coupling and the creation of sufficient flexibility options in the energy system, renewable energies will be fully competitive by 2040.
8. Meaningful savings of grid operation costs can be achieved if the focus is on decentralised electricity generation from renewable energies and generation-related hydrogen production from variable renewable energies.

Learn more about the study on our landing page

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www.klimaneutrales-stromsystem.de

Unterstützer Statements Downloads Impressum **English**

BEE Studie

Neues Strommarktdesign

Das heutige Strommarktdesign ist nicht in der Lage, den klimapolitisch notwendigen Ausbau Erneuerbarer Energien zu gewährleisten. Daher hat der Bundesverband Erneuerbare Energie e.V. (BEE) eine durch die Fraunhofer Institute für Energiewirtschaft und Netzbetrieb (IEE) und Solare Energiesysteme (ISE) durchgeführte und von der Kanzlei Becker Büttner Held (BBH) juristisch geprüfte Studie vorgelegt.

BEE Bundesverband Erneuerbare Energie e.V.

BWE Bundesverband WindEnergie · die energie landwerker · ENERTRAG Eine Energie voraus · Fachverband BIOGAS · GREEN PLANET ENERGY · INITIATIVE ENERGIEN SPEICHERN INES

Thank you for your attention!

Bundesverband Erneuerbare Energie e. V.
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