

Germany's Sustainability Strategy: Towards 100% Renewables

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Umweltbundesamt



Contents

- German Federal Environment Agency
- A set of three energy policy goals
- The German Government's Energy Concept
- Transformation of the Energy System
- The consequences for Germany
- Summary

The Federal Environment Agency

- Germany's central environment agency since 1974
- **Scientific support** and consultation
to the Ministry of Environment
- **Implementation** of environmental **laws**
(e.g. emission trading scheme, certification of chemicals,
pharmaceuticals, pesticides;)
- **Information** to the general public concerning environment
protection



Federal Environment Agency

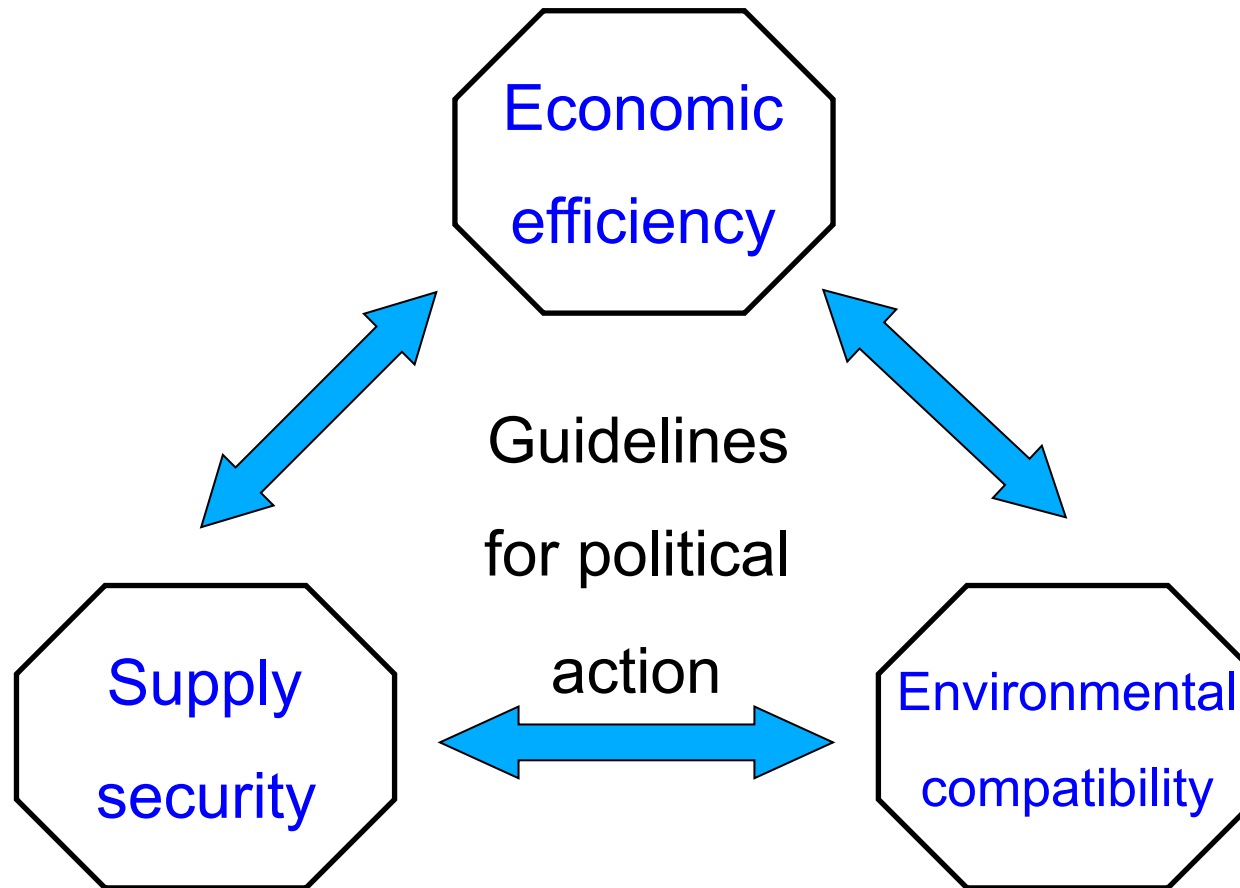
- HQ: Dessau; Offices in Berlin (ETS), Bad Elster (Research Center, water hygiene), Langen (Network Air Quality), air quality monitoring stations → Zugspitze
- 1.500 Employees,
Majority: Natural Scientists , about 50 Lawyers
- All Aspects of Environmental Policy
 - Fundamental Environmental Strategies
 - Protection of the environmental media
 - Best available techniques
 - Chemical Policy



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A set of three energy policy goals



The status quo

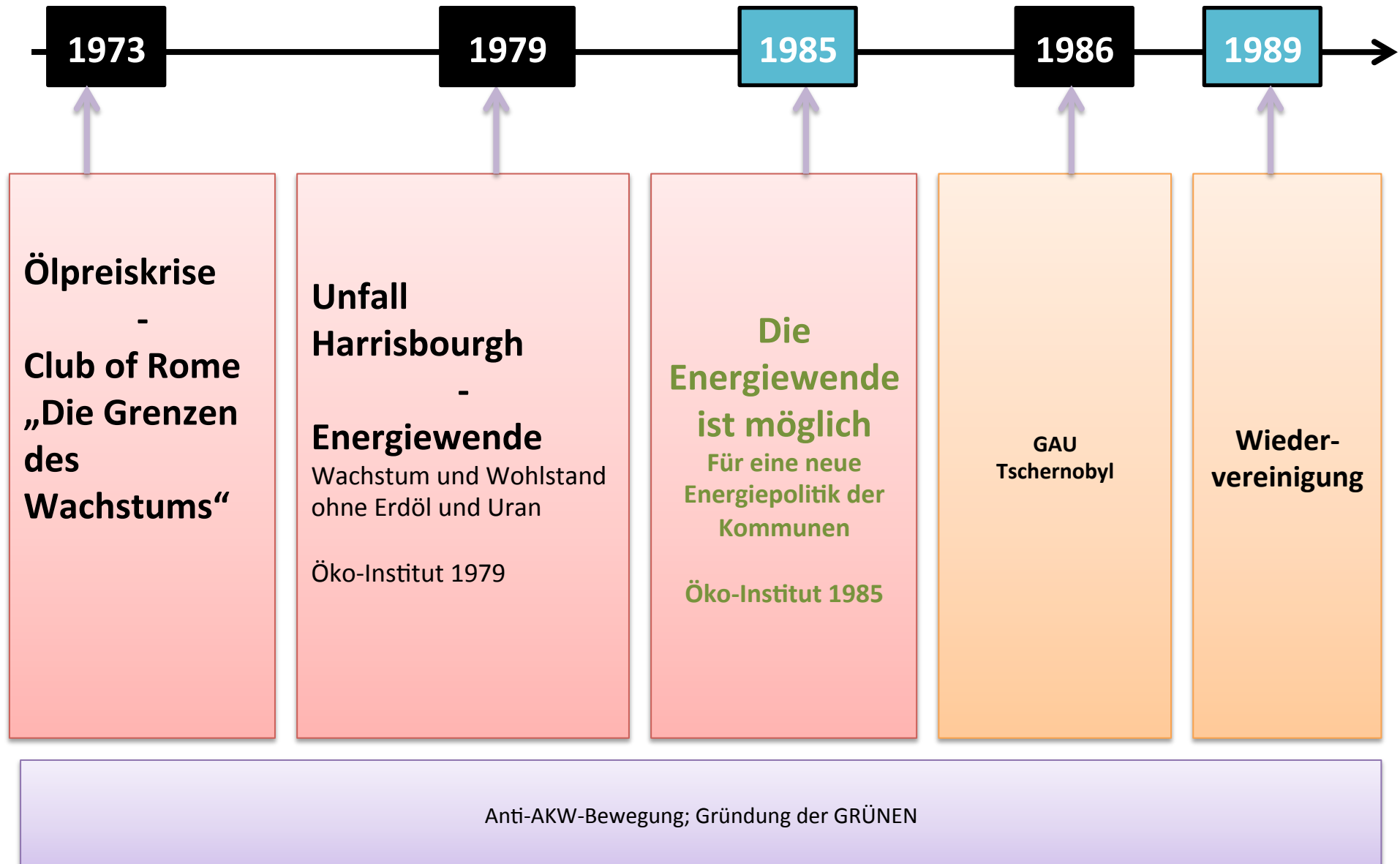
Energy supply today:

- Not secure → We **import** 70% of our energy sources
- Not efficient → Fossil fuels have high **external costs**
- Not environmentally compatible → **Greenhouse gases** and **air pollutants**

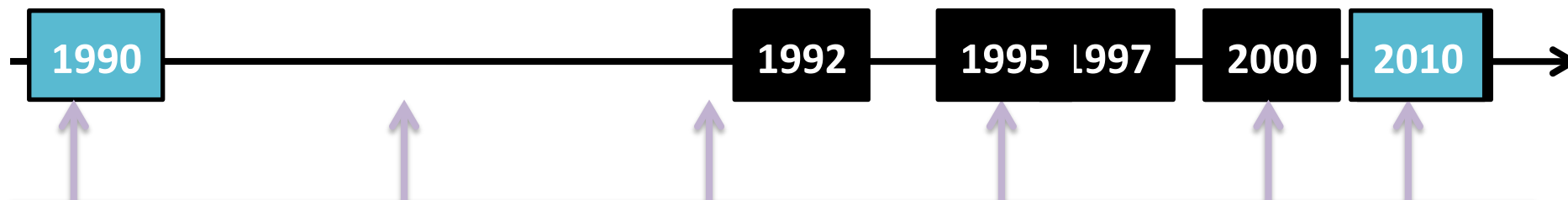
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Energiewende



Energiewende

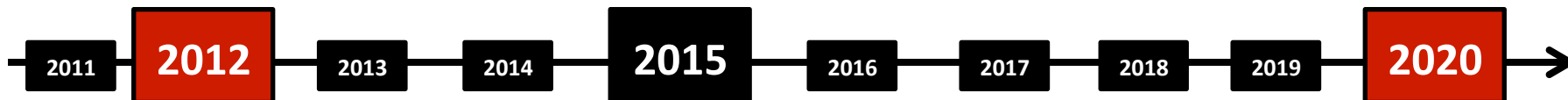


ENERGIEWENDE AUF DEM WEG

- 1990 Stromeinspeisegesetz
- 1990 ff lokale und regionale Energiekonzepte
- 1992 Rio-Konferenz → UNFCCC **2°C** - Ziel
- 1995 Energiewende von unten
- 1997 Kyoto-Protokoll
- 2000 EEG

2010: Integriertes Klima- und Energieprogramm (IKEP)

Energiewende



Erneuerbare und Energieeffizienz für ALLE Anwendungen (Strom, Wärme, Kraftstoffe)!

ENK

Langfristziel bis 2050

Maßnahmen

bis 2022: Atomausstieg

EE

Novell des EEG

Ausbau der Energieeffizienz

Netz

Novelle EEG
Bundesnetzpannung

2011: Gesetzespaket zur Energiewende

Goals of energy and climate policy

Timeline 2050; All relevant sectors; Specific Goals, over 100 specific Measures, Funding

		2020	2030	2040	2050
Climate	Greenhouse gases (vs. 1990)	- 40%	- 55%	- 70%	- 80 to - 95%
Renewable energies	Share of electricity	35%	50%	65%	80%
	Overall share (Gross final energy consumption)	18%	30%	45%	60%
Efficiency	Primary energy consumption	- 20%			- 50%
	Electricity consumption	- 10%	- 25%		
	Energy consumption in buildings	20% heat demand			80% primary energy

Specific measures

- Over 100 measures in the following areas:
 - Renewable energies
 - Electricity grids
 - Energy efficiency
- → Reliable framework conditions for all players



Source: BMU

Energy Concept: A triple approach

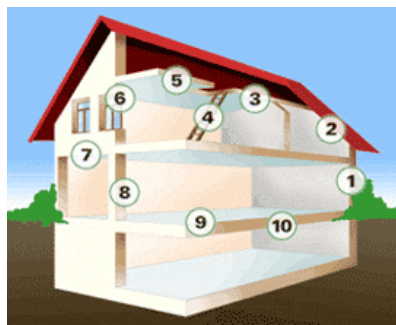
1. Renewable energy sources:

- Rapid, continuous expansion
- Cost-efficient and environmentally friendly



3. Efficiency:

- Reduce energy consumption
- Ensure efficiency



2. Future grids:

- Flexible and powerful
- Integration of electricity from renewable sources



Renewable energies - Basis for action

- 2011 amendment to the Renewable Energy Sources Act (EEG):

- Other tools:
 - Act on the Promotion of Renewable Energies in the Heat Sector
 - Market Incentive Programme
 - Sustainability Ordinance for Biofuels
 - Research funding

1979

Aeromann, D
33 kW



1975 Tvindmøhle, DK, 2 MW läuft und läuft und läuft ...



1983 GROWIAN, D
3 MW
abgebaut 1986

Forschungsminister Matthöfer : „Wir wissen, daß es uns nichts bringt. Aber wir machen es, um den Befürwortern der Windenergie zu beweisen, daß es nicht geht.“



Amendment to the Renewable Energy Sources Act (EEG)

- Continues the tried-and-tested approach of the EEG, particularly the principle of priority feed-in
- **Market integration** incentives, e.g. with introduction of the market premium and flexibility premium
- Adjustment of fixed **tariffs**
- **Compensation** for energy-intensive industries



Copyright: H.-G. Oed



Copyright: H.-G. Oed

Example: Offshore wind energy

- Special programme "Offshore Wind Energy": €5bn credit volume
- Cluster connection ("Offshore multi-socket")
- One-stop approvals
- Offshore grid plan for the EEZ



Example: Onshore wind energy

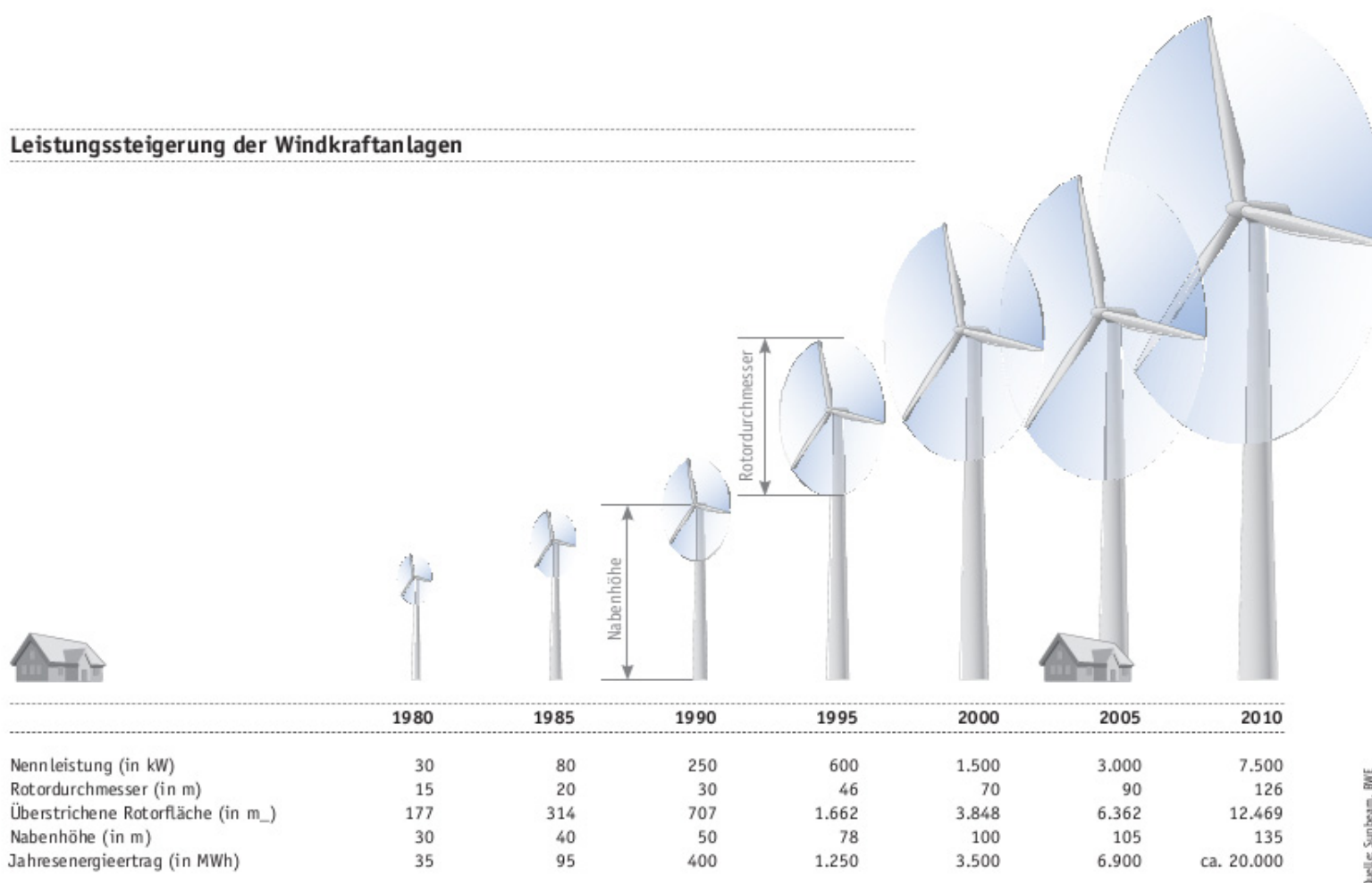
- More widespread designation of suitable sites
- Simplified provisions for repowering in construction and planning law
- Reduction of light emissions
- Modernisation of radar systems



Source: BMU

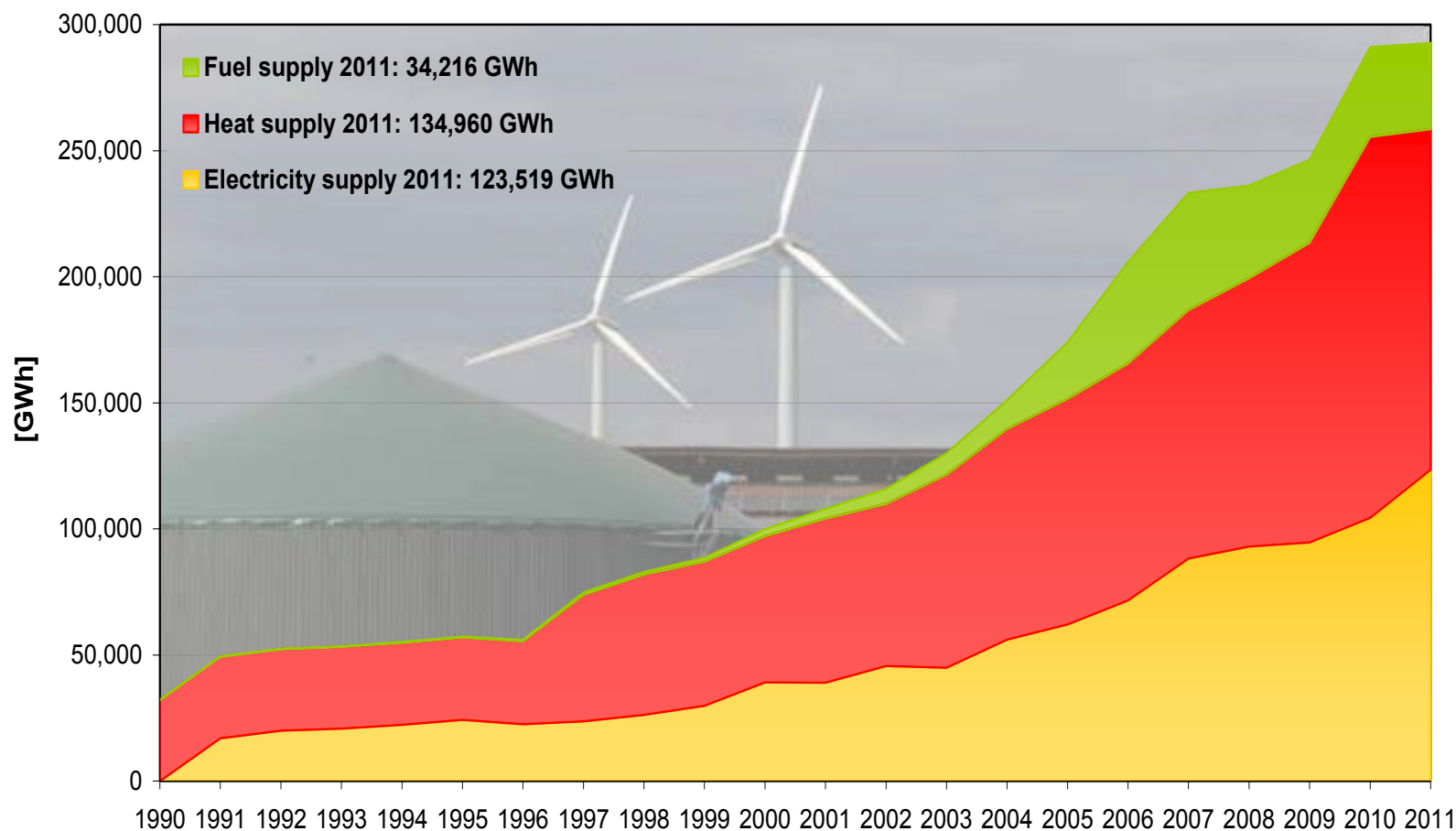
Größenentwicklung von WEA

Leistungssteigerung der Windkraftanlagen



Quelle: Sunbeam, BWE

Development of renewables-based final energy supply in Germany, by sectors



Source: BMU - E I 1 according to Working Group on Renewable Energy-Statistics (AGEE-Stat);
1 GWh = 1 Mill. kWh; 1 TWh = 1 Bill. kWh; image: BMU / Bernd Müller; as at: December 2012; all figures provisional

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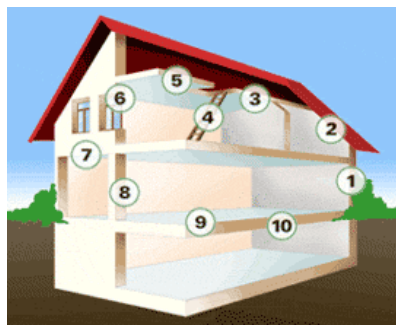
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Source: BMU

Expanding the grids

- **Grid development plan** for a functioning single European electricity market

- **Objective:**

- An **interlinked EU** electricity grid
- Basis for an **electricity supply almost entirely from renewables** by 2050



Source: BMU

Amendment to the Energy Industry Act (EnWG)

- Fundamental principles for **smart meters** and **smart grids**
- Coordinated **grid development** and **requirement planning** for **transmission grids**
- **Transparency** and **public participation**
- **Exemption from grid charges** for **energy storage facilities**



Source: BMU

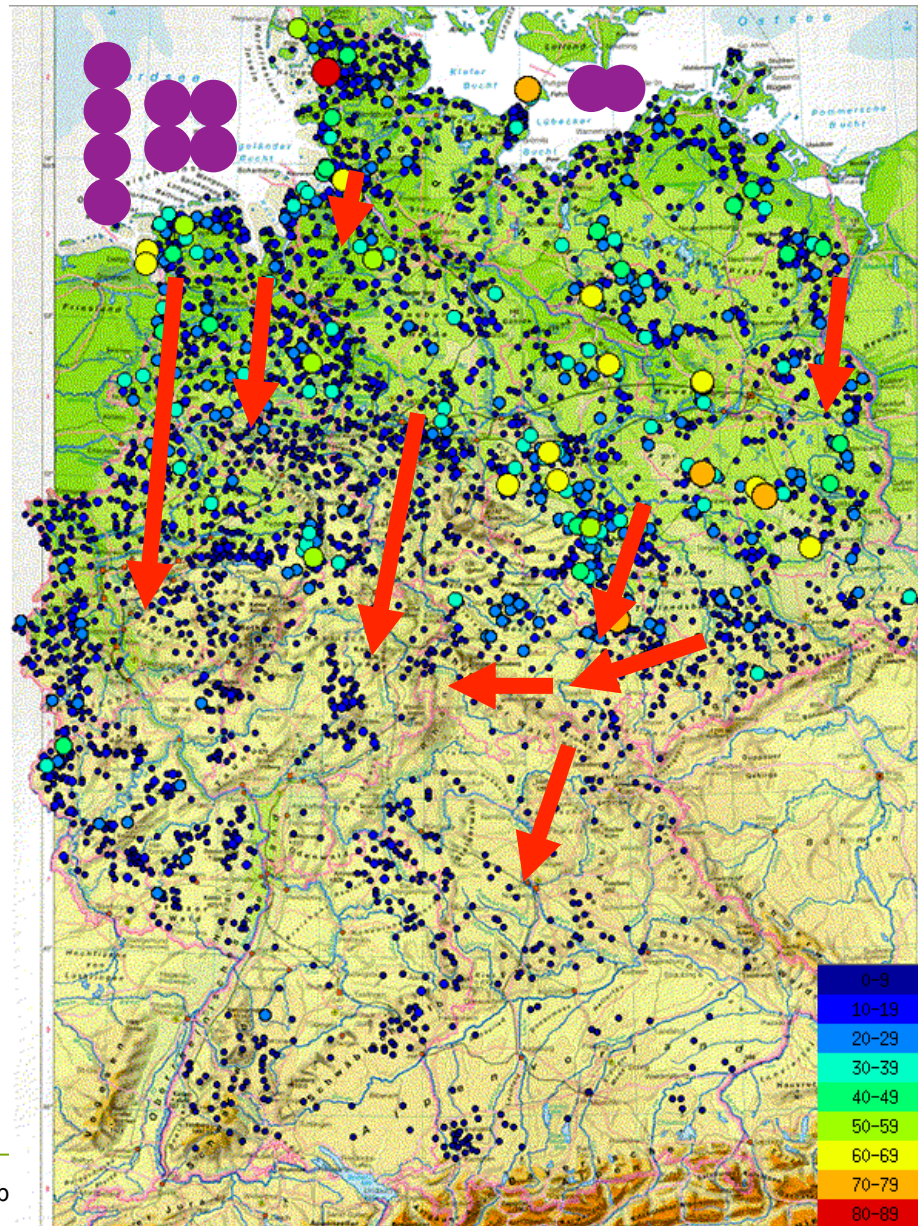
Grid Expansion Acceleration Act (NABEG)

- **Specialist planning at Federal Government level** specifies route corridors for long-distance and cross-border electricity lines
- **Early involvement of citizens** in planning procedures
- **Use of underground cables** in the 110 kV range
- **Cluster connection** of offshore wind farms



Source: BMU

Necessary
extensions of the
extra high voltage
transmission
network required by
further
development of
wind power
(Source: dena Grid
Study)

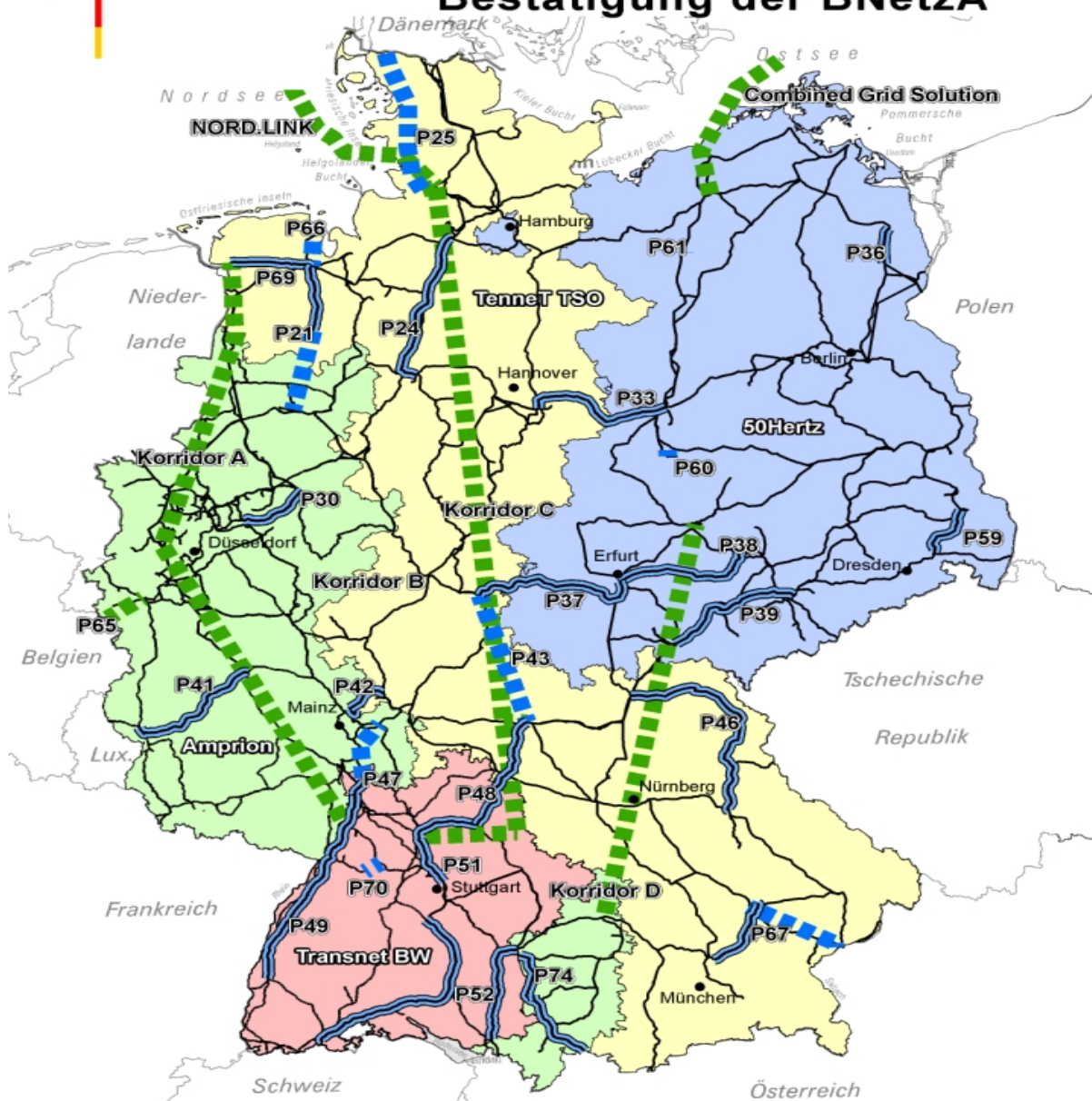


Source: ISET,
IWET, dena
Grid Study
2005, own
illustration

(MW)



Netzentwicklungsplan: Bestätigung der BNetzA



Legende

- ■ ■ Neubau - Gleichstrom
- ■ ■ Neubau - Wechselstrom

- Netzverstärkung - Wechselstrom
- Startnetz

Energy Concept: A triple approach

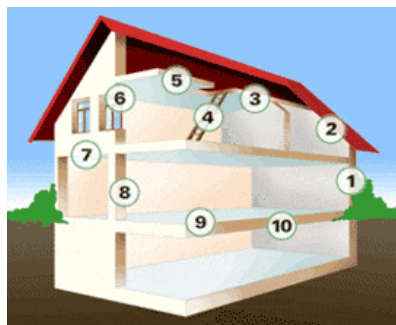
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Energy efficiency is the key



- Energy- efficient buildings
 - Energy services
 - Expanding energy management
 - Energy efficiency fund
 - National Climate Initiative
- Tap potential – Reduce energy costs – Relieve pressure on the environment

Energy-efficient buildings

- **New buildings:** Approximation of the standards to the **nearly-zero energy standard** (= almost climate-neutral) by around 2020
- **Existing buildings:**
 - Virtually climate-neutral by 2050
 - Double the modernisation rate to 2%
 - Cut primary energy demand by 80% by 2050
- Extensive **funding programmes:**
 - Building modernisation programme:
1.5 billion Euros per annum
 - Market incentive programme for the use
of renewable energies in the heat sector:
approx. 400 million euros p.a.

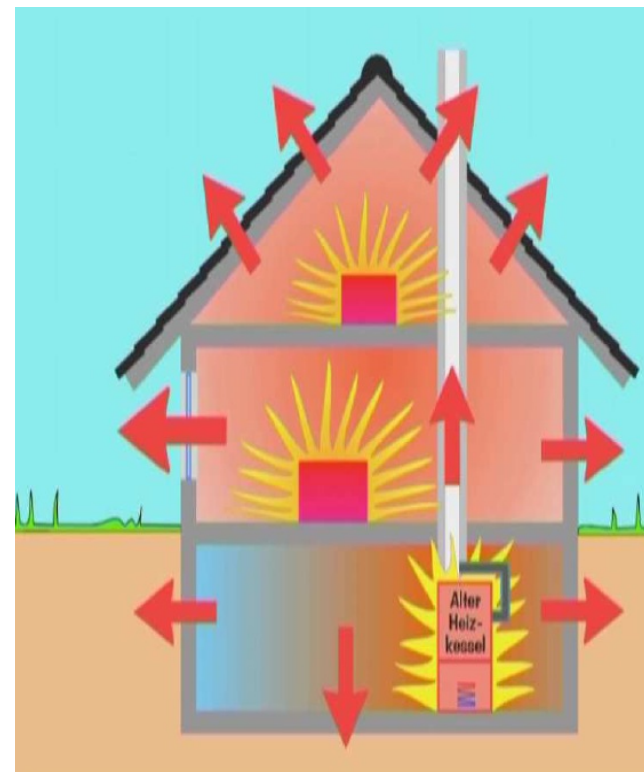


Chart:

Dipl.Ing. Frank Lischka "Abenteuer Energiesparen"

Amendment to the Combined Heat and Power Act (KWK-G)

- Deadline for the commissioning of new plants **extended** to 2020
 - Period during which nuclear power plants are to be replaced
 - Increases investment security
- Elimination of the 6- or 4-year limit on premium payments
 - Allows a **more flexible, electricity-focused** approach to operation

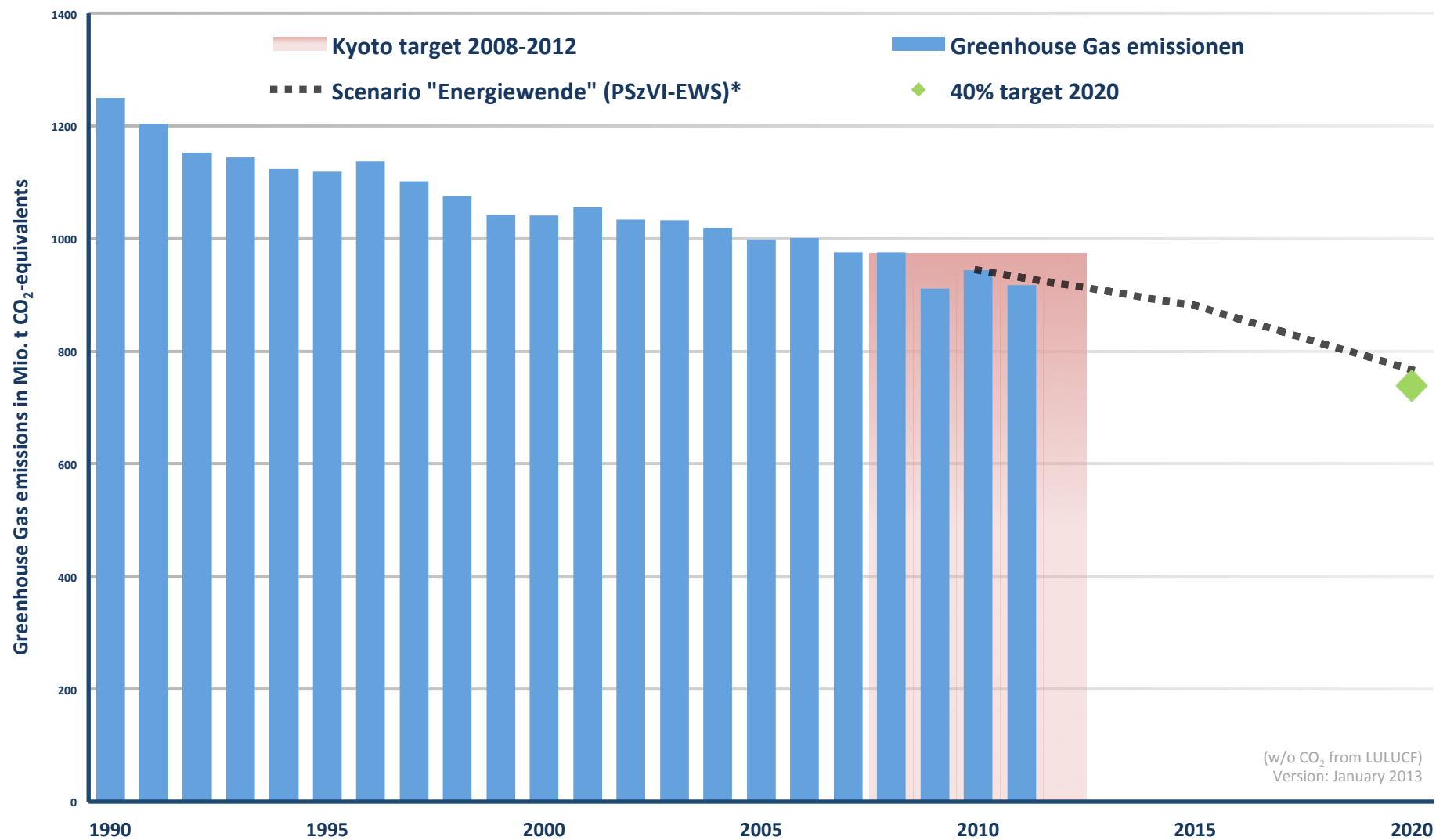


Source: BMU

The Energy and Climate Fund (ECF)

- Growing to more than €3bn per annum by 2013
- Funded from the auction proceeds for emissions trading certificates
- Allocation:
 - Renewable energies
 - Energy efficiency
 - Building modernisation
 - National and international climate protection
 - Environmental projects and research
 - Electro-mobility
 - Compensation of electricity prices for energy-intensive companies





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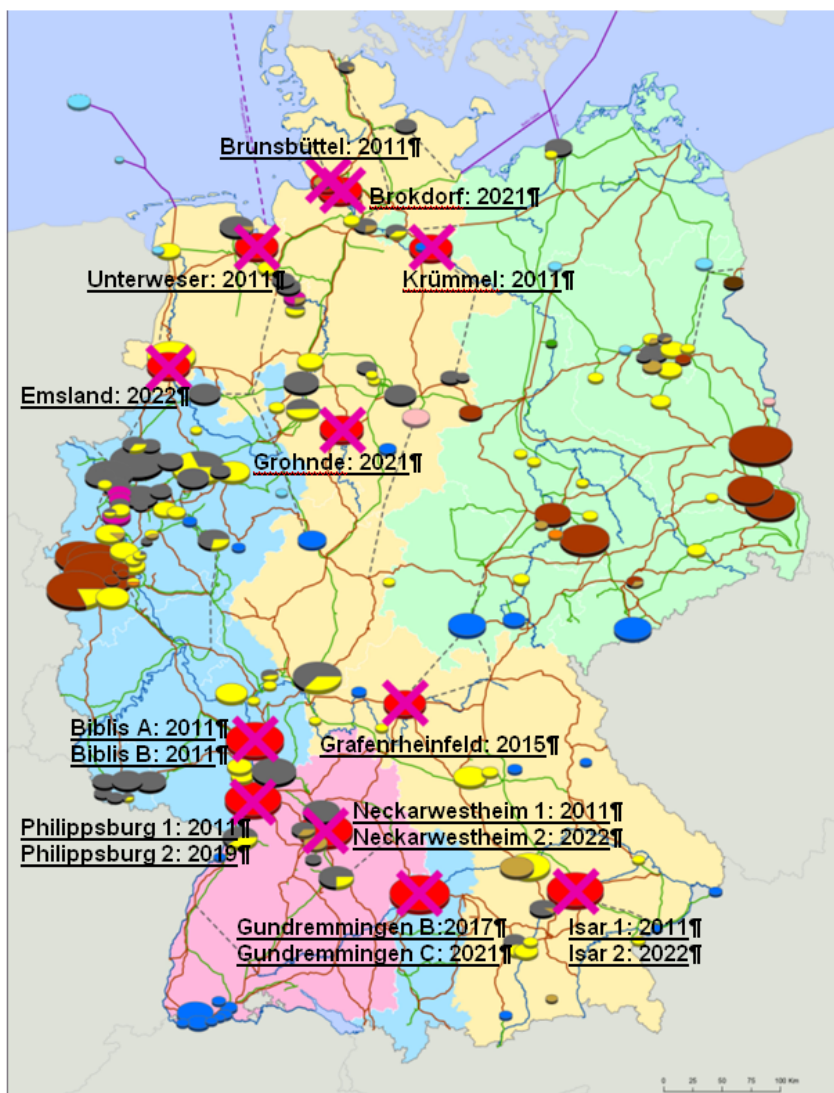
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Transformation of the Energy System

- Moratorium on nuclear power in the aftermath of Fukushima
- Reassessment of the risks by the Ethics Commission
- Previously: Nuclear power as a bridging technology
- **Now:**
 - Nuclear power to be phased out completely by 2022
 - The Energy Concept measures remain valid, but some elements will be implemented more rapidly

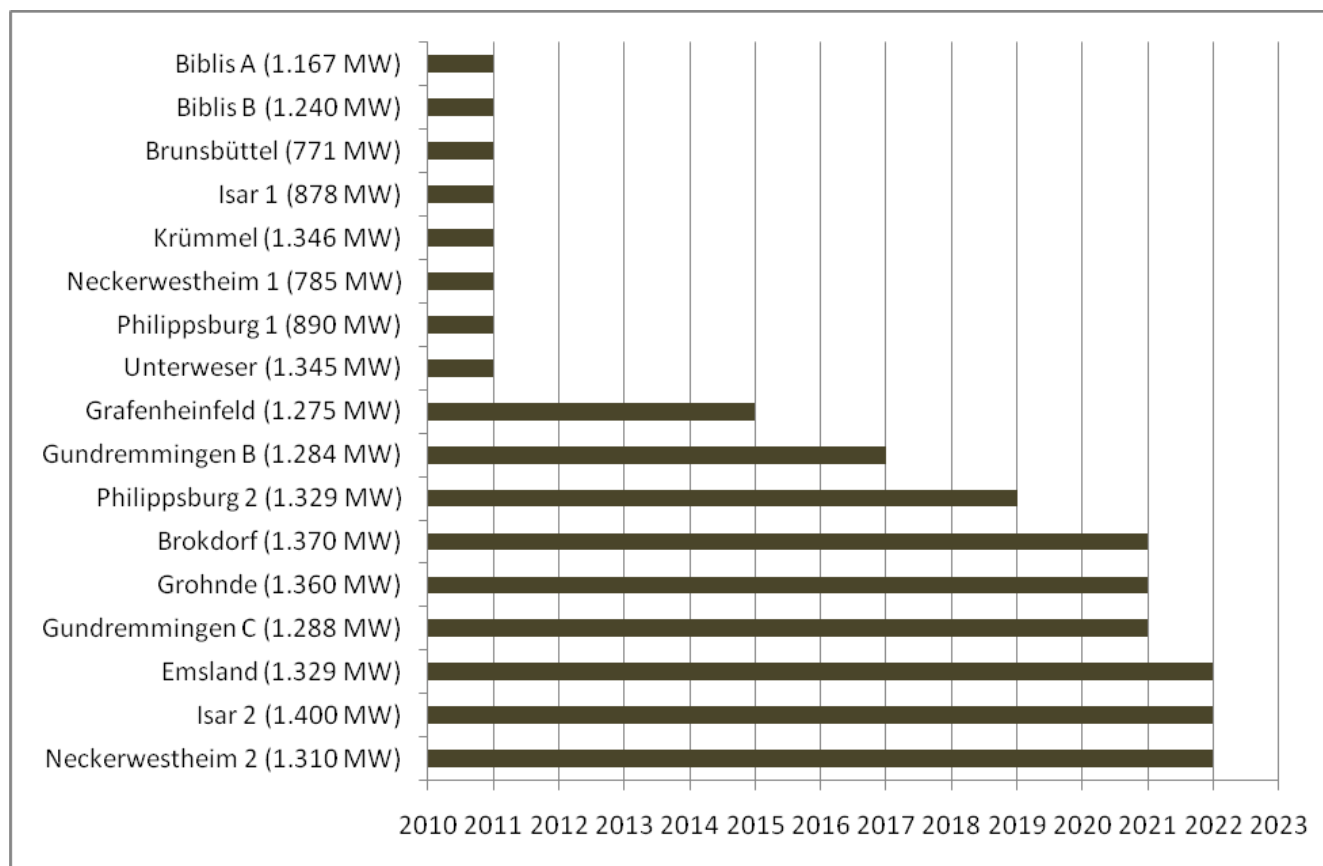
Amendment to the Atomic Energy Act

Gradual phasing out of nuclear power



- 7 oldest plants + Krümmel:
Immediate decommissioning
- Gradual phasing out of
nuclear power by 2022
- Shutdown years:
2015, 2017, 2019, 2021, 2022

Phase-out data and remaining capacities



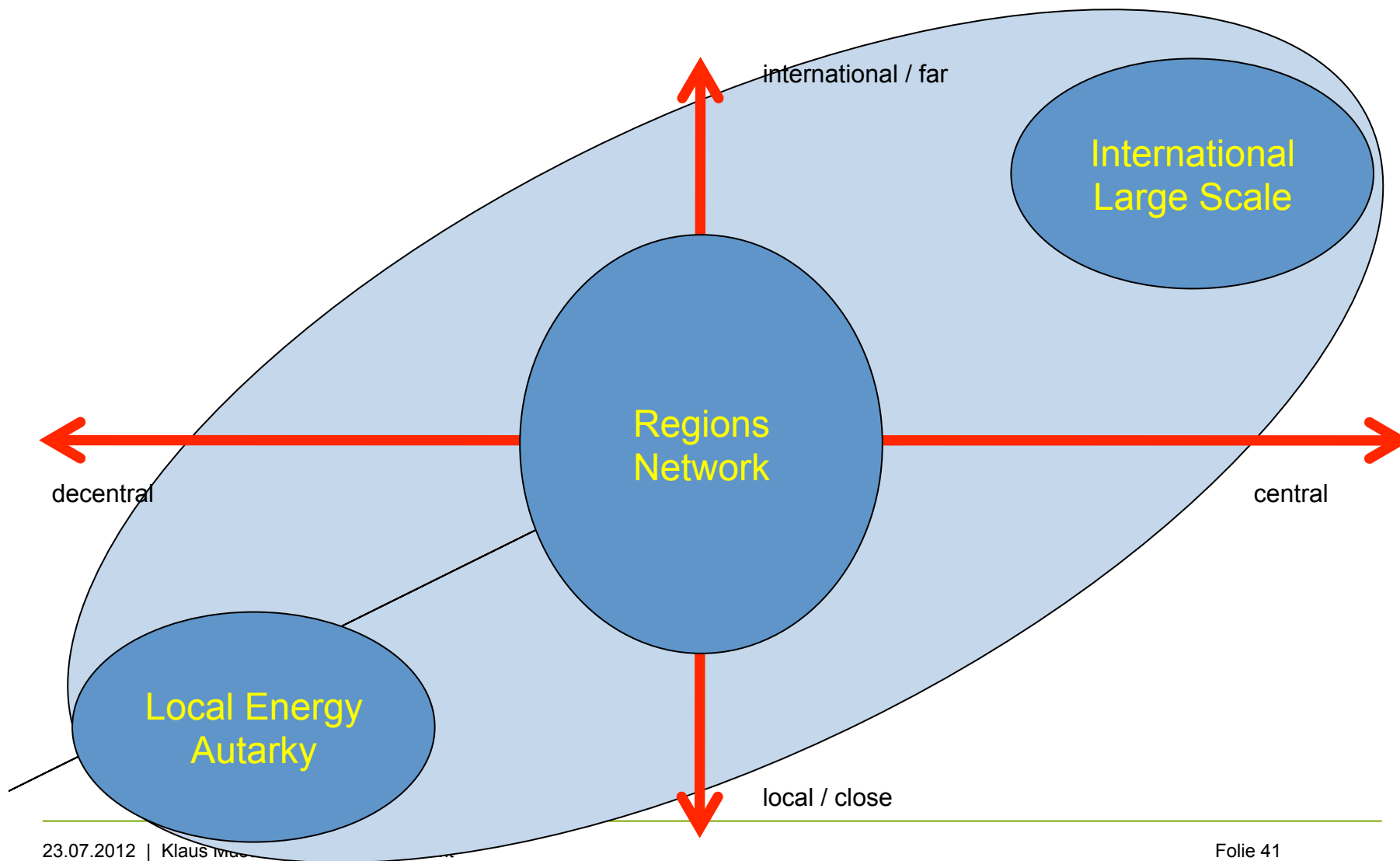
	2011	2015	2017	2019	2021	2022	total
Capacity taken off grid in MW	8,422*	1,275	1,284	1,329	4,018	4,039	20,367

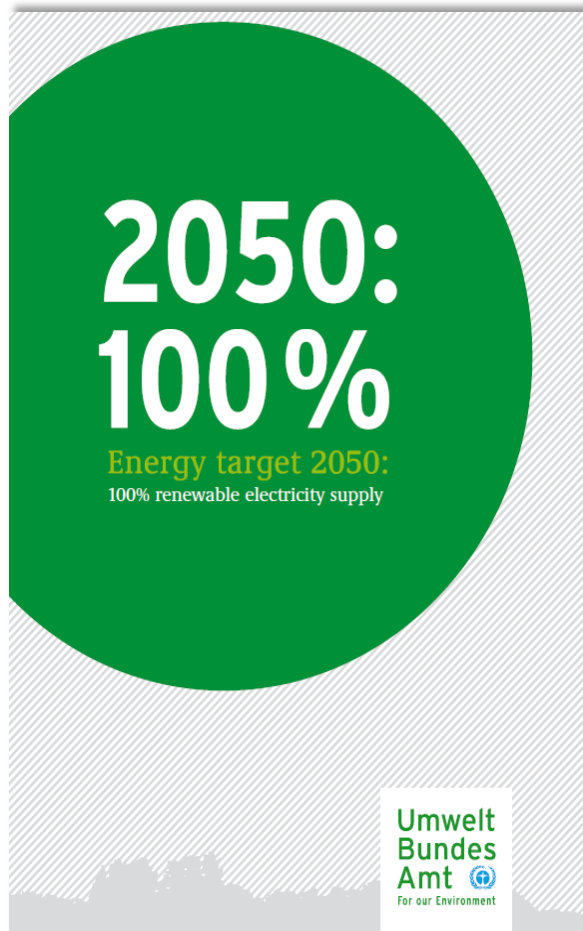
Net output

*2.1 GW already removed from the grid
since 2008

Three “archetypical” UBA scenarios

- **“Local Energy Autarky” (2011, unpublished):**
 - Small-scale decentralized energy systems use locally available RE
 - No grid connection to outside
- **“Regions Network” (2010):**
 - German Regions use their RE potentials extensively
 - Electricity exchange throughout Germany
 - Only small share of power imports from neighbouring countries
- **“International Large Scale” (2012, under progress):**
 - Germany's and Europe's electricity supply is based on all RE potentials in Germany, Europe (large-scale technology projects)
 - High import share via a well-developed intercontinental transmission grid

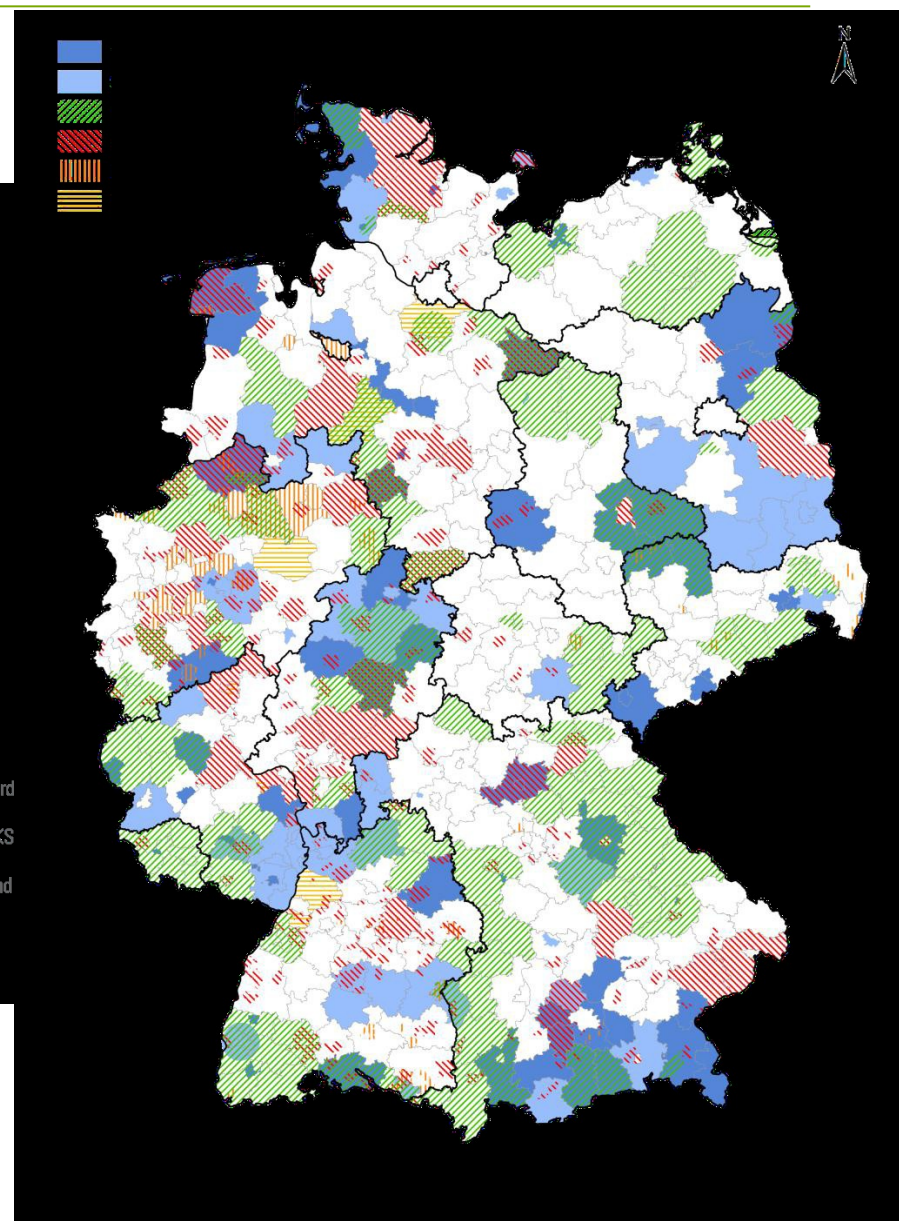
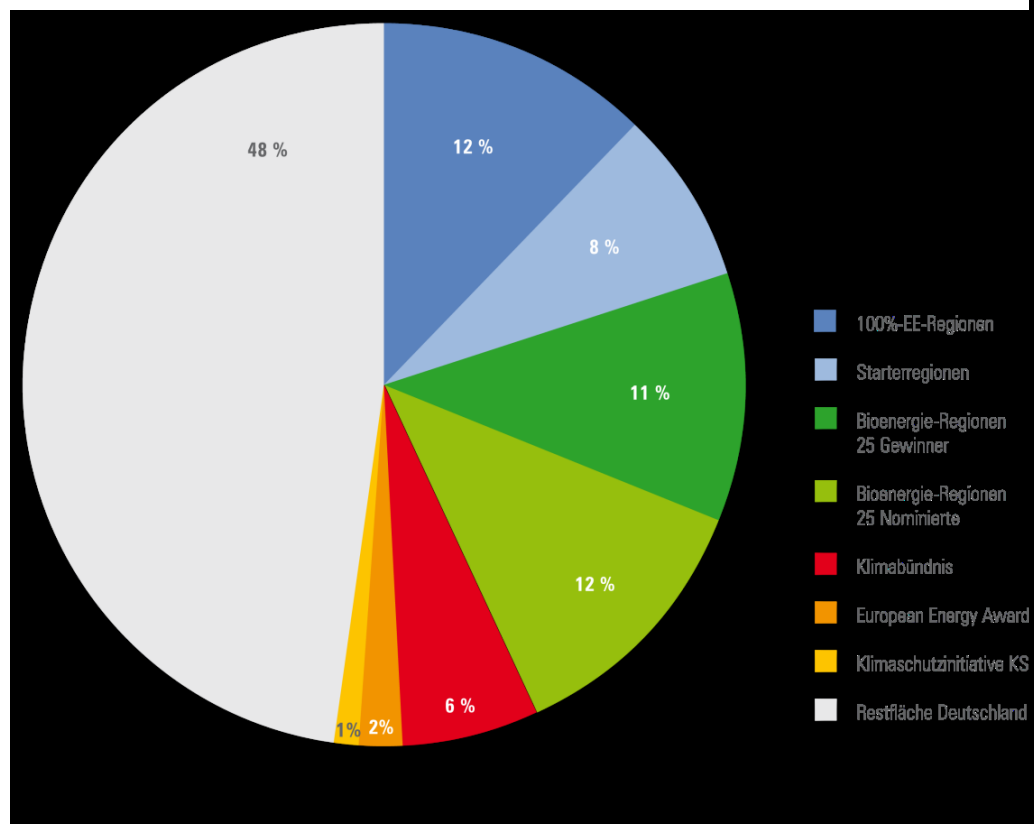




**“Regions Network” scenario
(UBA, 2010)**

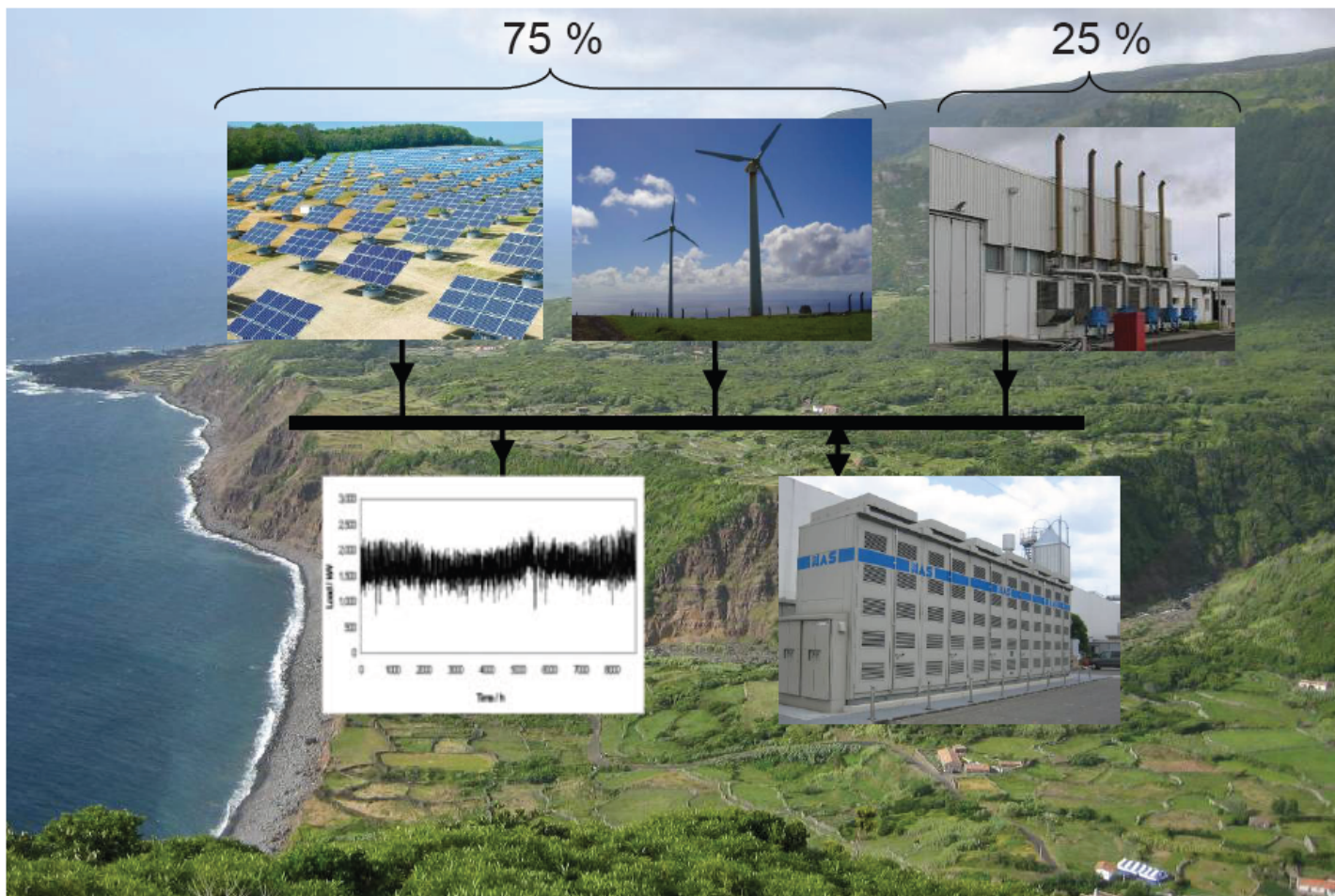
(Download from www.uba.de)

Active regions for REN

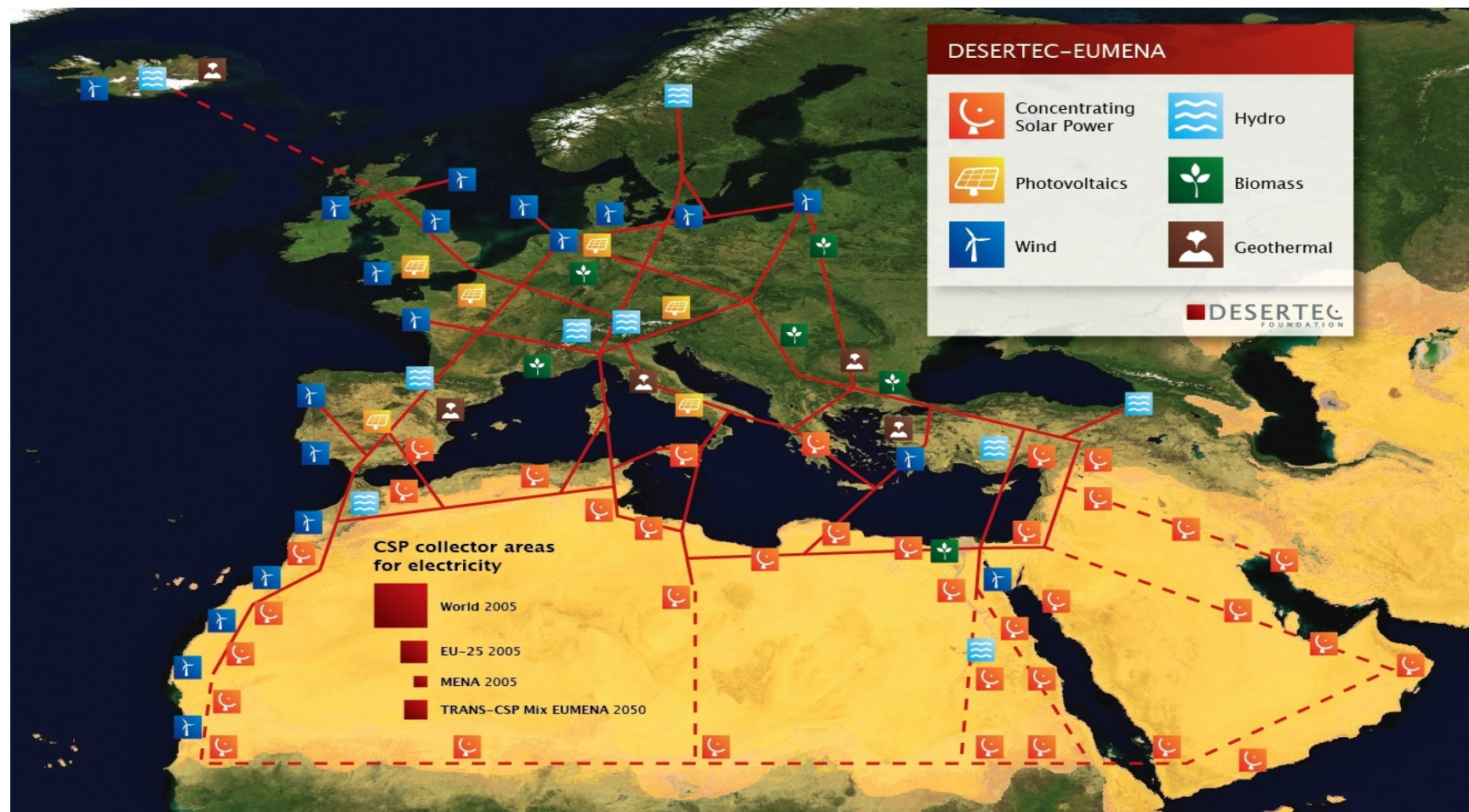


Über 50% sind aktiv, um die Weichen
in Richtung 100% EE zu stellen.

Example: Yunicos Graciosa Project: Optimized Renewable Energy Supply System *Layout based on 7% annual fuel price increase*



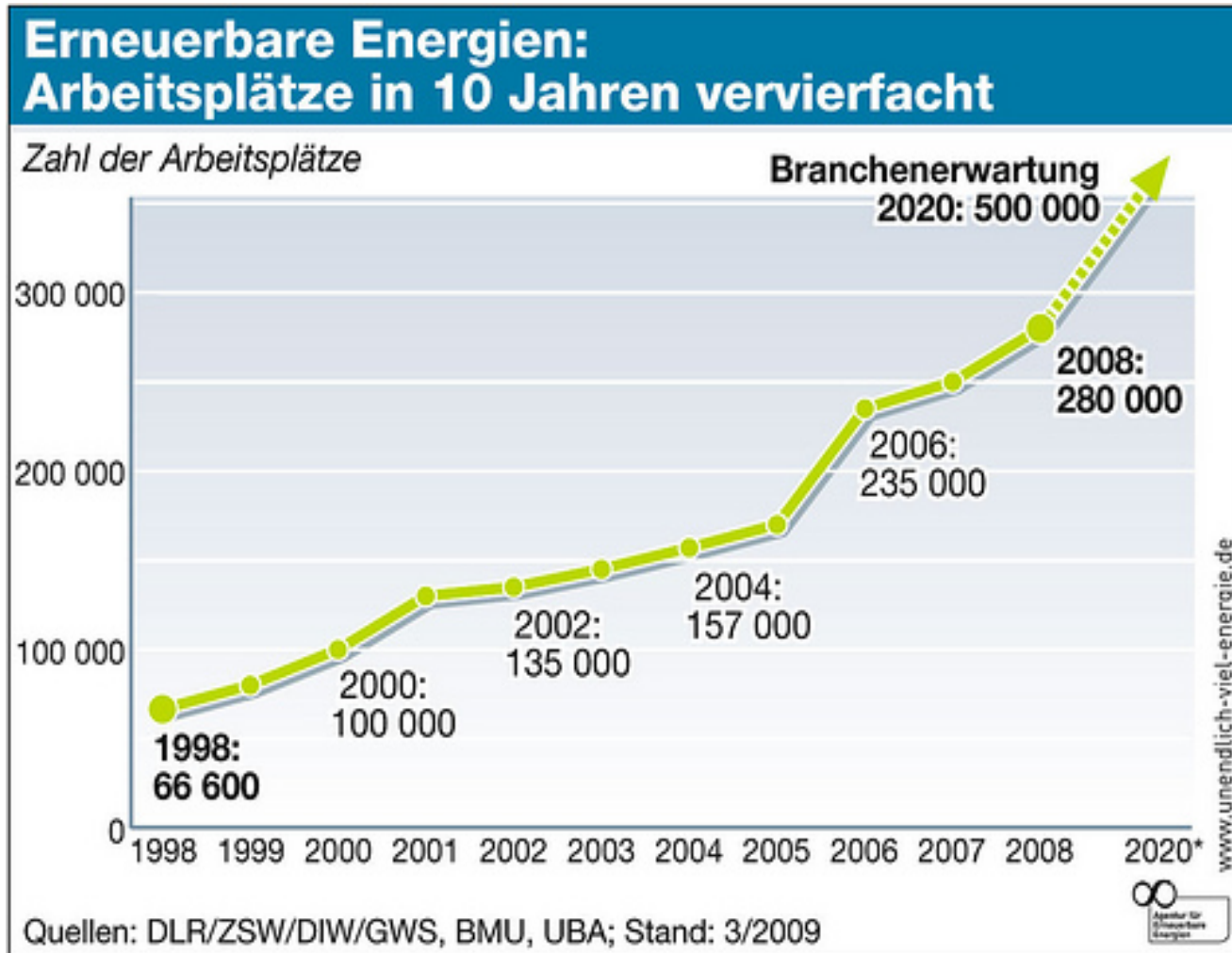
DESERTEC



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Climate policy has a high employment potential



Climate protection

- EU-wide **emissions trading**:
 - No increase in greenhouse gas emissions

- For Germany:
 - Simultaneous compensation of the phasing-out of nuclear power and the replacement of CO₂-intensive power plants via:
 - Expansion of renewables
 - Additional cogeneration plants
 - Achievement of efficiency targets



Source: BMU

→ **Climate targets can still be met**

Summary

- Germany is completely restructuring its energy supply
- Central pillars: Renewable energy sources and energy efficiency
- The restructuring offers financial opportunities
- Climate protection is still guaranteed

***Thank you for
your attention***



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