

NUCLEAR AFTERMATH:

PHASE-OUT & LONG-TERM CHALLENGES IN GERMANY

UNS GEHT'S UMS GANZE

CONTENT

- 1 Nuclear energy & phase-out
- 2 Nuclear waste: lessons from the past
- 3 The Commission on the Storage of High-Level
Radioactive Waste
- 4 At what cost?
- 5 The path to a safe final disposal

1| NUCLEAR ENERGY & PHASE-OUT

FUKUSHIMA CHANGED GERMANY!



PROTESTS AFTER FUKUSHIMA





Chernobyl: 1986

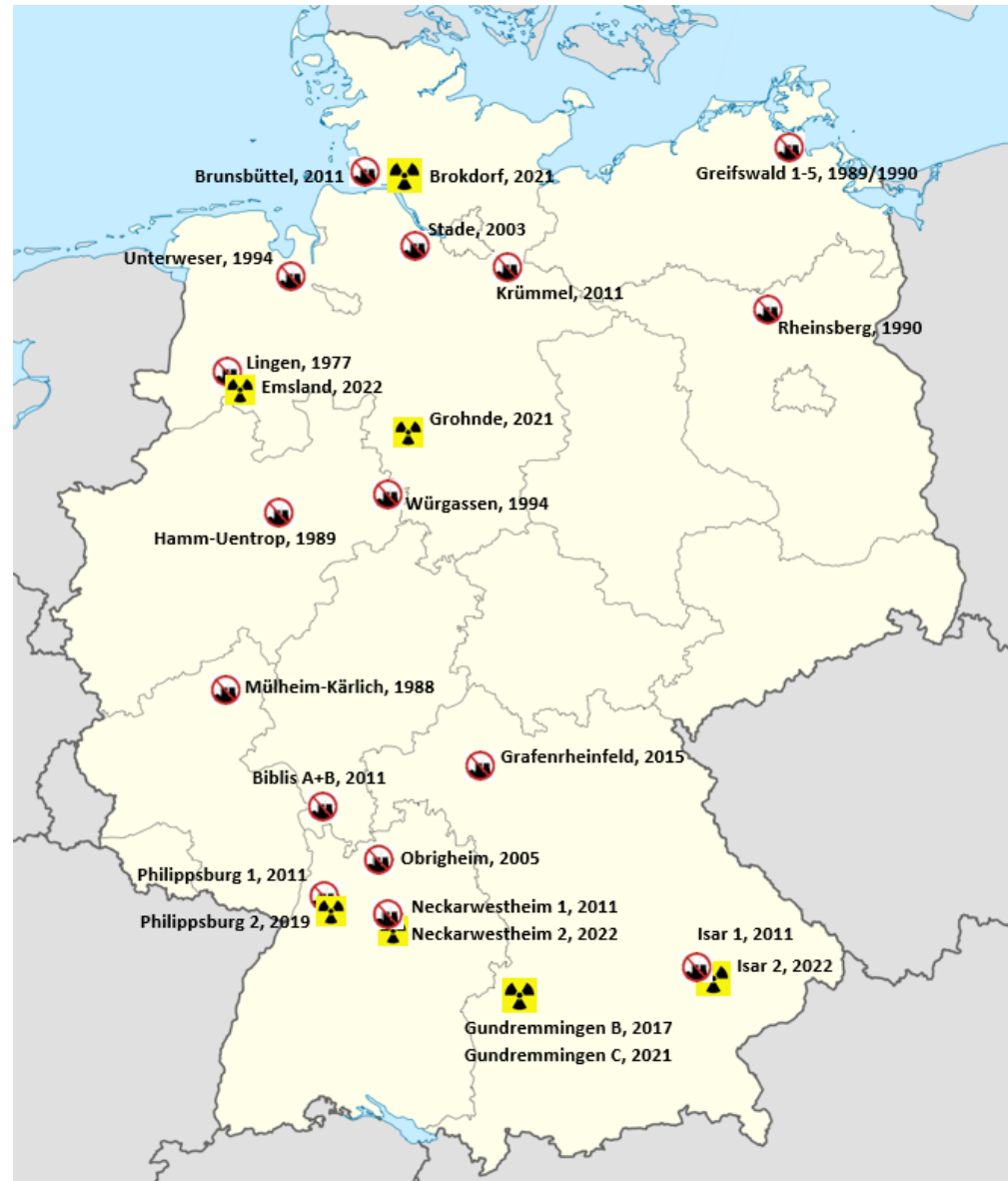
1. Phase-Out: 2000

Fukushima: March 2011

2. Phase-Out: June 2011



NUCLEAR PHASE-OUT



2| NUCLEAR WASTE: LESSONS FROM THE PAST

NUCLEAR WASTE IN GERMANY

- High radioactive waste: 28.100 m³
- Medium and low radioactive waste:
 - Deployed in Schacht Konrad: 303.000 m³
 - Depleted Uranium: 100.000 m³
 - Waste from the drowned storage mine „Asse“: 48.000 m³
 - Other waste: 5.500 m³



Total: almost 1/2 million tonnes of nuclear waste!

NUCLEAR WASTE IN GERMANY



FINAL STORAGE: TRY & ERROR

» Asse:

- 1967 to 1978 storage of 125.787 barrels into empty salt mine
- No long-term security-check in advance
- Today: water entry 12 m³/day, structure/substance of the mine is bad
- Barrels are not safe, removal is the only option – but how? (dangerous)

» Gorleben:

- Chosen in 1977 for political reasons,
- Long-term conflict in science, politics & society

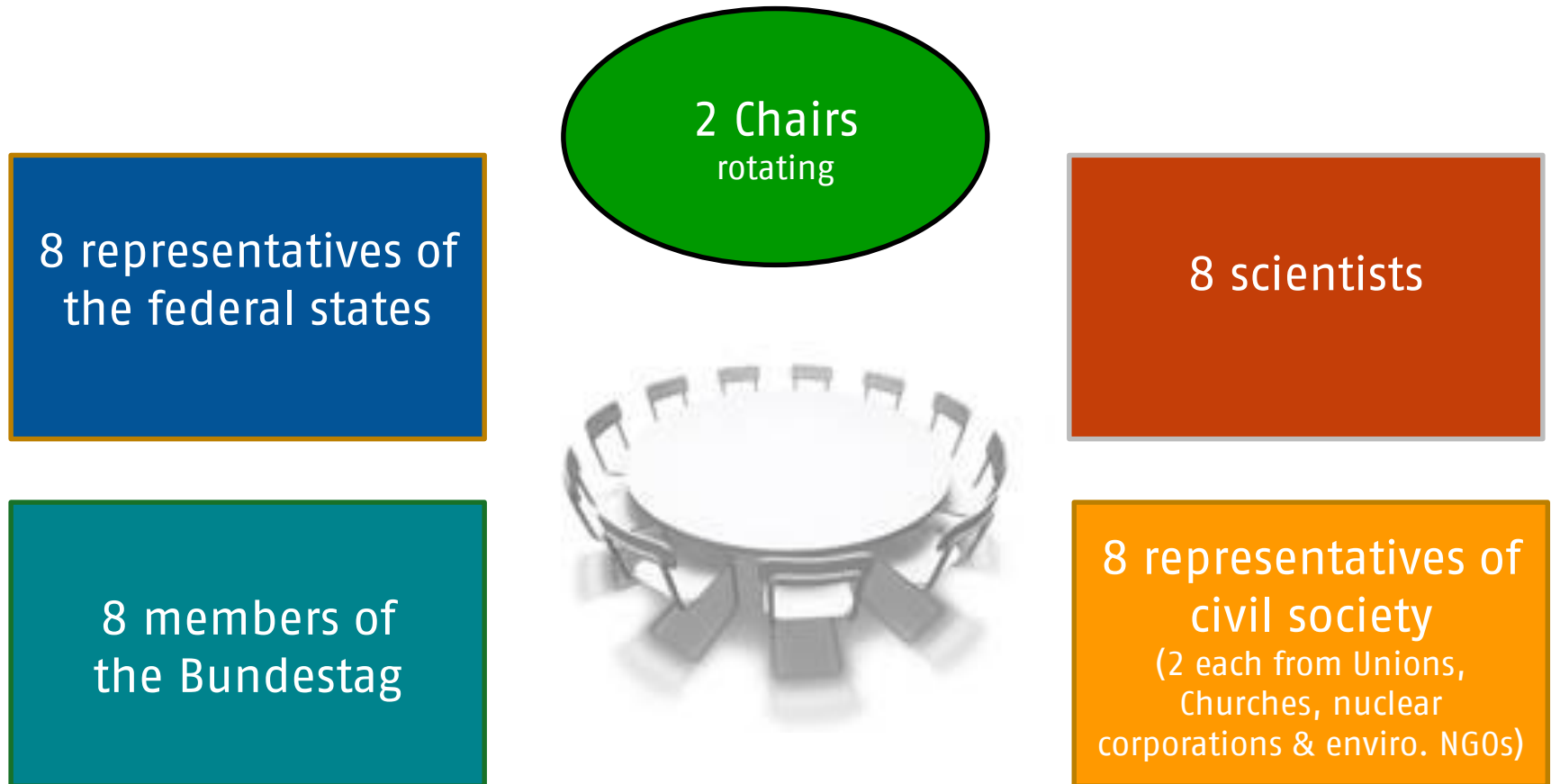
NUCLEAR WASTE IN GERMANY "ASSE"

LOSS OF THE TRUST AND CONFIDENCE OF THE POPULATION IN RESPONSIBLE AUTHORITIES



3| THE COMMISSION ON THE STORAGE OF HIGH- LEVEL RADIOACTIVE WASTE

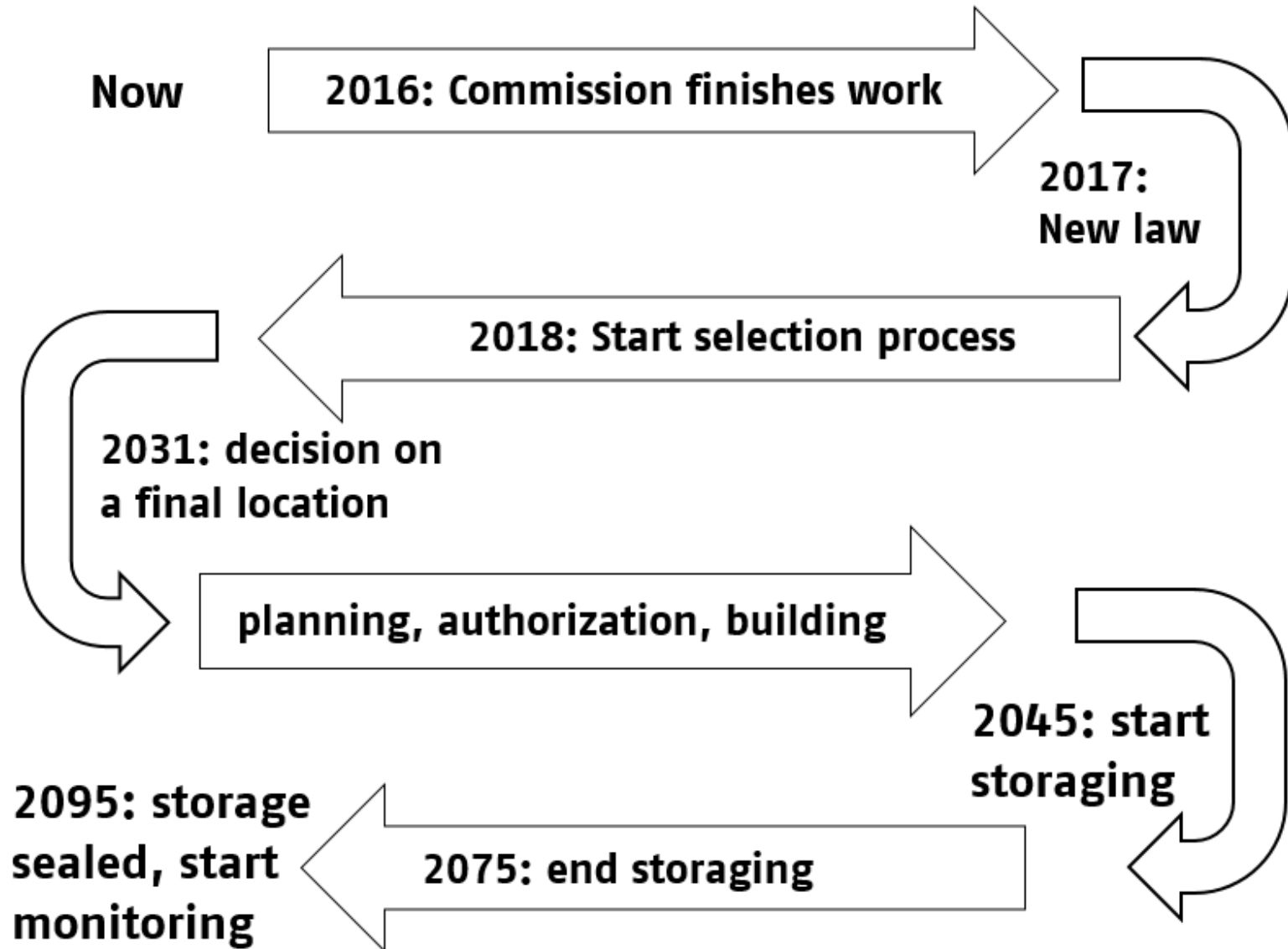
STRUCTURE OF THE COMMISSION



TASKS OF THE COMMISSION

- ❖ Establishment of criteria for site selection
- ❖ Evaluation of Repository Site Selection Act
 - ❖ (Standortauswahlgesetz, StandAG)
 - ❖ Legislative procedure has been completed in March 2017
- ❖ Development of concept for participation of public society

TIMETABLE OF NUCLEAR STORAGE



PRINCIPLES FOR SELECTION OF STORAGE

- » National responsibility
- » Equal treatment
- » Polluter-pays-principle
- » Legitimacy by procedure
- » Building trust



4 | AT WHAT COST?

FINANCING OF GERMANY'S NUCLEAR PHASE-OUT

LAW OF DECEMBER 2016 (KFK-GESETZ)

energy companies secure reserves of 24,2 Mrd. €
purpose: deconstruction, container, transport

- companies/ operators have unlimited increased liability
- obligation for quick deconstruction
- sum has to be liquid (= „real“ money)

state secures 23,6 Mrd. € (including risk charges of 6,2 Mrd. €)
purpose: intermediate- and final storage

- public fund
- exempt from increased liability as soon as risk primes are paid
- intermediate storages operated by state-owned society

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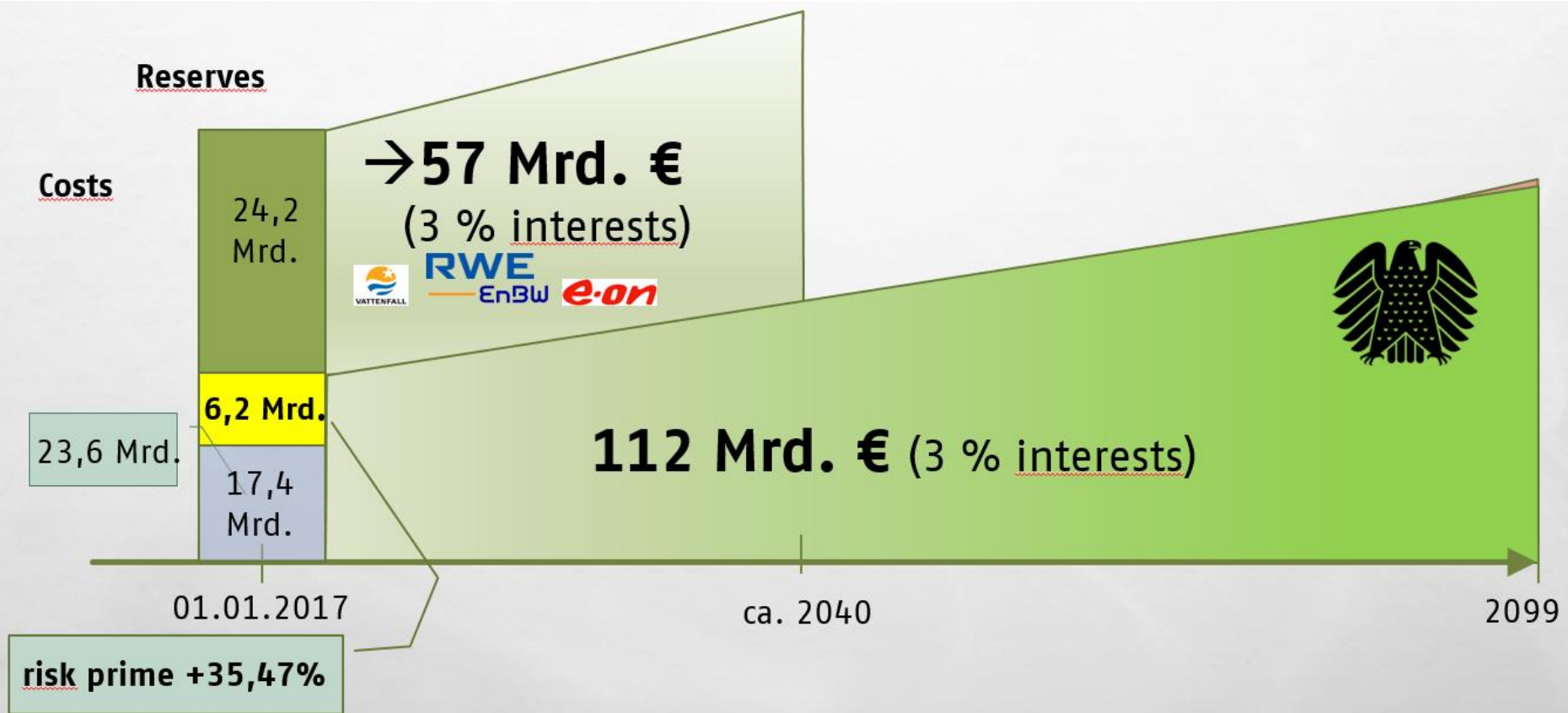
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- public fund
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Conditions:

- companies have to withdraw announced complaints (against final storage, nuclear phase-out)
- no misuse of reserves allowed
- law concerning company liability has been passed combined
- accounting regulations including proof of liquidity are necessary

RESERVES & EXPECTED COSTS



5| THE PATH TO A SAVE FINAL DISPOSAL?

• **Final Disposal** is the last step in the waste management process. It involves the safe and secure disposal of waste materials, ensuring that they do not pose a risk to the environment or public health.

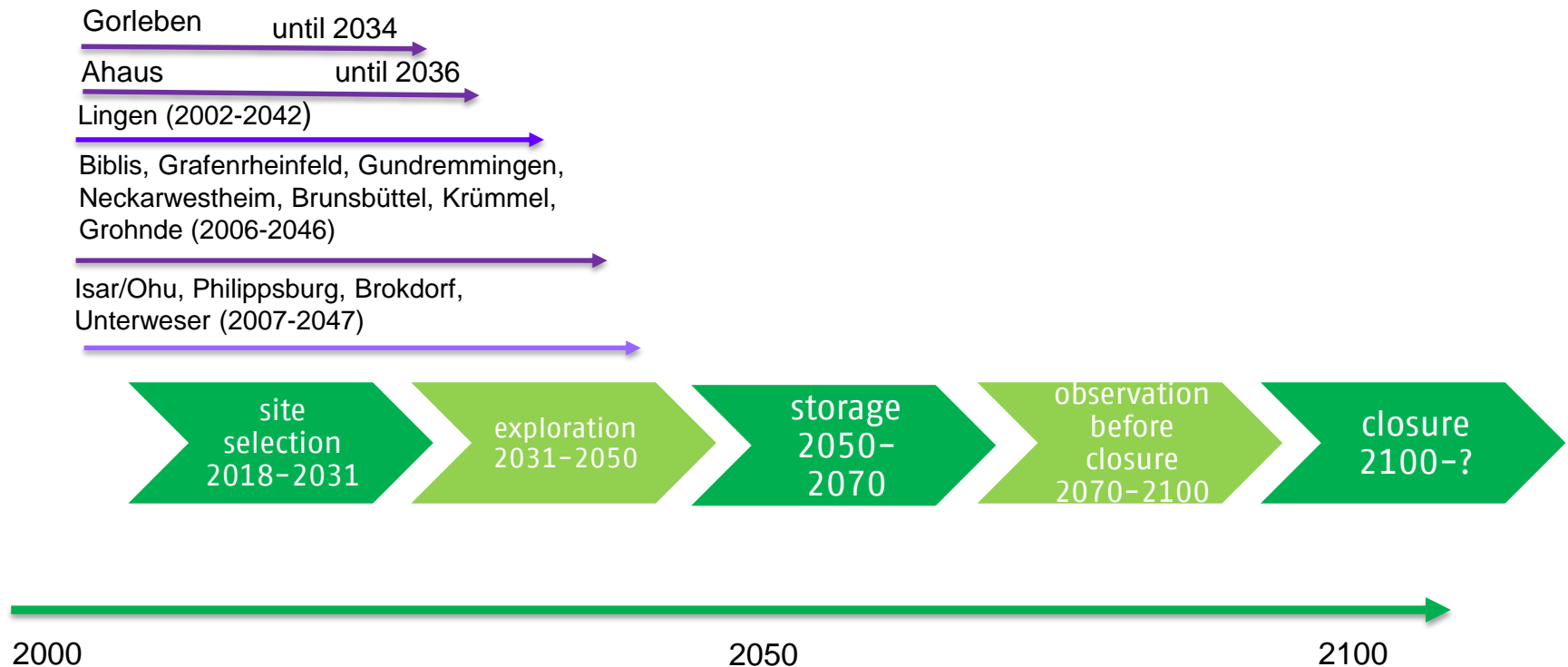
• The path to final disposal involves several steps, including waste identification, classification, and treatment. The goal is to ensure that waste is disposed of in a way that minimizes its impact on the environment and public health.

• The path to final disposal is a complex process that requires careful planning and execution. It involves working with regulatory agencies and other stakeholders to ensure that waste is disposed of in a safe and secure manner.

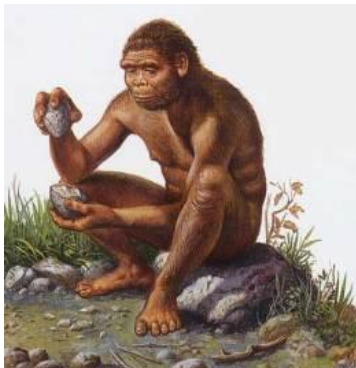
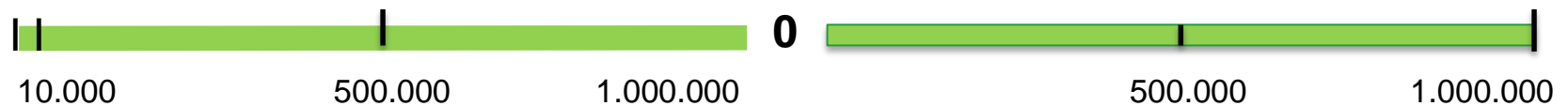
RECOMMENDATIONS FOR DISPOSAL SELECTION:

- » Goal of finding the safest form of disposal for high-level radioactive waste: safety takes precedence
- » Waste must be stored in Germany
- » Disposal must not place a permanent burden on future generations
- » Possibility to correct mistakes: irreversibility must be avoided
- » Whole process must be transparent, with significant participation of the citizens concerned

INTERMEDIATE STORAGE: 40 YEARS – BUT AFTERWARDS?



1 MILLION YEARS: CAN YOU IMAGINE?



SEARCH PROCESS

first phase	Application of criteria on the basis of available data, preliminary safety checks
	Law of the German Bundestag and the Federal Assembly about regions of sites for overground exploration
second phase	Overground exploration of several appropriate regions for sites
	Law of German Bundestag and Federal Assembly about appropriate sites for underground exploration
third phase	Underground exploration of several sites
	Law of German Bundestag and Federal Assembly about final location for a final disposal site

comparative

transparent

based on
scientific
evidence

participative

all over the
country
(Gorleben too)

CRITERIA

- » **Primacy of safety** → precedence of geology
- » **All rock types:** clay, salt, crystalline
- » **Kinds of criteria:** exclusion criteria, minimum specifications, geoscientific assessment criteria, planning science criteria
- » Changes to Working Group for the Selection Procedure for Final Repository Locations: “white map”, reversibility, overburden rock, max. temperature at 100 Celsius

PUBLIC PARTICIPATION

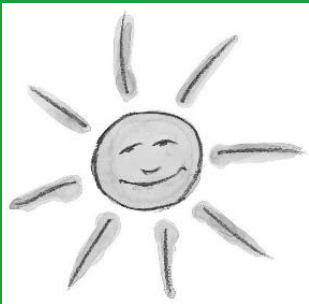
Local	Regional conferences and discussions with local population
Supra-regional	"Council of the regions" expert conference
National	National support body
Broad population	Information platform with a transparent registry of information

→ especially in the concept of participation **key demands** from the participation formats of the commission have been considered (e.g. "Council of the regions", inclusion of interim storage-communities, citizen, commissioner for participation)

WHERE IS THE JUSTICE? LET'S CALL IT A DILEMMA ...

- » Gorleben
- » Lawsuits made by the energy providers
- » Interim storage
- » Right of future generations

THANK YOU



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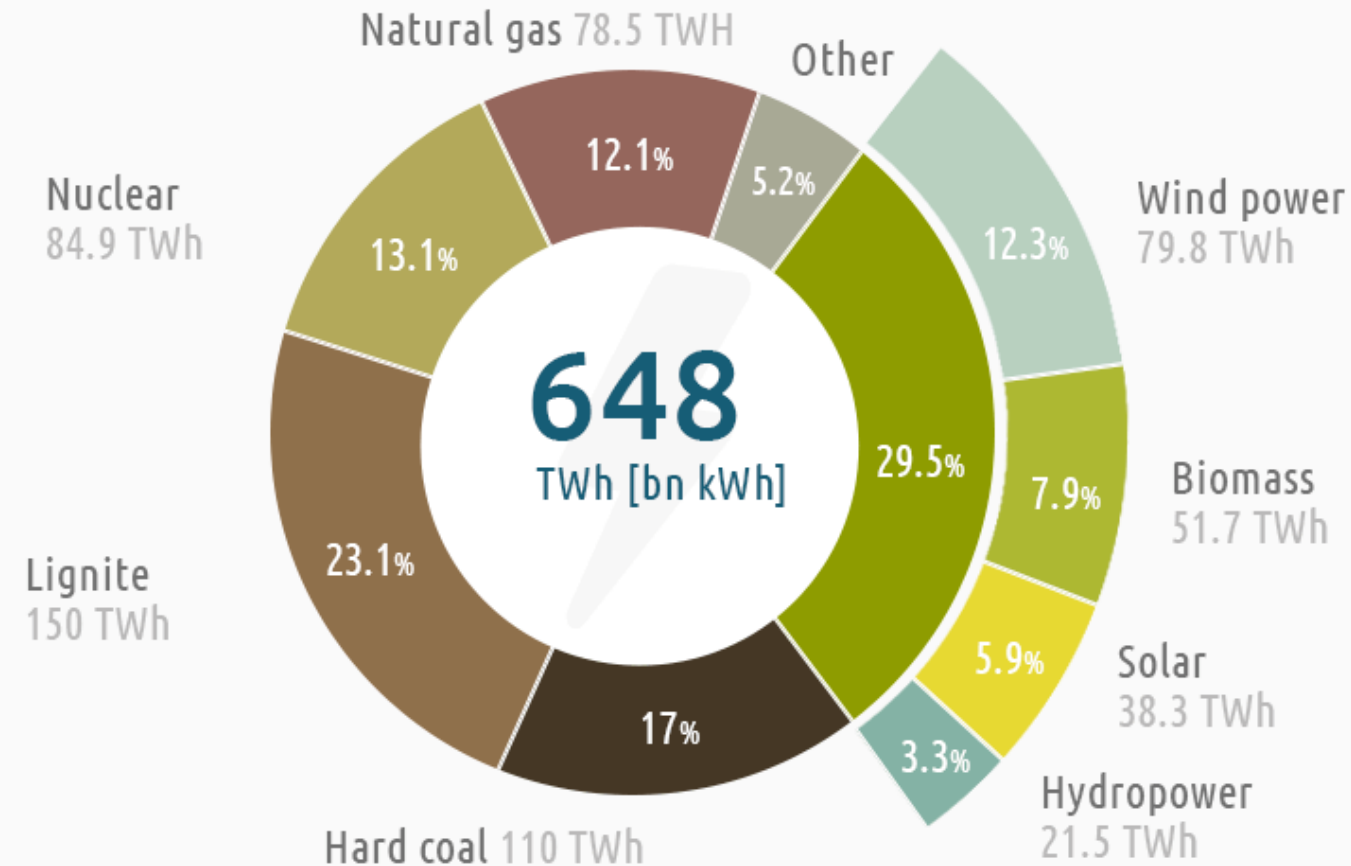
BACKUP:

STEPS OF SITE SELECTION PROCEDURE

- ❖ Based on commission report
- ❖ Investigation of regions coming into consideration and selection of sites for overground exploration (Art. 1, § 13 StandAG)
- ❖ Law for overground exploration; finally proposals for sites for underground exploration (Art. 1, § 14 StandAG)
- ❖ Law for underground exploration (Art. 1, § 17 StandAG)
- ❖ underground exploration and comparison of sites, decision for a site per law (Art. 1, § 20 StandAG)
- ❖ Approval procedure according to § 9b section 1a AtG for establishing, operation and shutdown of final disposal site

GROSS POWER GENERATION MIX GERMANY 2016

Share of energy sources in German power production



Source: AGE, 2016

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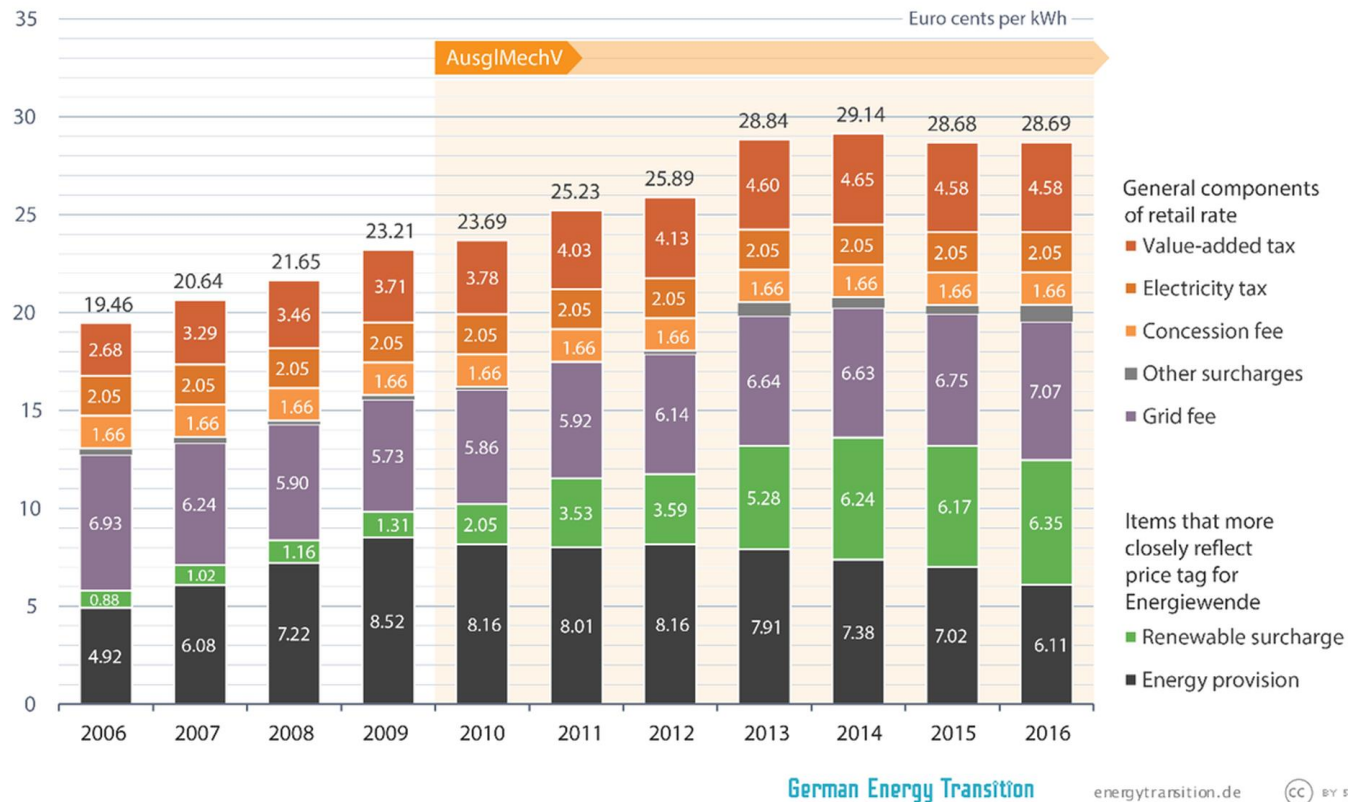
UNS GEHT'S UMS GANZE

PRICES ARE STABILIZING



German retail power rates stable since 2013 although renewables increased by a third
Average retail electricity rate in Germany, 2006-2016

Source: BDEW | for households consuming 3500 kWh / year



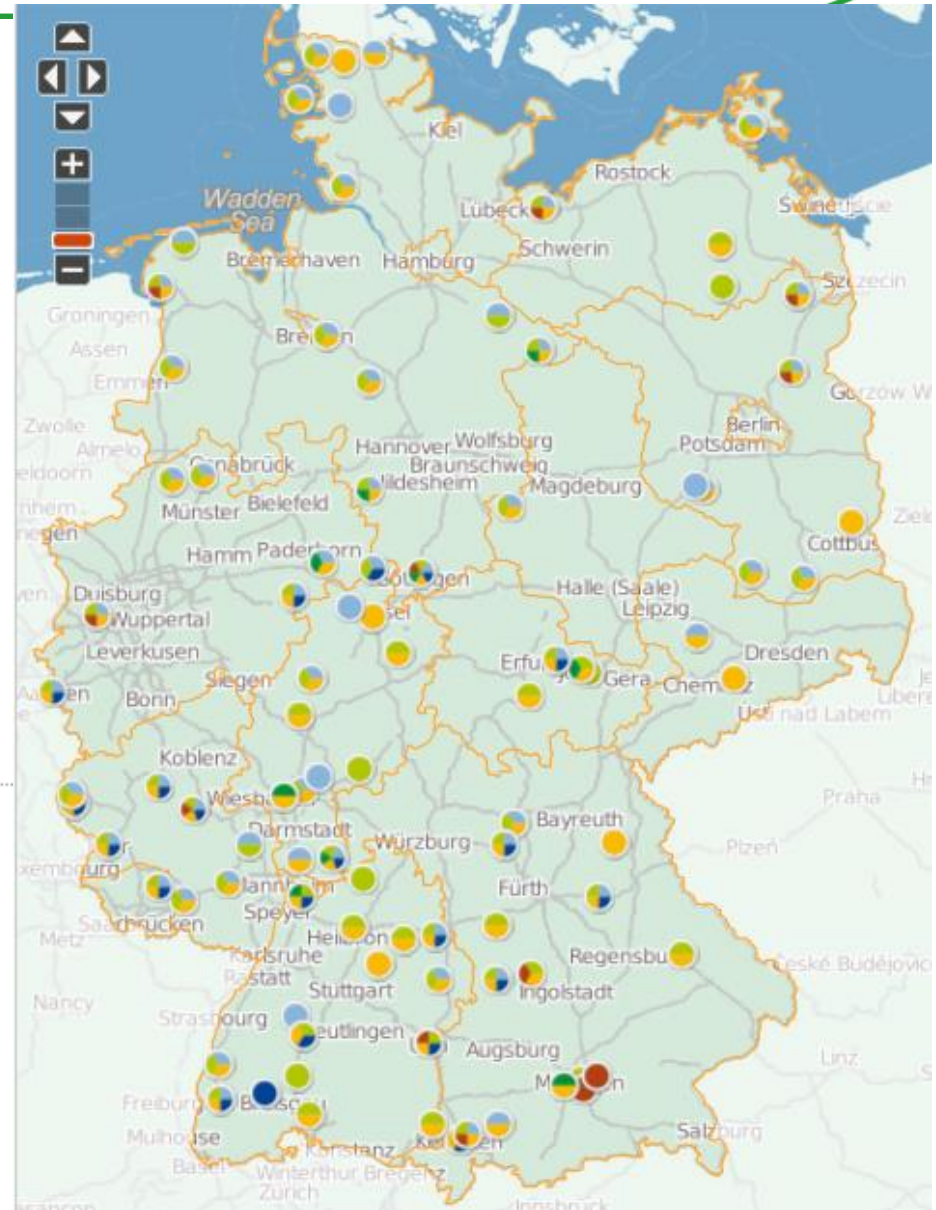
Accessed on June 16, 2016 at www.energytransition.de

AROUND 100 „ENERGY MUNICIPALITIES“ ACROSS GERMANY

- Commit going **100% renewable**
- Benefit from **value chains**
- **Energy Advice** for local population
- Creation of an **energy concept**

Technologien

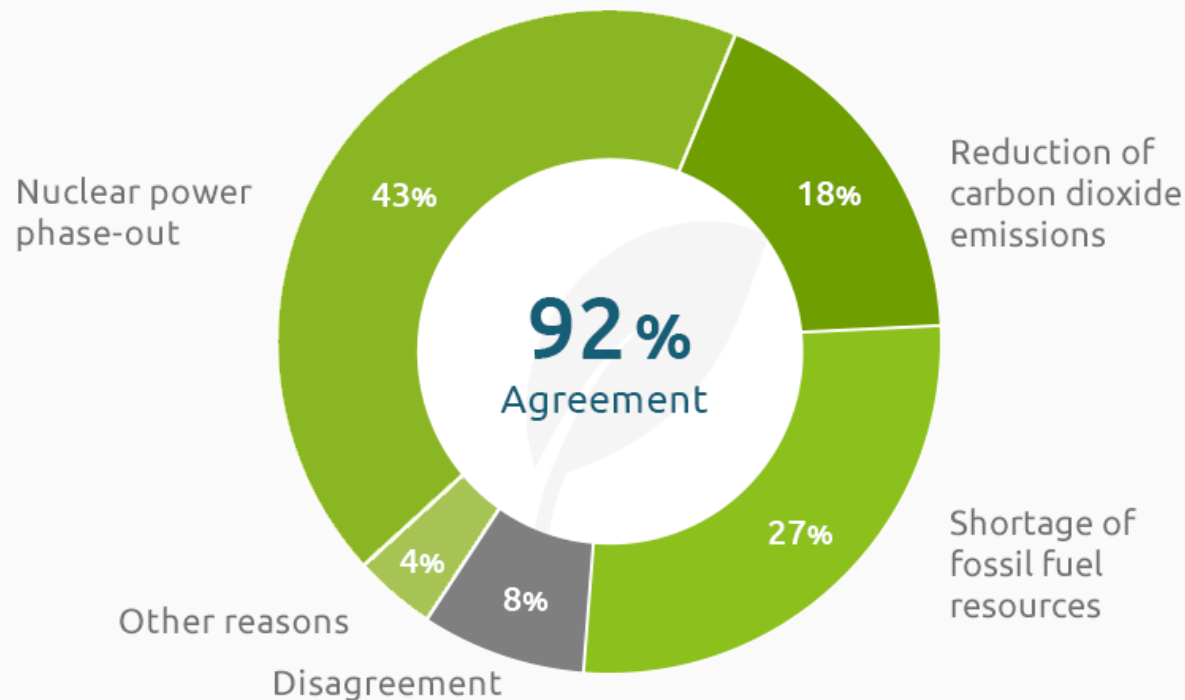
- ☐ Wind
- ☐ Wasserkraft
- ☐ Sonne
- ☐ Biomasse
- ☐ Erdwärme
- ☐ Ökostrom



92% SUPPORT

WHY GERMANS SUPPORT THE ENERGIEWENDE

92% of German consumers agree with the energy transition

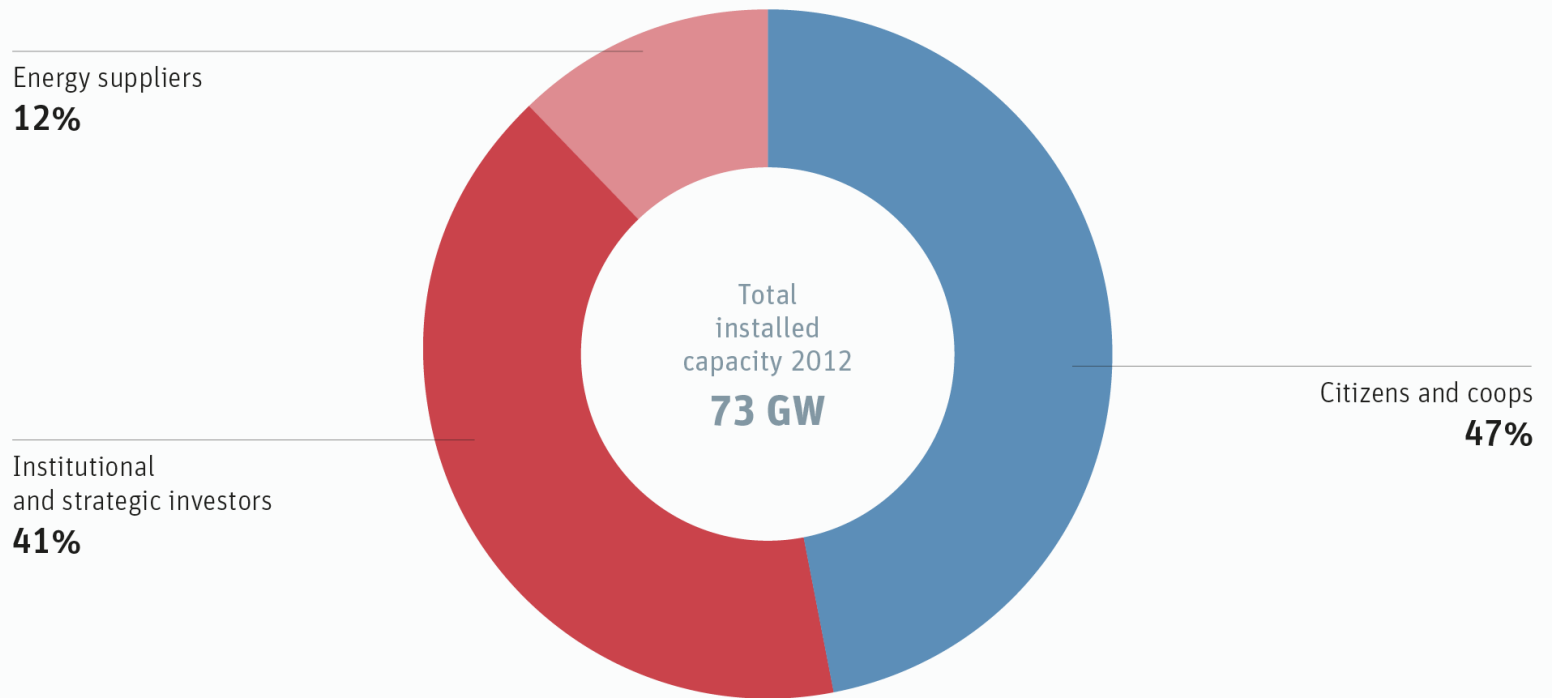


Source: PricewaterhouseCoopers 2015

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ONLY 12% OWNED BY THE „BIG FOUR“

THE „ENERGIEWENDE“ BELONGS TO THE PEOPLE!

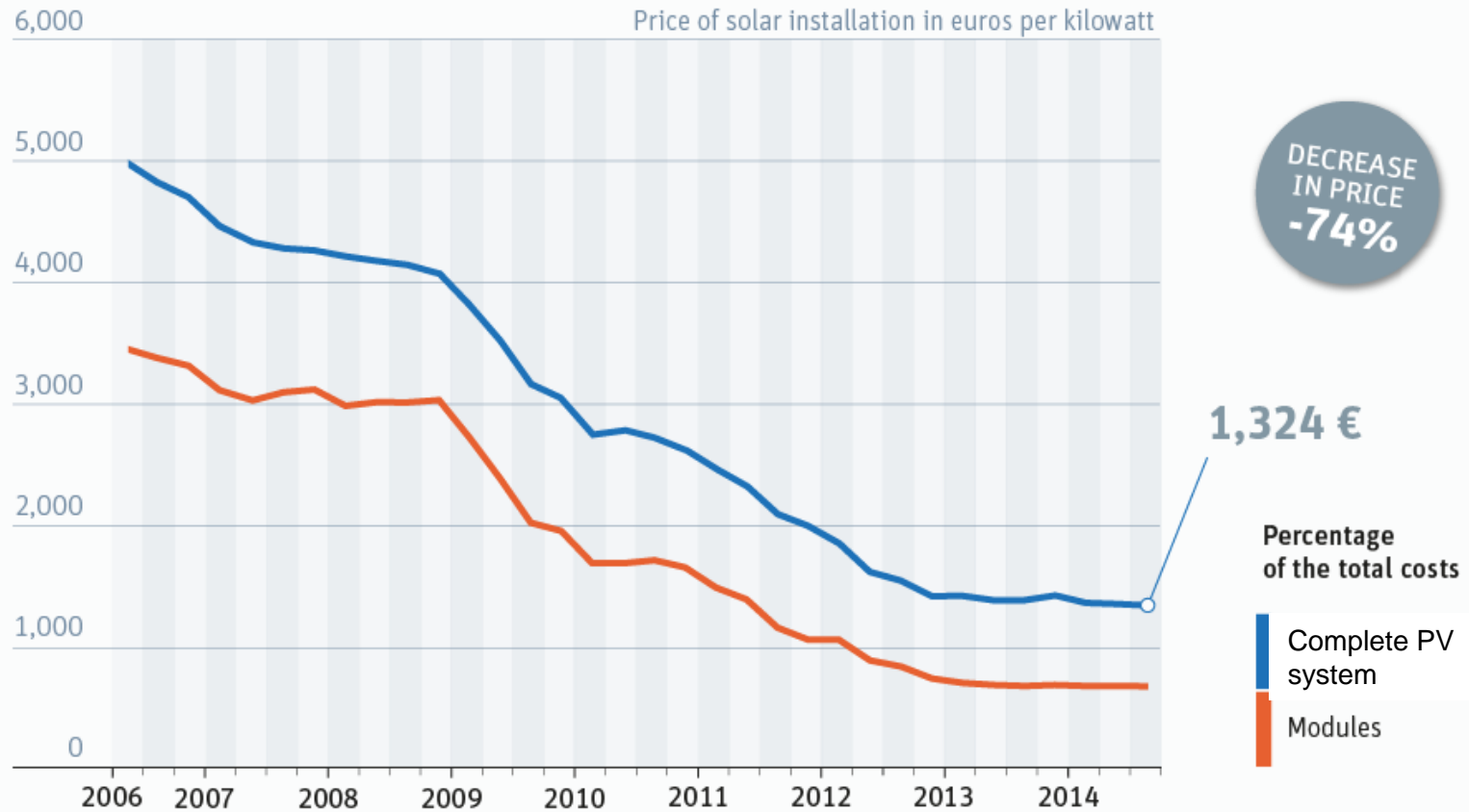




Price of solar down in Germany by 74 percent since 2006

Average system price for installed rooftop solar from 10 to 100 kilowatts

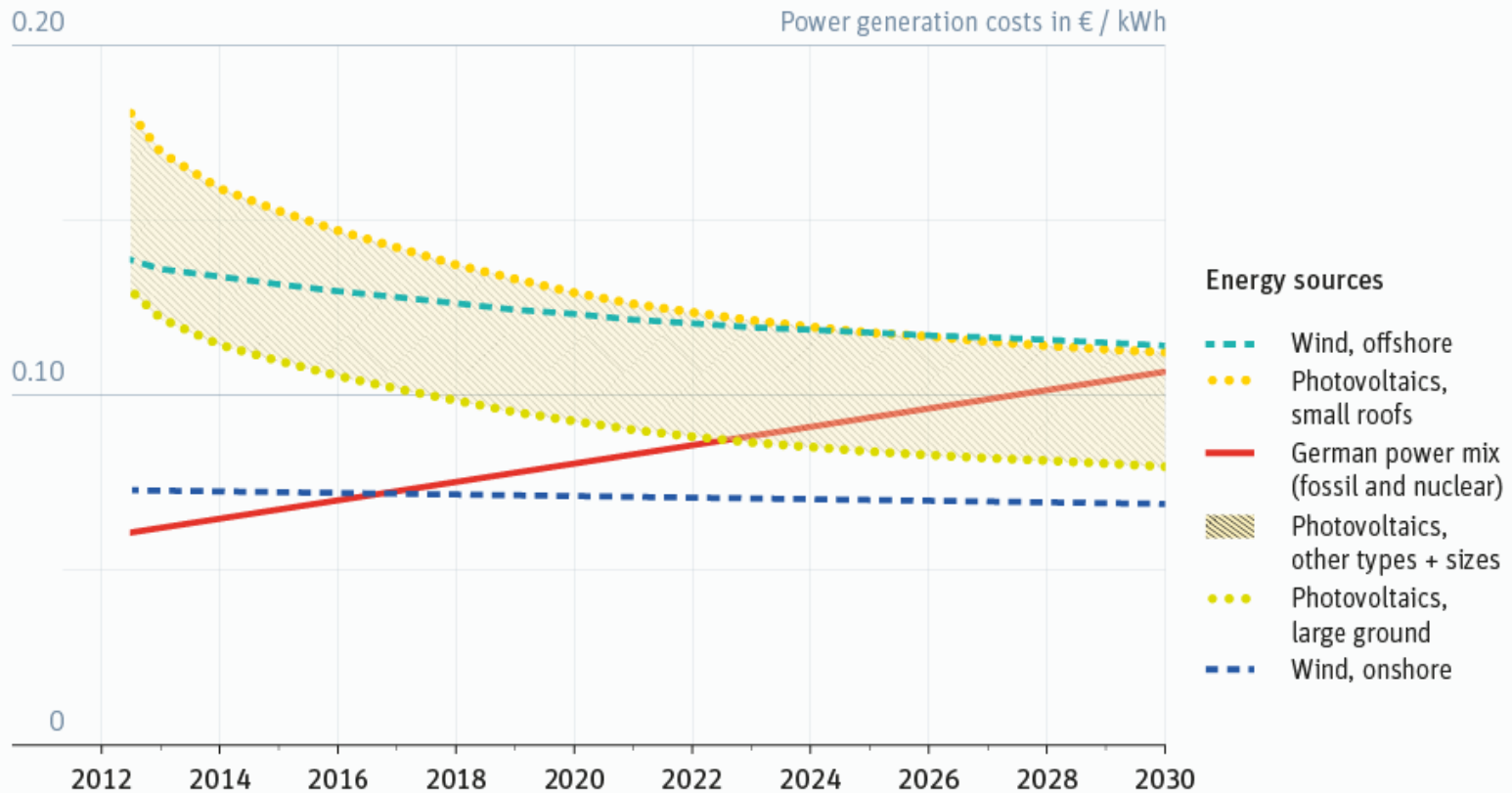
Source: EUPD Research and BSW-Solar



Renewables are becoming competitive

Forecast of power generation cost in Germany up to 2030

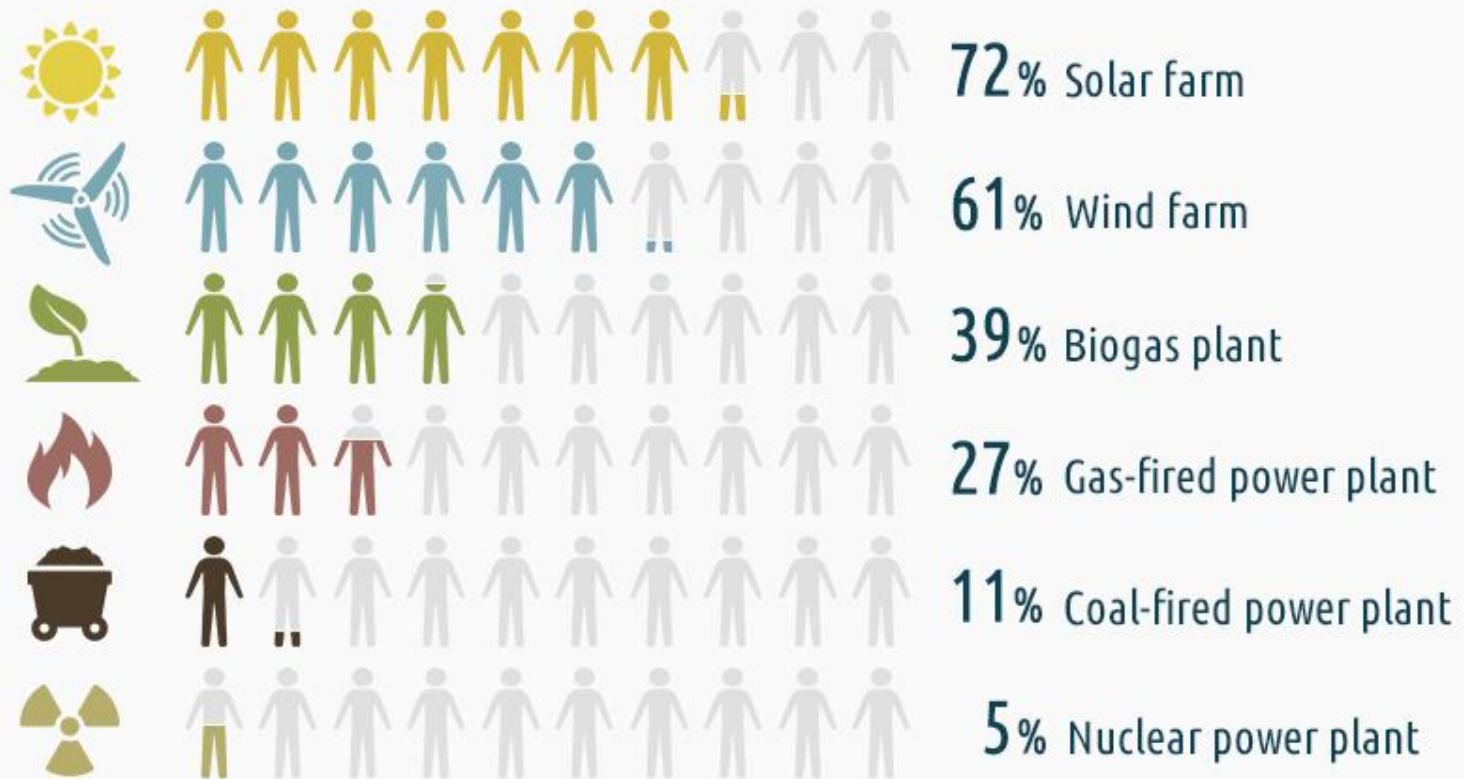
Source: Fraunhofer ISE



PEOPLE LOVE RENEWABLES!

A POWER PLANT IN YOUR NEIGHBORHOOD?

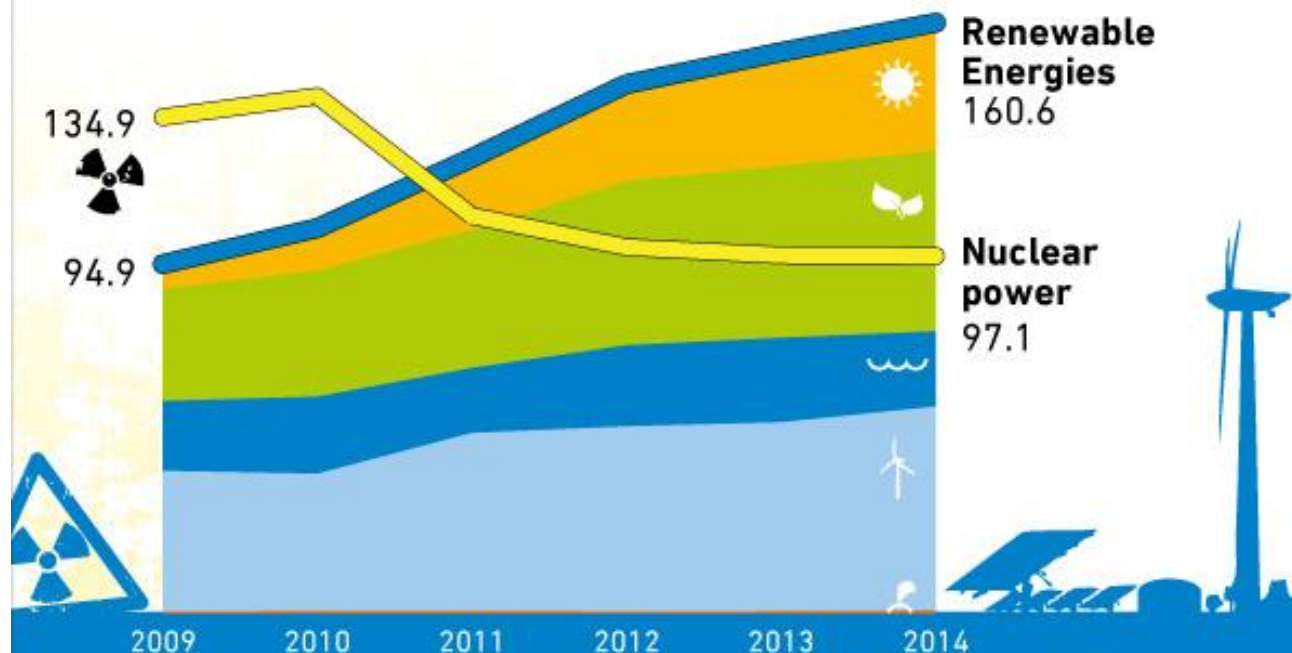
Acceptance of power plants in the neighborhood [2014 in Germany]



Result of a survey conducted by TNS Emnid among 1015 respondents

Renewable Energies in Germany Replace More and More Nuclear Power

Gross electricity generation from Renewable Energies and nuclear power, billion kilowatt hours



Electricity generation from renewable energies has increased by 50 percent to more than 160 bn kilowatt hours since 2010.

Source: AG Energiebilanzen; as of 3/2015



RENEWABLE
ENERGIES
AGENCY
renewables-in-germany.com

3| UN SUMMITS 2015

1. Sustainable development goals
2. Implementation Paris agreement

SUSTAINABLE DEVELOPMENT GOALS



Implementation Paris Agreement

- » Ratification of the agreement
- » Enter into force prior to the elections in the US
- » Review Mechanismus
- » Securing the financing

THERE IS NO PLANET B



3 POSSIBLE COOPERATION

- Exchange of **Best-Practise-Examples**
 - Renewable Energies Law (EEG)
 - Climate Change Legislation
 - Adapting to Climate Change
- Coal phase-out
- Implementation of SDGs
- Think global, act local.