The German Energiewende

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Geode Meeting, Brussels, November 18, 2014

EnKliP
Energy and Climate Policy | Consulting

FÖS | GREEN BUDGET GERMANY
FORUM ÖKOLOGISCH-SOZIALE MARKTWIRTSCHAFT

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General Aspects of the Energiewende

Costs of Renewable Energy in the Power Sector

The New Renewable Energy Sorces Act (EEG)

Balancing Wind and Solar Power

The Coal Debate in Germany

Effects of the Energiewende to the Neighbors

Challenges

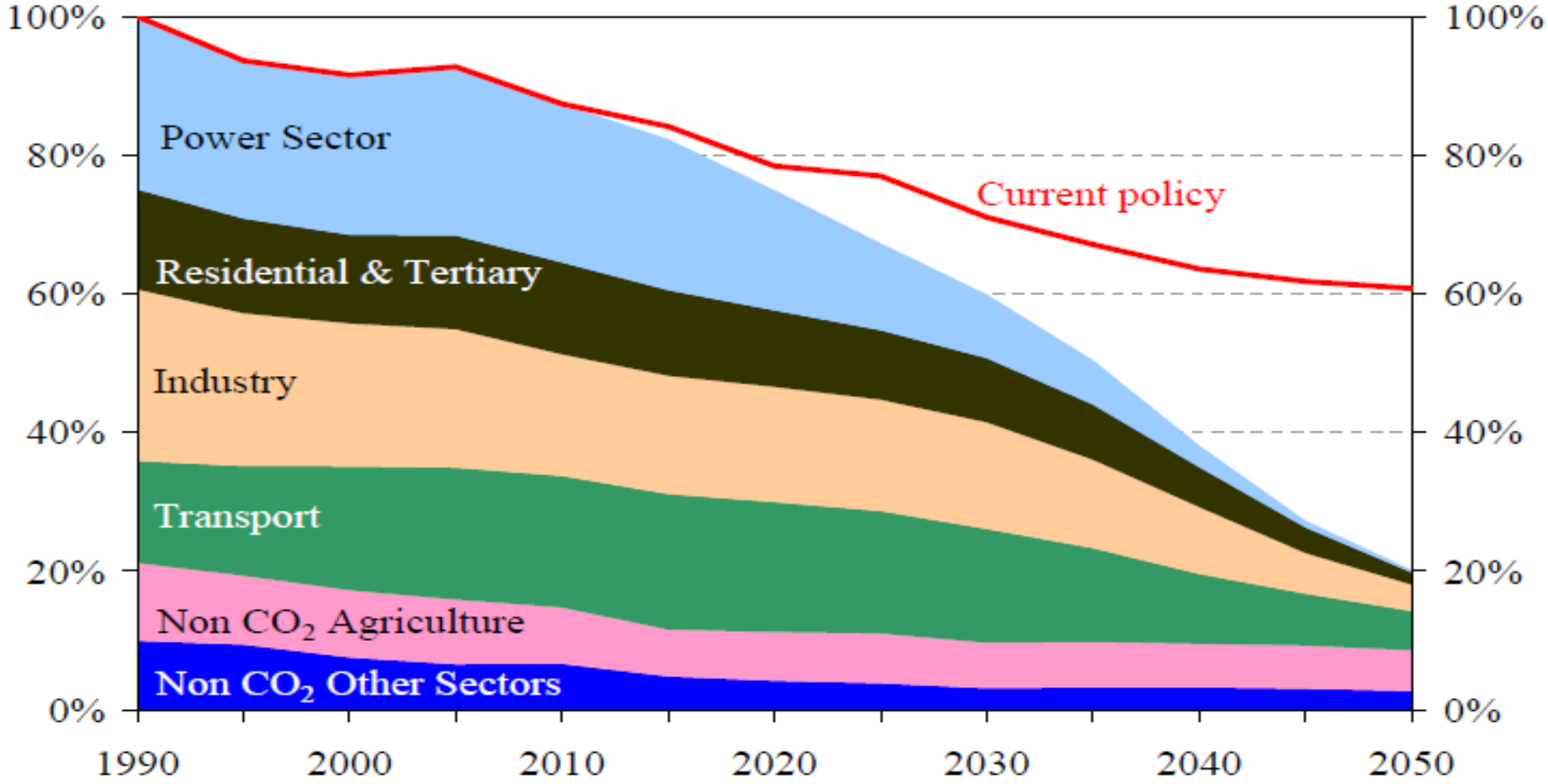
Kofi Annan 2014

Former Secretary General of the United Nations

"The Climate Crisis threatens the well-being of hundreds of million people. It undermines the human right to food, water, health and security.

This is not only a worrying future scenario but is already happening today."

Challenges



Reductions in EU GHG emissions in order to achieve a domestic reduction of 80% by 2050 (100% = 1990)

(EC 2011, Roadmap for moving to a competitive low carbon economy in 2050)

Challenges

In the power sector, affordable and almost zero-emissions technologies exist

Renewables:	Wind power
	Solar power
	Hydro power
	Geothermal power
	Biomass
Carbon Capture, Transport and Storage (CCTS):	Still relevant GHG-emissions Not available before 2020
Nuclear:	No sustainable option

Challenges

German generation system needs modernisation

A) For climate protection reasons

B) Many power plants are old

- 50% of installed coal capacity is older than 30 years
- 25% of installed coal capacity is older than 40 years
- 40% of installed natural gas capacity is older than 30 years
  (source: BNetzA)

C) Phase out of nuclear power until 2022

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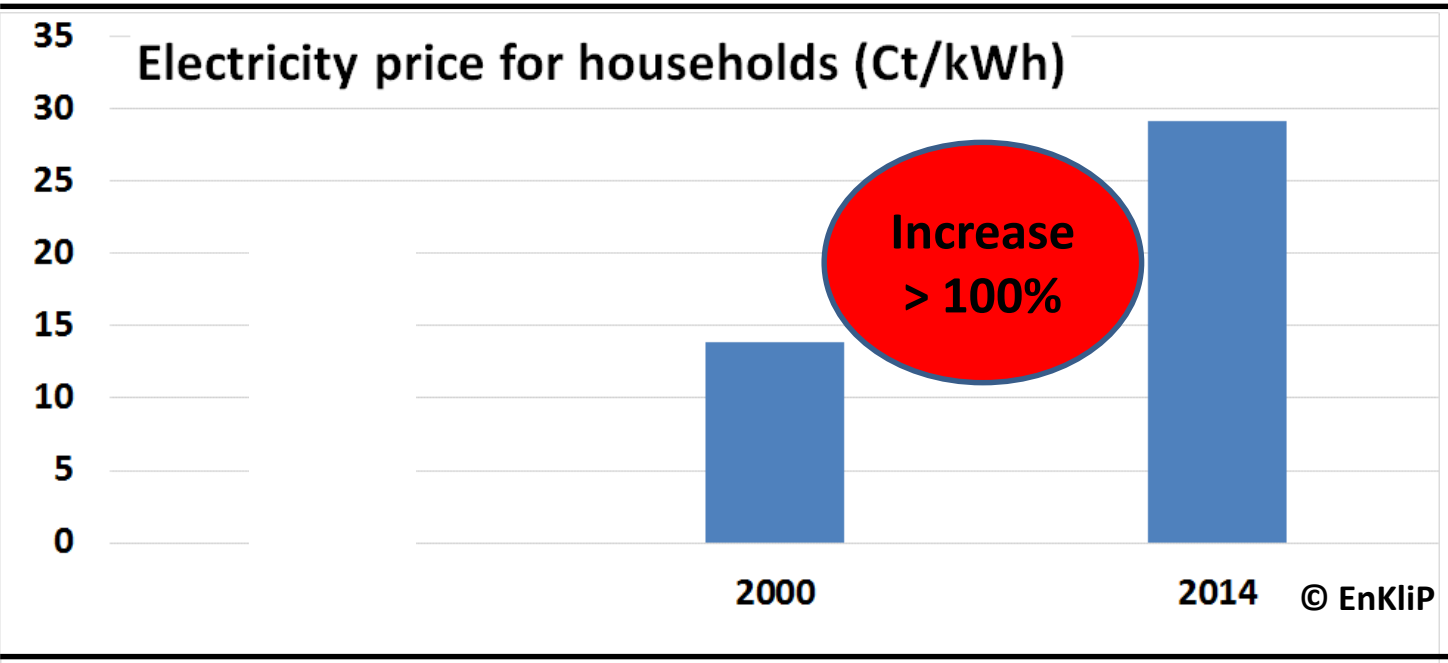
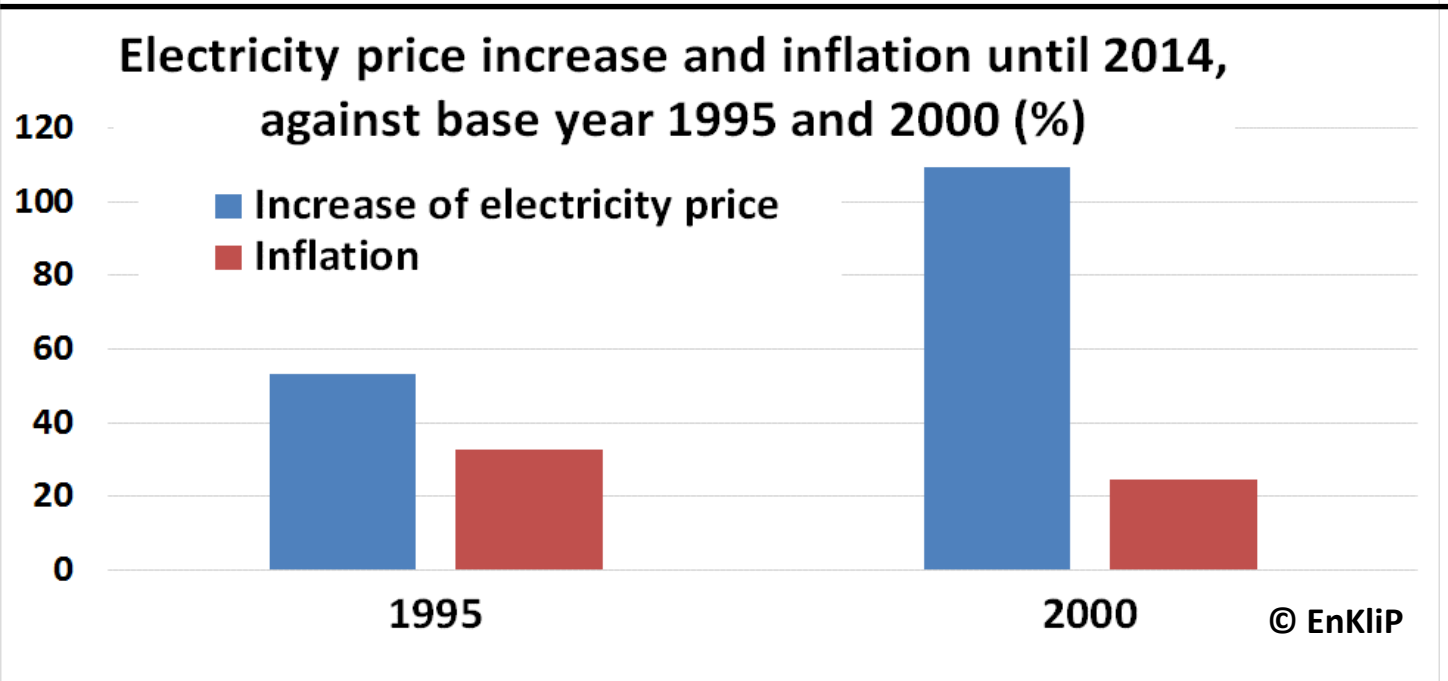
RES-Costs


Electricity price for households (Ct/kWh)
35
30
25
20
15
10
5
0
Increase
> 100%
2000
2014
© EnKliP


Electricity price increase and inflation until 2014,
against base year 1995 and 2000 (%)
120
100
80
60
40
20
0
Increase of electricity price
Inflation
1995
2000
© EnKliP

RES-Costs

Recent opinion poll with menbers of largest German industry federation VDMA

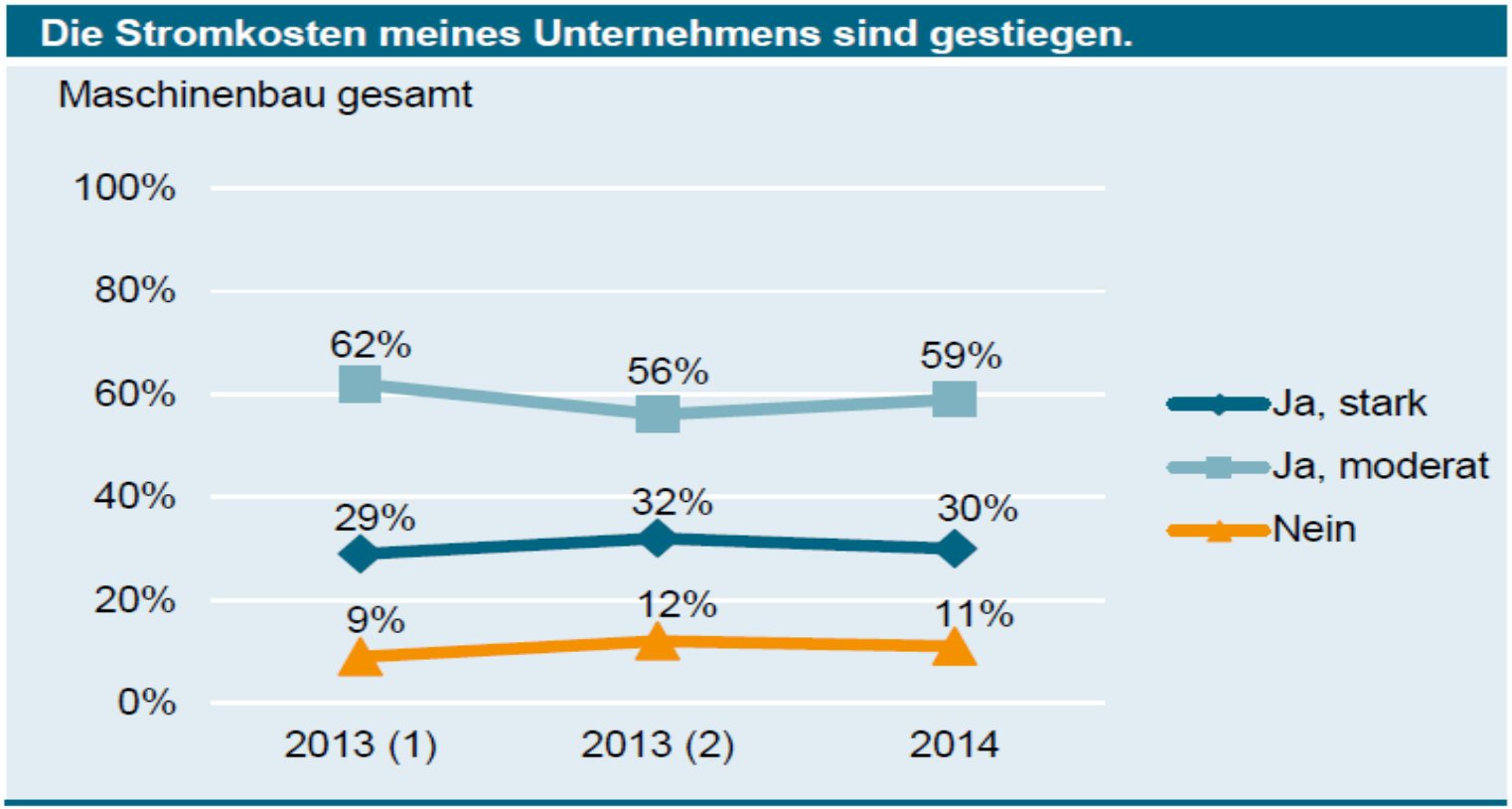


Abb. 7: Insgesamt 89 Prozent der befragten Unternehmen verzeichnen weiterhin gestiegene Stromkosten. Quelle: VDMA

RES-Costs

Recent opinion poll with menbers of largest German industry federation VDMA

➔ 2/3 recent think price increase was moderate or low

Recent opinion poll with people

92% think an increase expansion of RES „important“ or „extraordanary important“

55% think that EEG surcharge is „adequate“, 4% think it is „to low“ ***(source AEE)***

RES-Costs

EEG-surcharge 2014: 6,24 Ct/kWh, for 25% RES-E

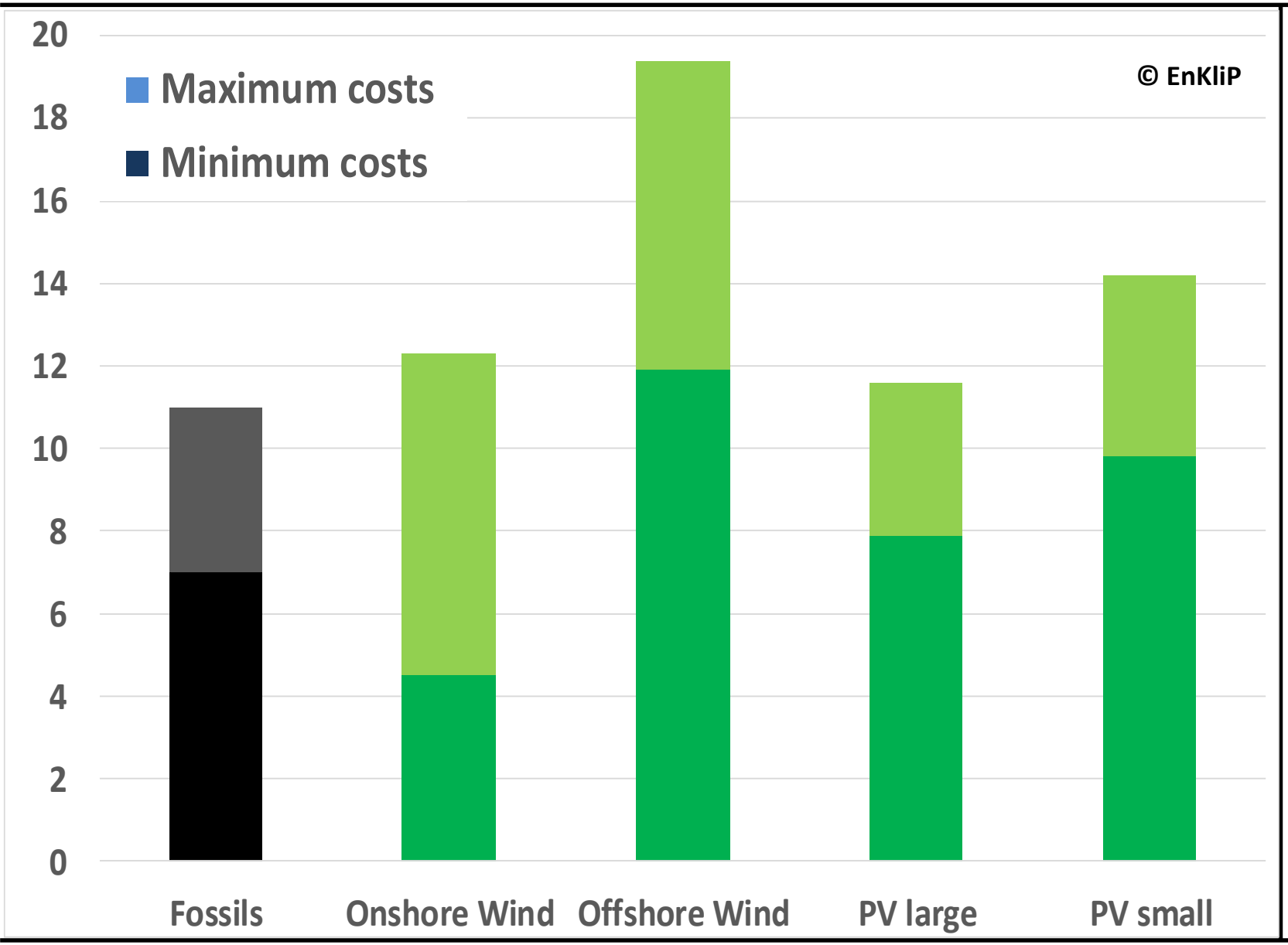
EEG-surcharge ≠ extra costs for RES-E extansion

EEG-surcharge compares

- **full costs of new RE-installations with**
- **operation costs of old, written down and subsidised conventional power plants**

➢ ***A fair calculation would compare the electricity generation costs of <u>new</u> conventional and renewable power plants***

Production costs for power generation with new power plants



Sources:

Prognos 2013

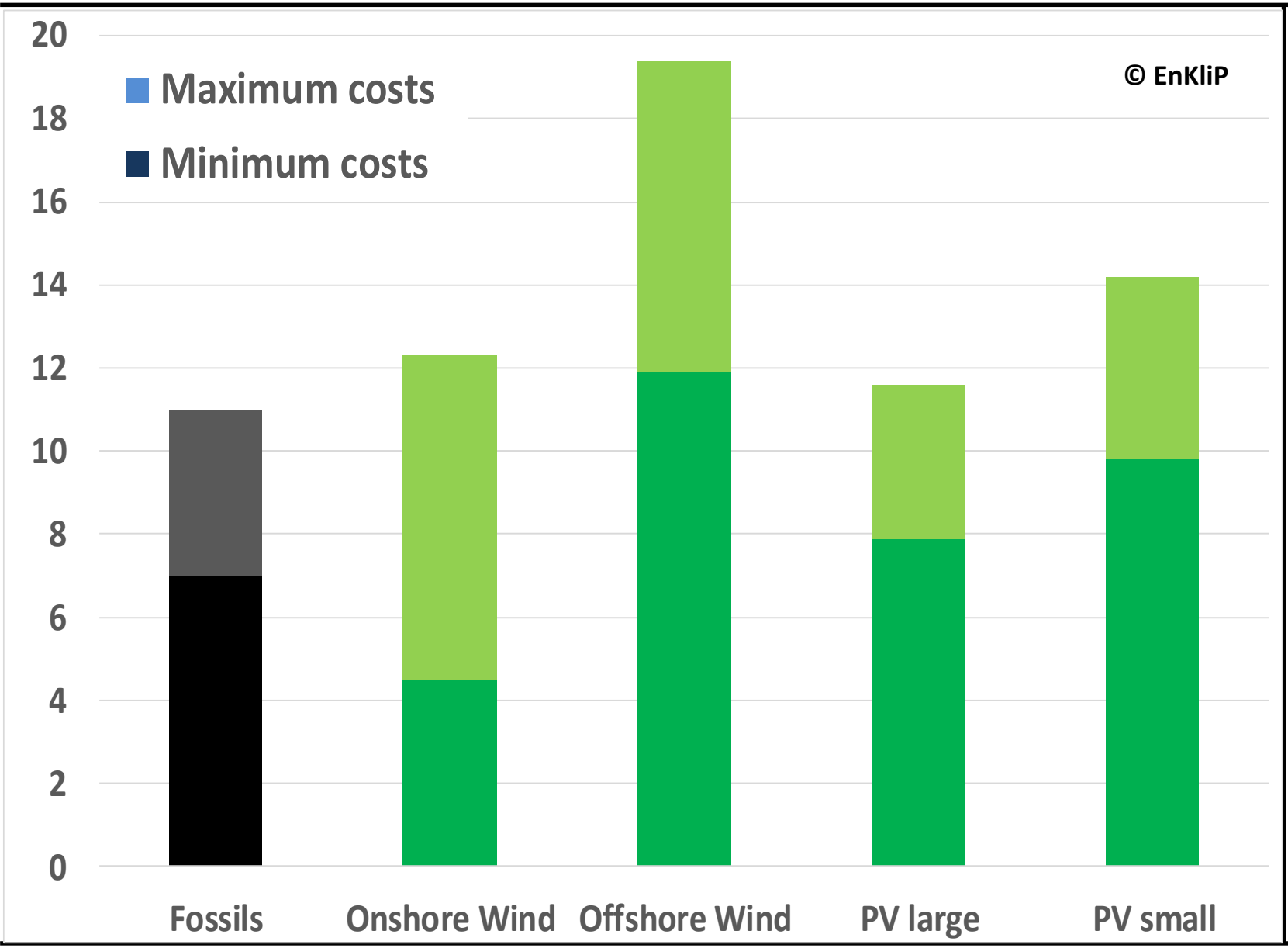
Agora 2013

DECC 2012

Fhg ISE 2013

FÖS 2012

Production costs for power generation with new power plants



External costs:

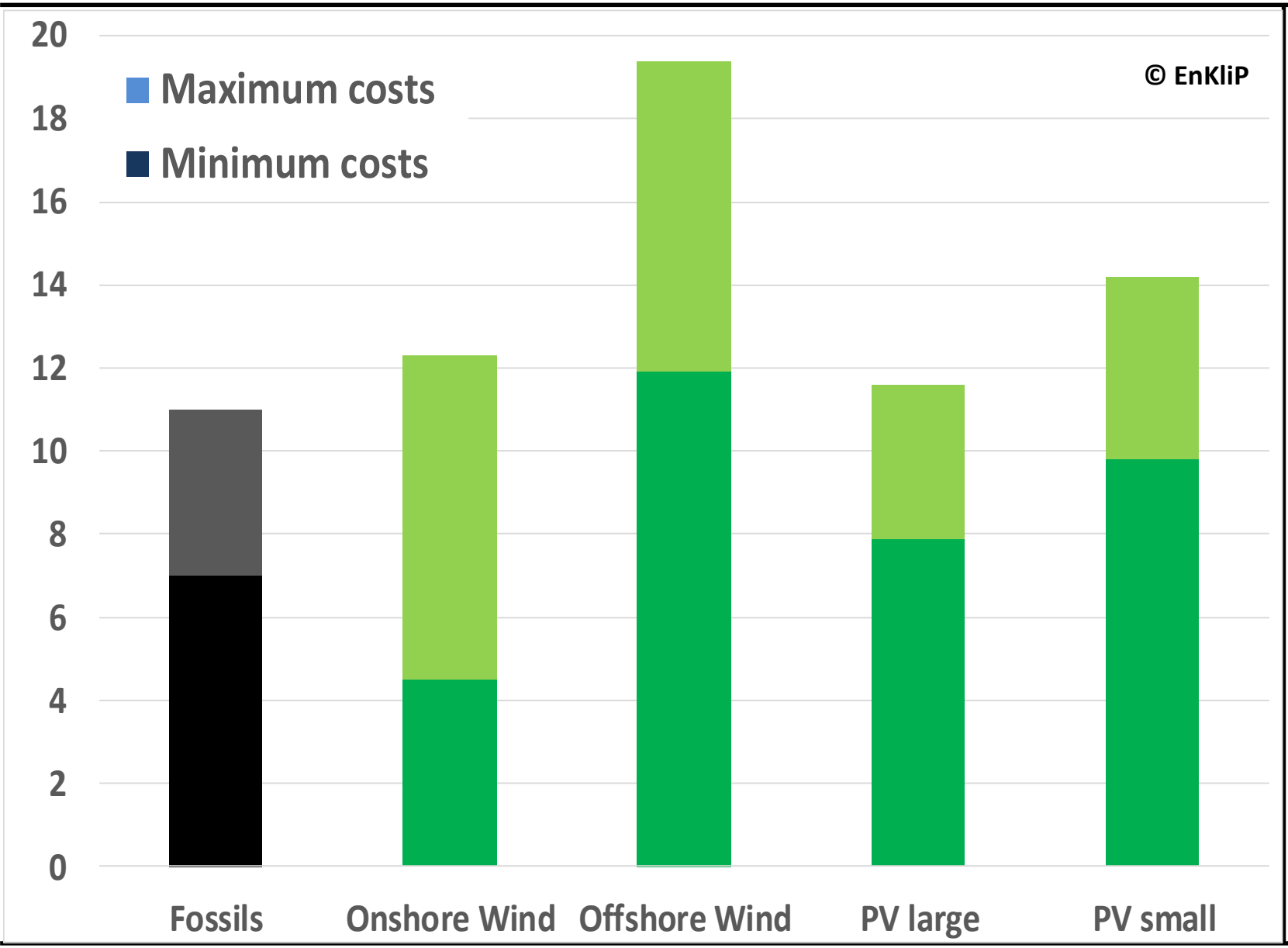
Brown coal:
9,2 Ct/kWh

Hard coal:
7,5 Ct/kWh

Gas:
3,8 Ct/kWh

Nuclear:
9-35 Ct/kWh

Production costs for power generation with new power plants



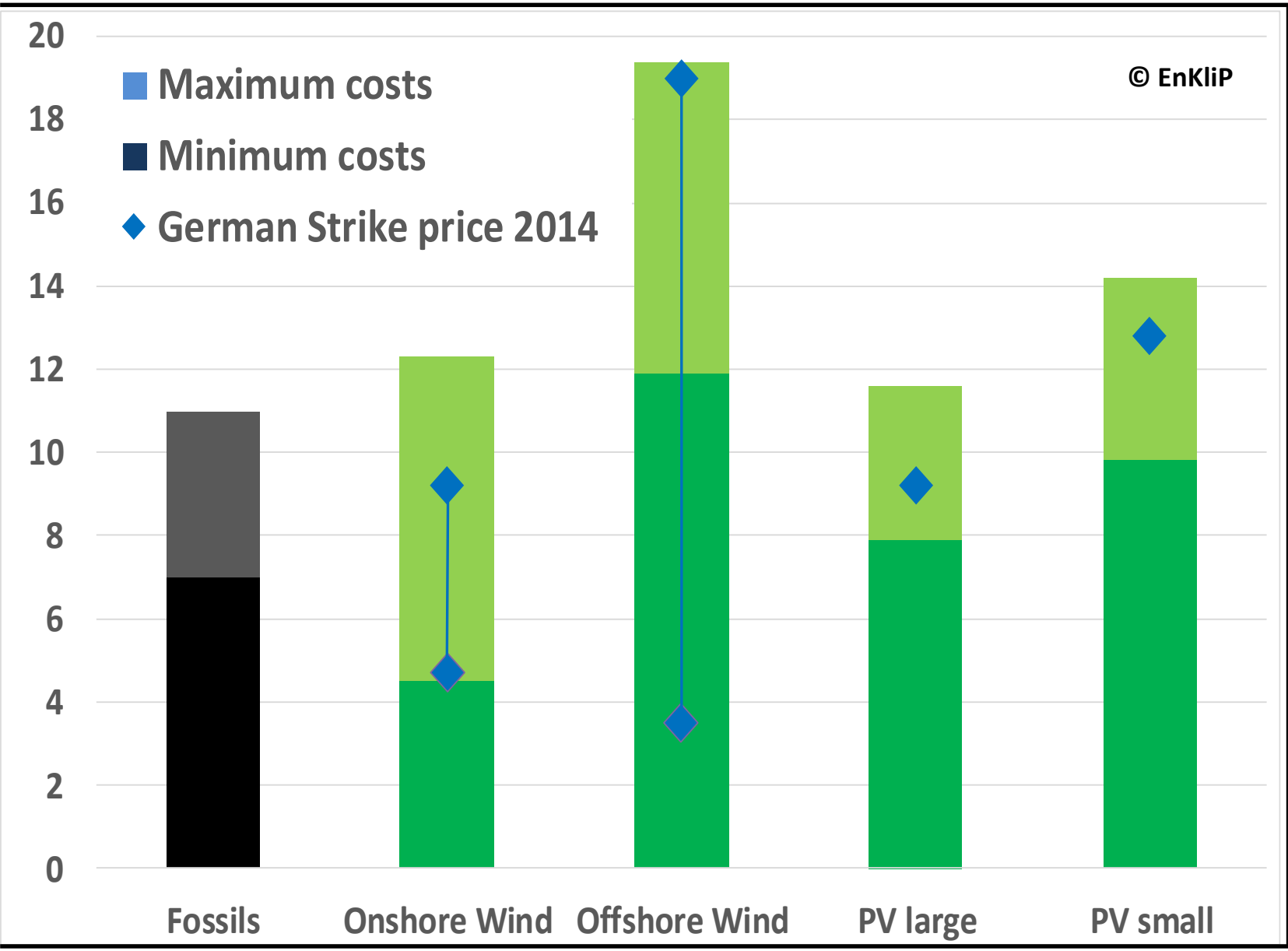
Trend:

RES-E ↘

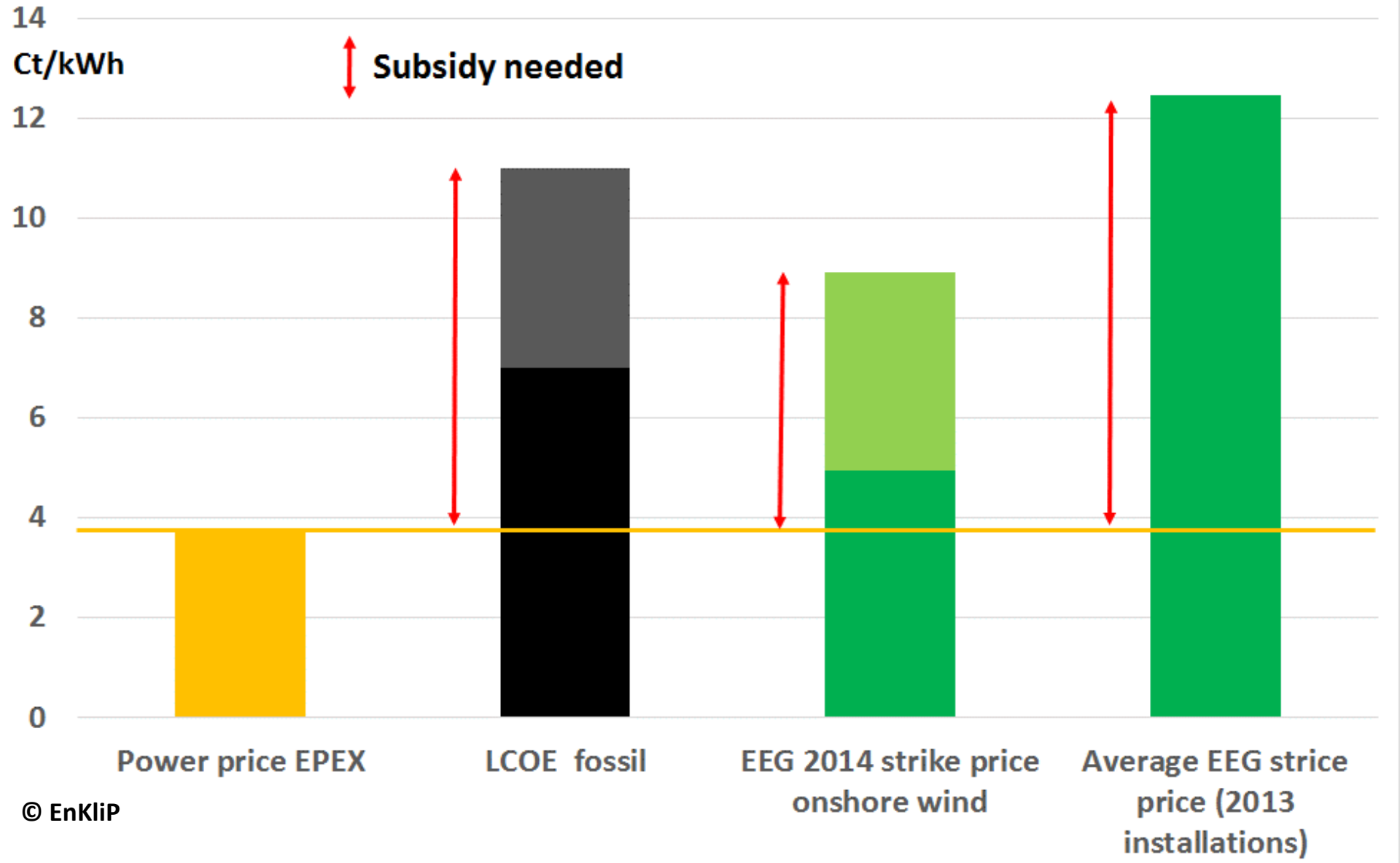
Fossil ↗

Nuclear ↗

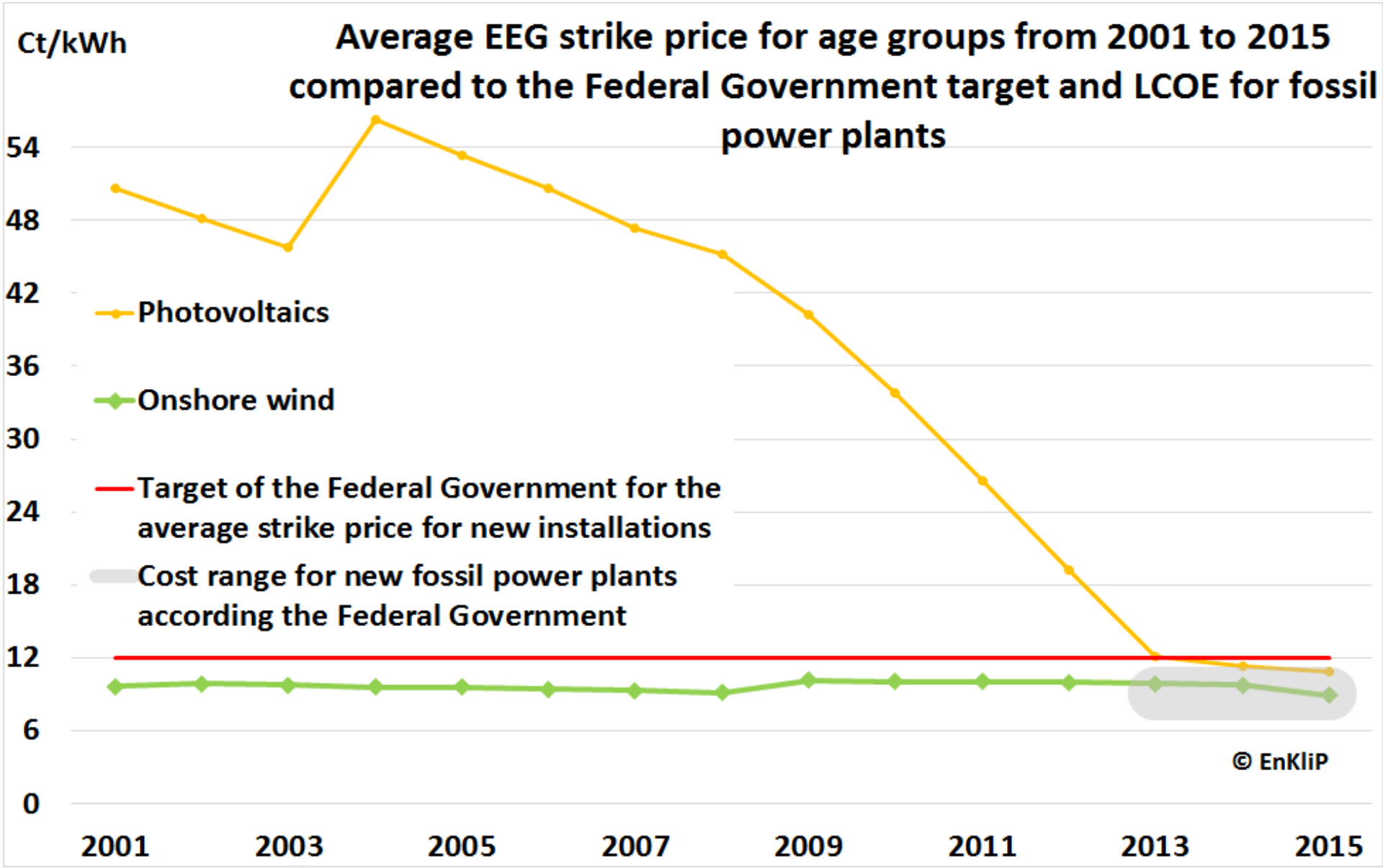
Production costs for power generation with new power plants



EEG surcharge: the wrong indicator

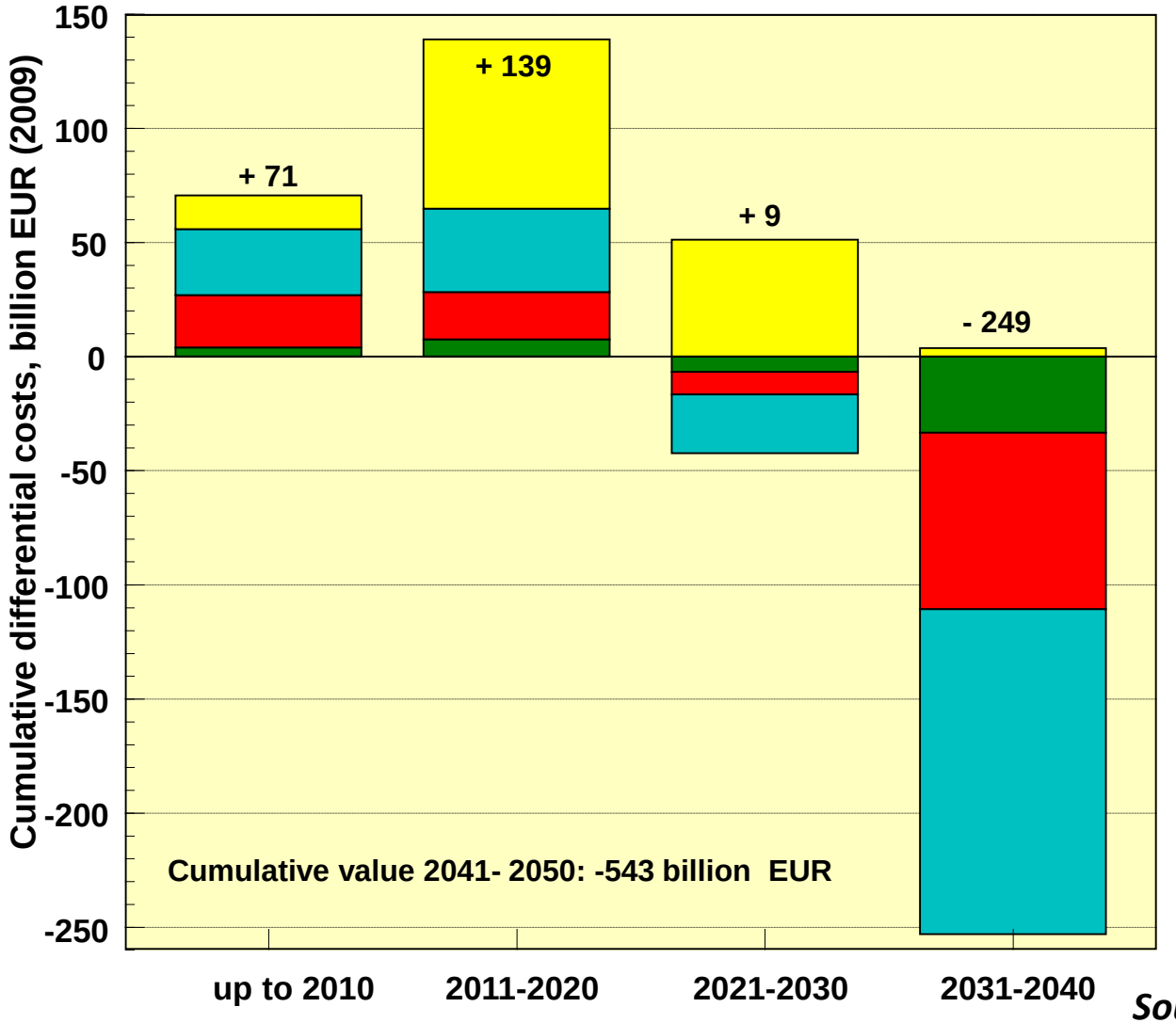


RES-E costs


Ct/kWh
Average EEG strike price for age groups from 2001 to 2015 compared to the Federal Government target and LCOE for fossil power plants
54
48
42
36
30
24
18
12
6
0
Photovoltaics
Onshore wind
Target of the Federal Government for the average strike price for new installations
Cost range for new fossil power plants according the Federal Government
© EnKliP
2001
2003
2005
2007
2009
2011
2013
2015

German Government study on RES-expansion: Cumulative differential costs

- Scenario 2011 A; all renewables; pricepath A -



Szen11/DIFKUMGES; 12.11.11

RES-share 2040

Total	50%
RES-E	75%
Heating	40%
Fuels	30%

GHG-reduction: 72%

Source: DLR et al. 2012

RES costs

Conclusions on the costs of renewables

- **Some RES-E are no more expensive than conventional energies, such as onshore wind and photovoltaics**
- **If external costs are internalised, most RES-E are cheaper than conventional energies**
- **RES extension is an investment in the future – also from the economical view**

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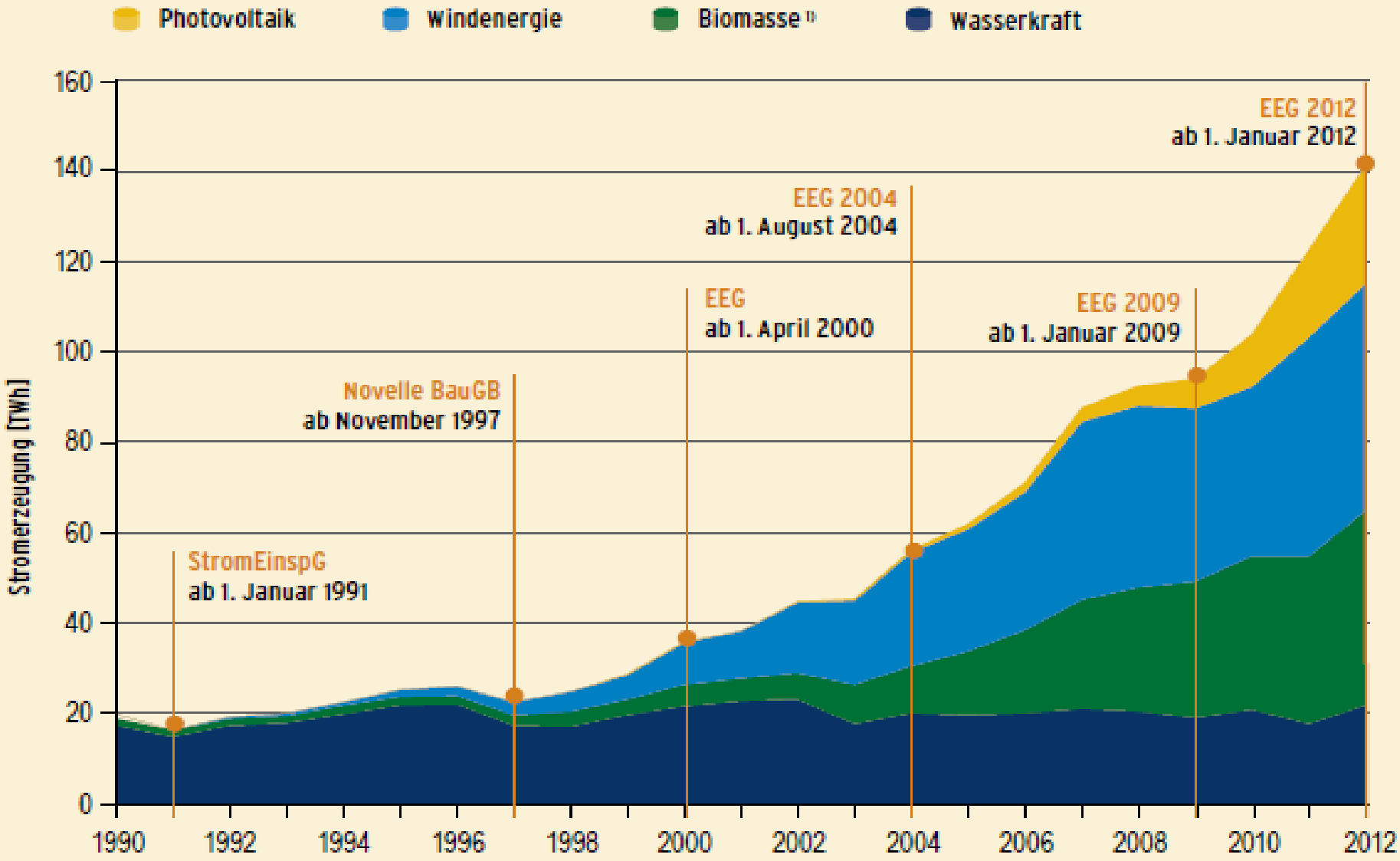
EEG 2014



Source: BMU 2013

The new German EEG

Discussion lead by

- **Misunderstandings**

EEG is reason for most shortcomings with the Energiewende

EEG-surcharge represents RES-E costs

More market makes it cheaper and better

The new EEG and new energy policy in Germany

Discussion lead by

- **Misunderstandings**
- **Market oriented thinking**

Direct marketing, also for Wind and PV, to stimulate them to feed in according the demand ?

Change to bidding system to lower costs ?

The new EEG and new energy policy in Germany

Discussion lead by

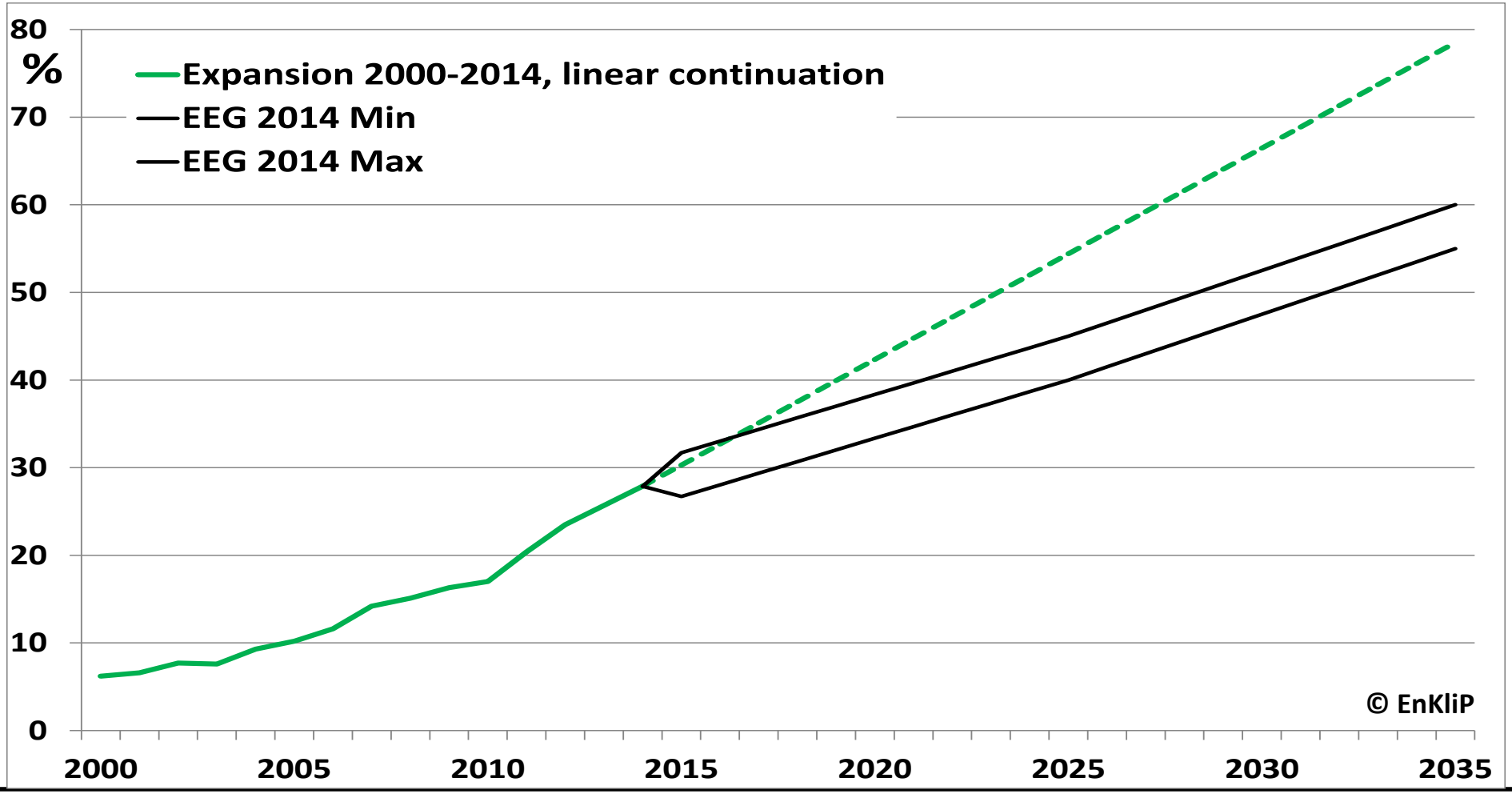
- **Misunderstandings**
- **Market oriented thinking**
- **Negative atmosphere against RES**
- **Unfavorable responsibilities**

Changes in the EEG

- Fixed strike price is abolished
  Obligatory direct marketing (basis premium tariff)
  (EEG 2012: mandatory direct marketing)
  ➔ For variable RES-E not resonable
  ➔ Leads to higher costs (0,4 Ct/kWh)
  ➔ Puts big players in a better position
- „Sun tax“ for own consumption of RES-E
  (mainly photovoltaic, 30 – 40 % of the EEG surcharge is to be payed)
- Reduction of feed-in-tariff for onshore wind

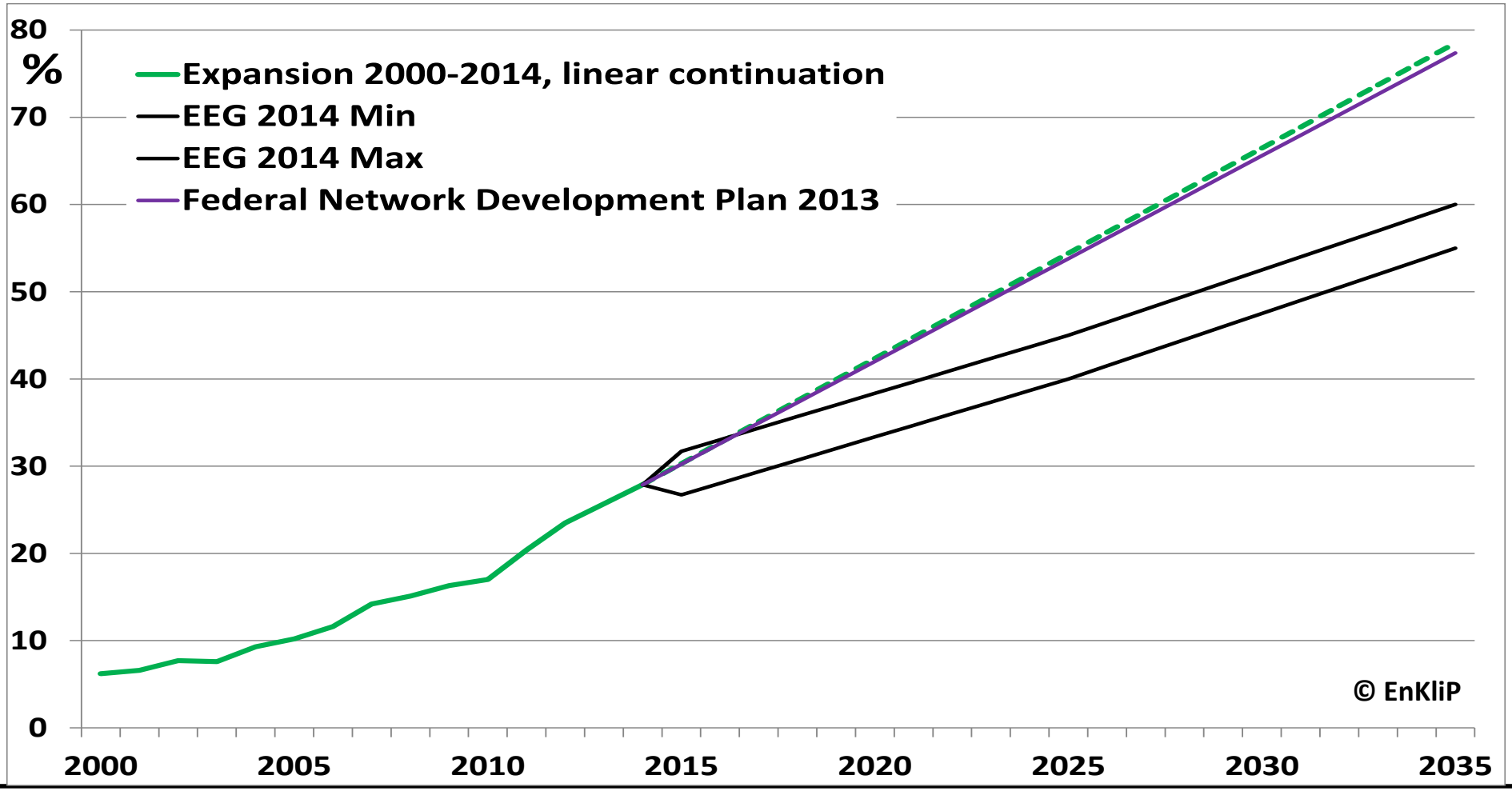
Fundamental changes in the EEG

➔ From minimum targets to a corridor for RES-E-Expansion



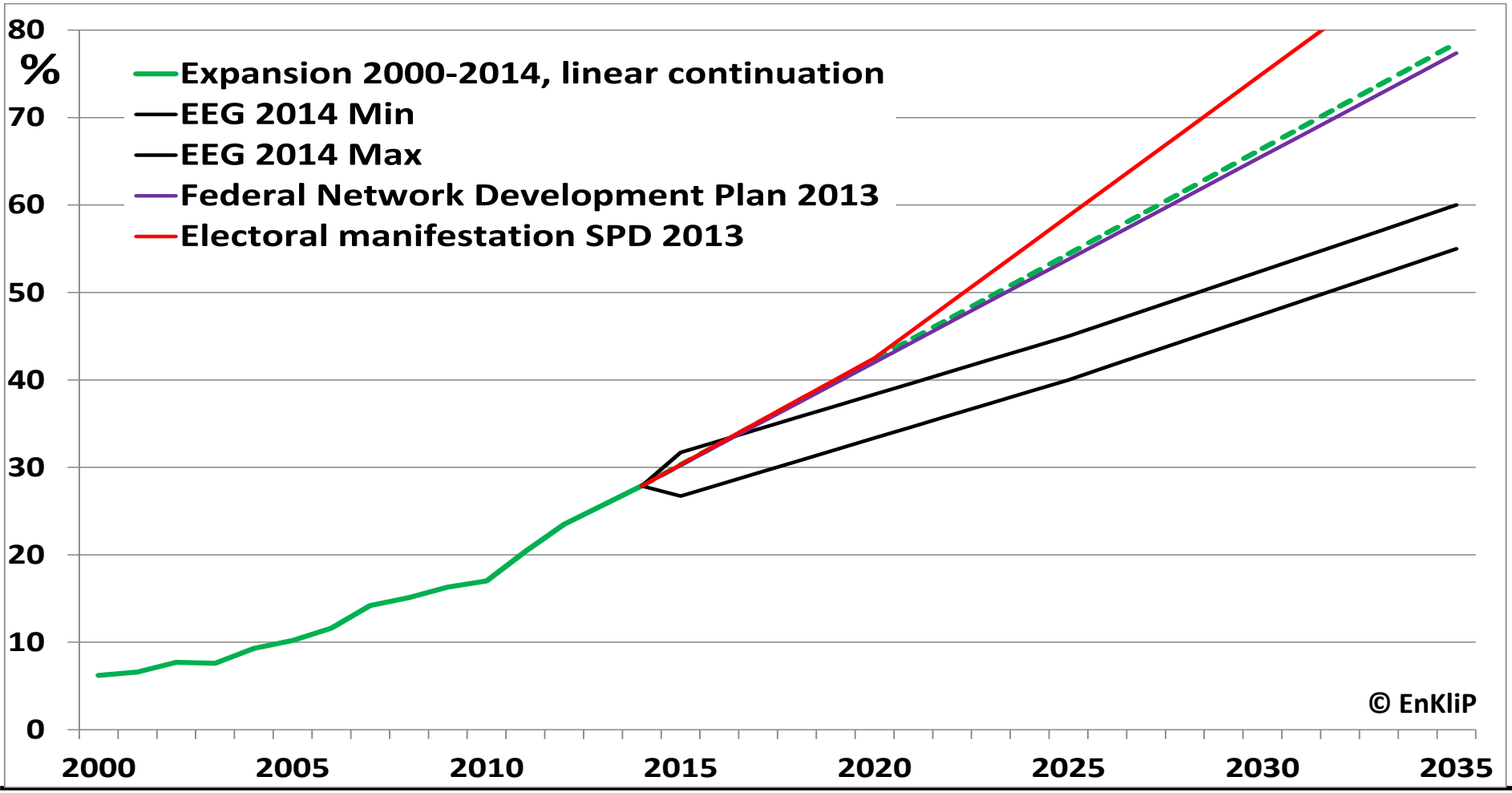
Fundamental changes in the EEG

➔ Corridor for RES-E-Expansion



Fundamental changes in the EEG

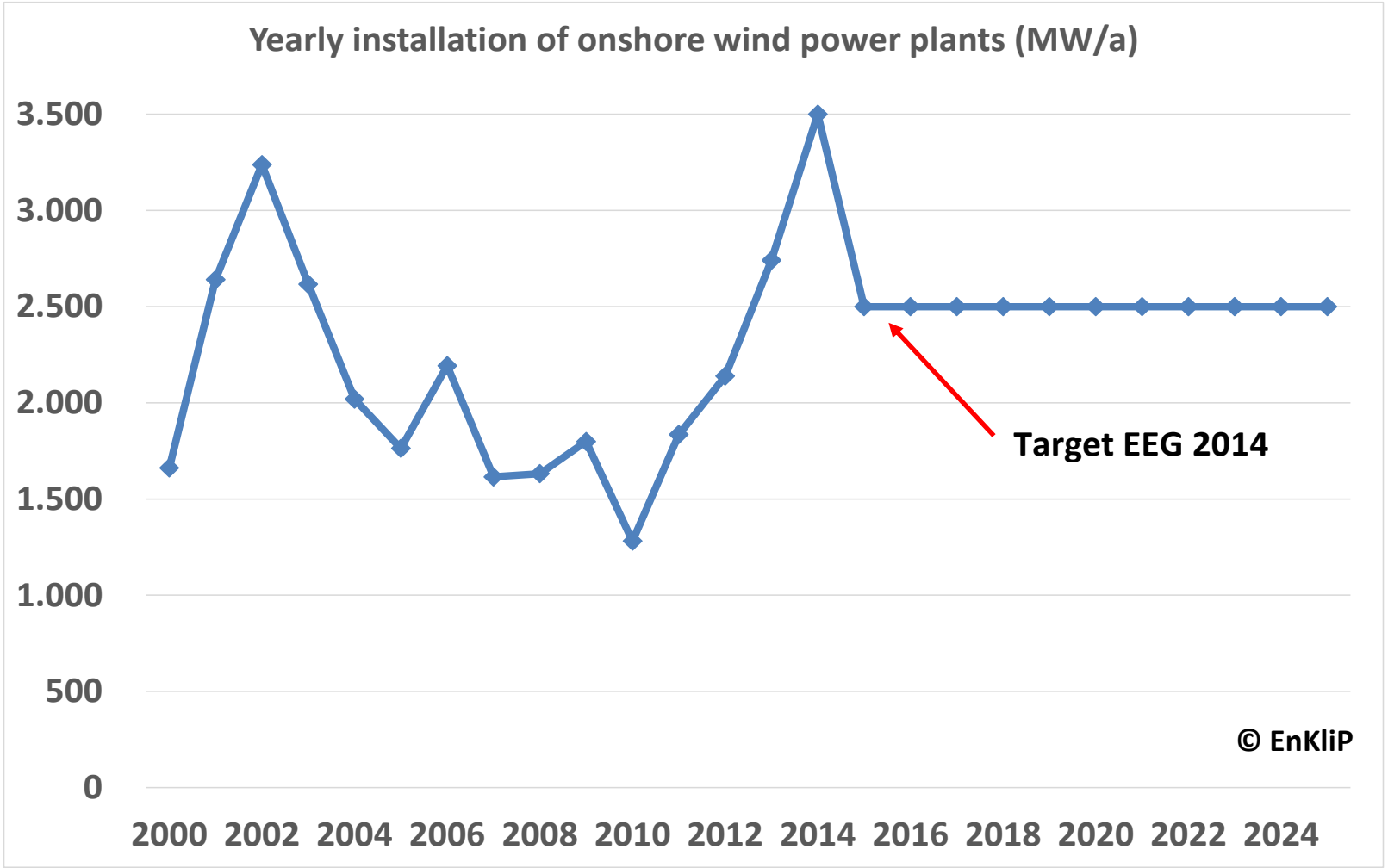
➔ Corridor for RES-E-Expansion



Fundamental changes in the EEG

➔ Corridor for RES-E-Expansion

- 2500 MW/a onshore wind and photovoltaics



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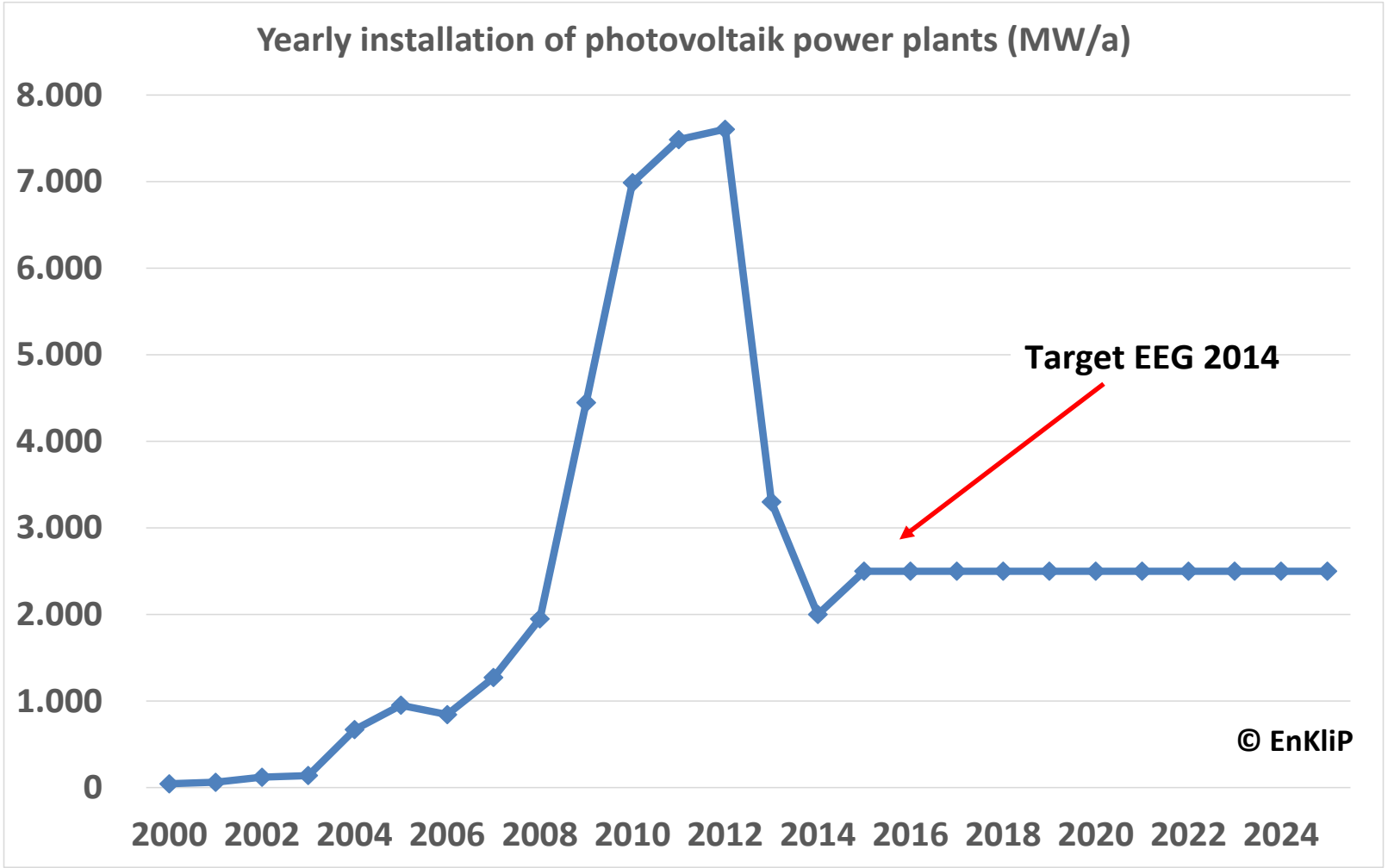
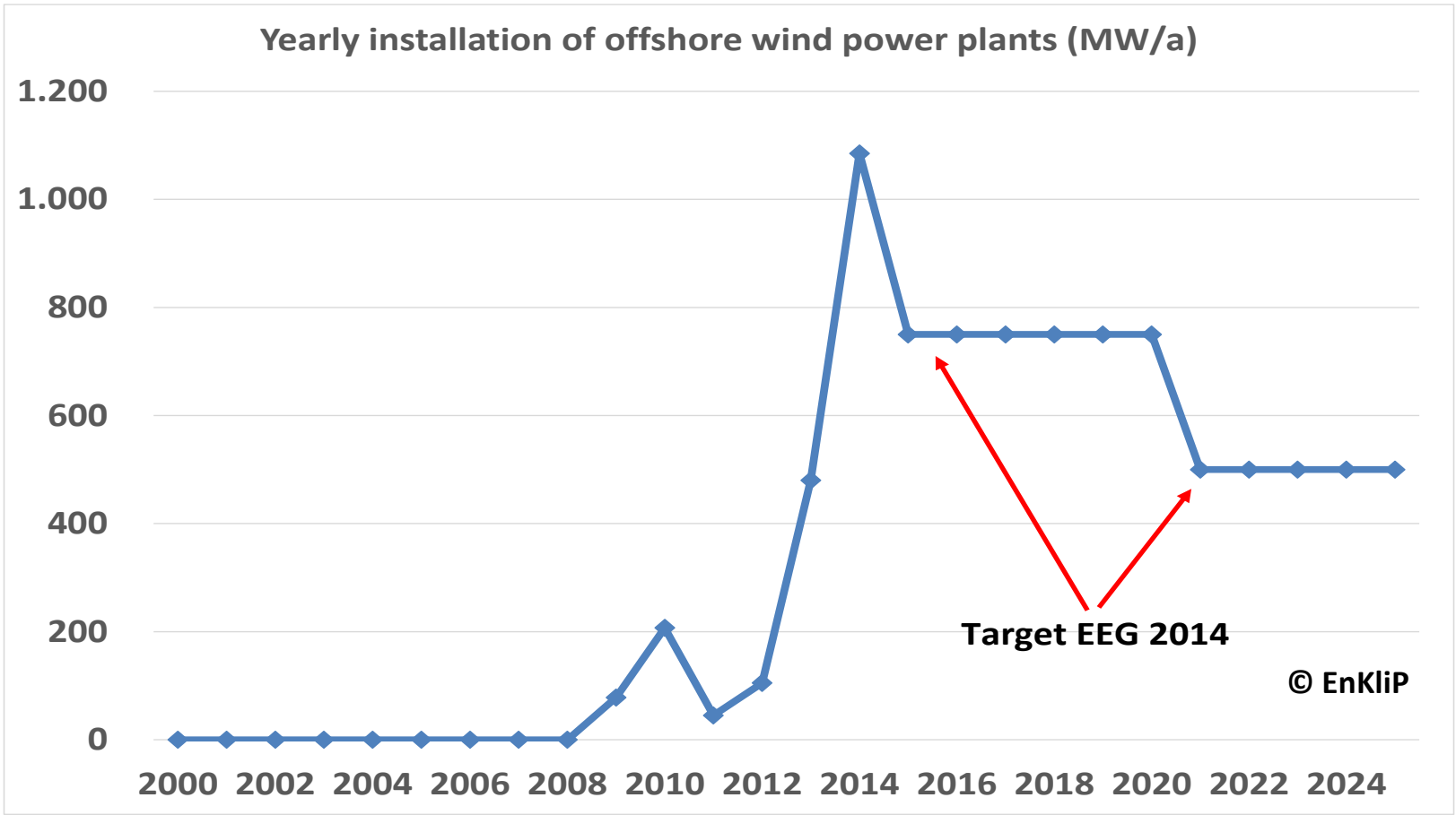


Fundamental changes in the EEG

➔ Corridor for RES-E-Expansion

- 2500 MW/a onshore wind and photovoltaics
- 750/500 MW/a offshore wind

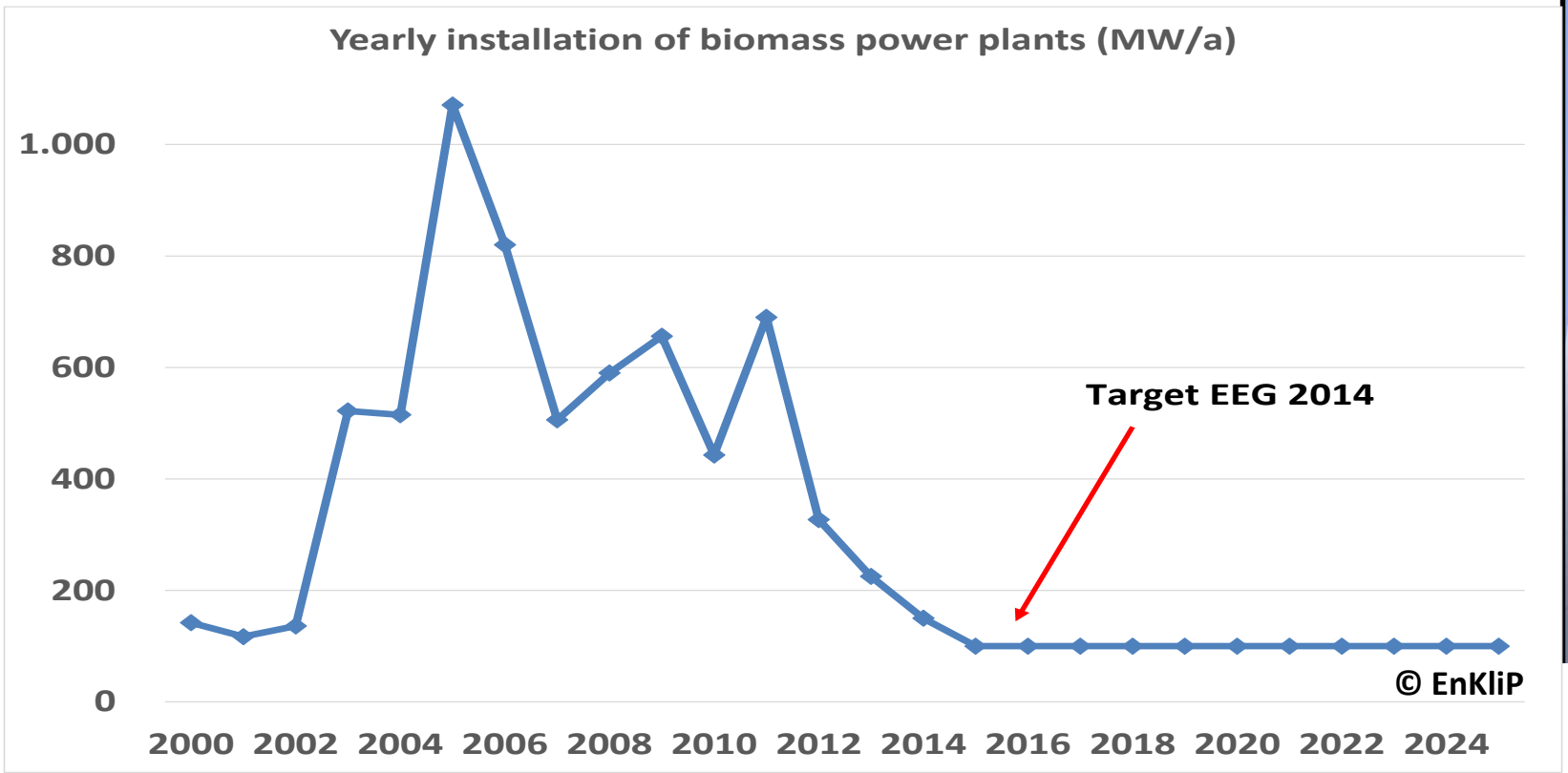


EEG 2014

Fundamental changes in the EEG

➔ Corridor for RES-E-Expansion

- 2500 MW/a onshore wind and photovoltaics
- 750/500 MW/a offshore wind
- 100 MW/a biomass



Fundamental changes in the EEG

➔ Corridor for RES-E-Expansion

- 2500 MW/a onshore wind and photovoltaics
- 750/500 MW/a offshore wind
- 100 MW/a biomass

➢ *Corridor will clearly reduce RES-E expansion*

➢ *Still strong increase, share of 80% in 2050 can be reached*

Change to bidding process

- scheduled for „latest 2017“
- pilot project for open space photovoltaics

➢ *International experience: few evidence for cost savings*

➢ *Disadvantage for small and medium companies*

➢ *Risk for the dynamic expansion*

VDMA opinion poll: Does the new EEG help?

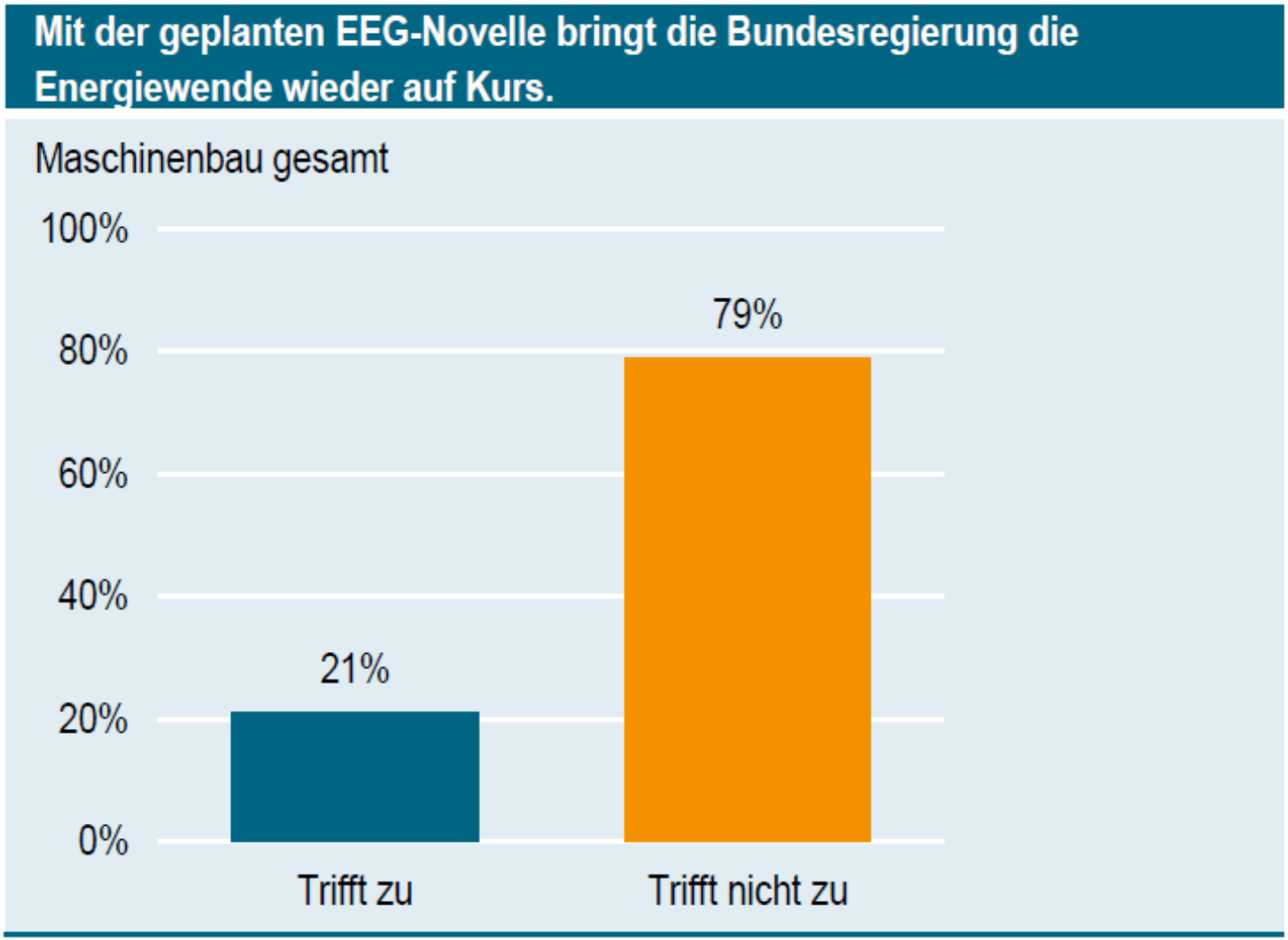
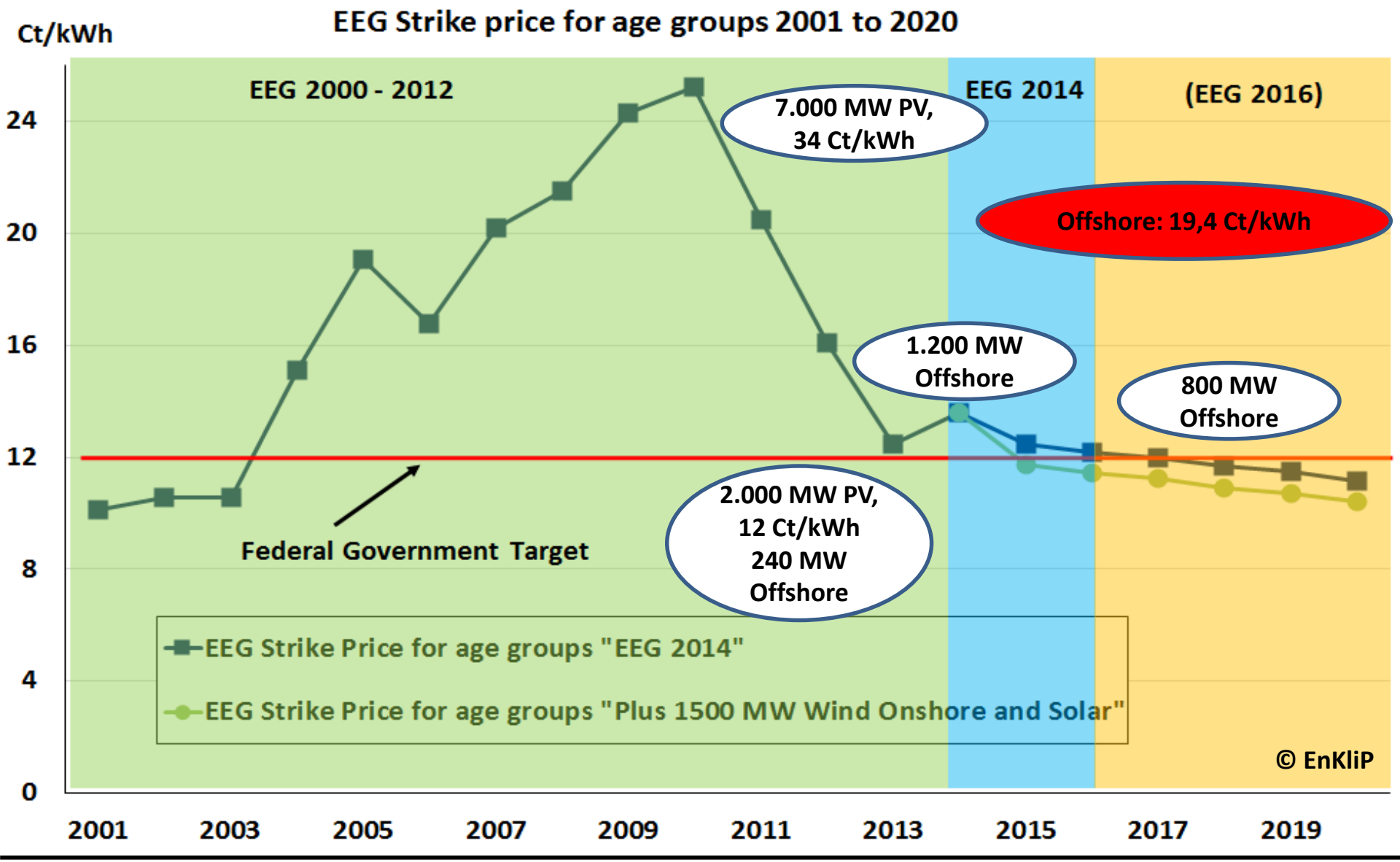


Abb. 2: Für fast 80 Prozent der Maschinenbauer ist klar: Die EEG-Reform alleine führt die Energiewende nicht zum Erfolg.

Quelle: VDMA

Cost effects of the EEG 2014: Average strike price of age group



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Balancing of fluctuating RES-E (1/3)

- **Beside variable RES (wind, solar), back up or „flexibilitiy“ capacity is needed**
- **Flexibilitiy capacity needs to produce electricity when wind and solar does not supply sufficient power**

➢ **The question is: how often do we need these flexibilitiy capacities?**

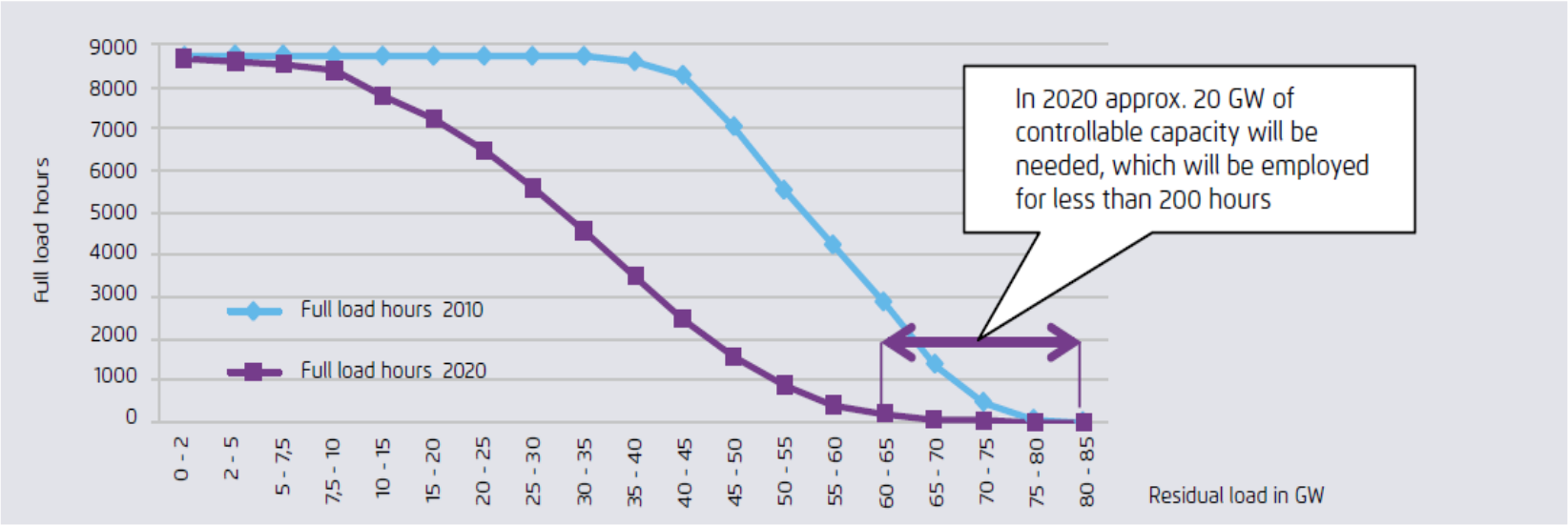

Figure 8: Demand for flexible and controllable back-up capacity to cover maximum peak load (Source: Agora Energiewende 2013).

Balancing of fluctuating RES-E (2/3)

What technologies are available?

- Grid expansion to use geographic compensation
- Grid expanison to use existing storage capacities (Scandinavia, Alpine region)
- Optimization of existing biomass power plants
- Demand side management
- Standby sets
- Storage capacities
- Gas turbines

Costs of gas turbines to cover the 20 GW flexibilitiy capacity needed until 2020:

0,15-0,3 Ct/kWh

Source: Agora Energiewende, EnKliP

Balancing of fluctuating RES-E (3/3)

Additionally, „excess RES-E“ can to be used

- In the heating sector
  - Heating pumps for district heating
  - Heating pumps in well isolated buildings
  - Hydrogen
  - „Wind-gas“
- In the transport sector
  - E-mobility for cars
  - Overhead lines on the Autobahn for trucks
  - Hydrogen for trains, ships, plaines
  - „Wind-gas“
- In the long run: hydrogen or „wind-gas“ to produce electricity if wind and sun is not sufficient

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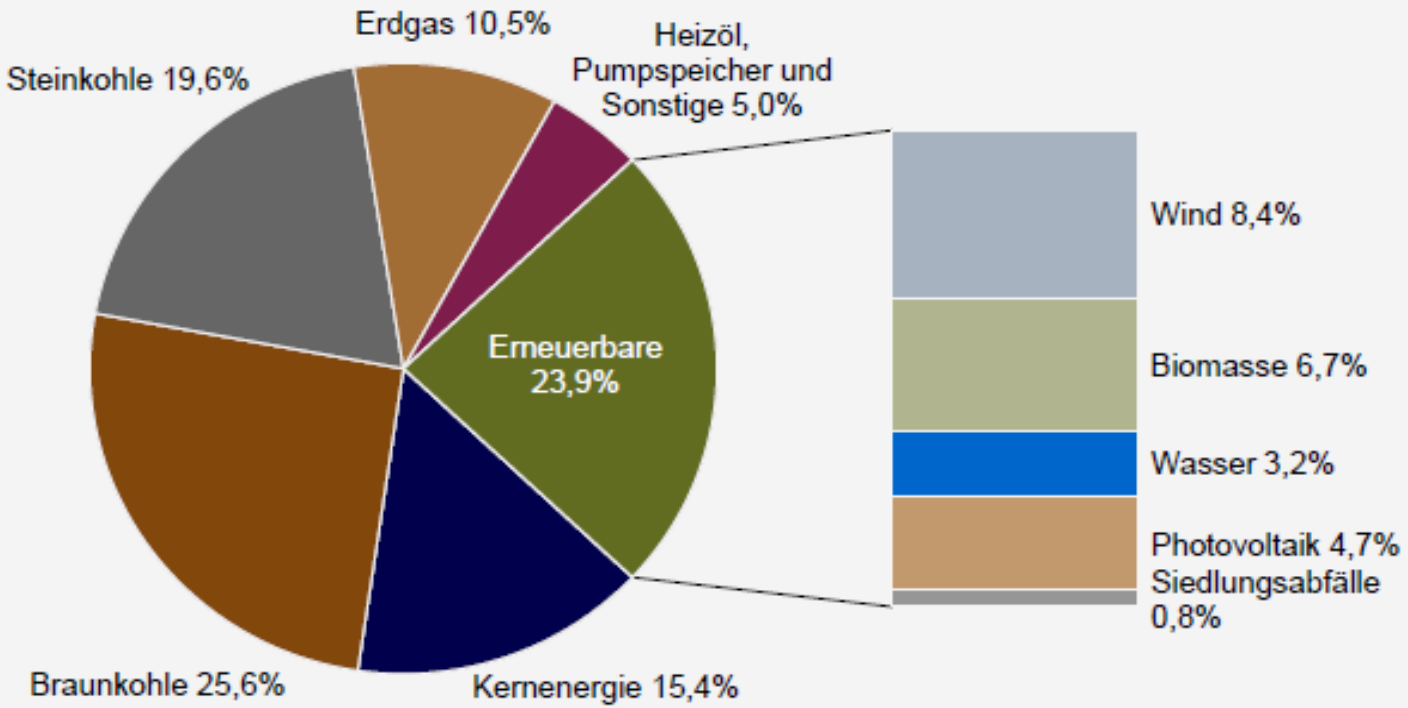
The Coal Debate in Germany (1/4)

Brutto-Stromerzeugung
nach Energieträgern 2013

bdew
Energie. Wasser. Leben.

Brutto-Stromerzeugung 2013 in Deutschland: 634 Mrd. Kilowattstunden*

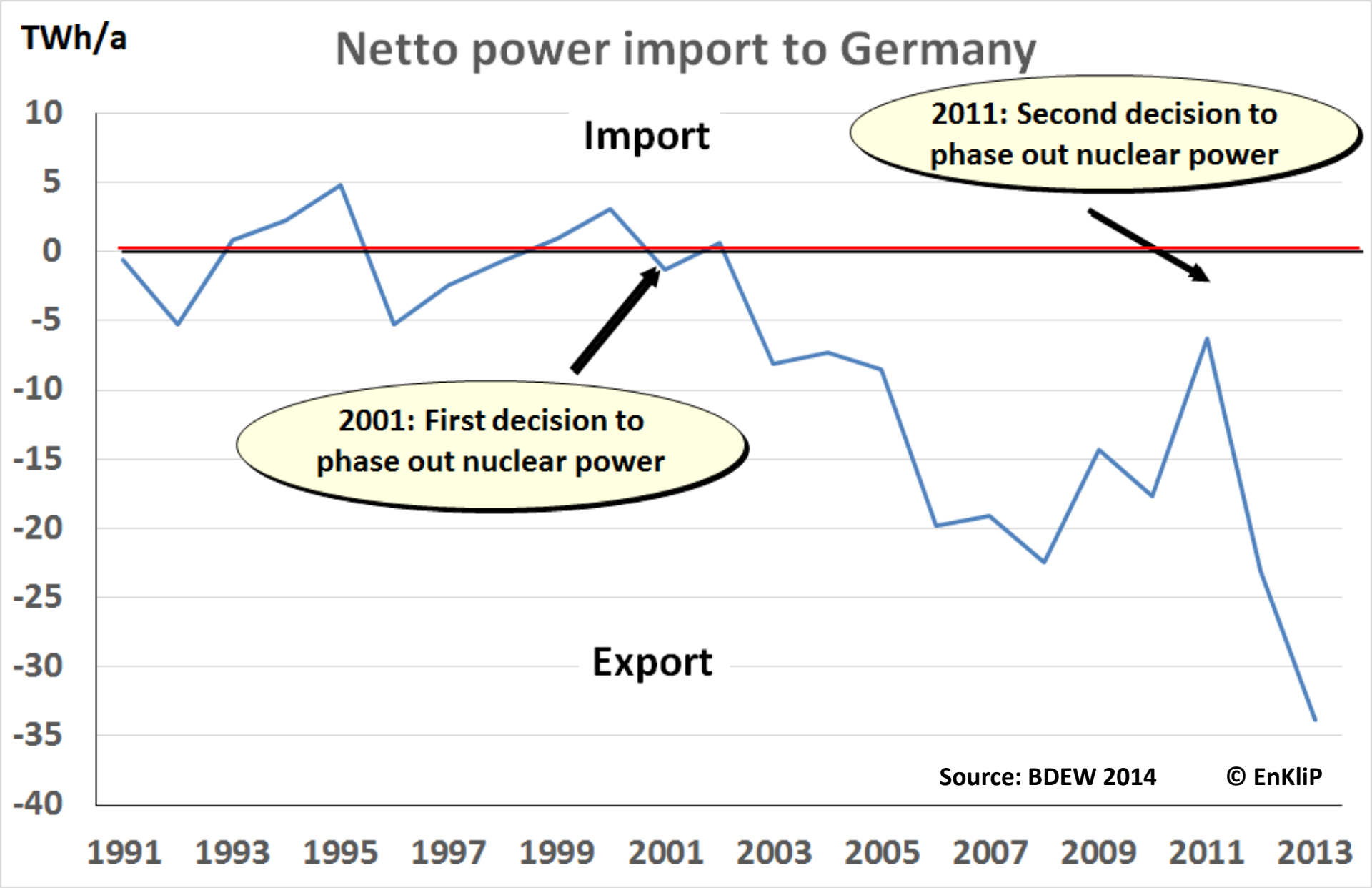


Quellen: BDEW, AG Energiebilanzen Stand: 02/2014

* vorläufig

BDEW Bundesverband der Energie- und Wasserwirtschaft e.V.

The Coal Debate in Germany (2/4)



The Coal Debate in Germany (2/4)

The „Energiewende-Paradoxon“

- Strongly increasing RES-share
- Increasing CO2-emissions

How can this be?

- Increasing power export (netto)
- Increasing grid-capacity to neighbor-countries
- High price for natural gas
- Low CO2-price (CO2-price of 40-60 €/t needed to ensure a shift from coal to gas)
- Phase-out of nuclear power

➔ This does not mean that the Energiewende is wrong or increasing RES-share would make no sense. But important things are missing in the Energiewende.

The Coal Debate in Germany (3/4)

Some political actors made phase out of coal-power-plants to a priority

- **Greenpeace, Friends of the Earth, Campact, other NGOs**
- **The Greens, Socialists (Die Linke)**
- **Ministry for the Environment (Climate Action Plan)**

German climate target:

- **Minus 40% GHG-emissions until 2020**
- **About 7 %-points are missing *(source: BMUB 2014)***
- **Phase out of some coal power plants needed**

Until some days ago it was unclear if the Federal Government would phase out some coal power plants (about 10 GW)

The Coal Debate in Germany (4/4)

Decision of the Ministry of Economy and Energy:

No political action concerning coal power plants

Minister for Energy Gabriel:

- **„It is an illusion, that Germany could simultaniously phase out nuclear and coal power.“**
- **Phase out of coal power plants would not protect the climate due to the CO2-cap of the EU emission traiding system.**

Conventional power companys and trade unions were too strong

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Energiewende and the neighbor countries

The effect of the German Energiewende to its neighbor countries

- Increased electricity transport form north to south via Poland, The Netherlands, Tzech Republik, etc.
- Reduced profits for power plants
- Reduced gross marked electricity price
- Reduced price of CO2-certificates
- Reduced costs for RES-technologies (makes climate protection cheaper, also for German neighbors)
- Reduced risk of a nuclear accident and its consequences
- Germany gains important experience in dismanteling nuclear power plants – can be hlepful for others
- No negative effects on support security visible

Thank you for your attention

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