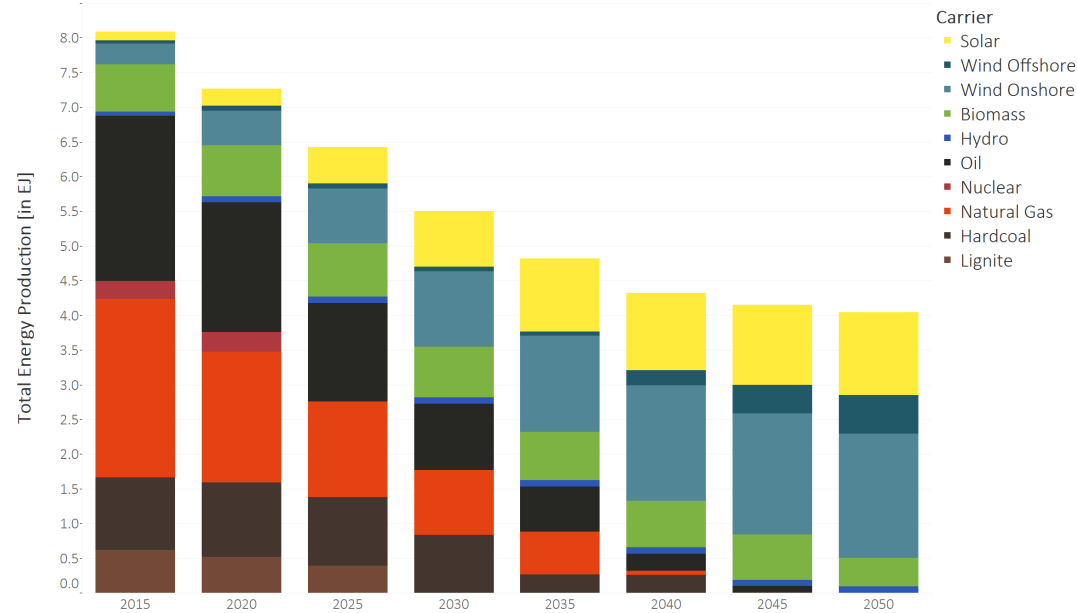


Energiewende “Made in Germany” - Low Carbon Transformation in the European Context



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Updated in the frame of the BMBF-Research project “Future of Fossil Fuels“ (FFF)

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1 Low-carbon energy transformation in Europe and in Germany



Energiewende – the structure

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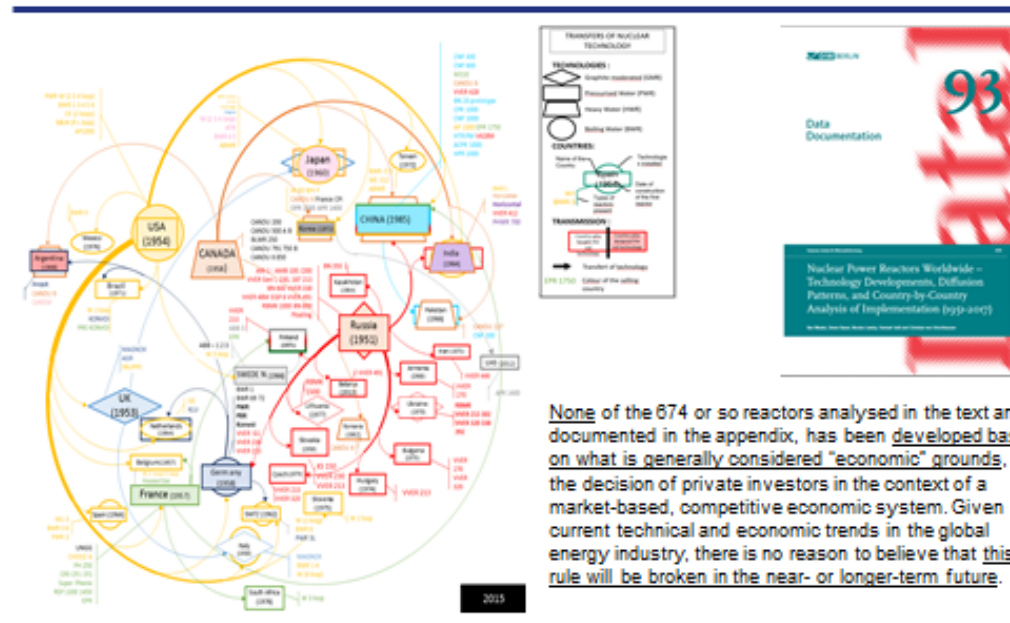


2 European-wide controversies on the energy mix

2.1 Nuclear power not part of a low-carbon energy mix

- ~ None of the 674 reactors has ever been constructed economically (Wealer et al. 2018)
- ~ Current economic perspectives hopeless (Davis 2012, 201)
- ~ Only “Nuclear paradox“ can explain the European Reference scenarios (EC 2016; Löffler et al. 2018)
- ~ Critical issues of decommissioning and long-term storage of nuclear waste unresolved (Wealer 2018)

Wealer et al. (2018): Nuclear Power Reactors Worldwide – Technology Developments, Diffusion Patterns, ...



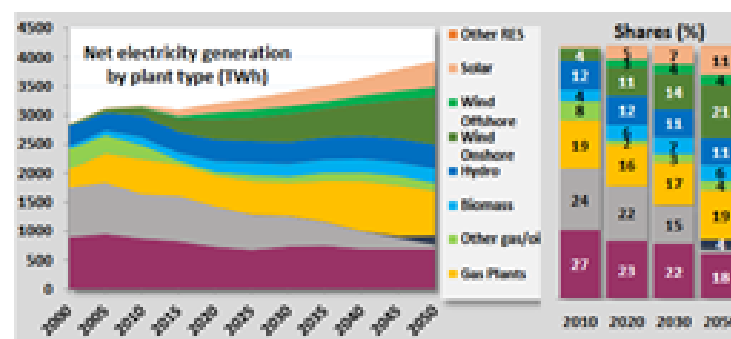
2.2 Illusive (Bio-)CCTS, or “negative emissions“

	Pre-2000 “clean coal“	2000-2010 “lost decade“ for CCTS	2010 - 2020 “lost decade“ for BE- CCTS	2020 - ... DACTS + geoengineering
CDS/R	~ fossil fuel industry, coal dominant ~ IEA program “Clean Coal“	~ failed attempts ~ illusion of CCTS maintained (Hirschhausen, Herold, and Oei 2012)	~ emergence of BE-CCTS in climate scenarios (Fuss et al. 2018) ~ but: if CCTS does not work, how can BECCTS?	
Energy system, renewables as alternatives	~ alternatives inexistent (e.g. low cost renewables)	~ emerging, but not @large scale	~ breakthrough of renewables, though facing political opposition	~ perhaps well-meaning coalition of climate modelers and engineers (Creutzig et al. 2019)

2.3 100% (or almost) renewables

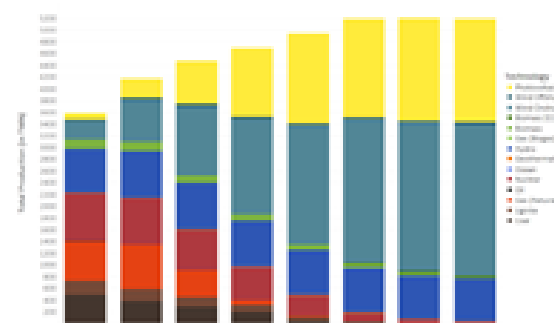
Comparison With the EU Reference Scenario 2016

EU Reference Scenario



Source: European Commission (2016)

GENESYS-MOD v2.0



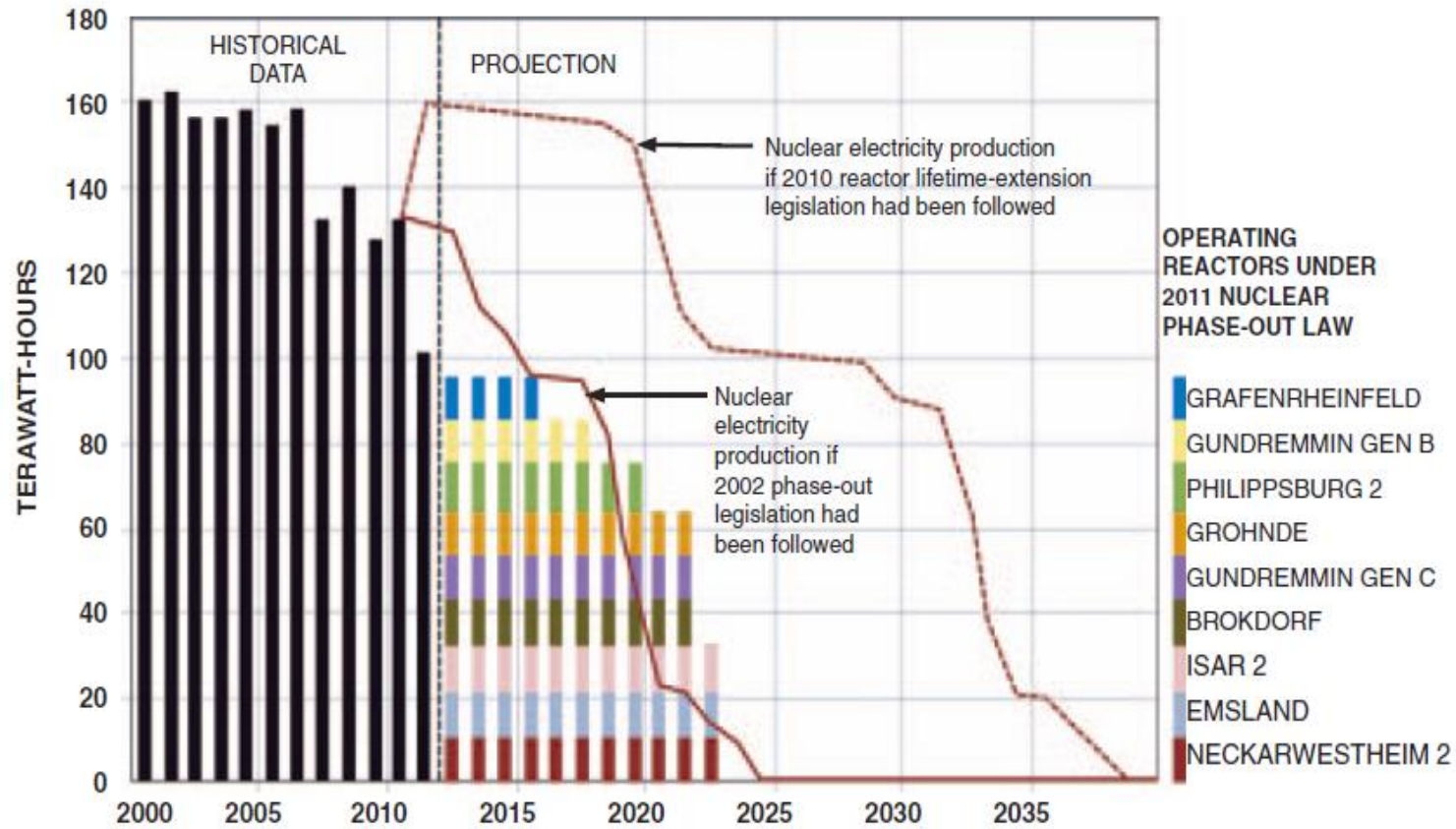
- Much higher shares of solar PV and Onshore Wind.
- Biomass, due to its limited potential, faces only small utilization in the power sector.
- Phase-out of coal and natural gas.
- No lifetime extension or capacity addition of nuclear power plants.
- Higher electricity demand due to sector coupling.

3 Energiewende “Made in Germany“

3.1 Glass half full

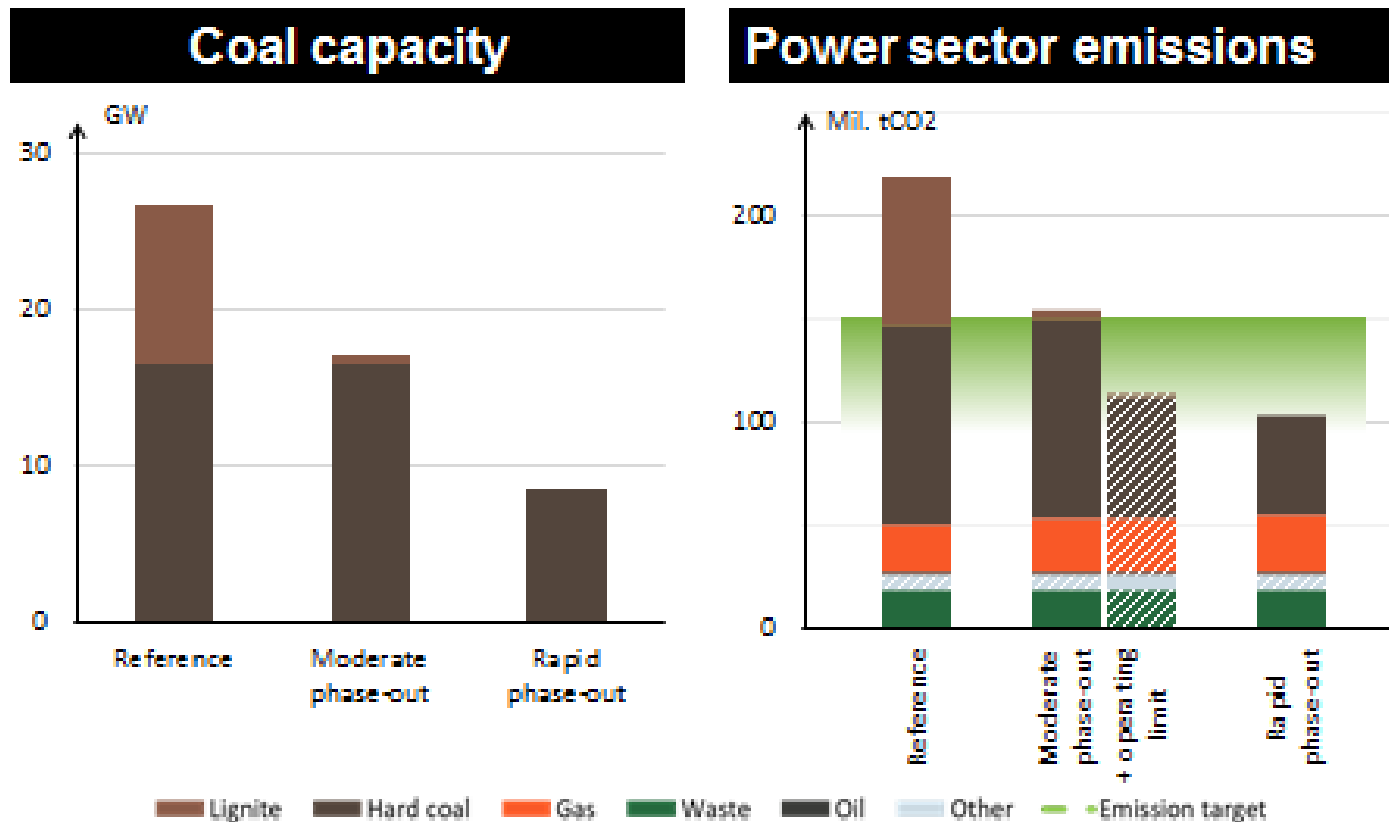
	Reduction of nuclear energy	Share of Renewable Energy		Reduction GHG-Emissions	Reduction of Energy Demand			
		Gross final energy	Electricity Production		Primary Energy	Domestic Heat	Final Energy Transport	Electricity Demand
2015	-47%							
2017	-56%							
2019	-60%							
2020		18%	35%	-40%	-20%	-20%	-10%	-10%
2021	-80%		40-45%					
2022	-100%							
2025								
2030		30%	50%	-55%				
2035			55-60%					
2040		45%	65%	-70%				
2050		60%	80%	-80% to 95%	-50%	-80%	-40%	-25%
Base	2010	-	-	1990	2008	2008	2005	2008

3.2 Disconnecting nuclear power plants (Matthes (2012))

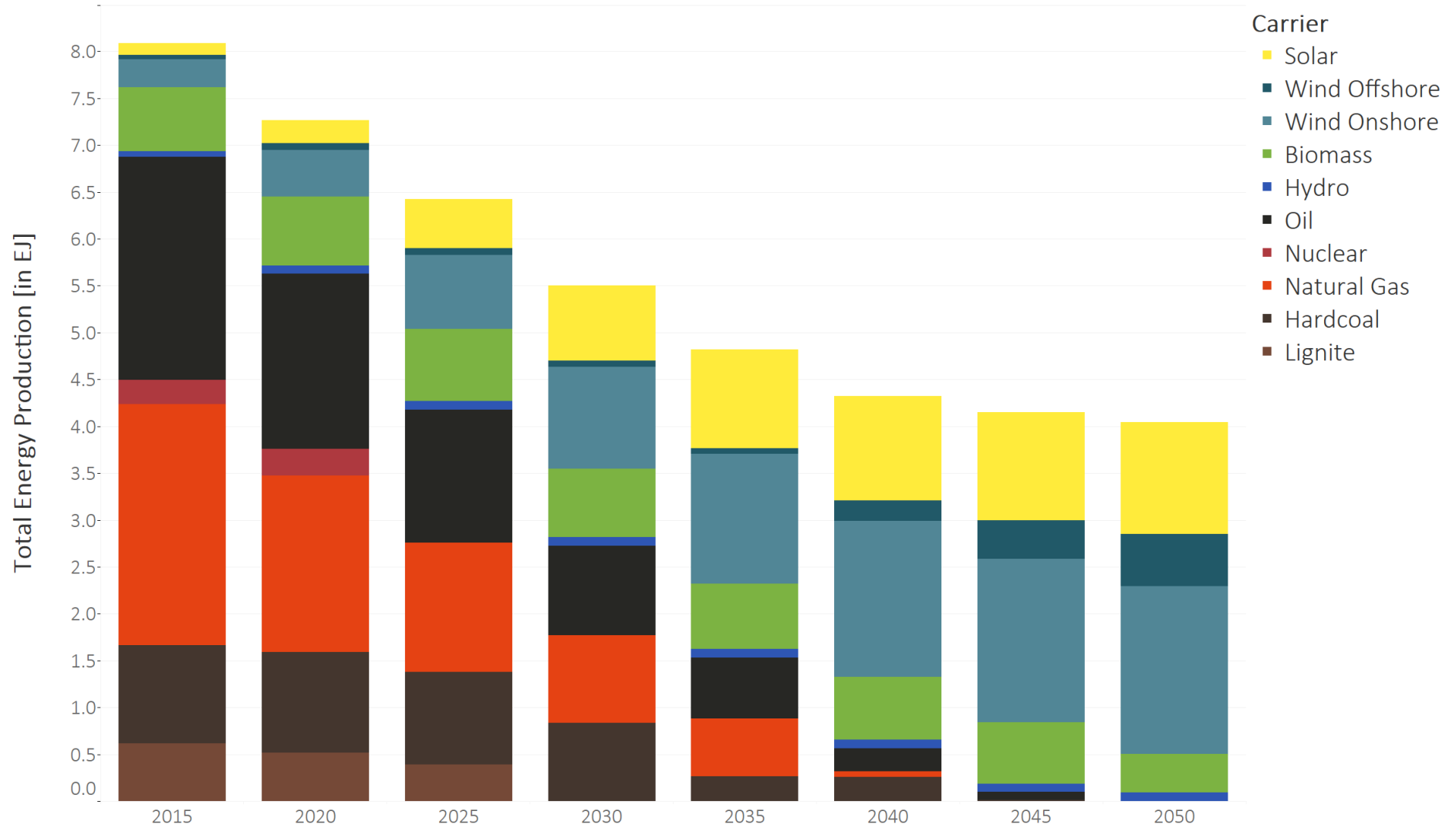


3.3 Coal phase out

Emissions for phase-out scenarios in 2030



3.4 Natural phase-out in Germany (Eidens et al. 2019)



4 The need for coordination

...

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