

Climate Protection Scenario 2050 for Germany

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Background

- Title of the study: *Klimaschutzszenario 2050 – 2. Endbericht*
(2050 Climate Protection Scenario for Germany – 2nd final report)
- Consortium: Öko-Institut (lead) and Fraunhofer Institute for Systems and Innovation Research ISI
- Commissioned by: Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
- Publication year: 2015 (German full report)
2016 (English summary)

Scenarios

- **EMS (2012) – Existing measures scenario (2012):**
Reference scenario including policies adopted until October 2012
- **CS 80 – Climate protection scenario 80:**
Show technical feasibility of reaching Germany's energy and climate targets
- **CS 95 – Climate protection scenario 95:**
High ambitious scenario: 95% GHG emissions reduction by 2050

Important guardrails:

- Similar industry production levels as today
- Limited biomass potential (mainly domestic biomass).

Targets of the Energiekonzept (2010)

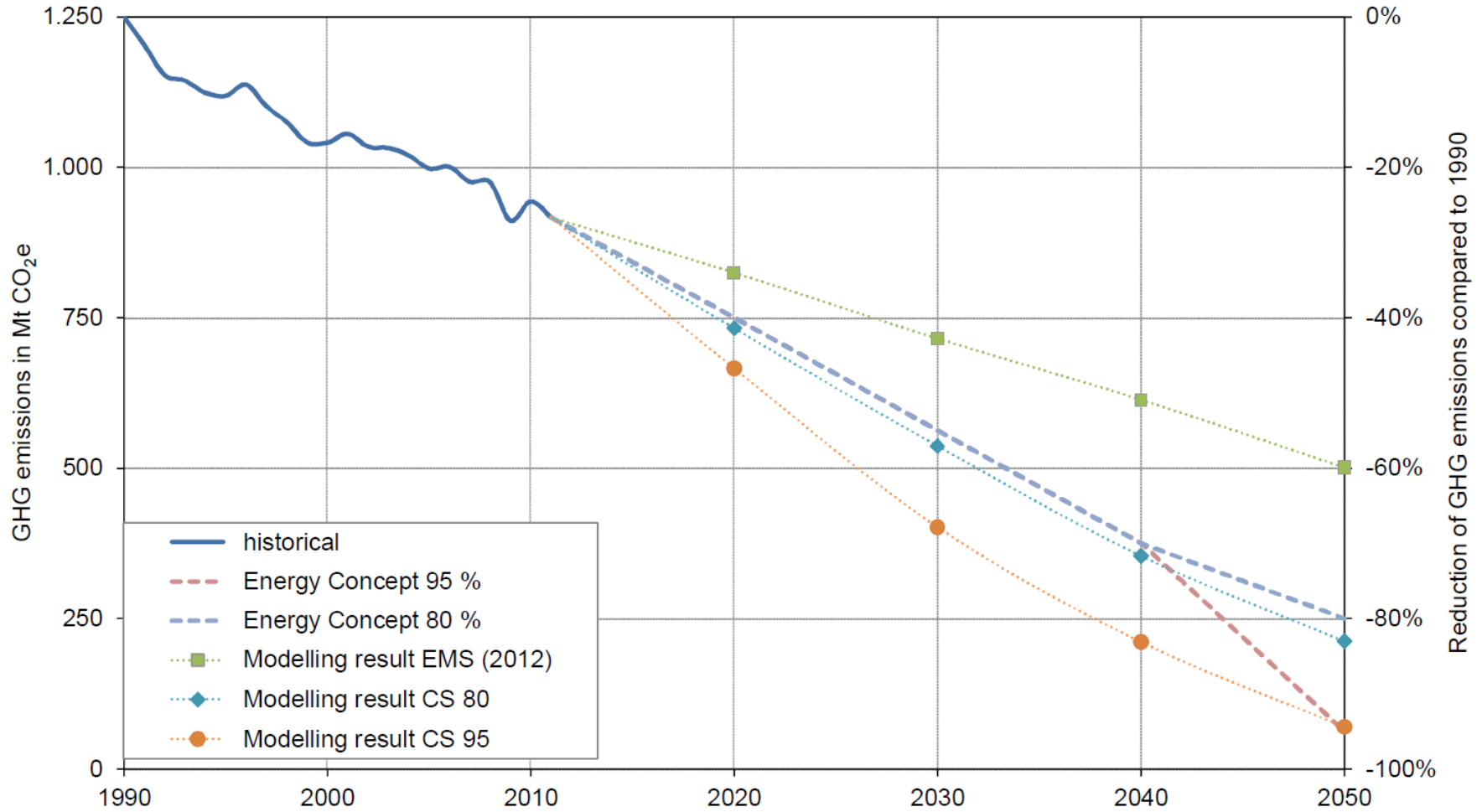
	Reduction of GHG emissions	Renewable shares		Reduction of energy consumption				Increase in energy productivity
		Gross final energy	Gross electricity consumption	Primary energy	Heat for buildings ^a	Final energy for transport	Gross electricity consumption	
2020	min. -40%	18%	35%	-20%	-20%	-10%	-10%	2.1% p.a.
2025			40% to 45%					
2030	min. -55%	30%	50%					
2035			55% to 60%					
2040	min. -70%	45%	65%					
2045								
2050	-80% to -95%	60%	80%	-50%	-80%	-40%	-25%	
Basis	1990			2008	2008	2005	2008	2008

^a Reduction in final energy demand in 2020, reduction of non-renewable primary energy demand in 2050

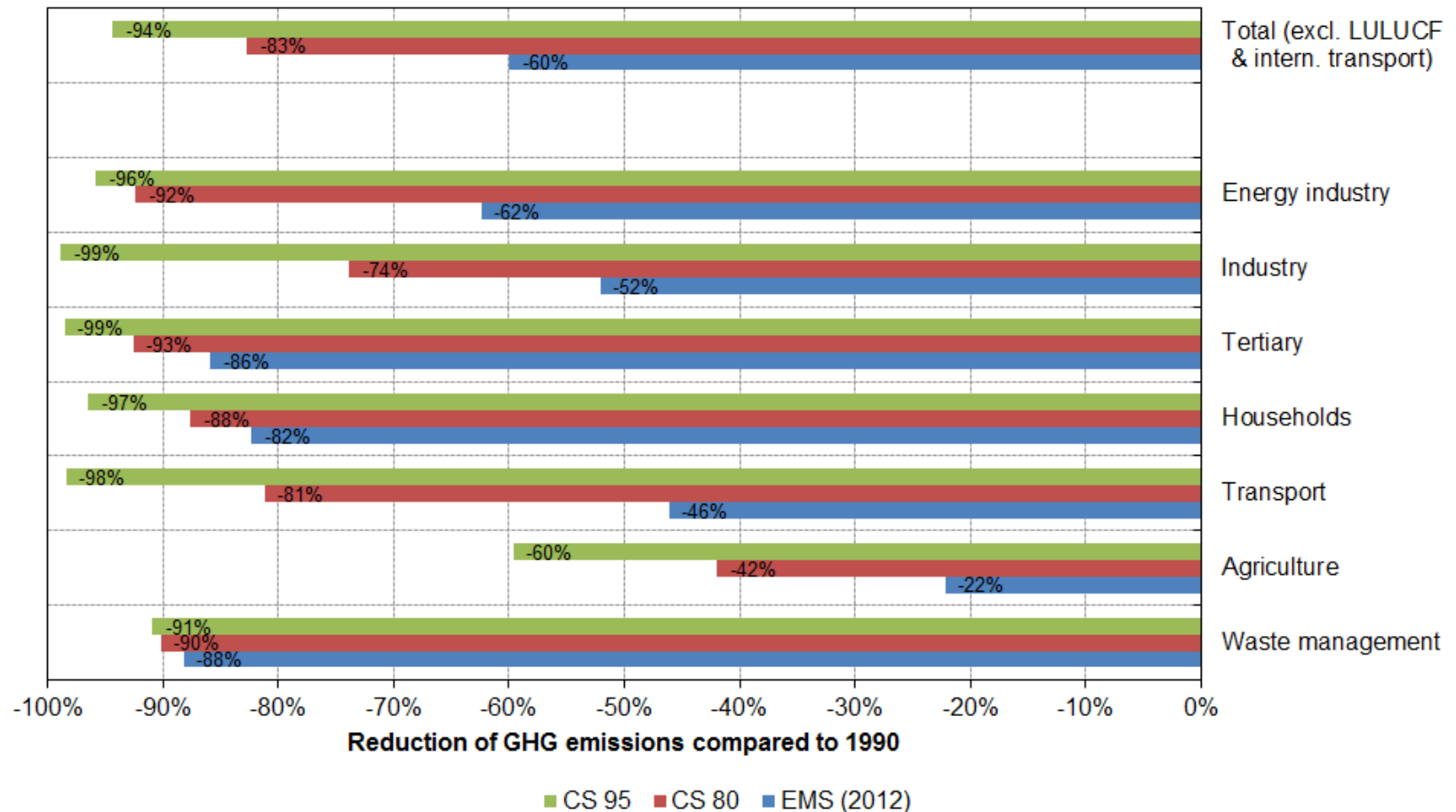
Mitigation options (selection)

- Renewable share of GFEC: >95% for 95% GHG emission reduction
- Strong increase of energy efficiency in final energy sectors (buildings, industry, tertiary, transport).
- Limited biomass potential (mainly domestic biomass).
- Electricity as primary source (e.g.):
 - Heat pumps and electric boilers (power-to-heat),
 - Transport: Electric vehicles and synthetic fuels (power-to-liquid).
- Phase-out of nuclear energy by end of 2022.
- CCS only in the high ambitious scenario (CS 95) and only in sectors linked to industrial processes (→ no CCS at power plants).
- Behavioral changes e.g. in mobility & nutrition (meat consumption).

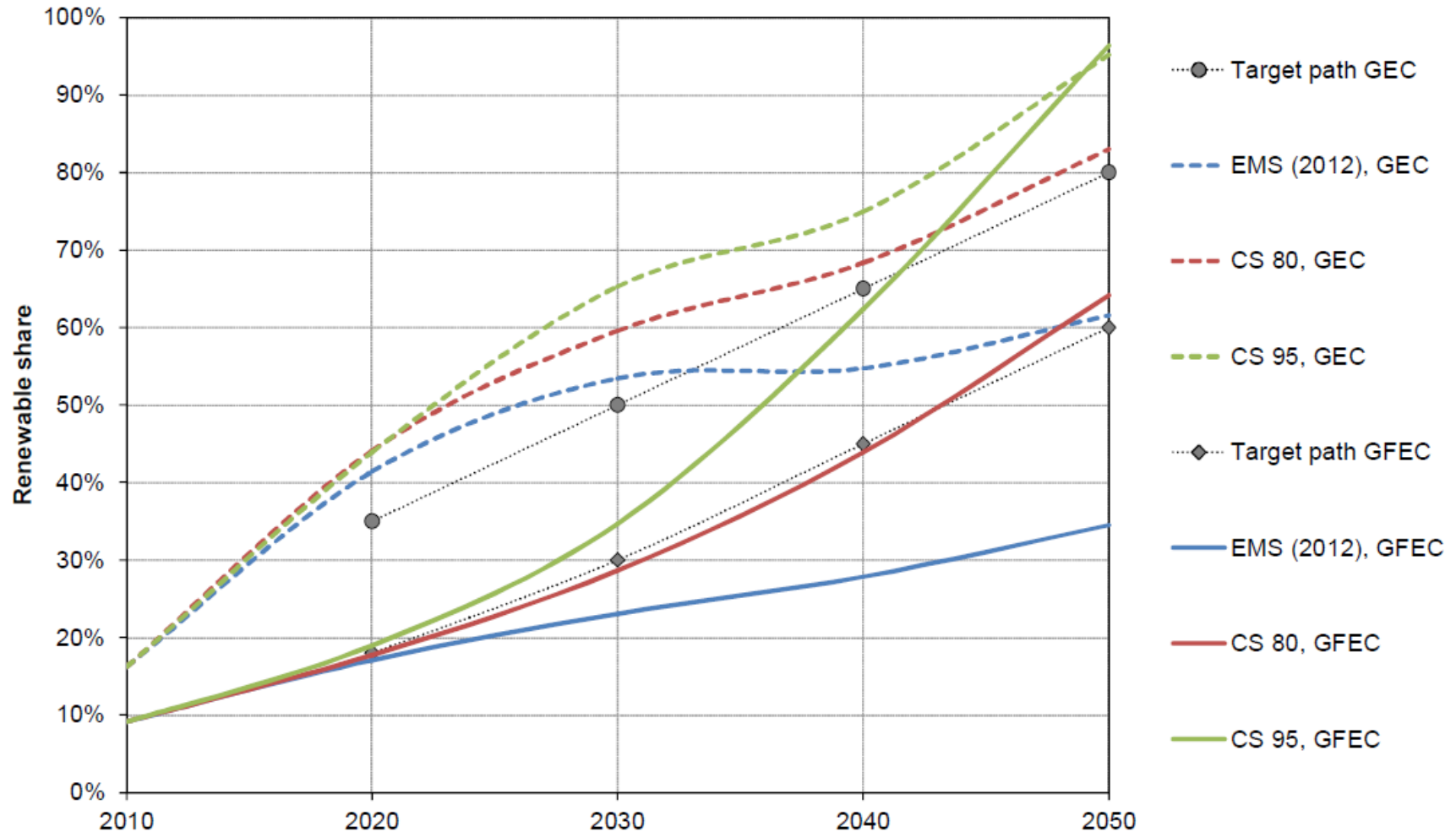
GHG emissions



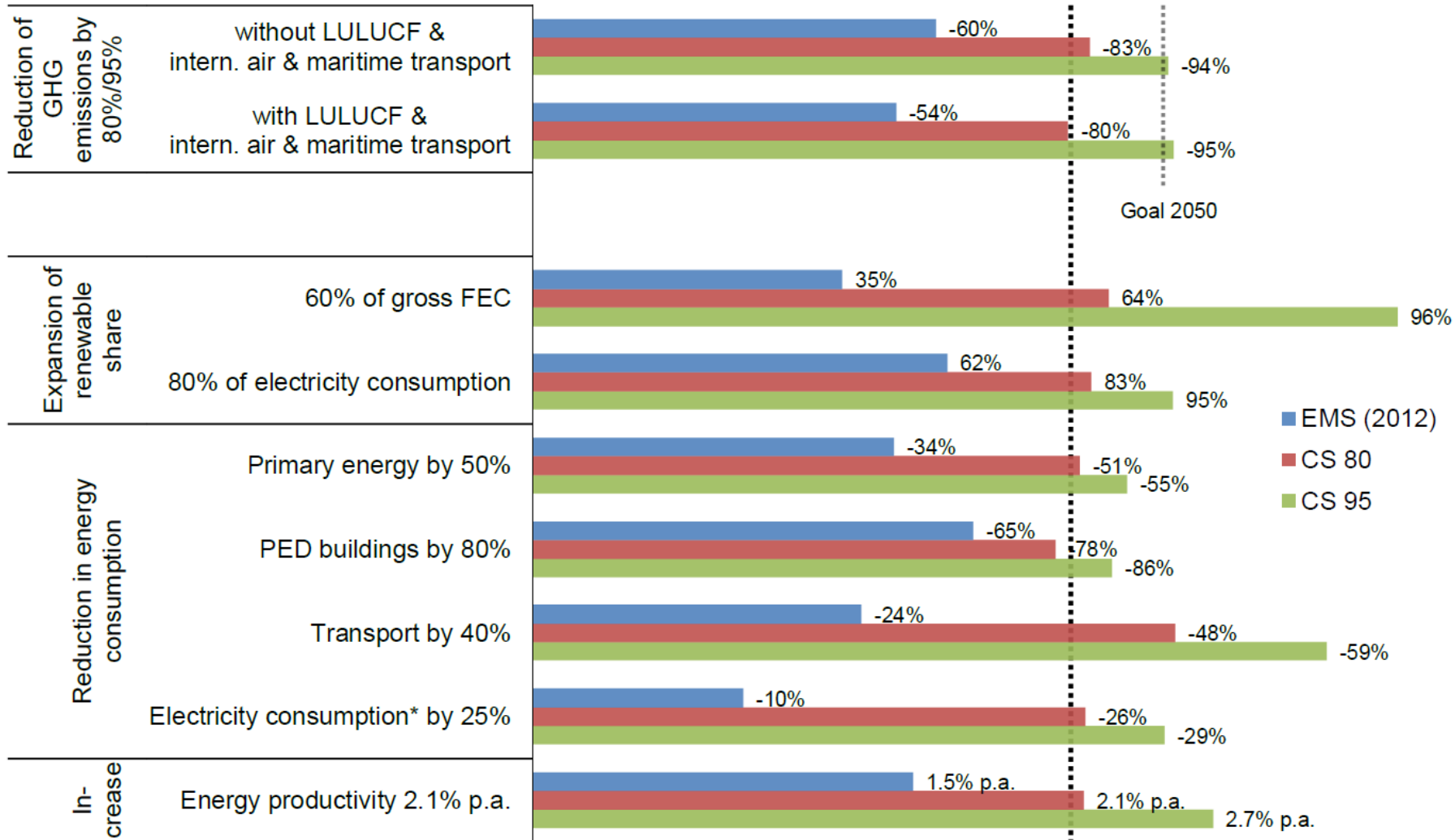
Relative GHG emission reductions in 2050 compared to 1990



Renewable shares in energy consumption



Fulfilment of 2050 targets



Main results and perception

- Key findings:
 - In general, national energy targets support well a GHG emission reduction of 80% by 2050.
 - But: Some targets need clarification or redefinition.
 - For 95% GHG emission reduction significant overachievement of energy targets is necessary.
 - In the KS 95 scenario agriculture is the largest source of remaining emissions.
- How was the study perceived by the public and policy makers?
 - There are only few studies in Germany which include all GHG relevant sectors. Therefore *Klimaschutzszenario 2050* got attention in policy and scientific communities.

Conclusions and challenges

- Main challenge: Reaching national target in a bottom-up modelling without setting sectorial emission targets
- Robust outcomes of the study:
 - More than 95% renewable energies for 95% GHG emission reductions
 - Strong increase of electricity consumption due to new applications
 - Agriculture sector as main emission source in a 95% scenario
- Less certain:
 - Exact types of new electricity consumption (Power-to-Heat/Gas/Liquid?)
 - Are there alternatives to CCS in mitigating industrial process emissions?
- Going from 80% to 95% GHG reduction means decreasing emissions by additional three quarters!

Outlook – ongoing related projects

- Next modelling round of Climate Protection Scenarios 2050
 - Achieving 95% without CCS
 - Examine connection of 2030 sector targets and 2050 long-term target
- 2019 WEM projection under the MMR covering year until 2035
- Coal phase-out 2038 as a result of the German „coal commission“

Contact

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Study *Klimaschutzszenario 2050* is available online:

- English summary: <https://www.oeko.de/publikationen/p-details/climate-protection-scenario-2050/>
- Full report: <https://www.oeko.de/publikationen/p-details/klimaschutzszenario-2050-2-endbericht/>