

Transforming the German Energy System - Analysis of Domestic Mitigation Options with REMIND-D

Transition with or without CCS in a „coal country“

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Structure of the presentation





1. Short description of the scenarios
1. Is 100% RES possible?
1. What would be the costs for reaching 100% RES?
1. Development of the final energy consumption / demand

REMIND-D



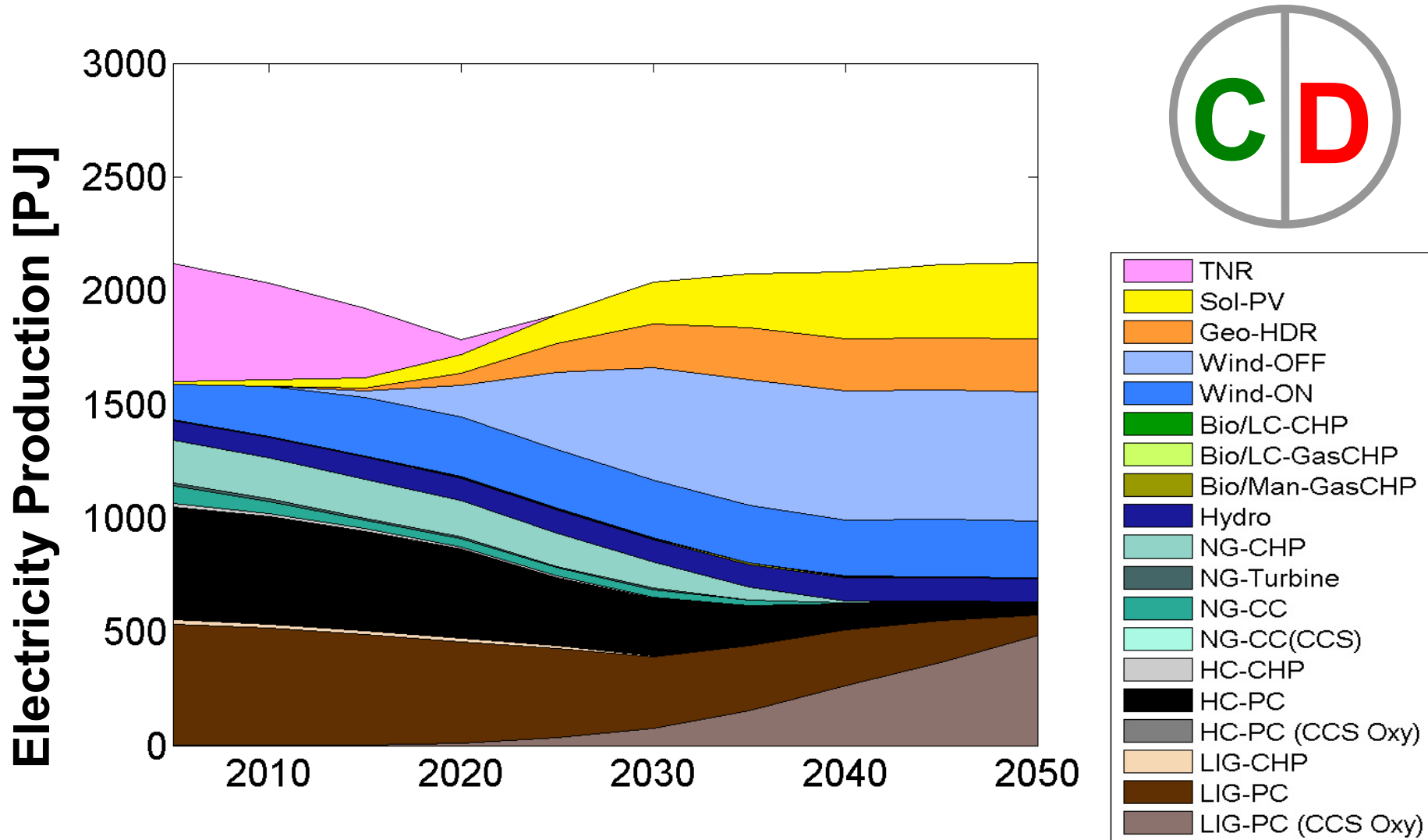
- Coupled energy-system and macroeconomy model
- Growth model (Ramsey-type)
- Time horizon 2005-2100, 5-year resolution
- Optimizes intertemporally („perfect foresight“)
 - „First best solution“
 - Objective function: welfare maximization
- Full technology flexibility for mitigation

Short description of the scenarios

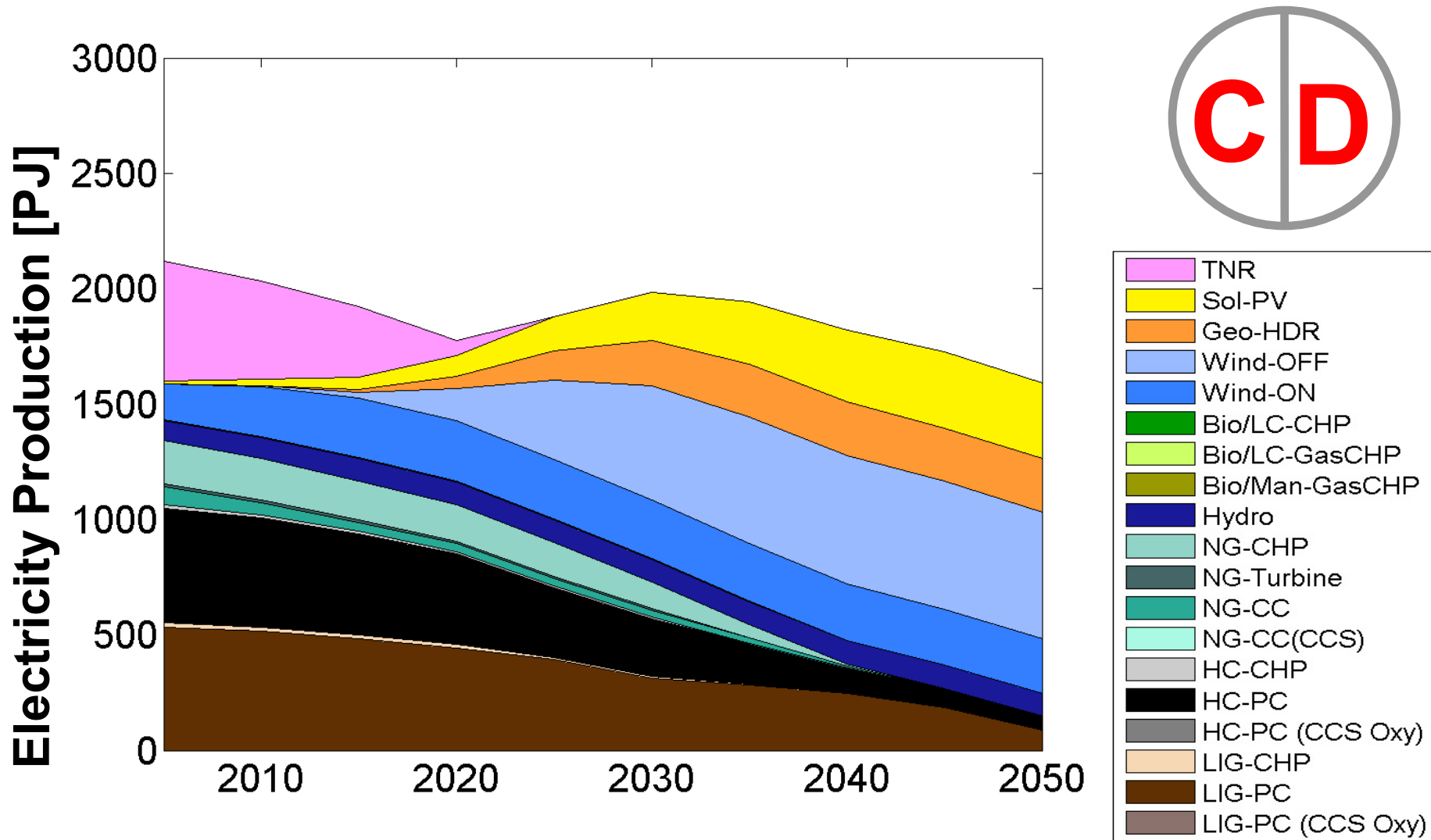
	use C CS	NOT use C CS
NOT D ecommission coal power plants		
D ecommission coal power plants		

- CCS potential: 10 GtCO₂ for 2010-2100
- Nuclear phase-out... “old status quo”
- BAU Case: ~40% CO₂ emission reduction vs. 1990
- Policy Case: ~85% CO₂ emission reduction vs. 1990

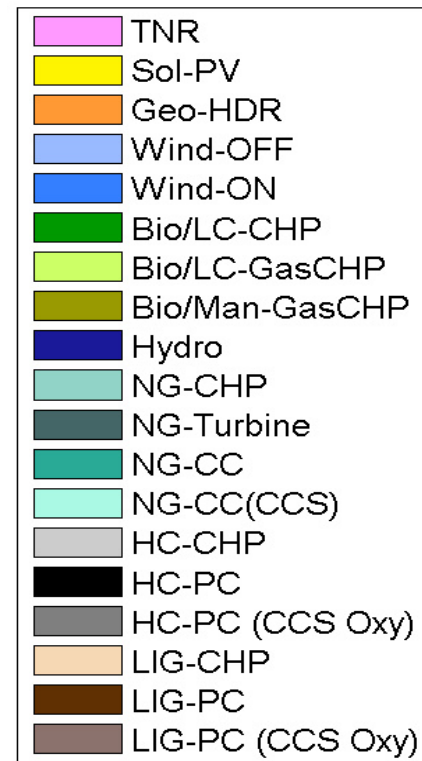
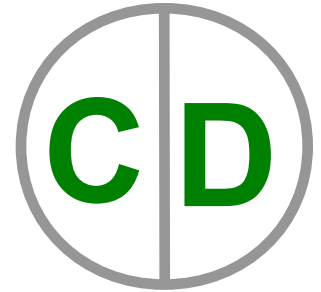
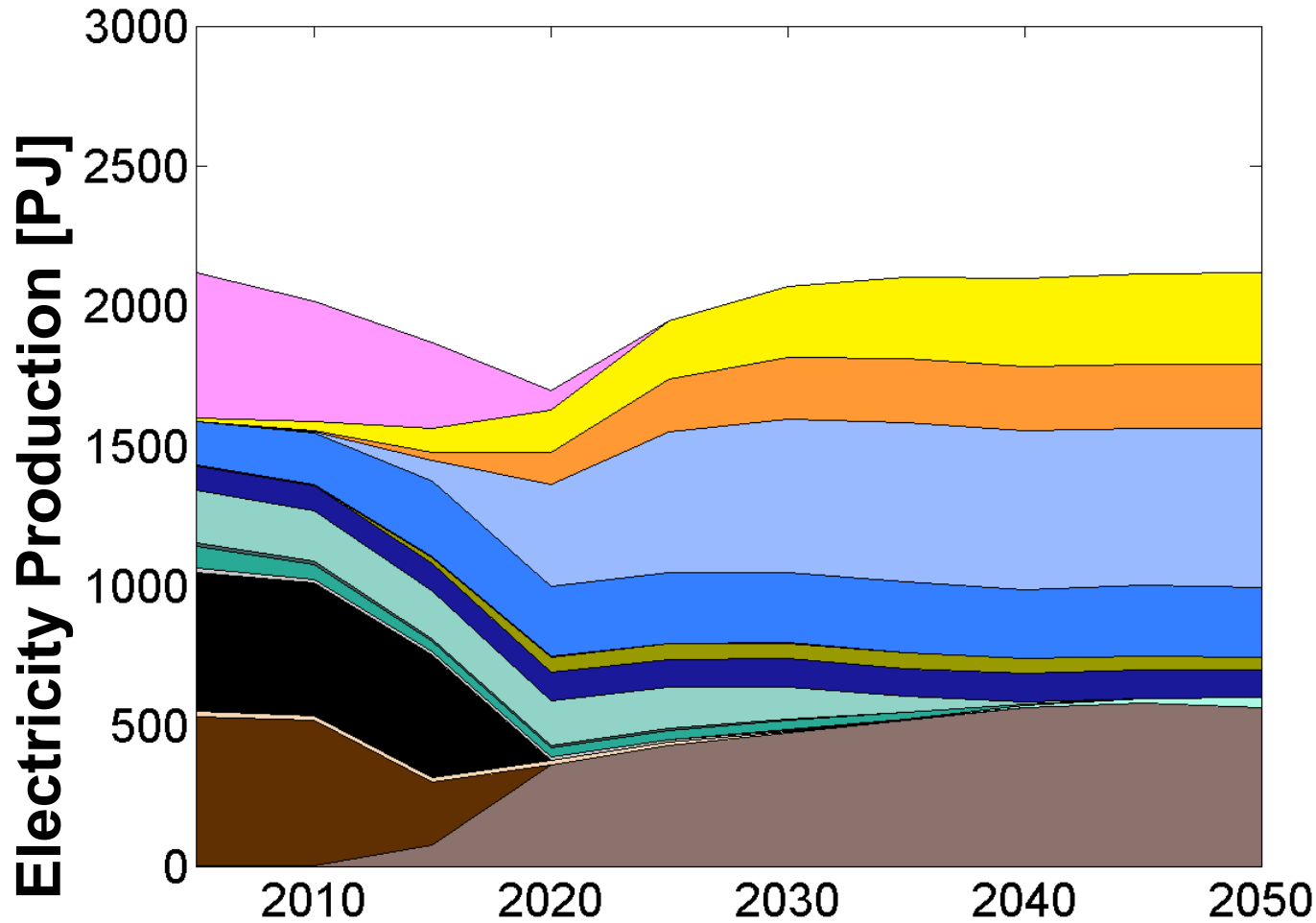
Is 100% RES possible?



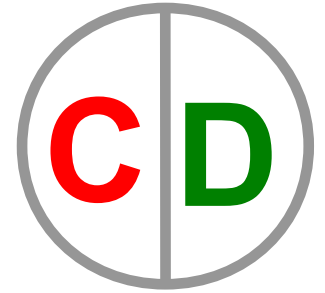
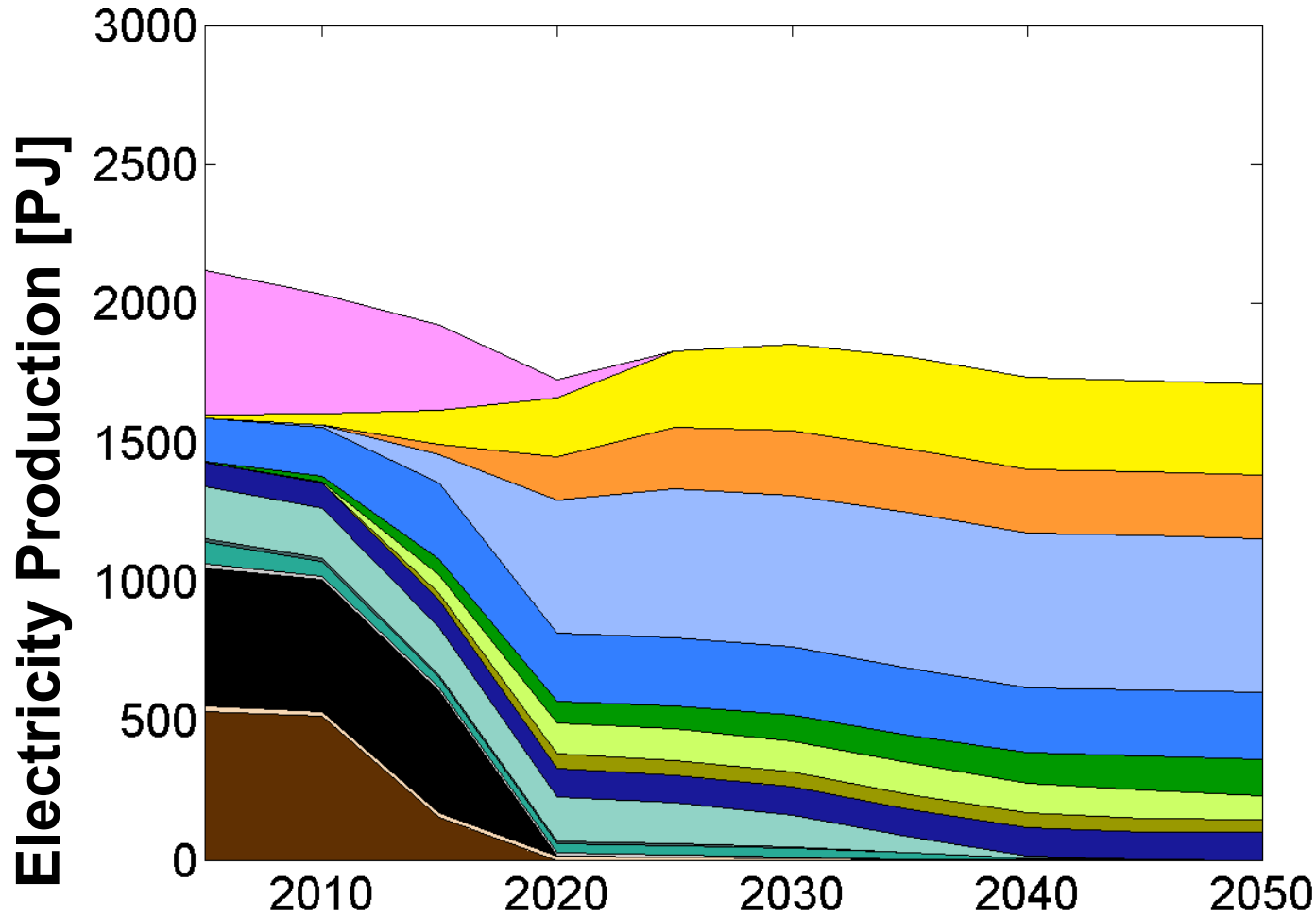
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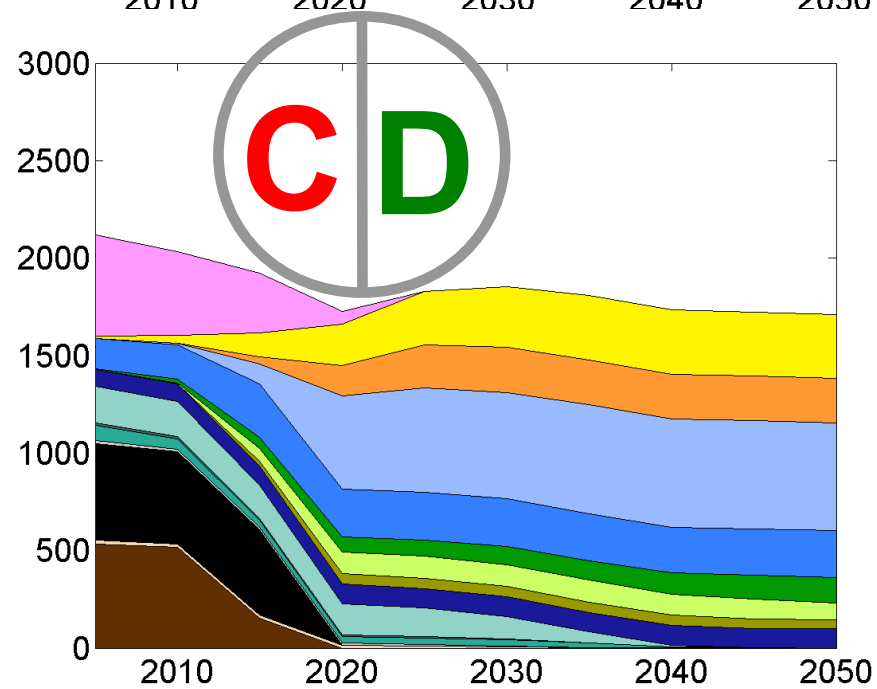
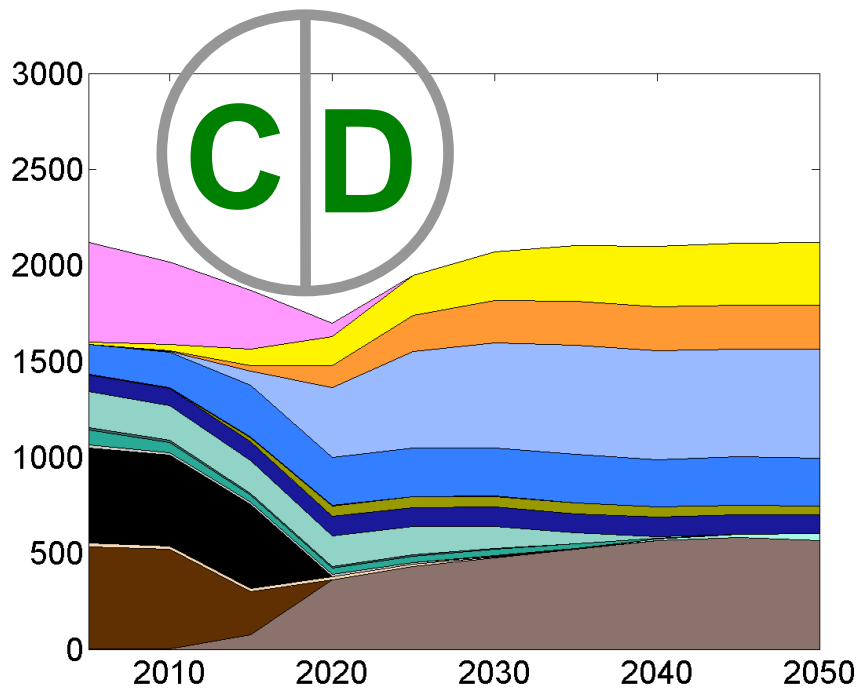
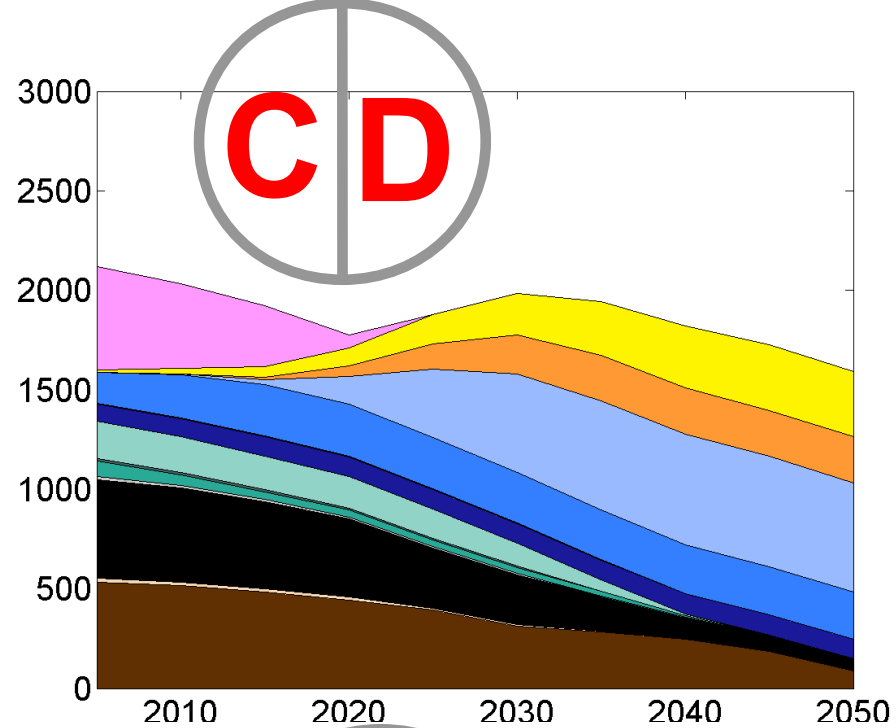
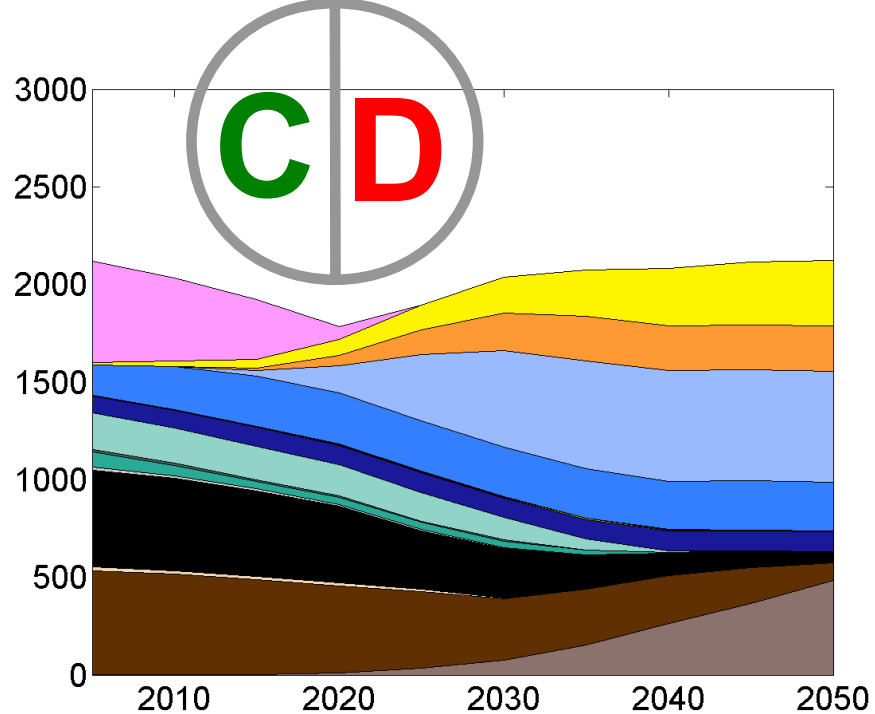
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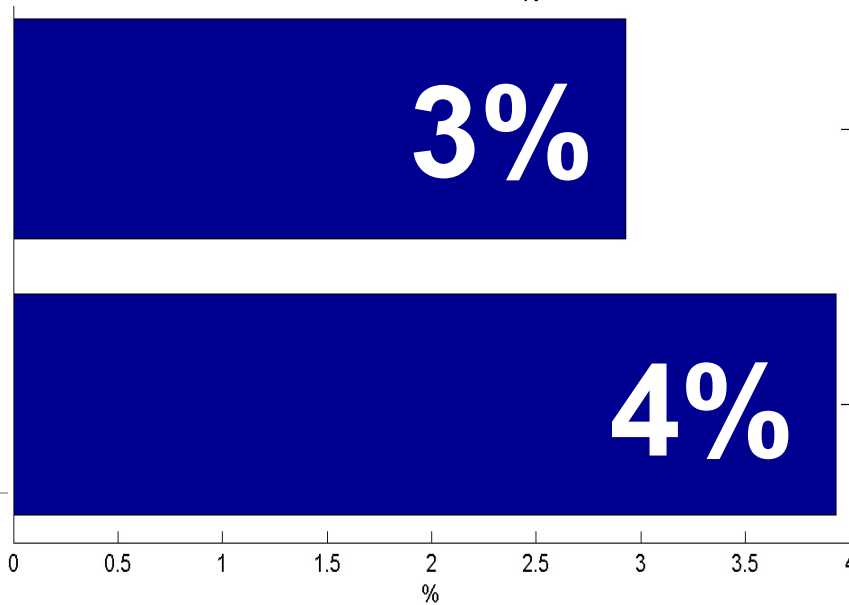
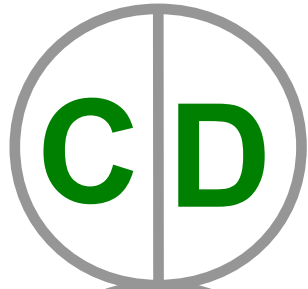
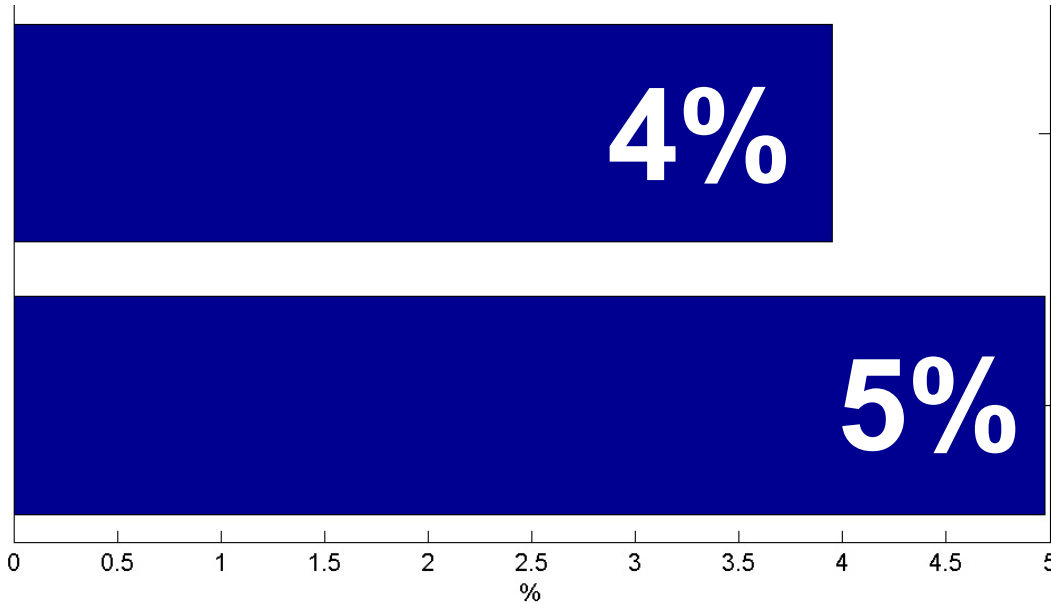
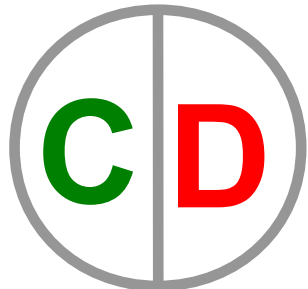
Is 100% RES possible?



- TNR
- Sol-PV
- Geo-HDR
- Wind-OFF
- Wind-ON
- Bio/LC-CHP
- Bio/LC-GasCHP
- Bio/Man-GasCHP
- Hydro
- NG-CHP
- NG-Turbine
- NG-CC
- NG-CC(CCS)
- HC-CHP
- HC-PC
- HC-PC (CCS Oxy)
- LIG-CHP
- LIG-PC
- LIG-PC (CCS Oxy)

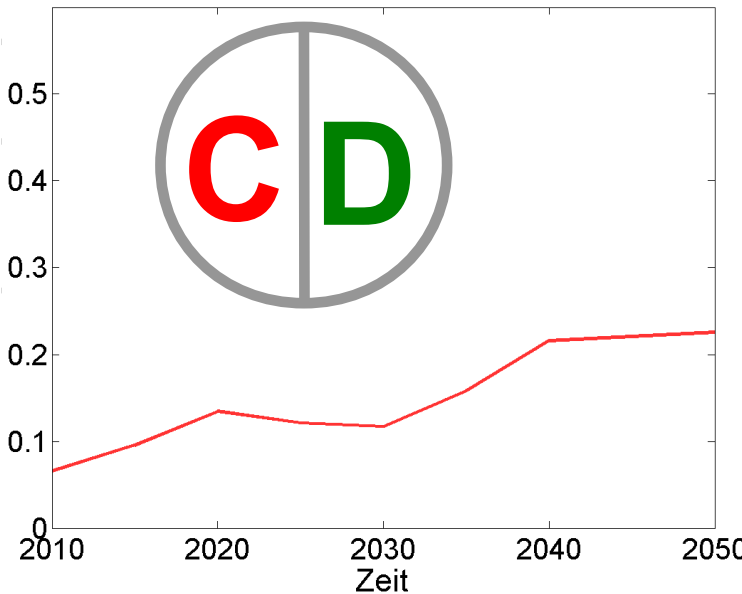
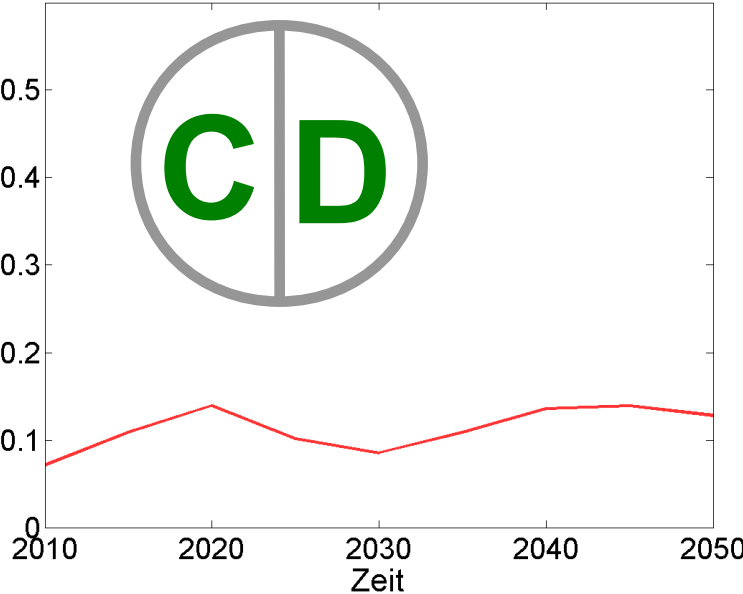
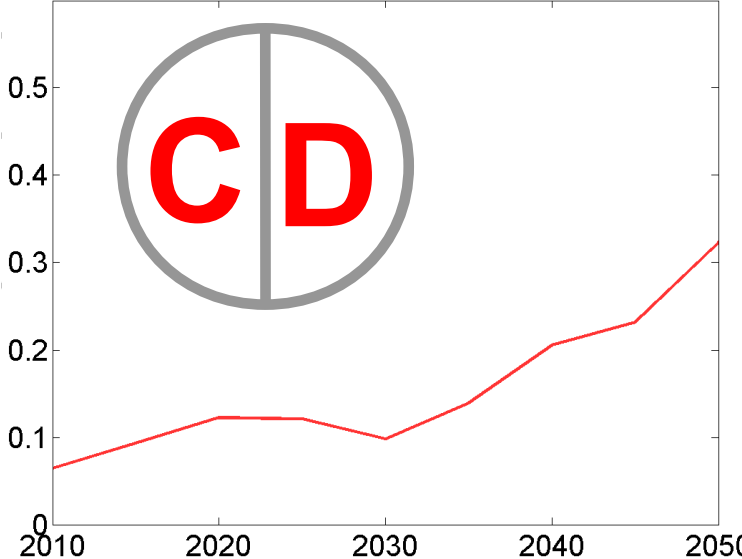
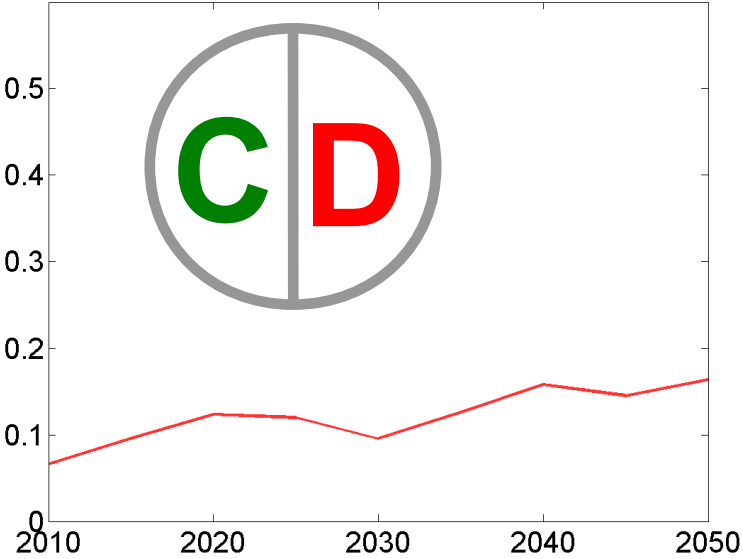


Costs for reaching 100% RES? GDP Losses (NPV):

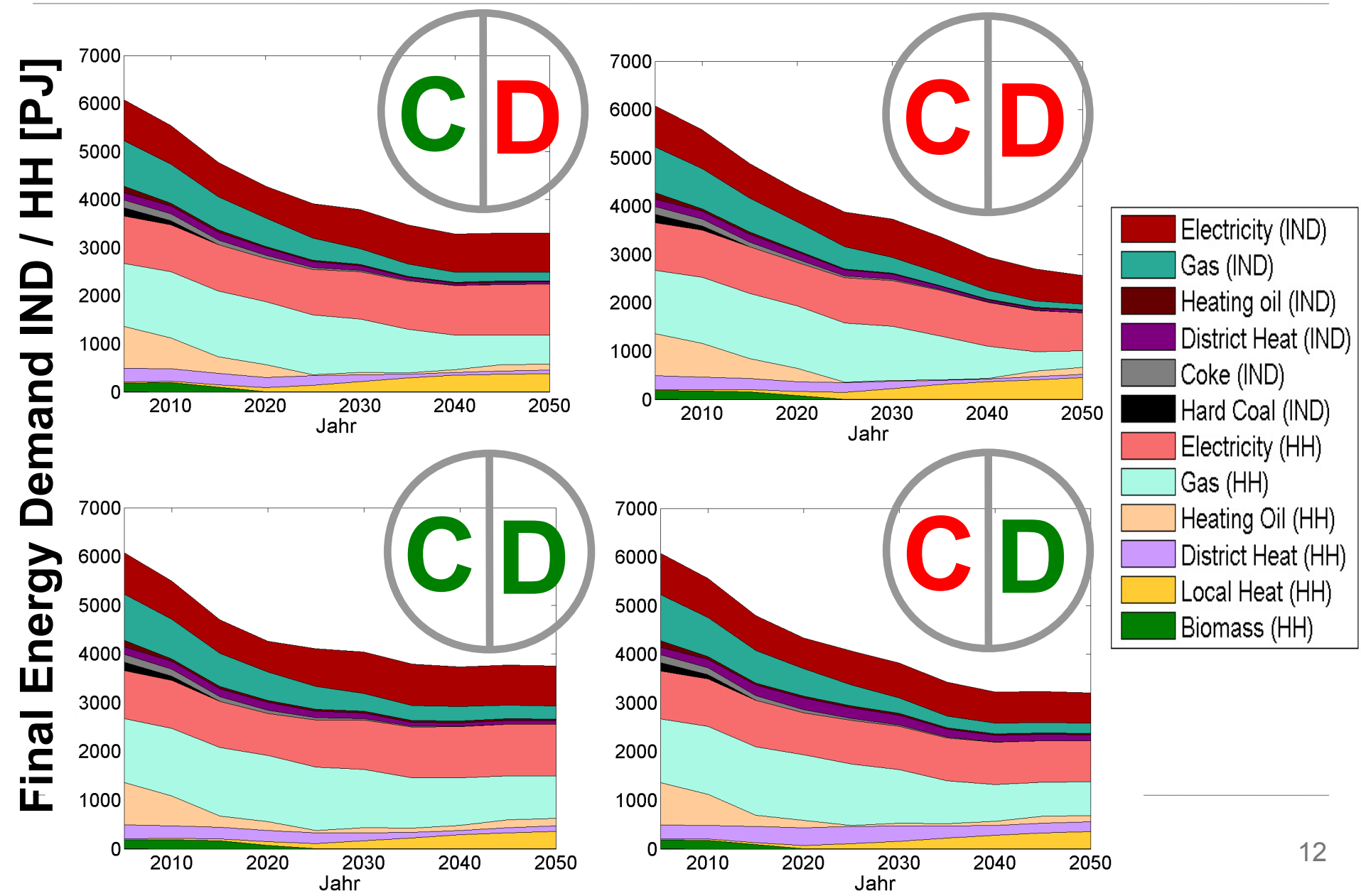


Costs for reaching 100% RES? Electricity Prices:

Electricity Prices [€/kWh]



Development of the final energy consumption / demand



Conclusions

- 100% RES in the electricity sector is (theoretically) possible
- The costs primarily depend on the availability of CCS and on the decision of whether to decommission coal power plants or not.
- The final energy consumption/demand decreases in all scenarios due to substitution and efficiency measures

Thank you for your attention...
...Questions?