Brandenburg University of Technology Cottbus - Senftenberg

Discount factors and hurdle rates: the dark horses of capacity expansion planning

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ENERDAY 2021

Agenda

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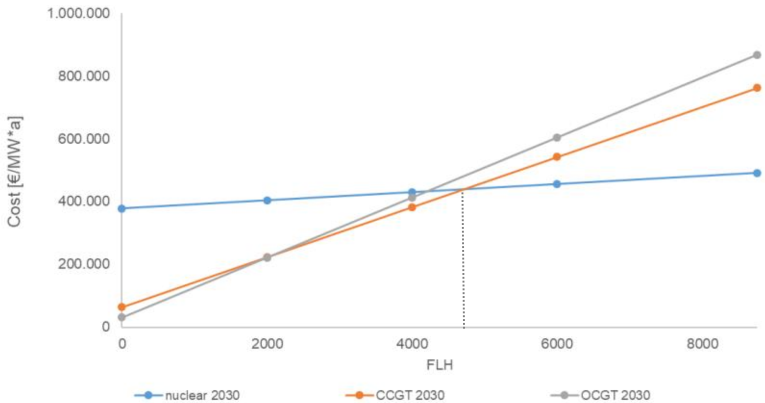
1. Motivation
2. Research question
3. Model set-up
4. Results
5. Takeaways

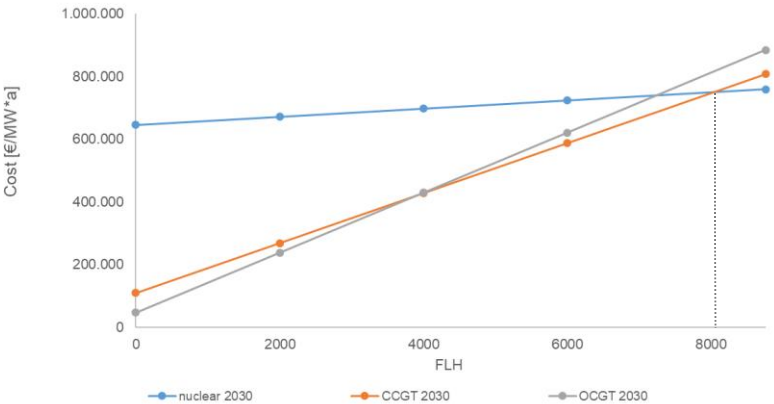
Motivation

- Our hypothesis is that hurdle rates (HR) are the ‘**dark horses**’ of capacity expansion planning → an observation that hurdle rates have little discussion in the body of research, however slight variations in this value cause significant changes in Full Load Hours (consequently, in the optimal investment mix).

HR = 6 %



HR = 12 %



Research focus

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How sensitive are energy investment models to assumptions on hurdle rates?

i.e. what are the impacts of uniform or technology-specific hurdle rate assumptions (and resulting annuity payment) on optimal investment mix and carbon emissions?

Disclaimer

This presentation contains preliminary results and focuses on *hurdle rates* exclusively.

Model set-up

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- **Greenfield investment model** in both conventional and RES technologies
- **Pan-EU** geographical scope
- **Three scenarios** for European energy futures from ENTSO-E (sustainable transition [ST], distributed generation [DG], EU comission‘s reference scenario 2030 [EUCO])
- **Eight scenarios** for hurdle rates that affect annuity calculation

Hurdle rates projected for 2030

Uniform hurdle rates					
All technologies	4%	6%	8%	10%	12%

Technology specific hurdle rates (NERA 2015)			
Technology	Low risk	Medium risk	High risk
Nuclear	10.5%	12.4%	17.4%
Lignite	8.9%	10.2%	19.4%
Hard Coal	8.9%	10.2%	19.4%
CCGT	8.0%	12.2%	15.3%
OCGT	8.0%	12.2%	15.3%
Photovoltaic	6.9%	8.5%	13.4%
Wind Onshore	7.5%	8.7%	13.3%
Wind Offshore	9.3%	10.9%	14.2%

Hurdle rate scenarios are based on NERA (2015) estimations and entail key risks affecting hurdle rates: wholesale price risk, allocation risk, policy risk and fuel/carbon price volatility.

Investment mix for uniform HRs and ENTSO-E projections for 2030 [GW]

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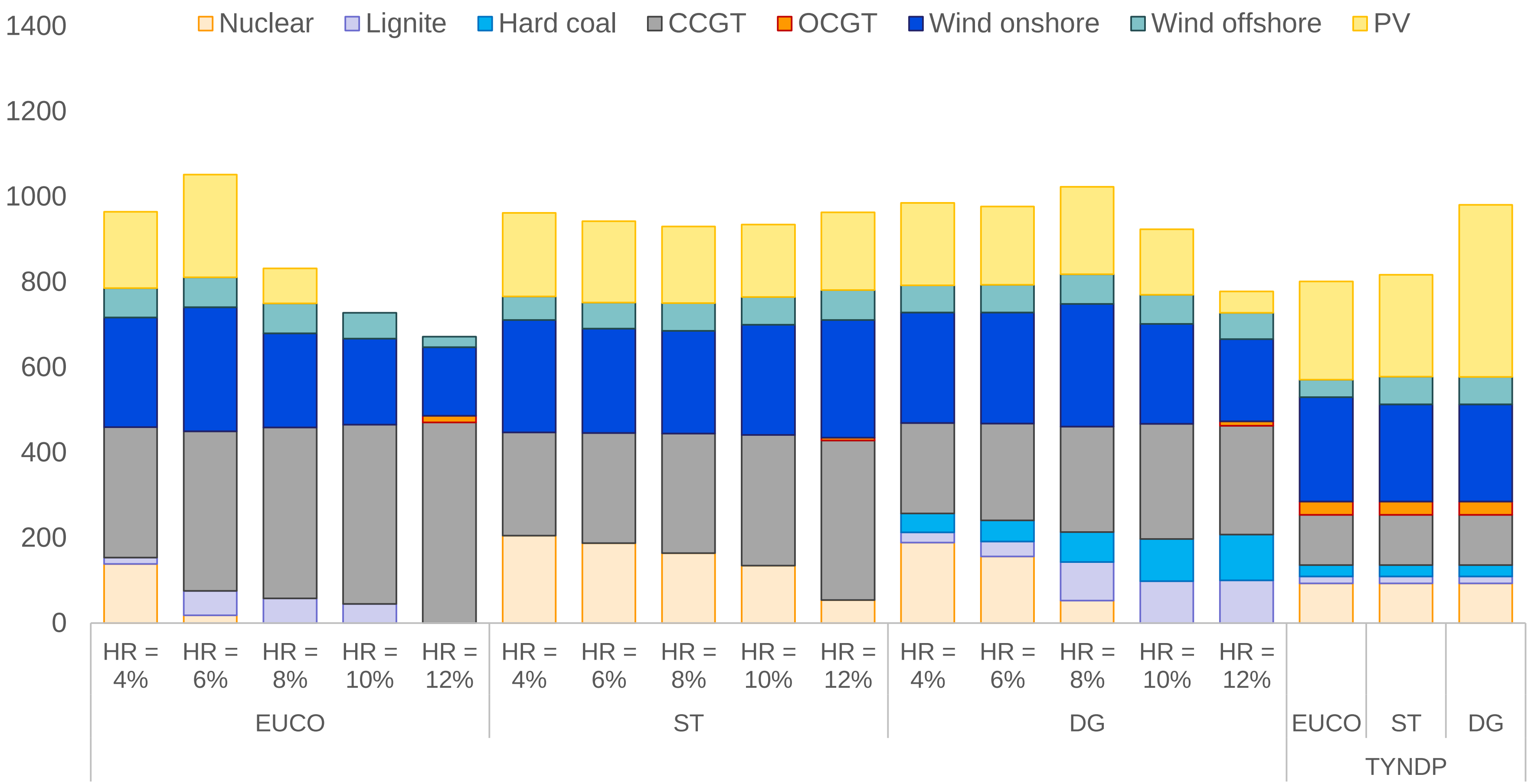

Investment mix for technology specific HRs and ENTSO-E projections for 2030 [GW]

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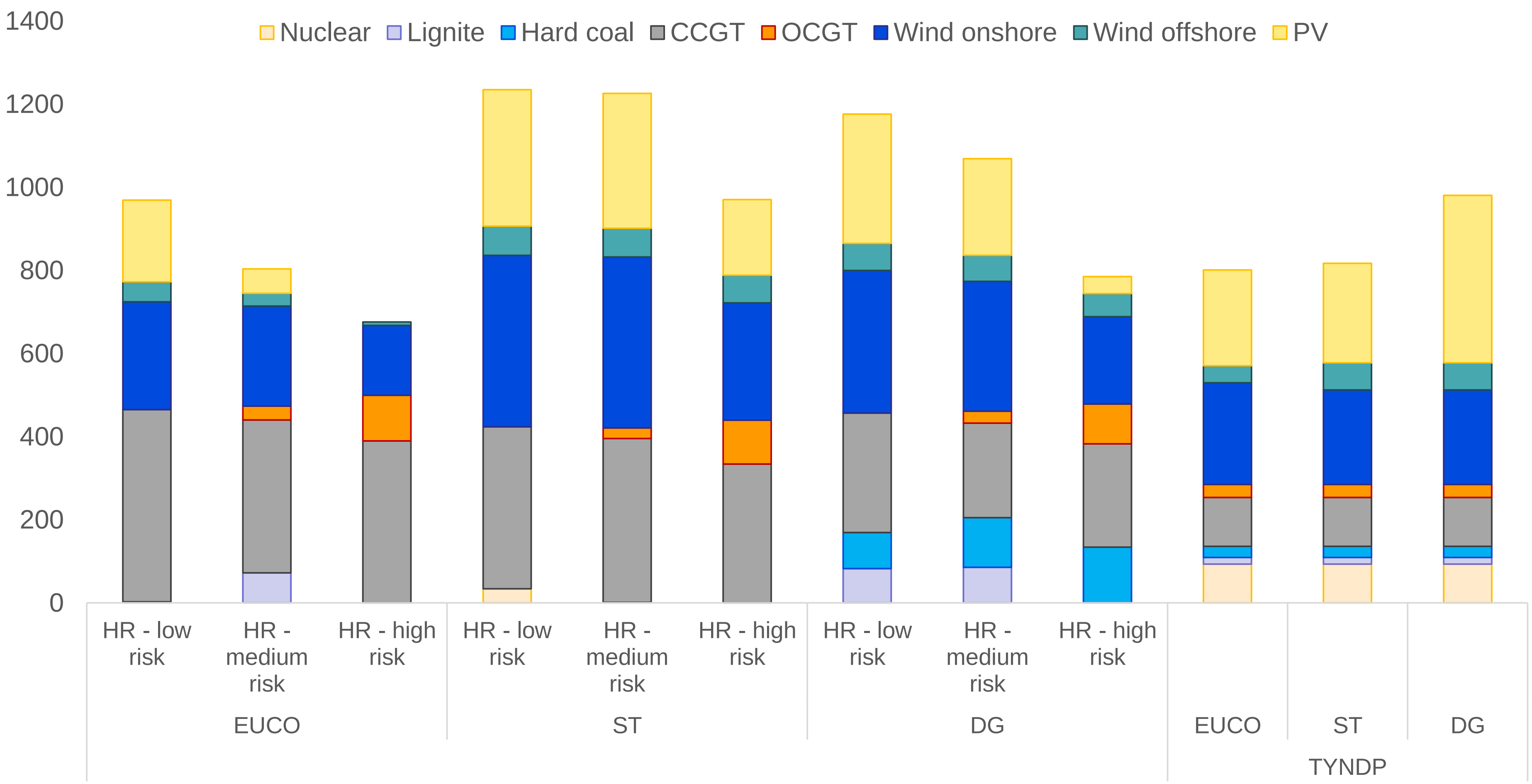
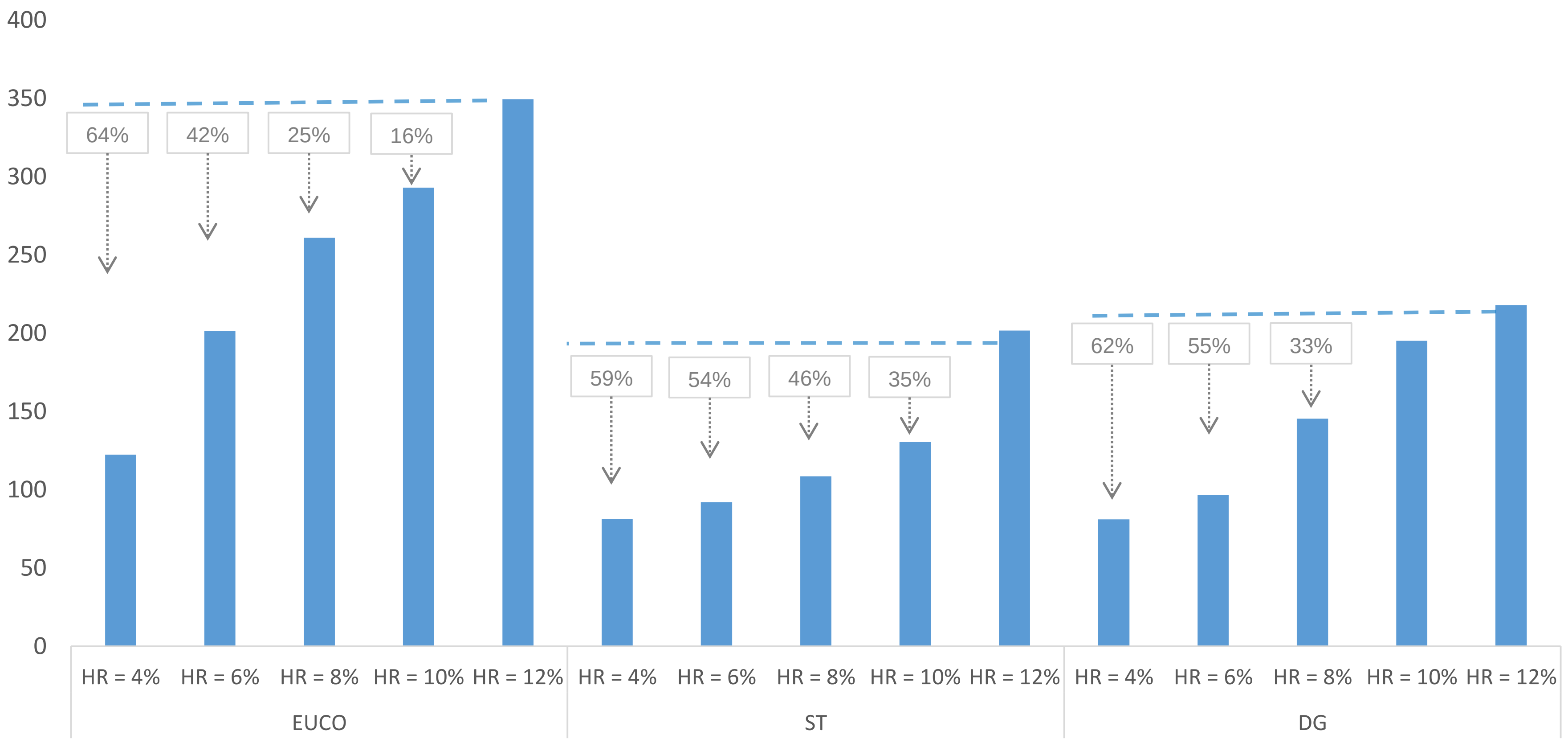


Results: CO_2 emissions intensity for uniform hurdle rates [g CO_2 e/kWh]



Takeaways

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Policy take-away:

Low hurdle rates entail great contributions of renewable technologies in the system.

Thus, low hurdle rates (low ECB interest rates) contribute to lower carbon emissions intensity of the energy system and facilitate decarbonization pathways.

Modelling take-away:

Slight variations in assumption on hurdle rate values exerts significant influence on the entire energy system (investment mix, emission intensity, etc.)

Models focusing on energy transition process should consider technology specific hurdle rates (and conduct sensitivity analysis).

Contact

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Literature

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