

Aligning government incentives for optimal renewable capacity investments using Contract-for-differences

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Extended Abstract

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Abstract Summary

Increasing the share of renewable energy sources such as wind and solar poses challenges for EU member states, as optimal deployment locations depend on weather and market conditions that are unevenly distributed across countries. These technologies are capital-intensive, and governments reduce market uncertainty through support schemes such as Contracts for Difference (CfDs). While such instruments are crucial for project feasibility, they also shift investment decisions toward policymakers.

Consequently, governments may deviate from globally optimal capacity levels when maximising national rather than global welfare. Indeed, benefits, such as lower wholesale prices and increased resilience to fossil fuel price shocks, partly spill over across borders and are not considered for the national welfare. Moreover, the local welfare impact of additional renewable capacity depends on uncertain factors, including electricity demand, marginal generation costs, and cross-border transmission capacity. Despite their relevance for policy design regarding CfDs and renewable deployment, these incentives for suboptimal national investment have not yet been quantified in the literature.

This study aims to (i) identify the key drivers of misaligned investment incentives, (ii) develop a stylised Stackelberg modelling framework to quantify deviations from optimal capacity and associated welfare impacts, and (iii) evaluate intergovernmental compensation schemes that can realign incentives with the global optimum. The framework enables analysis on the effectiveness of such schemes under different parameter settings and government risk preferences.

Initial results confirm that misaligned incentives indeed exist, driven by the creation of cross-border benefits. This suggests that countries with lower renewable potential may be willing to compensate those with higher potential to achieve globally efficient outcomes.

The findings are relevant for policymakers and stakeholders, as they not only address where and how much renewable capacity should be deployed, but indeed how to achieve these targets in an equitable and efficient manner.

Presenting Author Biography

Pieter Quaghebeur is a PhD researcher focusing on long-term electricity contracts. He is affiliated with KU Leuven (ESIM research group), VITO and EnergyVille. His research examines how instruments such as Power Purchase Agreements and Contracts for Difference can support timely investment to drive the energy transition. He develops optimisation models to analyse their impact on risk reduction, investment incentives, and market behaviour. Prior to his PhD, Pieter obtained an MSc in Renewable Energy Engineering, with a specialisation in energy system analysis, from the Technical University of Denmark.