

THE CRITICAL ROLE OF ECONOMIC ASSUMPTIONS IN COST-EFFECTIVENESS ANALYSIS FOR FOSSIL FUEL POWER PLANT CO₂ CAPTURE AND STORAGE

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Overview

Carbon Capture and Storage (CCS) has been considered as a key enabler for continuous usage of fossil fuel in future electricity generation portfolio under environmental emission constraints¹. Cost-effectiveness evaluation is an important dimension for such technology assessment; specifically, various studies have conducted techno-economic modelling of CCS at multiple temporal and spatial scale to explore its economic feasibility². Although all works confirmed huge potential of CCS in power sector decarbonization given proper market incentive and policy support³; however, economist criticized that economic parameters, which are largely assumed in most techno-economic models, could have tricky impact on the outcomes of the assessment results.⁴

Methods

Starting from here, in this paper we propose a global sensitivity analysis regarding to economic parameters in CCS techno-economic models. Firstly, a concise literature review is conducted to summarize the economic parameters to be included in the analysis in this paper. Statistics of such parameters in literature, including discount rate, fixed charge factor, real escalation rate, carbon price, fuel cost, and capital cost amortization rate, are also integrated in this paper to get the variable space in this paper. Secondly, the economic parameters importance in CCS economics (using CO₂ avoidance cost \$/kg CO₂ avoided as index) are ranked by random forest analysis incremental mean square error (IMSE). Finally, the top important economic parameters identified in previous step are further discussed to explore the rationales behind these economic assumptions as well as the regional disparity regarding such parameters. In a nutshell, in this step, we could answer the following questions: Which economic parameters are the most influential factors for fossil fuel power plant CCS economic assessment? Are these parameters assumed reasonably right now? If yes, how possible are they going to change? If not, what extra information are needed as supplements to make a sound economic assumption?

Results

No results available now

Conclusions

No conclusions available now

References

- 1 IPCC Climate Change 2014: Mitigation of Climate Change (Working Group 3 Contribution to the Fifth Assessment Report of IPCC. 2015). (<http://www.ipcc.ch/report/ar5/wg3/>).
- 2 Rockström, J. *et al.* A roadmap for rapid decarbonization. *Science* **355**, 1269-1271 (2017).
- 3 Sanchez, D. L. & Kammen, D. M. A commercialization strategy for carbon-negative energy. *Nature Energy* **1**, 1-4 (2016).
- 4 Pindyck, R. S. The use and misuse of models for climate policy. *Review of Environmental Economics and Policy* **11**, 100-114 (2017).