







UNLOCKING ADVANCED NUCLEAR INVESTMENT:

Balancing Operational Flexibility and Competitive Behavior Concerns with Capability CfDs



MOTIVATION

Nuclear power is a low-carbon, dispatchable energy source crucial for achieving net zero. However, high capital costs pose investment

RESEARCH QUESTION

• How different subsidy

risks. Traditional financial schemes like Contracts-for-Difference (CfDs) provide revenue stability but can distort markets. A proposed "Capability CfD" seeks to balance revenue stability with optimal dispatch, essential for integrating nuclear power into future energy systems.

schemes impact the operational flexibility and market behavior of nuclear?

METHODOLOGY

Equilibrium model to evaluate the impact of different subsidy contracts on nuclear operations.
1. Perfect Competition as a benchmark.
2. Feed-in-Tariff (FiT) encouraging maximum production regardless of market signals.
3. Capability CfD: a new scheme we propose
4. Stackelberg corresponding to lump sum payment to subsidize investment

KEY RESULTS

- FiT results in overproduction, leading to inefficiencies.
- Capability CfD closely approximates optimal dispatch, even though nuclear plants slightly overproduce.
- Stackelberg equilibrium (lump sum payment) leads to market manipulation, raising prices artificially.



<u>Relative share of production means accross the year</u>

Results: the share of nuclear production varies depending on the

CONCLUSION

- **Capability CfDs** promote operational flexibility while minimizing the risks of market manipulation.
- Closely match the Perfect Competition solution, with minor overproduction.

RELATED LITERATURE

- J. Jenkins et al. (2018), The benefits of nuclear flexibility in power system operations with renewable energy, Applied Energy
- Lundin, E. (2021). *Market power and joint ownership: Evidence from nuclear plants in sweden*, The Journal of Industrial Economics
- Schlecht, I., Maurer, C., and Hirth, L. (2024). *Financial* contracts for differences: problems with conventional

scheme. Stackelberg results in strategic capacity withdrawals and FiT maximises production. Capability CfD is a middle ground and approximates the Perfect Competition solution.

CfDs in electricity markets and how forward contracts can help solve them. Energy Policy

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