How to Procure Green Power for Real Emissions Reductions?

Yago del Barrio Álvarez, Benjamin F. Hobbs

Department of Environmental Health and Engineering, Johns Hopkins University

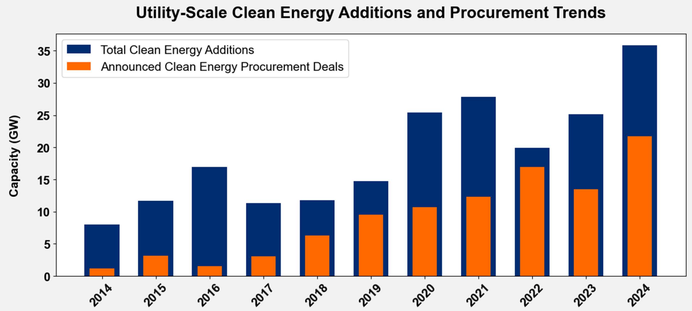
Why Corporate Green Procurement?

Energy customers in the United States have announced **over 100 GW of clean energy procurement deals** since 2014.

These announcements represent nearly 50% of the total utility-scale clean energy capacity additions.

45% of Fortune 500 companies have committed to carbon neutrality by 2050.

Data centers are driving corporate clean energy procurement, and the IEA projects their electricity demand will double by 2030.



Data Source: IEA Monthly Energy Review April 2025, CEBA Deal Tracker

Research Motivation and Objectives

What should count as Clean Energy Procurement?

Temporal matching: Hourly / Annually

Spatial matching: Local / Remote

Additionality: Is it really new capacity?

How can corporate clean energy procurement be designed to deliver real, system-wide emissions reductions?

Aim 1: Evaluate **the system-wide impacts** of corporate procurement strategies under different policy and system scenarios, and identify when they **fail to deliver additional emissions reductions**.

Aim 2: Develop a **bilevel model** to assess how large corporations influence clean energy investments and system outcomes, including potential inefficiencies

Modeling framework

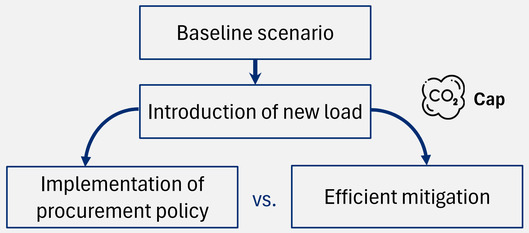
Single level model:

min: Total system costs
investment & operation variables
s.t. Operation constraints
System & Procuring policies

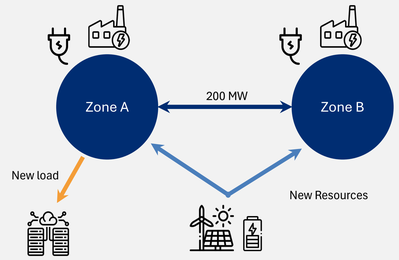
Procuring policies:

System policies:
- Ren. Port. Stan
- Emissions Cap

Scenario workflow:



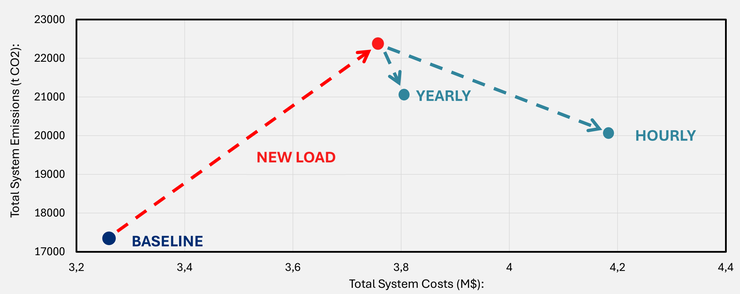
Two-node toy system:



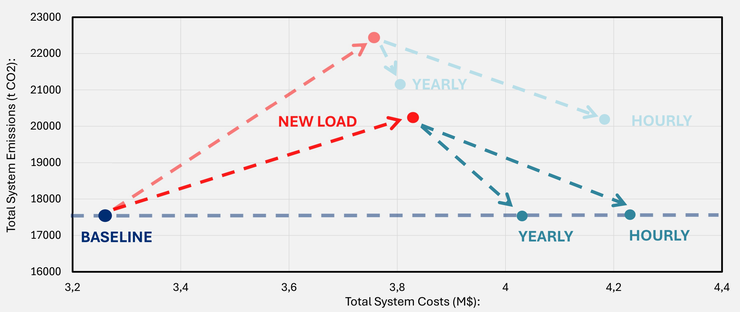
Description:
- 168 hours (representative week)
- New data center100 MW (~14% of existing load)
- Green energy procured by contracting output of new renewables and batteries with excess sold to market

Preliminary results

Non-binding RPS: 35%



Binding RPS: 50%



- **100% procurement successfully mitigates emissions if RPS is binding**
- **Annual matching more cost-effective if RPS is binding**
- Spatial matching effectiveness depends on the energy mix carbon intensity

Ongoing work

Large Corporate Buyer → Ability to influence the market outcome

Bi-level model:

Upper level: **min:** Procurement Investment ± Market transactions
Procurement Investment variables
s.t. Investment restrictions
Procuring policies
Operation of procuring assets

Operation of the system

Procuring decisions

Lower level: **min:** Total System Costs (Investment + Operation)
System & Operational variables
s.t. Investment restrictions
Operation constraints
System policies

Next steps:

Grid congestion effects:

Characterization of effective vs symbolic mitigation

Renewable siting limits and resource competition

Acknowledgements

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