

Marchés et décentralisation des échanges électriques

Cédric Clastres

Professeur d'Economie

Université Grenoble-Alpes/Faculté d'Economie de Grenoble/GAEL
Chercheur Associé Chaires « Economie du Climat » et « European Electricity
Markets », Université Paris-Sciences-Lettres/DAuphine

Thématiques de recherche

- ✓ Marchés centralisés et décentralisation des échanges électriques: insertion des technologies distribuées.
- ✓ Initié par une recherche sur l'autoconsommation (Doctorant de la Chaire "Economie du Climat").
- ✓ Poursuite au travers de plusieurs projets:
 - Economic Trades in Energy Communities and Optimal Cost Allocation – Projet IRGA – Laura Wangen;
 - Analysis of Uncertainty in Renewable Energy (Wind and Solar) Generation Forecasts, Flexibility Policies, and their Impact on Energy Prices and Electricity Markets – Projet GS – Maurice Ekoué;
 - French Electricity Consumption in 2050/2060 – Techno-economic Aspects of Its Evolution in the Face of Climate Change – Projet CEA/I-Tese – Valentin Satgé;
 - Les Communautés Energétiques, Réseaux et Marchés : entre centralisation et décentralisation des échanges électriques – Pack Amorçage – Labex EnergyAlps.

Energy communities and organisational models

Objectives

To present an overview of energy communities' features in economics.

What are optimal trading models for ECs & under which conditions?

Approach

An analysis of regulation, incentives and implementations of energy communities in Europe / Constrained maximisation linear program (MPEC).

Main results

1. ECs' potential to become a standard organisational model is still uncertain, as existing market principles must be adapted and an increase in system costs.
2. Their financial viability, trading mechanisms and equity (on network tariffs and balancing costs recovering) are currently under researches.
3. Centralised coordination improves financial outcomes and social welfare by favouring internal trades between members inside the EC.
4. Importance of economic incentives, energy efficiency, and storage to maximise both individual and community-wide welfare

Self-consumption and the sharing of distribution costs

Objectives

To study how to optimally share the distribution network costs between self-consumers (energy communities) and ordinary consumers: a solution of the “utility death spiral”.

Approach

We use cooperative game theory with the core as a solution to compute optimal network tariffs, reducing incentives to by-pass the distribution network (i.e. staying in the grand coalition).

Main primary results

1. The core exists thus there exist solutions (incurred cost) which are efficient for each profile of consumers to jointly remunerate the distribution network.
2. To set tariffs is more complex: tariffs based on the volume or fixed fees are outside of the core; the Shapley-Value solution is inside it.
3. Three-part tariffs are in the core and the share of fixed/variable part relies on the stability of the Core and differentiation needs between consumers.

Distributed resources and Markets

Objectives

What would be the impact of renewable energy uncertainty (wind and solar) on market prices?

How does renewable generation uncertainty affect producers' optimal bidding strategies between the day-ahead and intraday markets?

Approach

Fixed effect regression / Two stages optimization model (Kuhn and Tucker's rules).

Main results

1. Results shows RES uncertainty/intermittency impact on price is higher than the forecasts ones and align with existing studies in Texas (Weber & Woerman, 2024) and in northern European markets (Hosius et al., 2023).
2. Effect of flexibility cost: A higher marginal cost curvature discourages intraday adjustments and increases the day-ahead quantity, as flexibility becomes costly.
3. Flexibility acts as an option value—its marginal value depends jointly on uncertainty magnitude, intraday price signals, and ramping costs.

Working Papers

Ekoue, M. K. Supply-Side Flexibility in Sequential Electricity Markets under Renewable Forecast Uncertainty.

Laura Wangen. Trading models for Energy Communities: Optimisation of collective benefits under various scenarios for P2P trades.

Stagé V. Load, public policies and decentralized technologies: a decomposition of the load using GAMs Models.

Baruah K., Clastres C., De Cannières A. Tariff structure for distribution networks: a case study for European prosumers and stakeholders.

Clastres C., Woerman M. The supply of energy services: Do local service providers use DSO or telecommunication network?

Maurice K. Ekoue, Matt Woerman, Cédric Clastres. Intermittency and uncertainty in wind and solar energy generation: An econometric approach to their impact on the French intraday market price. 2024 (**Working paper CEEM**).

Publications

Ekoue, M. K., Woerman, M., & Clastres, C. (2025). Intermittency and uncertainty in wind and solar energy: Impacts on the French electricity market. ***Energy Economics***, 142.

Clastres, C., Ekoue, M. K., & Wangen, L. (2025). Local energy trading. In *Elgar Encyclopedia of Energy Economics* (pp. 307-310). **Edward Elgar Publishing** (Book chapter).

Laura Wangen and Cédric Clastres. Cost Allocation in Energy Communities. **IAEE Energy Forum**, 33(116):23–26, 2024.

Barbara Antonioli Mantegazzini, Cédric Clastres, and Laura Wangen. Energy communities in Europe: An overview of issues and regulatory and economic solutions. **Economics and Policy of Energy and the Environment**, 2022(2):5–23, May 2023.

Satgé V., Gabriel S., Clastres C. 2025. Sensitivity analysis of load profiles: Implications for resource adequacy in future power system. **Energy**, Volume 335.

Colloques/Séminaires Nationaux

- AFSE, Université Paris-Saclay, juin 2025.
- Winter Student Workshop FAEE, Grenoble, 2024 et 2025.
- 2nd Conference on Decentralized Energy Systems, Rouen, France, March 2024. Université de Rouen Normandie (LERN) and NEOMA Business School (the World We Want) and Paris School of Economics (Urban New Deal chair).
- 38th International Conference On Efficiency, Cost, Optimization, Simulation and Environmental Impact Of Energy Systems, 29 June - 4 July, 2025, Paris, France.
- Journée scientifique CEA/I-Tésé, 18 septembre 2025, Paris.

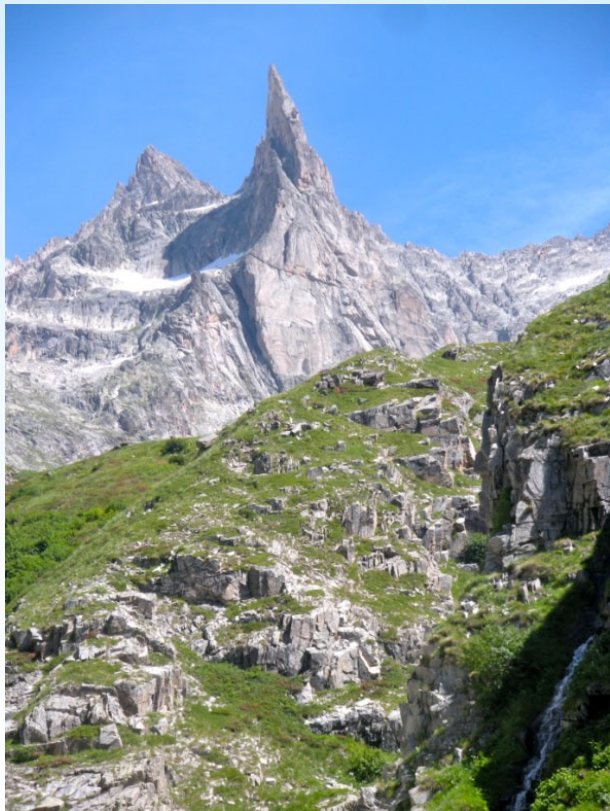
Colloques/Séminaires Internationaux

- Young Energy Economists and Engineers Seminar en mai 2024 en Belgique (Louvain).
- IAEE 45th INTERNATIONAL CONFERENCE ISTANBUL 2024 "Energy Sustainability, Security, Efficiency and Accessibility in a Time of Transition", June 2024.
- 8th AIEE Energy Symposium Current and Future Challenges to Energy Security Padua, 28-30 November, 2024.
- USAEE, Baton-Rouge, Novembre 2024.
- International Energy Workshop (IEW) 2025, Nara, Japan, June 2025. Research Institute of Innovative Technology for the Earth (RITE).
- 46th IAEE International Conference ENERGY SOLUTIONS FOR A SUSTAINABLE AND INCLUSIVE FUTURE, Paris, France, June 2025. FAEE, IAEE.
- AIEE, Rome, novembre 2025.

Collaborations et projets futurs

- Projet sur l'allocation des coûts dans les réseaux de distribution en présence d'auto-consummation ou Communautés Energétiques - G-INP.
- Projet sur la fourniture de services dans les réseaux de distribution et l'impact des énergies distribuées sur les marchés et réseaux – Matt Woerman (University of Colorado).
- Communautés énergétiques, répartition des coûts et bien-être collectif – Barbara Antonioli Mantegazzini (University of Lugano).
- Allocation des coûts de distribution avec incertitude sur la demande – Alexandre de Cannière (Elya).
- Projets COMMONS - COMmunity MOdeling and eNergy Sharing assessment (AMI PEPR TASE);
- Projets ANR CEMED - Communautés Energétiques et Modélisation des Echanges Décentralisés (écrit, en attente de soumission).

Thank you for your attention



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