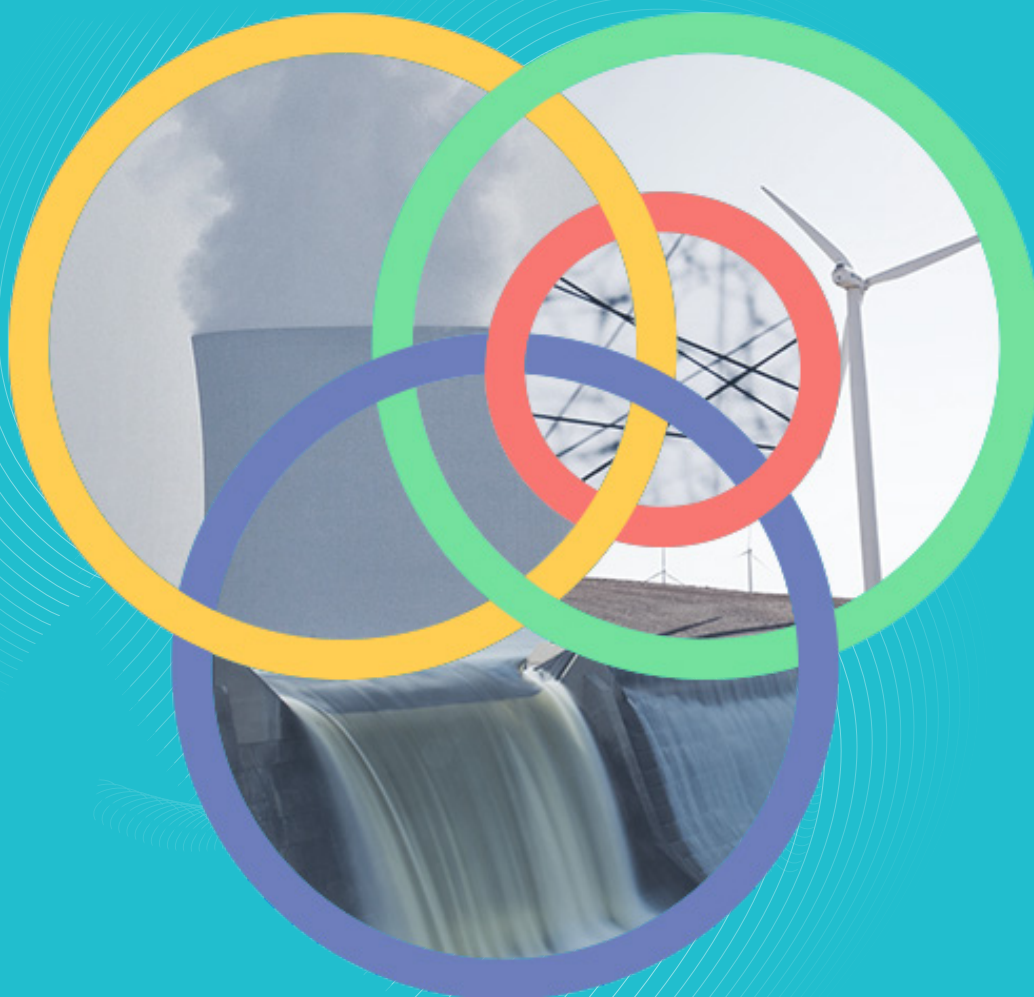




Dauphine | PSL 

CHAIRE EUROPEAN ELECTRICITY MARKETS

ACTIVITY REPORT 2020



Research chair supported by



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A word from the CEEM Scientific Director

Dear friends of the Chaire European Electricity Markets (CEEM),

The past year has been transformative. In the energy sector, as large parts of our lives moved online, the security of the electricity supply has become more vital than ever. Together with food security and high-quality healthcare, the reliable access to electricity is an indispensable condition for the good functioning of our economies and societies.

In its field, the CEEM at the Université Paris Dauphine-PSL has answered the challenge of moving forward under changed circumstances by launching a new collaborative research project on the “Long-term financing of investments in hybrid electricity markets”. Together with our colleagues in partner institutions in France and Europe, we are aiming at insights on how to best ensure the adequate and profitable provision of low carbon electricity in the presence of profound technological, behavioural and organisational changes. We look forward to sharing with you some of the results of our work during the coming months.

Sincerely,

Jan Horst Keppler

Jan Horst Keppler
CEEM Scientific Director
Université Paris Dauphine-PSL

SECTION I: The life of the CEEM

1. Internal operations

On a daily basis, CEEM's work is carried out in accordance with the strategic guidelines established in collaboration with the partners and the Scientific Director. Assisted by his Scientific Advisor, the latter is responsible for the organisation of CEEM's three areas of work, i.e. scientific research, the organisation of events for the dissemination of research as well as the supervision of doctoral students and the training of young researchers. The administrative aspects are managed by the CEEM Coordinator. About twenty researchers associated with the Chaire, in addition to research assistants, complete the Chaire's team (for more details, visit the Chaire's website <http://www.ceem-dauphine.org/home/en/>, which centralises all the different information concerning the CEEM, including the presentations of scientific events).

THE TEAM

Jan Horst KEPPLER

CEEM Scientific Director
and Professor of
Economics at University
Paris Dauphine-PSL,
is responsible for the
organisation of the Chaire
as a whole, as well as of
its research activities.



● **Fabien ROQUES**

Associate Professor in Economics at University Paris Dauphine-PSL, and Associate Researcher at Cambridge University's Electricity Policy Research Group, is Scientific Advisor to CEEM.



Patrice GEOFFRON •

Professor of Economics at University Paris Dauphine-PSL, is responsible for the field “Decentralisation and harmonisation of the links between local grid and the supply/demand balance at both the National and European level”.



- **Fatoumata DIALLO**

CEEM Coordinator.



Steve SERAFINO

CEEM Coordinator.
(From the 17th of
February 2021)



ASSOCIATE RESEARCHERS

Today, the CEEM has, altogether, around 30 researchers working on the European electricity markets at different levels. In particular, the involvement of a researcher implies a collaboration, to varying degrees, in terms of events organized by the CEEM and participation in the CEEM copyright repurchase program for the *Working Papers* as well as peer-reviewed publications in journals. This structure has a proven track record and will continue in the next period.

- **Clara BALARDY**, Researcher
- **Amaury de BALINCOURT**, Researcher
- **Marie BESSEC**, Researcher
- **Pierre BOUFFORT**, Researcher
- **Régis BOURBONNAIS**, Researcher
- **Mauricio CEPEDA**, Researcher
- **Cédric CLASTRES**, Researcher
- **Florent COGEN**, Doctoral student
- **Alexandre COQUENTIN**, Researcher
- **Anna CRET**, Researcher
- **Michel CRUCIANI**, Researcher
- **Guillaume DEZOBRY**, Researcher
- **Théo DRONNE**, Doctoral student
- **Lamine DUCARD DAKE**, Researcher
- **Dominique FINON**, Researcher
- **Patricia VAN HORN FLORIN**, Researcher
- **Julien FOUQUAU**, Researcher
- **Romain GATÉ**, Researcher
- **Patrice GEOFFRON**, CEEM Responsible for the “Decentralisation” field
- **Frédéric GONAND**, Researcher
- **Stéphane GOUTTE**, Researcher
- **Mamadou GUEYE**, Post-Doctoral Researcher
- **Morwenna GUICHOUX**, Researcher
- **Daniel HERRERA**, Researcher
- **Jan Horst KEPPLER**, CEEM Scientific Director
- **Cyril MARTIN DE LAGARDE**, Researcher
- **Seungman LEE**, Researcher
- **Arnaud LEMANT**, Executive Doctorate in preparation, employee at EDF Renewables
- **Yannick LE PEN**, Researcher
- **Yuanjing LI**, Researcher
- **Olivier MASSOL**, Researcher
- **William MEUNIER**, Researcher
- **Léopold MONJOIE**, Doctoral student
- **Alexis PASKOFF**, Researcher
- **Marie PETITET**, Researcher
- **Thao PHAM**, Researcher
- **Sébastien PHAN**, Researcher
- **Marion PICHOU**, Doctoral student
- **Olivier REBENAQUE**, Post-Doctoral Researcher
- **Fabien ROQUES**, CEEM Scientific Advisor
- **María-Eugenia SANIN**, Researcher
- **Charlotte SCOUFLAIRE**, Researcher
- **Maria-Juliana SUAREZ FORERO**, Doctoral student
- **Ángela TORRES CORONA**, Doctoral student
- **Pierre UGINET**, Researcher
- **Antoine VERRIER**, Researcher
- **Manuel VILLAVICENCIO**, Researcher
- **Julie Hyun Jin YU**, Researcher

2. Governance

STEERING COMMITTEE

The Steering Committee is CEEM's governing body. It sets CEEM's strategic guidelines, validates its prospective budget and controls expenditure. Fixed by the Partnership Agreement, its composition includes partners representatives, the CEEM's Scientific Director, a second University Paris Dauphine-PSL teacher-researcher, a Paris-Dauphine Foundation representative, CEEM's Scientific Advisor and two qualified external persons. The Steering Committee meets twice a year. In 2020, as part of the renewal of its Partnership Convention, four meetings were held on 02 and 29 June, 02 July and 18 December.

CURRENT MEMBERS OF THE STEERING COMMITTEE ARE:

- **Jan Horst KEPPLER**, CEEM Scientific Director and President of the Steering Committee
- **Yannick JACQUEMART**, Director, Department of Power System Economics (DiESE), RTE
- **Vincent RIOUS**, Head of the Centre of Economic Studies of the Power System Economics Department, RTE
- **Jérôme PIGAT**, Head of the Centre of Short-Term Supply-Demand Balance, R&D Department, RTE
- **Patrice BRUEL**, Regulatory Director, EDF
- **Fabienne SALAÛN**, Project Manager, Regulations Department, EDF
- **Philippe VASSILOPOULOS**, Director of Product Design, EPEX Spot
- **Éric FALLAS**, Head of Studies and Applied Models, Total Direct Energie
- **Patrice GEOFFRON**, Professor of Economics, University Paris Dauphine-PSL
- **Sandra BOUSCAL**, Director of the Paris-Dauphine Foundation
- **Fabien ROQUES**, CEEM Scientific Advisor and Compass Lexecon (Observer)
- **David NEWBERY**, Director Cambridge Energy Policy Research Group, Faculty of Economics (non-voting)
- **Graham WEALE**, Honorary Professor for Energy Economics and Politics, Faculty of Management and Economics, Ruhr Uni Bochum (non-voting)

VALIDATION COMMITTEE

The Validation Committee decides on the acceptance of the *Working Papers*, as well as of scientific articles which have not previously been the subject of a *Working Paper*, prepared by CEEM researchers within the CEEM's research incentive program. Each "candidate paper" is sent to the members of the Validation Committee, a first time for comments, and, after the integration of any comments, a second time for validation. The Validation Committee is notified electronically each time a new scientific production is submitted for the application to the research incentive program. Each of the CEEM partners appoints a representative to take part in the work of the Validation Committee. In 2020, the Committee validated 4 *Working Papers* and 2 publications in *Energy Journal* and *Revue Économie industrielle*.

CURRENT MEMBERS OF THE VALIDATION COMMITTEE ARE:

- **Jan Horst KEPPLER**, CEEM Scientific Director
- **Fabien ROQUES**, CEEM Scientific Advisor and Compass Lexecon
- **Yannick JACQUEMART**, Director, Department of Power System Economics (DiESE), RTE
- **Vincent RIOUS**, Head of the Centre of Economic Studies of the Power System Economics Department, RTE
- **Jérôme PIGAT**, Head of the Centre of Short-Term Supply-Demand Balance of R&D Department, RTE
- **Patrice BRUEL**, Regulatory Director, EDF
- **Fabienne SALAÛN**, Project Manager, Regulations Department, EDF
- **Philippe VASSILOPOULOS**, Director of Product Design, EPEX Spot
- **Éric FALLAS**, Head of Studies and Applied Models, Total Direct Energie
- **Romain VERDIER**, Energy Management, Total Direct Energie
- **Patrice GEOFFRON**, Professor of Economics, University Paris Dauphine-PSL
- **Yannick LE PEN**, Associate Professor, University Paris Dauphine-PSL

PARIS-DAUPHINE FOUNDATION

The Paris-Dauphine Foundation manages all CEEM's legal and financial aspects. It is the third partner of the tripartite agreement between CEEM's partners and University Paris Dauphine-PSL, which includes the Paris-Dauphine Foundation. Apart from the teacher-researchers of University Paris Dauphine-PSL's, CEEM employees (coordinator, research assistants), from a legal point of view, are employees of the Paris-Dauphine Foundation. The CEEM, as such, has no legal existence as an employer.



SECTION II: FINANCING LONG-TERM INVESTMENT IN HYBRID ELECTRICITY MARKETS

Chaire European Electricity Markets (CEEM), Université Paris Dauphine–PSL

A new initiative to adapt to the challenges of
the Energy Transition

CONTEXT

The Chaire European Electricity Markets (CEEM) is an economic research chair at the University of Paris Dauphine–PSL supported by its partners RTE, EDF, EPEX Spot and Total Direct Energie. Its research focusses on the decarbonation of electricity generation and the sustainability of long-term investment in the energy transition. It organises regular conferences and seminars to discuss and disseminate its research and is engaged in a systematic effort to assist PhD students and young researchers in developing their careers. In all three areas, research, dissemination, and training, the CEEM is actively developing collaborations with other research centres.

RESEARCH

The latest transversal research theme of the CEEM and its associated researchers is devoted to “Financing Long-Term Investment in Hybrid Electricity Markets”. Major transformations are underway in the electricity sector. The priority of decarbonisation implies investing in an ever more capital-intensive system. Various mechanisms (private or public, freely negotiated or regulated, based partially or entirely on marginal cost or full cost, etc.) have been implemented in order to provide appropriate incentives for low carbon investments as well as better visibility and lower risk for investors. Current energy only markets (EOM) based on prices mainly set by short term marginal cost provide neither, even when complemented by additional markets for capacity, flexibility or system services. A new regulatory framework adopting a broad perspective that is not limited to EOM and revenue stacking from add-on mechanisms is required to allow for efficient solutions that favour competition and least-cost trajectories towards a sustainable energy transition.

Future research will show whether different long-term arrangements and alternative market designs can be conceptualised as part of a single coherent paradigm that would allow empirical verification, publication in scientific journals and the formulation of relevant policy proposals. The current CEEM research effort is organised in the form of six Working Groups concentrating on different areas of research, each coordinated by a senior researcher:

- A. The Empirical Evidence of Full Cost Recovery in Liberalised Electricity Markets** (Graham Weale),
- B. Why Do Electricity Markets Work Differently under Decarbonisation?** (Jan Horst Keppler),
- C. International Benchmarks for Hybrid Market Designs** (Fabien Roques),
- D. The Link between Short Term Dispatch and Long-Term Financing** (Jan Horst Keppler),
- E. Retail Tariffs and Investment** (Carine Staropoli),
- F. Modelling Long-Term Policy Objectives and Market Designs** (Patrick Criqui).

The work in all six research areas aims at verifying current intuitions and hypotheses to allow discussions on financing long-term investment in electricity markets to reach the next level.

I. Presentation Of The CEEM Working Groups

TEAM OF THE CEEM

- **Jan Horst Keppler**, scientific Director and Professor of Economics at University Paris Dauphine-PSL, is responsible for the organisation of the Chaire as a whole, as well as of its research activities.
- **Fabien Roques**, Associate Professor in Economics at University Paris Dauphine-PSL, and Associate Researcher at Cambridge University’s Electricity Policy Research Group, is Scientific Advisor to the CEEM.
- **Patrice Geoffron**, Professor of Economics at University Paris Dauphine-PSL, is responsible for the field “Decentralisation and harmonisation of the links between local grid and the supply/demand balance at both the National and European level”.
- **Fatoumata Diallo**: CEEM Coordinator at University Paris Dauphine-PSL.

PARTNERS OF THE CEEM

- **Yannick Jacquemart**, Director, Department of Power System Economics (DiESE), RTE
- **Vincent Rious**, Head of the Centre of Economic Studies of the Power System Economics Department, RTE
- **Jérôme Pigat**, Head of the Centre of Short-Term Supply-Demand Balance, R&D Department, RTE
- **Patrice BrueL**, Regulatory Director, EDF
- **Fabienne Salaün**, Project Manager, Regulations Department, EDF

- **Philippe Vassilopoulos**, Director of Product Design, EPEX Spot
- **Éric Fallas**, Head of Studies and Applied Models, Total Direct Energie
- **Sandra Bouscal**, Director of the Paris-Dauphine Foundation
- **David Newbery**, Director Cambridge Energy Policy Research Group, Faculty of Economics
- **Graham Weale**, Honorary Professor for Energy Economics and Politics, Faculty of Management and Economics, Ruhr Uni Bochum

COLLABORATORS DESIGNATED BY THE PARTNERS OF THE CEEM

RTE

- **Sandrine Bortolotti**
- **Alexander Bruhns**
- **Gabriel Bareux** (Directeur de la R&D de RTE)
- **Gérald Vignal** (R&D)

EDF

- **Benoît Peluchon**
- **Marcelo Saguan**
- **Khalil Helioui**
- **Théo Dronne**

EPEX SPOT

- **Philippe Vassilopoulos**

TOTAL DIRECT ENERGIE

- **Éric Fallas**
- **Quentin Wojtecki**



SIX WORKING GROUPS

1. WORKING GROUP A

The Empirical Evidence of Full Cost Recovery in Liberalised Electricity Markets

- **Team leader:** Graham Weale (RU Bochum)
- **Charlotte Scouflaire** (Université Paris Dauphine-PSL and ORANO)
- **Benoît Peluchon** (EDF)
- **Sandrine Bortolotti** (RTE)
- **Éric Fallas and Quentin Wojtecki** (Total Direct Energie)

2. WORKING GROUP B

Why Do Electricity Markets Work Differently under Decarbonisation?

- **Team leader:** Jan Horst Keppler (Université Paris Dauphine-PSL)
- **Benoît Peluchon** (EDF)
- **Éric Fallas and Quentin Wojtecki** (Total Direct Energie)

3. WORKING GROUP C

International Benchmarks for Hybrid Market Designs

- **Team leader :** Fabien Roques (Université Paris Dauphine-PSL/ Compass Lexecon)
- **Sandrine Bortolotti** (RTE)
- **Chloé Le Coq** (Université Paris II Panthéon-Assas (CRED))
- **Olivier Rebenaque** (Université Paris Dauphine – PSL)
- **Marcelo Saguan** (EDF)
- **Philippe Vassilopoulos** (EPEX Spot)
- **Rebecca Ly**, Research assistant (University of Cambridge)

4. WORKING GROUP D

The Link between Short Term Dispatch and Long-Term Financing

- **Team leader:** Jan Horst Keppler (Université Paris Dauphine-PSL)
- **Léopold Monjoie** (RTE)
- **Marcelo Saguan** (EDF)

5. WORKING GROUP E

Retail Tariffs and Investment

- **Team leader:** Carine Staropoli (Université Paris 1)
- **Nicolas Astier** (Stanford)
- **Sandrine Bortolotti** (RTE)
- **Cédric Clastres** (GAEL, Université Grenoble-Alpes)
- **Khalil Helioui** (EDF)
- **Olivier Massol** (IFPEN)
- **Yannick Perez** (CentraleSupélec)
- **Manuel Villavicencio** (Deloitte)
- **Léopold Monjoie** (RTE)
- **Clément Cabot** (Deloitte & Mines ParisTech)

6. WORKING GROUP F

Modelling Long-Term Policy Objectives and Market Designs

- **Team leader:** Patrick Criqui (CNRS-Université Grenoble-Alpes)
- **Sandrine Bortolotti** (RTE)
- **Alexander Bruhns** (RTE)
- **Marion Pichoud** (CEEM-Dauphine, RTE)
- **Fabienne Salaün** (EDF)
- **Benoît Peluchon** (EDF)
- **Marie-Alix Dupré La Tour** (RTE)
- **Théo Dronne** (CEEM-Dauphine, EDF)
- **Manuel Villavicencio** (Deloitte)
- **Emmanuel Hache** (IFPEN)

II. Internal Work Seminars

1. WORKSHOP, UNIVERSITÉ PARIS DAUPHINE-PSL, Espace One, 1st Floor, 21 September 2020, 14h30-17h00

This first CEEM workshop brought together 26 researchers and experts specializing in European electricity markets at the Université Paris Dauphine-PSL. Most of them were physically present, some of them participated by video.

Following the welcome by CEEM Scientific Director, Jan Horst Keppler, the participants briefly presented their affiliation, background and research interests to the group. Then, Jan Horst Keppler briefly recalled the context of the energy transition of the research project, the ambition to formulate a first synthesis of results by July 2021 and the nature of the research on the basis of the working document distributed prior to the meeting. All participants welcomed this new research initiative and expressed a willingness to collaborate on the basis of converging research interests as well as shared experiences and data concerning European electricity markets.

After intensive discussions, participants agreed on six specific research areas. The originally proposed four research areas on “Empirical Observation”, “Theoretical Justification”, “International Comparison” and “Articulation of Long-Term Contractualization and Competitive Dispatch” were retained. However, the group considered it necessary to add the two new areas, “Retail Tariffs and Investment” and “Modelling Long-Term Policy Objectives and Market Designs”.

For each area, working groups have been set up and a lead contact has been designated. It was agreed that the working groups would begin to work their area of research. The idea is to conduct an initial literature review, identify key research questions, data or funding needs, and potential deliverables. A further meeting in November 2020 would allow each group to present their exploratory research to the first circle.

2. ZOOM WORKSHOP OF THE SIX WORKING GROUPS, 24 November 2020, 14h30-18h00

Overall presentation of the works and research projects, in the following order, by each working group. 21 researchers and experts attended.

- A. Empirical Evidence and Literature Search** (Graham Weale)
- B. Why Electricity Markets Work Differently under Decarbonisation ?** (JHK)
- C. International Benchmark** (Fabien Roques)
- D. The Link between Short Term Dispatch and Long-Term Financing** (JHK)
- E. Retail Tariffs and Investment** (Carine Staropoli)
- F. Modelling Long-Term Policy Objectives and Market Designs** (Patrick Criqui).

III. Agenda

15 AND 16 FEBRUARY 2021

CEEM SEMINARS ON “FINANCING LT INVESTMENT IN HYBRID ELECTRICITY MARKETS”

Two international workshops on the afternoons of 15th and 16th February will be held in order to confront the CEEM emerging research with that of international experts who are working in the same area. Groups A, B and C will be passing on 15th February and Groups D, E and F on 16th February, always in exchange with the work of international experts.

FROM 1ST FEBRUARY 2021 TO 31 MAY 2021

CALL FOR PAPERS ON “FINANCING LONG-TERM INVESTMENT IN HYBRID ELECTRICITY MARKETS”. SPECIAL ISSUE OF ECONOMICS OF ENERGY AND ENVIRONMENTAL POLICY

JUNE 2021

INTERNATIONAL CLOSING SEMINAR WITH THE PRESENTATION OF THE FINAL INDIVIDUAL OR COLLECTIVE RESEARCH WORK



A N N E X:

Comprehensive Overview Of The Chaire European Electricity Markets (CEEM) Activities – 2020

I. Scientific Research

A. PHD THESES IN PROGRESS

1. “The Efficiency of Short-Term Electricity Markets with Variable Renewables and their Impact on Forward Prices and Hedging Strategies”

- **Ángela Viridiana TORRES CORONA**
- **Thesis funded exclusively by Chaire EEM**
- **Supervision: Jan Horst KEPPLER**

The first year of this thesis was devoted to studying the electricity risk premium’s main composition in the day-ahead electricity market. During the second year of my thesis, the shape of the supply curve in the day-ahead German/Austrian market and its composition factors were studied. The supply curve has changed its shape - to that of an inverted S - due to the increase of electricity produced by variable renewable energy (VRE) and the behavior of inflexible production - nuclear and coal - fuel based energy. In this research, I find that, contrary to what economic theory predicts, the market supply curve is not only shaped by marginal costs but also by factors related to producer’s market expectations - such as the expected demand and the expected production of the closest and cheapest substitutes to generate electricity. These results are remarkable, as they indicate that producers respond in anticipation to factors that may trigger an increase in price volatility. This deliberate change in their production is good for efficiency, as it absorbs some of the shocks in price volatility. In the current year, I aim to study the impact on the price of electricity futures caused by the demand shock during the lockdown period related to the Covid-19 crisis.

2. “Activation and Remuneration of Flexible Distributed Resources: What Incentive Mechanisms for a Global Economic Optimisation in the Context of Emerging Community Markets?”

- **Marion PICHOU**
- **CIFRE thesis with RTE**
- **Supervision: Jan Horst KEPPLER**

This work assesses the value of demand flexibility for production costs, in a probabilistic way, for the day-ahead market for all central Europe in 2030 and compares this value for 3 different degree of flexibility, no consumption flexibility at all, day-ahead controllability of flexible consumption and long-term pricing signal. Then the gain of the use of flexibility on production costs is compared with the reinforcement costs needed by the DSO because of these activations of flexibility in the day-ahead markets, computed on nearly 2000 substations. The consumption flexibilities studied in this work are EV charging, water heaters and electrical heating.

The main results of 2020 are:

The controllability of the load has a lot of value for the production costs and loss-of-load costs. The controllability enables a gain of approximately 1.3 b€ with respect to no controllability, which represents 2% of the total system costs. A large share of this value, 70%, is captured by a long-term pricing signal. The value of flexibility for the production costs overcomes the costs of the needed reinforcements, whatever the signal used (short-term or pricing).

Filtering demand flexibility activations for wholesale markets that are the cause of important network reinforcements is nevertheless a coordination mode between the DSO and markets that tends to optimize global costs.

In 2021, the work will now focus on the coordination of market actors, from day-ahead to balancing markets for flexibility activations with uncertainty. The coordination between the DSO and the market will be designed with a filtering of activation offers at different terms of the short-term markets, before the day-ahead, before the intraday sessions or before the balancing.

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3. “Challenges and Impact on the Design of Electricity Markets due to Emerging Local Systems”

- **Théo DRONNE**
- **CIFRE EDF thesis**
- **Supervision: Fabien ROQUES**

In 2020, Theo Dronne published a CEEM Working Paper co-written by Fabien Roques and Marcelo Saguan, on “Local Flexibility Markets for Distribution Network Congestion-Management: Which Design for Which Needs?” (Working Paper No. 47, December 2020).

He is currently working on market-design for investment in local flexible assets for distribution system operator purposes. He also focuses his dissertation on the coordination between emerging local organization and global system issues.

4. “The Short-Term Supply-Demand Balance of the Electricity System in 2025-50: Impacts of Decarbonisation on the Architecture and Economic Fundamentals of European Balancing Markets”

- **Florent COGEN**
- **CIFRE RTE thesis**
- **Supervision: Fabien ROQUES**

My main research avenues during 2020 were the following:

- ▶ Doing a literature review on electricity markets as a whole, and more specifically on the current state of balancing in Europe and on the future balancing markets. I was able to show the progressive liberalization of the electricity sector, especially during the last 20 years, that led to the current state of the electricity markets and to the different balancing processes across Europe. The literature also explains the theoretical reasons driving the transition from local balancing processes to common balancing markets: to reach an economic optimum, and to support the integration of renewable energy sources on the network. The theoretical design of balancing markets is already broadly discussed. However, there is a lack of practical studies aiming at doing a cost benefit evaluation of this transition, that also take into account the future organization of the balancing markets (namely PICASSO, MARI and TERRE platforms) and an exhaustive representation of physical constraints applied to the generation units. The first part of my thesis will then try to fill this gap, by studying the economic and technical impacts of possible combinations of MARI, TERRE, and the current balancing process used in France for mFRR and RR reserve types (called Mécanisme d'Ajustement, or MA). As the literature indicates that agent-based modeling is well suited for the simulation of complex systems like electricity markets, I looked at existing agent models that would be able to represent the balancing markets described before. I did not find an appropriate one, and I consequently tried to develop a balancing section in a market modeling platform used by RTE, called Prometheus. The last phase of my literature review, which is still ongoing, is to identify ways to model agent's behavior on electricity markets.
- ▶ Developing the balancing section in the Prometheus market simulation platform, given that Long term, Day-ahead and Intraday markets were already implemented. This includes the development of several modules. The first one formulates orders of BSPs (Balancing Services Providers) on the MARI and TERRE markets, according to the technical constraints on their generating units. Then, another module formulates orders of TSOs (Transmission System Operator). The volume of these orders corresponds to the needs of each TSO, and the price is determined depending on its pricing behavior. Finally, I developed a module that could simulate the MA, by gathering the data of all generation units in France and solving the balance problem with the least costly solution, while still complying to the physical constraints applied to all the units.

My goals for 2021 are:

- ▶ To finalize the literature review, especially on agent's behavior;
- ▶ To simulate several configurations of MARI, TERRE and Mécanisme d'Ajustement and to compare the results of these configurations on economic and technical indicators to identify an optimum;
- ▶ To write and then submit an article on this subject by the summer of 2021;
- ▶ To begin the next part of my thesis during the second semester of 2021, that will focus on the impact of decarbonation on Supply-Demand Balance in the context of common balancing markets.

5. “Energy Transition: How Legitimacy Changes in the Discourse of Utilities. Textometric Analysis of 15 Years of CSR Reports”

- Arnaud LEMANT, Executive Doctorate in Business Administration
- Supervision: Patrice GEOFFRON
- Defense planned 21 January 2021

With decentralised networks or self-consumption, will we still need utilities in the future? This research looks at how energy transitions challenges the legitimacy of utility companies. Studying Corporate Social Responsibility reports over the last 15 years and across 12 utilities with statistical discourse analysis shows evolution in the vocabulary and variation across companies. Emergence of concepts such as energy transition, clean power, or carbon footprint, shows how vocabulary changes and integrates new threats and opportunities. This move is heterogeneous, as each company progresses on its own path. But there is an increasing convergence after the Paris Agreement. While utilities relied yesterday on a cognitive legitimacy strongly tied to their traditional role, it has changed into different types of legitimacy. Discourse analysis shows how none of the utilities studied can stay out of energy transition paths.

6. “How Market Design Affects Actors’ Behaviors and Price Formation in an Imperfect Environment: The Case of Capacity Markets”

- Léopold MONJOIE
- CIFRE RTE thesis
- Supervision: Fabien ROQUES

In recent years, the electricity sector has been characterized by the introduction of competition-based mechanisms aimed at solving the problems of adequacy between supply and demand. One of the solutions consists in the implementation of capacity markets, in which the actors owning capacities are remunerated for their availability during critical periods for the system. This remuneration takes the form of a price, which is the result of a confrontation between, on the one hand, the availability of the actors owning capacities and, on the other hand, the demand seeking to cover peaks of consumption during critical periods. Therefore, the effectiveness of such a mechanism is conditioned by price formation, itself being the result of actors’ behaviors and strategies in this mechanism. In this context where any deviation of the price from the true value of additional capacity for the system can cause adverse effects, and where policymakers seem to lack both theoretical and empirical arguments to reach a consensus on the correct market design for capacity markets, the thesis “How Market Design Affects Actors’ Behaviors and Price Formation in an Imperfect Environment: The Case of Capacity Markets?” seeks to provide some answers.

In a first paper, I study the effects of different capacity product designs on investment and production decisions in electricity markets. Using a single project valuation model, we simulate future profits of different generation technologies and we give the investment the options to participate in the capacity market, as well as two managerial options: postponing investment decisions and mothballing the asset. We show that the bidding behavior in the capacity market and production decisions are significantly correlated with the procurement design. Hence, the role of this mechanism in correcting electricity market inefficiencies and the incentive to invest in greener technologies could be significantly altered by the choice of policymakers in product designs.

A second paper studies the implications of different market designs on investment decisions in electricity. We focus our analysis on capacity markets that provide incitation to invest in generation capacity. While the supply function emerges naturally from producers on those markets, the regulator must administratively create the demand function. Hence, its design can take various forms depending on which agents sustain the cost of capacity. To assess each design implication, we introduce an analytical model to represent the interdependencies between three electricity markets: the upstream energy market, the downstream retail market, and the capacity market.

In parallel, I also work on adapting multiunit auction models to capacity markets. Indeed, the literature review shows such models present multiples advantages if we want to understand the specificities of actors’ behaviors in capacity markets: they have proven both their theoretical and empirical robustness in analyzing strategic behaviors in energy markets; they can account for multiple extensions such as allocation externalities, uncertainty, and imperfect information; and they can be used to compare the effectiveness of different market designs.

7. “Analysis of the Economic Challenges Associated with the Integration of Electric Vehicles into the Electricity Network”

- Maria-Juliana SUAREZ FORERO
- CIFRE thesis with Renault (in collaboration with IFPEN)
- Supervision: Patrice GEOFFRON

In the context of the energy transition and the large ambition of carbon neutrality, the Vehicle Grid Integration (VGI) has become a subject of major interest for transportation and power systems stakeholders. It is question of adding value to the Electric Vehicles (EV) fleet when supporting a local or a national electric grid. Several concerns about this technology have appeared and my research looks for recovering and analyzing the benefits and the possible complexities from a technical and an economic point of view. The thesis is focused on France and Germany.

Once the review of the literature achieved, we worked in a study case of VGI application on a local and isolated territory. Till now, these territories depend on fossil energies and EV could be a helpful tool for assisting the required transition through clean energies. We calculated the requirements in Renewable Energies (Ren) power plants for getting the energetic independency and the associated costs with an optimization model that is a merit order model of the electricity system with VGI considering car’s normal usage. We found a potential interest in the use of VGI facilities for decarbonizing the electricity mix. Reduced costs through an optimal utilization of REn production was observed in the results. It is intended to present this study for a possible publication.

Besides the interest from the power system point of view, in this research there is as well an interest on recharge systems. An algorithm developed within the research center of Renault will be used for simulating a future fleet with some millions EV. The proposed algorithm could contribute to decarbonize the electricity mix (or could optimize the charge with another objective) using a virtual battery composed of EV fleet batteries without entailing a significant degradation over lifetime. The remaining work will consider the European policy for energy transition, the perspectives and implications of EV massive adoption and an analysis of market interactions if a storage system with a large capacity is introduced in the electricity unit commitment problem. An accurate model of VGI integration in France and Germany is attended.

B. EUROPEAN COLLABORATIVE RESEARCH PROJECTS

1. The OSMOSE¹ Project:

A [H2020 EU project](#) (2018-2021) led by RTE with 31 partners

2. The Magical Project:

Market and Grid-Oriented Integration of Central and Local Energy Markets

II. Scientific Publications

A. CEEM WORKING PAPERS (WP)

1. Rents of Electricity Generators in France and Germany due to Carbon Trading under Different Allocation Mechanisms (WP 44)

- **March 2020**
- **Authors: Jan Horst Keppler** (Chaire EEM, Université Paris Dauphine-PSL) and **Alexis Paskoff** (École des Mines ParisTech, and Chaire EEM, Université Paris Dauphine-PSL).

Abstract

The European Union Emission Trading Scheme (EU ETS), the key pillar of the EU’s climate policy, establishes a Europe-wide carbon price. With over 50% of allocated carbon quotas, electricity generators are heavily affected by carbon pricing. However, its impact on generators’ rents and profits varies widely from one technology to another and depends on the price of the quotas as well as their allocation mechanism, i.e. auctioning or grandfathering. Based on detailed models of the electricity systems in France and Germany, the present paper establishes precise estimates of the impact of carbon pricing on the profits of power producers in these two countries. The model is based on hourly 2017 price data from the EPEX Spot day-ahead market and fully accounts for fuel switching between coal- and gas-plants of different efficiencies. The paper also discusses the different impacts of auctioning and grandfathering for consumers, low carbon and fossil fuel-based producers as well as government revenues.

Keywords: European Carbon Market (EU ETS), Electricity Markets, Allocation Mechanisms, Inframarginal Rents.

1. Optimal System-Mix Of flexibility Solutions for European Electricity.

2. The European Target Model for Electricity Markets – Achievements to Date and Key Enablers for the Emergence of a New Model (WP 45)

- **March 2020**
- **Author: Fabien Roques** (Associate Professor, CGEMP Université Paris Dauphine-PSL, and Florence School of Regulation, Chaire EEM, Université Paris Dauphine-PSL).

Abstract

The European target model for electricity markets has been shaped over the past three decades by successive legislations and reforms. The initial focus in the 1990s was on creating an integrated market fostering efficient cross border trade and competition, which delivered significant benefits and is still ongoing via the Network Codes and the Clean Energy Package implementation process. However, the paper shows how changing policy priorities in the 2000s focussed on climate change and security of supply have create news challenges for market integration through a revival of national uncoordinated state interventions. European electricity markets have therefore in recent years evolved toward a patchwork of hybrid markets featuring: i) support mechanisms for clean technologies; ii) capacity mechanisms addressing security of supply concerns; and iii) new planning processes to coordinate generation and grid development. The paper then shows how these hybrid markets have a number of common features and explores the conditions for the emergence of a more structured and coordinated new target model, chief among them a more integrated approach towards planning and deployment of key infrastructures, and greater coordination of some of the underlying policies and governance processes.

Keywords: Electricity Market, Liberalisation, Market Design, Integration.

3. Retailers’ Strategies Facing Demand Response and Markets Interactions (WP 46)

- **April 2020**
- **Authors: Cédric Clastres** (University of Grenoble-Alpes, CNRS, INRAE, Grenoble INP, GAEL, 38000 Grenoble, France/ Chaire European Electricity Markets) and **Haikel Khalfallah** (University of Grenoble-Alpes, CNRS, INRA, Grenoble INP, GAEL, 38000 Grenoble, France).

Abstract

Demand response programmes reduce peak-load consumption and could increase off-peak demand as a load-shifting effect often exists. In this research we use a three-stage game to assess the effectiveness of dynamic pricing regarding load-shifting and its economic consequences. We consider a retailer’s strategic supplies on forward or real time markets, when demand is uncertain and with consumer disutility incurred from load-shedding or load-shifting. Our main results show that a retailer could internalize part of demand uncertainty by using both markets. A retailer raises the quantities committed to the forward market if energy prices or balancing costs are high. If the consumer suffers disutility, then the retailer contracts larger volumes on the forward market for peak periods and less off peak, due to a lower load-shifting effect and lower off-peak energy prices.

Keywords: Dynamic and stochastic model, electricity markets, load-shifting, disutility.

JEL codes: C61, D12, L11, L22, L94, Q41.

4. Local Flexibility Markets for Distribution Network Congestion-Management: Which Design for Which Needs? (WP 47)

○ **December 2020**

○ **Authors:** **Théo Dronne** (EDF R&D and Chaire EEM, University Paris Dauphine-PSL, France); **Fabien Roques** (Scientific Coordinator, Chaire EEM/ Associate Professor with University Paris Dauphine-PSL, and the Florence School of Regulation); **Marcelo Saguan** (EDF R&D).

Abstract

With the growth of decentralized resources, congestion management at the distribution level has become a growing issue in Europe. Several initiatives with local flexibility markets are being implemented, with different designs and objectives. In this paper we provide a comparative assessment of four case studies of local flexibility markets (ENERA, GOPACS, UKPN, ENEDIS) in different countries: Germany, the Netherlands, the United-Kingdom and France. We identify a number of differences across these countries that have an impact on drivers of implementation of these local flexibility markets and their market design such as the type and depth of congestion, the organization and governance of networks operators, the current approach for congestion management and the need for the development of additional flexibility sources. We find that the different market design choices can be explained by the local specificities and use the four case studies to generalize our findings and define a typology of possible approaches for flexibility markets depending on the electricity system local specificities, as well as the sector governance and the policy priorities.

Keywords: Local Flexibility Market; Congestion Management; Market-Design.

B. CEEM PUBLICATIONS IN PEER-REVIEWED JOURNALS

1. Revue Économie industrielle

► *“LES EFFACEMENTS DE CONSOMMATION ÉLECTRIQUE ET LE SURPLUS DES ACTEURS ÉNERGÉTIQUES».*

Cédric Clastres (University of Grenoble-Alpes, CNRS, INRAE, Grenoble INP, GAEL (UMR 5313) and Chaire EEM) and Patrice Geoffron (University Paris Dauphine-PSL, LEDa, UMR CNRS-IRD) and Chaire EEM).

2. Revue Energy Journal

► *“AN EMPIRICAL ANALYSIS OF THE BID-ASK SPREAD IN THE CONTINUOUS INTRADAY TRADING OF THE GERMAN POWER MARKET”.*

Clara Balardy (University Paris Dauphine-PSL, LEDa, [SDFi]).

III. Scientific Seminars

1. Research seminars reserved for CEEM Partners

The Chaire European Electricity Markets set up, in 2018, a regular research seminar reserved for its partners and invited academics, aimed at deepening specific research subjects. The objective is to combine cutting-edge research on topical issues with exchanges allowing great freedom of speech.

► 25-02-2020, SEMINAR ON “THE EUROPEAN ELECTRICITY MARKET DESIGN”

KEY SPEAKERS’ PRESENTATIONS:

- **Alberto Pototschnig** (European University Institute, Florence and former Director General of ACER)
- **European Electricity Markets in 2020:** Outlook, Policies, Challenges
- **Fabien Roques** (Compass Lexecon, CEEM, Université Paris Dauphine-PSL and Florence School of Regulation)
- **Thoughts on European Market Design and where To Go next**

2. Paris-Sciences-Lettres Energy Economics Research Seminar

The Paris-Sciences-Lettres Energy Economics Research Seminar is organised jointly by CERN (Mines Paris Tech), CGEMP (University Paris Dauphine-PSL), Chaire European Electricity Markets (CEEM (University Paris Dauphine-PSL)), and i3 (Interdisciplinary Institute for Innovation), members of PSL. It is led by François Lévêque (CERN and Mines Paris Tech), Dominique Finon (CEEM and CNRS-CIRED) and Patrice Geoffron (Director of CGEMP, University Paris Dauphine-PSL).

► 26-02-2020, 48TH SESSION : “QUELS ENJEUX ET MOYENS DE RÉDUIRE LES COÛTS DU CAPITAL DES INVESTISSEMENTS EN PRODUCTION ÉLECTRIQUE ?”

KEY SPEAKERS’ PRESENTATIONS:

- **Nils May** (Senior research fellow, DIW Berlin)
Financing Power: Impacts of Energy Policies in Changing Regulatory Environments
Article co-écrit avec Karsten Neuhoff en cours de publication dans The Energy Journal (Actuellement Discussion Paper DIW-1684).
[Nils May Presentation](#)
- **Benoît Peluchon** (Chercheur senior, EDF-Département R&D)
Market Design and the Cost of Capital for Generation Capacity Investment
[CEEM Working Paper 41-2019](#)

► 27-05-2020, 49TH SESSION : “LA NOUVELLE ÉCONOMIE PÉTROLIÈRE SOUS CONTRAINTE CARBONE”

KEY SPEAKERS' PRESENTATIONS:

- Étienne Billette de Villemeur (Université de Lille, LEM)
Frugals, Militants and the Oil Market
Article co-écrit avec Pierre-Olivier Pineau (HEC Montréal) publié in : Games in Management Science, Springer, 2019.
[Étienne Billette de Villemeur Presentation](#)
- Waldemar Marz (IFO, ifo Institut)
Petrodollar Recycling, Oil Monopoly, and Carbon Taxes
Article co-écrit avec Johannes Pfeiffer, Journal of Environmental Economics and Management, March 2020.
[Waldemar Marz Presentation](#)

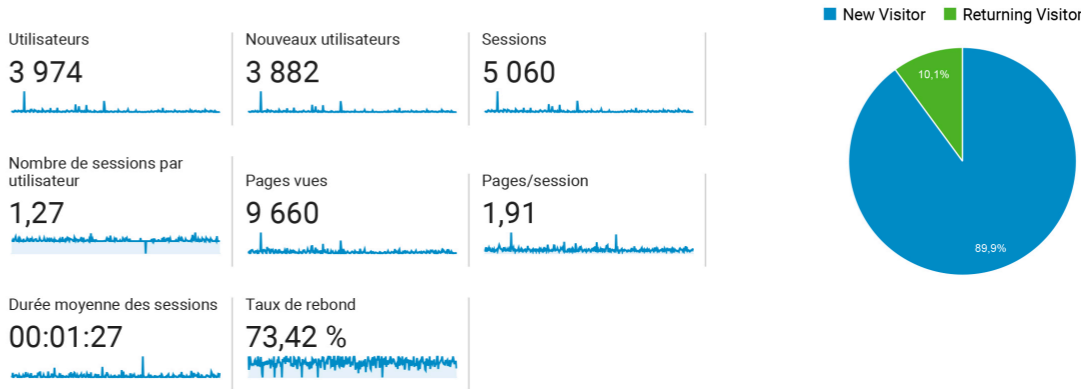
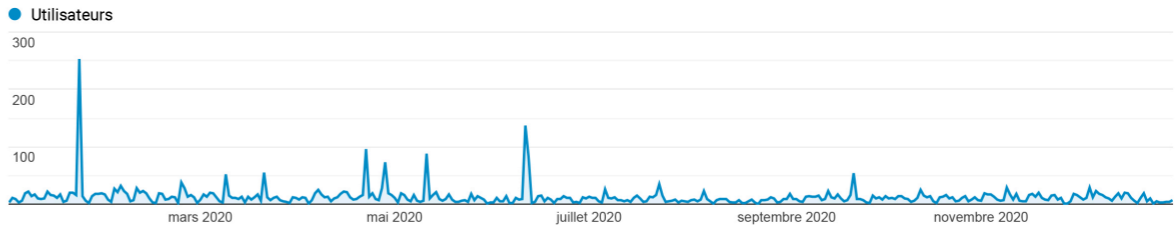
► 23-06-2020, 50TH SESSION : “PRIX DE L’ÉNERGIE, LOCALISATION DES ENTREPRISES ET POLITIQUES INDUSTRIELLES - COMMENT LES POLITIQUES ENVIRONNEMENTALES AFFECTENT LES ENTREPRISES ET LES INDUSTRIES ? QUELLES LEÇONS EN RETIRER?”

KEY SPEAKERS' PRESENTATIONS:

- Aurélien Saussay (Chercheur, London School of Economics-Grantham Research Institute, Sciences-Po et OFCE)
The Impacts of Energy Prices on Industrial Foreign Investment Location
Working Paper du Grantham Research Institute co-écrit avec Misato Sato (GRI Working Paper No. 311, December 2018).
- Antoine Dechezlepretre (Économiste senior, OCDE)
The Impact of Climate Policies on Businesses, Industrial Choices and Performances
The Economic Impacts of Environmental Policies, OECD (Forthcoming).

ADDITIONAL INFORMATION ON THE CEEM

WEBSITE USAGE STATISTICS



Langue	Utilisateurs	% Utilisateurs
1. en-us	1 596	40,07 %
2. fr-fr	1 243	31,21 %
3. fr	575	14,44 %
4. en-gb	169	4,24 %
5. de-de	52	1,31 %
6. ko-kr	37	0,93 %
7. de	36	0,90 %
8. it-it	34	0,85 %
9. es-es	30	0,75 %
10. en	15	0,38 %

WEBSITE

<http://www.ceem-dauphine.org/home/en/>

It allows the dissemination and coordination of CEEM activities and of various CEEM research projects. The “Members” secure access provides several research works and presentations of internal CEEM research seminars.

Several *Working Papers* are online according to a unique model specific to the CEEM:

<http://www.ceem-dauphine.org/working/fr>

All slides of organised scientific events are available online and downloadable.

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