

Winter School on Economics of Energy and Environment

Program and Abstracts of the presentations

Overview

	16 December 2026		17 December 2026		18 December 2026
9:00	Welcome of the participants				
	Morning Keynotes				
9:15	Philippe Quirion CIRED CNRS Amphi Peugeot		Nicolas Astier Paris School of Economics Amphi Peugeot		Afzal Siddiqui Stockholm University Amphi Peugeot
10:45	Coffee break				
11:00	Frank A. Wolak Stanford University Amphi Peugeot		Charles Weymuller EDF Chief Economist Amphi Peugeot		Veronika Grimm University of Technology Nuremberg Amphi Peugeot
12:30	Lunch				
	Afternoon Workshops				Seminars Groups
13:30	Ibrahim Abada GEM Alpine Business School sd.101 - sd.103	Pierre Uginet Grenoble University sd.102 - sd.104	Claire Bergaentzlé Technical University of Denmark sd.101 - sd.103	Lutz Sager ESSEC Business School sd.102 - sd.104	Seminar Groups
15:00	Coffee break				
15:30	Seminar Groups		Seminars Groups		Seminars Groups
17:30	End of the day				
18:00	Ice breaking event and Dinner				



16th of December



Research Director Philippe Quirion (CIRED)



- Title of the presentation : **What questions can and cannot be answered by long-term energy system modeling?**
- Abstract :
 - Long-term energy system modeling at the regional, national or continental scale has been massively used by academics, energy companies and public institutions alike. Among the conclusions from these studies, which ones are robust, given the uncertainties at stake? I base my answer on studies published by the French environmental agency Ademe, the electricity network operator RTE and academics.
 - Due to large uncertainties regarding the relevant discount rate, technology costs and performance, and since the optimum obtained using these models is 'flat on top', there is a large range of uncertainty regarding the optimal capacity of key electricity generation and energy storage technologies. More precise conclusions can be drawn regarding the optimal capacities of renewable energy sources and energy storage in aggregate.
 - The impact of climate change on the energy system depends on the location. For France, a robust conclusion is that little impact is to be expected on wind and solar generation. More uncertain are the impact on hydropower, thermal power plants and air conditioning.
 - This calls for more transparency in the assumptions and models, especially when they aim at enlightning public decisions.

Professor Frank A. Wolak (Stanford University)



- Title of the presentation : **The Engineering Economics of Energy Markets.**

Abstract :

- The vast majority of electricity in the United States and virtually all electricity in OECD countries is supplied through offer-based wholesale electricity markets. An increasing number of these jurisdictions have also adopted policies to promote low-carbon electricity supplies from intermittent solar and wind resources. This shift implies the need for greater coordination power system operation and wholesale and retail electricity market design.
- This lecture discusses the power system engineering, mathematical optimization, and economic modeling concepts necessary to understand how to adapt the electricity market designs to initial conditions in the industry, technical change in the transmission, generation, and retailing sectors and changing energy and environmental policy goals. The lecture begins by contrasting simplified financial wholesale market designs, like those that currently exist in Europe and initially existed in many parts of the United States, with locational marginal pricing (LMP) designs that have been adopted throughout the US. The economics of transmission planning in the wholesale market regime versus the vertically integrated monopoly regime will be discussed. Regulatory mechanisms to ensure long-term resource adequacy across these two regimes will be discussed. A mechanism for distribution network pricing to support the energy transition will be presented and its properties explored empirically.

Professor Ibrahim Abada (Grenoble Alps Business School)



- Title of the presentation : **Mitigating market incompleteness with minor market distortions: The case of negative spot prices for electricity**
- Abstract :
 - Risk-mitigation instruments are essential for fostering investments in renewable electricity-production assets and their role is all the more important in the case of market incompleteness. At the same time, such instruments may induce distortions of competition, thereby limiting the effectiveness of spot markets. A manifestation of such distortions is the increase in negative prices observed in many power markets. However, those negative prices also incentivize investments in storage.
 - The presentation will leverage a bi-level programming approach to propose a framework within which to integrate market distortions when analyzing incompleteness from a policymaker's perspective. The lower level of the framework models the power economy via an equilibrium formulation of the investment problem under risk aversion. A regulator offers a set of risk-mitigation schemes in the form of Contracts for Difference and price markups to foster investments, but these schemes can distort competitive bidding. At the upper level, the central planner tunes the design of contracts optimally so that social welfare is maximized. We provide a tractable reformulation and undertake a thorough numerical simulation inspired by the French power system, which demonstrates the potential for optimally adjusting the risk-mitigation instruments offered to electricity producers to enhance welfare and limit the prevalence of negative prices.

Pierre Uginet (post doctoral researcher at Grenoble Applied Economics Lab)



- Title of the presentation : **Estimating economic impacts of river water shocks: econometric approaches and the importance of spatial and temporal scales**
- Abstract :
 - Empirical environmental economics often faces a fundamental challenge: environmental processes evolve across complex spatial and temporal scales. Identifying causal effects therefore requires not only an appropriate econometric design, but also careful consideration of how environmental shocks and economic outcomes are measured and matched in space and time. Water availability provides a particularly useful setting to illustrate these challenges, as river flows are the outcome of interconnected hydrological processes and may affect economic activity through mechanisms operating over very different time horizons.
 - This presentation discusses different approaches to estimating the economic impacts of changes in river water availability, with a particular focus on the distinction between short-term shocks and persistent changes. These approaches capture different economic mechanisms and raise distinct identification challenges. In addition, a particular emphasis will be placed on the spatial and temporal scales at which data are observed. The description of environmental and economic processes is itself scale-dependent, and the choice of scale can therefore affect both the econometric estimation and the interpretation of the results.
 - The discussion will draw on empirical applications to glacier-fed river systems in South Asia, combining hydrological data with remotely sensed measures of economic activity. Rather than focusing on a single empirical specification, the presentation will use these applications to illustrate how different econometric approaches and data structures can be used to answer different questions about the economic consequences of water availability.

17th of December



Professor Nicolas Astier (Paris School of Economics)



- Title of the presentation: **Central planning strikes back**
- Abstract:
 - The deregulation of electricity markets aimed at improving efficiency along two main temporal horizons. In the short-run, market incentives would improve dispatch and optimize production (fuel procurement, managerial efforts, etc.). In the long-run, having private investors (instead of tax- or rate-payers) bearing the risk of building new power plants would deliver an efficient electricity mix (total capacity and technology shares) and spur innovation. While there is a broad consensus that the first objective was warranted, European policy-makers do not seem to have not fully embraced the second objective.
 - Instead, "hybrid" market designs with heavy-handed public interventions at the investment stage have increasingly prevailed, either implicitly (support to renewables, governments' roles in nuclear, coal and hydropower) or explicitly (capacity mechanisms, contracts-for-difference). Does the persistence of central planning signal its necessity to successfully achieve the energy transition or a (costly?) political reluctance to fully embrace markets in the electricity sector? This presentation will discuss the recent literature as well as an on-going research agenda on this issue.

Dr Charles Weymuller (Chief Economist EDF)



- Title of the presentation : **System Merits and Investment Externalities in Electricity**
- **Abstract :**
 - The value of an investment depends on other investment decisions, generating coordination problems that markets resolve imperfectly. In electricity, the insertion of renewables and storage rapidly changes the value and the risk profile of all the assets in the system. This article develops a unified analysis of interactions between asset values, optimal investment and risk sharing arrangements for electricity. It proposes two sufficient statistics: a vector of system merits gives the marginal social value of assets, and an interaction matrix encodes complementarity and substitutability patterns between assets. System merits guide investment priorities at the margin of a given system, while the interaction matrix describe redistributive effects of sub-optimal investments, which can be large even when capacity deviates little from the optimum.
 - With this analytical framework, we characterize optimal investment under risk-aversion and the consequences of market incompleteness. When risk is not properly shared at the investment stage, investment externalities arise and lead to significant welfare losses. Public support can mitigate this market imperfection, but it should be properly designed not to generate itself investment externalities. Optimal public support trades off the derisking objective against the preservation of investment incentives. Within the class of contracts linear in observable prices, optimal insurance share is lower for assets that generate stronger investment externalities. Technology-neutral auctions provide less derisking but better preserve investment incentives; their optimal perimeter include assets with enough degree of substitutability. Extending the analysis to electricity consumption assets, complementarities with production are large enough to generate multiple equilibria, favoring asset-specific support in joint optimization. A calibration for France using ERAA climate scenarios provides orders of magnitude for optimal mixes and contracts.

Professor Claire Bergaentzlé-Lorenz (DTU)



- Title of the presentation : **The regulatory bias toward capital investment: rethinking grid regulation for digitalisation**
- Abstract:
 - Europe is expected to invest nearly €1.87 trillion in electricity grids by 2050, almost doubling historical investment levels. This investment surge is driven by electrification, renewable energy integration, increasing peak demand, and aging infrastructure.
 - Digital technologies could reduce or delay grid expansion through smarter operation and enhanced maintenance, and thereby alleviate part of this investment effort. However, traditional grid investment based on expanding capacity rather than using assets "smartly" remains the dominant strategy.
 - Yet, a growing body of evidence suggests that current electricity network regulation constitutes a major barrier to the deployment of digital solutions in the grid. This course delves into how economic incentives embedded in grid regulation shape DSO investment decisions between traditional infrastructure expansion and digital alternatives, and explores alternatives to current time-of-use grid tariffs capable of achieving high levels of flexibility without disadvantaging non-flexible users.

Professor Lutz Sager (ESSEC Business School)



- Title of the presentation : **"Distributional Analysis of Environmental Policies: An application to Low Emission Zones"**
- Abstract :
 - Environmental degradation and economic inequality are two of the defining challenges of our time. The past decade has seen a resurgence of interest in inequality and distributional questions within environmental economic research. This presentation explores the intersection of environmental regulation and economic inequality. It begins with an overview of the economics of inequality and the environment, drawing on key findings from a conceptual review article published in the Journal of Economic Literature (Drupp/Kornek/Meya/Sager, 2025).
 - Special emphasis will be given to questions with great policy relevance, as well as open questions at the research frontier. Then, I will present an application from on-going work, which use high-resolution spatial data to estimate the distributional effects of Low Emission Zones in Germany (Bos/Drupp/Sager, 2025).

17th of December





- Title of the presentation : **Rethinking Energy Market Design in a Changing Geopolitical and Technological Environment**
- Abstract :
 - Geopolitical shifts, the transition toward climate neutrality, and rapid technological change are fundamentally reshaping the environment in which energy systems operate. Energy systems must simultaneously decarbonize, accommodate rapidly growing electricity demand from AI and other new uses, and become more resilient to geopolitical risks. At the same time, intensifying international competition and increasingly constrained public finances make cost-efficient solutions more important than ever. These developments call for a reassessment of energy market design and the policy instruments guiding the transformation.
 - The talk examines selected elements of energy market design based on recent research and discusses how they can be adapted to changing requirements. It focuses on capacity mechanisms in electricity markets as well as mechanisms for procuring gas and renewable energy carriers used as feedstocks. These examples illustrate how market design and the regulatory and institutional framework set by governments could evolve to ensure cost efficiency, security of supply, and resilience under changing conditions.

Professor Afzal Siddiqui (Stockholm University)



- Title of the presentation : **Heat and Power: Sector Coupling and Strategic Incentives in Sweden's Electrification Pathway**
- Abstract :
 - Besides adoption of variable renewable energy (VRE), decarbonisation envisages coupling between heat and power sectors via heat pumps (HPs). Accordingly, HPs are to anchor Sweden's electrification pathway but could bolster firms' market power with ensuing distortions. Using a Nash-Cournot model, we examine HPs' effects on economic and environmental outcomes. Under perfect competition, HPs lower both electricity prices and CO₂ emissions relative to the current baseline as nuclear generation is less crowded out by combined heat and power plants.
 - Yet, HPs not only enhance nuclear plants' prominence but also facilitate their generation withholding, thereby reducing welfare and increasing CO₂ emissions. Meanwhile, hydro reservoirs' temporal arbitrage becomes more effective as HPs render electricity scarcer during the winter and fall. Thus, hydro reservoirs' withholding water during such peak seasons only to "dump" it in off-peak ones exerts greater leverage. Finally, VRE expansion can mitigate, but not eliminate, these distortions from strategic behaviour.

Applications are expected for October 7 2026

Application: PhD students and junior post-docs can send their application until **October 7, 2026:**

1. A short letter of motivation with a detailed description of the dissertation topic.
2. A curriculum vitae with a description of research achievements.
3. A working paper/publication or a detailed description of the research topic to be presented at the Winter School.

These documents should be sent as one pdf file by email to Dr. Kerstin Bernoth, Dean of the DIW Graduate Center, and Ms. Ina Mueller, coordinator of the DIW Graduate Center: gradcenter@diw.de

In case you have questions, please contact: gradcenter@diw.de