Energy Economics and Climate Policy

Course title – Intitulé du cours	Energy Economics and Climate Policy
Level / Semester – Niveau /semester	M2 / S2
School – Composante	Ecole d'Economie de Toulouse
Teacher – Enseignant responsible I	Stefan Lamp (TSE)
Teacher – Enseignant responsible II	Mario Samano (HEC Montreal)
Other teacher(s) - Autre(s) enseignant(s)	Mauricio Bermudez (Accenture, London)
Lecture Hours – Volume Horaire CM	30
Course Language – Langue du cours	English

Teaching staff contacts – Coordonnées de l'équipe pédagogique :

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Course Objectives – Objectifs du cours :

Over the past decades, energy markets have become some of the most dynamic markets of the world economy. Traditional fossil fuel and electricity markets have shifted from heavy regulation to market-driven incentives. At the same time, growing environmental concerns have led to a number of new regulations and "environmental markets". The growth of renewable energy is another source of rapid change, bringing a new set of technological and policy challenges. This course on "Energy Economics and Climate Policy" aims to provide a detailed introduction to issues in energy markets and climate change economics. It is divided into three main blocks.

Block A provides an overview of energy-related economic research. It begins with a discussion of the underlying arguments for environmental regulation and develops the use of economic incentives (Pigouvian fees, permit markets) as opposed to more prescriptive types of regulation. This block also

covers empirical methods of causal inference and how they can be applied in the context of environmental policy evaluation. A second focus of this first block is the analysis of auctions in electricity markets, both in the wholesale market as well as in procurement auctions for new capacity.

Block B delves further into the analysis of electricity markets, with a focus on game-theory models of competition and their numerical solution. Calibration of these models is achieved using real-world data and Python, providing a base into quantifying the impact of technology-specific taxes and subsidies on equilibrium outcomes. The course then extends this model by introducing long-run models of investment and operations, enabling the computation of optimal investment levels in response to the expansion of renewables and the accompanying supply volatility. Electricity storage, considered the next technological wave in electricity markets, is also explored. The block concludes with non-model based approaches for predicting quantities and prices within electricity markets, utilizing Python for practical applications.

Finally, **Block C** will focus on policy issues related to carbon markets, such as the EU ETS. Mauricio Bermudez Neubauer, Principal Director at Accenture Strategy, will provide a detailed overview of the evolution of the EU ETS and discuss the challenges of emerging carbon markets.

Prerequisites – Pré requis :

This course does not have any formal prerequisites; however, it will be useful if students show a good understanding of intermediate microeconomics. Knowledge of applied econometrics will be useful for the discussion of empirical papers.

Practical information about the sessions – Modalités pratiques de gestion du cours :

This course does not rely on any textbook, but will use a variety of research articles, market data, and policy reports. All assigned readings, except book chapters, will be made available in advance online through the moodle course page. Slides will be made available after each lecture. Students are expected to read the papers assigned for the class and participate actively in class discussions.

Grading system – Modalités d'évaluation :

Students will be evaluated on the presentation of a research paper and a research proposal. Attendance is mandatory and class participation is part of the final grade.

- Group paper presentation (40%)
- Individual research proposal (50%)
- Attendance and class participation (10%)

Bibliography/references – Bibliographie/références :

This course is mostly based on published scientific articles and policy reports. Mandatory readings will be made available through the Moodle course page together with lecture notes, and any exercises.

Distance learning – *Enseignement à distance :*

Additional materials will be provided on the Moodle course website. One or several of the lectures might be given online.

Session planning - Planification des séances :

A. Empirical Methods in Energy Economics (Lamp, 9 hours)

1. Impact of environmental regulation on regulated firms
    a. Causal methods in energy and environmental economics
    b. The impact of the EU-ETS and environmental policy on firm-level outcomes
2. Analysis of auctions in electricity markets
    a. Wholesale electricity auctions
    b. Capacity auctions for renewable energy sources

B. Recent Advances in Energy Market Modeling (Samano, 15 hours)

3. General market issues in the electricity sector
    a. Generation, transmission, and distribution
    b. Use of empirical IO techniques to study electricity sector (Applications in Python)
4. Market power and renewables
5. Long-run models of investment and operation
6. Electricity storage
7. Using Machine Learning for predictions of quantities and prices in electricity markets (Applications in Python)

C. Policy-related questions in emission markets and energy trading (Bermudez, 6 hours)

8. The history and future evolution of the EU-ETS
9. Energy and carbon trading