Workshop

Economic Challenges for Energy

Madrid, 30-31 January 2012

FUNDACIÓN RAMÓN ARECES

economics for energy

With the collaboration of

Program

Monday, 30 January

9.00	Welcome address
9.05 -11.00	**Energy demand and energy efficiency**
	Energy efficiency policies, *Maximilian Auffhammer (Berkeley)*
	Energy efficient buildings, *Nils Kok (Maastricht)*
11.00 - 11.30	Coffee break
11.30 - 13.30	**Energy security**
	Quantifying oil price risks, *Lutz Kilian (Michigan)*
	Indicators of energy security in industrialized countries, A*ndreas Loschel (ZEW)*
13.30 - 14.30	Lunch
14.30 - 16.30	**Innovation in energy**
	Investments in new energy technologies, *Guy Turner (Bloomberg NEF)*
	Incentives in R&D, *David Pérez-Castrillo (UAB)*
16.30 - 17.00	Coffee break
17.00 - 19.00	**Energy and climate policies**
	The UK electricity market reform, *Alex Henney (EEE Ltd.)*
	Transport policies, *Stef Proost (KU Leuven)*
21.00	Dinner
	Guest speaker on costs of low-carbon technologies: *Valentina Bosetti (FEEM)*

Tuesday, 31 January

9.00 - 11.00	**Long-term energy and regulatory prospective**
	PRIMES and the 2050 energy roadmap, *Pantelis Capros (NTUA)*
	Strengths and weaknesses of low-carbon policy strategies after 2020 *Ignacio Pérez-Arriaga (Comillas)*
11.00 - 11.30	Coffee break
11.30 - 13.00	**Open session: The impact of oil demand and oil supply shocks on the real price of oil and on the economy,** *Lutz Kilian (Michigan)*
13.00 - 14.00	**General Assembly, Economics for Energy**

Energy efficiency policies

Global Climate Change is predicted to lead to significantly higher mean summer temperatures with significant increases in the number of extreme heat days. Households react to higher temperatures by purchasing air conditioners or more intensive use of their existing air conditioning equipment. In this presentation four studies will be described, which simulate the impacts of higher temperatures resulting from anthropogenic climate change on residential electricity consumption for California. Results for peak load and consumption at the grid level will be discussed as well as impacts based on a comprehensive household level dataset of billing data for California's three investor-owned utilities (Pacific Gas and Electric, San Diego Gas and Electric, and Southern California Edison). Finally, simulations consistent with higher adoption of cooling equipment in non-saturated areas will be conducted, as well as gains in efficiency from aggressive energy efficiency policies. The presentation will end with a comparison of air conditioner penetration in the United States versus China.

Energy efficient buildings

This presentation will look at the economics of "green" building, following the recent surge in investments in the energy-efficiency and sustainability of buildings during an unprecedented contraction in economic activity. The market implications of energy efficiency and sustainability in commercial and residential property market will be documented using large cross-sections of office buildings which have been "certified" by the U.S. Green Building Council and U.S. Department of Environmental Protection and a cross-section of residential dwellings that have been certified under the European EPBD scheme. The presentation will indicate that the analyses of large samples of buildings show how the attributes rated for both thermal efficiency and sustainability contribute to premiums in rents and asset values, both in the US and in Europe, providing evidence on market efficiency in pricing thermal efficiency.

Quantifying oil price risks

When discussing an economy's energy security, the first and foremost question is what oil price risks this economy faces. These risks arise from unpredictable fluctuations in the real price of oil in global markets. This presentation discusses improved real-time methods of forecasting the real price of oil at horizons up to one year. I contrast the resulting forecasts with actual outcomes for 1990-2010 and with the predictions of alternative forecasting methods such as oil futures prices or no-change forecasts. I also discuss the construction of forecast scenarios. Forecast scenarios allow us to assess the effects of hypothetical events on oil price forecasts. Examples include a global recovery, a financial crisis, an unexpected oil supply disruption, or a period of growing political tension in the Middle East resulting in speculative pressures.

Indicators of energy security in industrialized countries

The German government is about to drastically transform Germany's energy system. The long-term strategy has to be governed by energy security, economic efficiency and environmental compatibility of energy supply. In the presentation, a concept for a regular monitoring of the German energy policy will be presented. For each of the three objectives, indicators will be selected using existing studies and publicly available data, and an appropriate representation or aggregation form will be discussed.

Investments in new energy technologies

Technology has always dictated the choices made around energy provision. This presentation will review the role of emerging clean technologies, their costs and potential future role in the energy mix, based on the extensive database of Bloomberg New Energy Finance about current investments in this sector. This database collects most investments in renewable energy across the world, including their actual costs. The presentation will also address the evolution of carbon prices in the short term, based on the analysis carried out by Bloomberg.

Incentives in R&D

Firms' incentives to invest in R&D in order to develop a new product or a new production process are often too low. Similarly, their incentives to take to the market embryonic technologies so that these can be improved and to develop good management practices are also typically too low. In both cases, the reasons are related to the knowledge spillovers and to the fact that these decisions are expensive and highly risky. Nowadays, this problem appears, in particular, in energy markets, which face major environmental, security, and economic challenges. Most governments are aware of this situation and have proposed policies to affect firms' incentives. In this session the main rationales for the existence of subsidies to promote new technologies and some basic characteristics of efficient policies will be discussed.

The UK electricity market reform

The British government (unwisely) accepted a target under the Renewables Directive of 15% of total consumption, which translates into about 30% for the electric industry by 2020. This will only be achieved by some 30GW of wind, the majority of which is offshore and very expensive. A great deal of wind reduces the average price level of a market and also makes prices very volatile, undermining the investment role of a market. Thus it is necessary to have some form of capacity support for the gas turbines required to back up the windmills, which has been a source of much debate. The government furthermore hopes that up to eight nuclear plants will be built, which requires support by way of contracts. Achieving these (impossible) objectives requires both de-facto central planning and a restructuring of the electricity market, which in reality will not really be a market.

Transport policies

This presentation will examine, from a world perspective, long-term trends and broad policy options related to the road transport sector and its congestion, energy and environmental impacts. A brief review of long-term projections of demand for road transport suggests that problems related to road network congestion and greenhouse gas emissions are likely to become more pressing in the future than they are now. Next, from a macroscopic perspective, three policy measures aimed at addressing these problems will be reviewed: stimulating shifts in transport modes to decrease congestion and greenhouse gas emissions, boosting low carbon technology adoption to reduce greenhouse gas emissions and increase reliability of supply, and regulating land use to reduce road transport volumes. It will be hightlated that, although these policies can produce tangible results, they may also have unintended and costly consequences.

Guest speaker on costs of low-carbon technologies

The dinner presentation will review European expert surveys on the cost of low-carbon technologies and the effect of R&D in this area. There will be a special discussion on the integration of such future technologies in energy models, taking into account the uncertainty on costs. The presentation will deal with long-term CO_2 prices.

Long-term energy and regulatory prospective

The PRIMES energy model has been used to quantify alternative scenarios to 2050 for the EC Energy Roadmap. These scenarios consider different policy scenarios and technology penetrations, and result in different costs, carbon emissions and technology mixes. The presentation will provide an overview of the main projection results and will draw conclusions from comparing alternative pathways to 80% emission reduction by 2050 in the European Union.

PRIMES and the 2050 energy roadmap

The PRIMES energy model has been used to quantify alternative scenarios to 2050 for the EC Energy Roadmap. These scenarios consider different policy scenarios and technology penetrations, and result in different costs, carbon emissions and technology mixes. The presentation will provide an overview of the main projection results and will draw conclusions from comparing alternative pathways to 80% emission reduction by 2050 in the European Union.

Strengths and weaknesses of low-carbon policy strategies after 2020

In its March 2011 Communication "A Roadmap for moving to a competitive low carbon economy in 2050", the EU Commission commits to a reduction of greenhouse emissions of more than 80% by 2050. The subsequent 2050 Energy Roadmap examines how the EU energy sector can contribute with an 85% reduction of CO_2 emissions and an almost fully decarbonized electric power sector. The analysis of a set of diverse plausible scenarios allows the identification of likely common traits of the future energy model that could help in shaping the policy strategies for the post-2020 period. The conclusions, achievements, possible weaknesses and credibility of the Roadmap will be highlighted and offered for debate.

The impact of oil demand and oil supply shocks on the real price of oil and on the economy

There is overwhelming evidence that the real price of oil is endogenous with respect to the global economy. The presentation focuses on the determinants of the real price of oil since the 1970s with special emphasis on events since 2003. I examine in particular the role of speculation in oil markets, of peak oil, of supply decisions by oil producers, and of unexpected fluctuations in the demand for oil driven by the global business cycle. I also discuss models of the transmission of oil price shocks and why the distinction between different oil demand and oil supply shocks matters for this transmission. I outline implications for monetary policy responses to oil price shocks.

Maximilian Auffhammer, *Department of Agricultural and Resource Economics, University of California at Berkeley, U.S.*

Maximilian Auffhammer received his B.S. in environmental science from the University of Massachusetts at Amherst in 1996, a M.S. in environmental and resource economics at the same institution in 1998 and a Ph.D. in economics from UC San Diego in 2003. Professor Auffhammer joined the faculty at UC Berkeley in 2003 where he researches on environmental and resource economics, energy economics and applied econometrics. His research has appeared in the American Economic Review, the Review of Economics and Statistics, the Economic Journal, the Proceedings of the National Academies of Sciences, the Journal of Environmental Economics and Management, the Energy Journal and other academic journals. He serves on the editorial board of the Journal of Environmental Economics and Management, is a Research Associate at the National Bureau of Economic Research in the Energy and Environmental Economics group, a Humboldt Foundation Fellow, and a lead author for the Intergovernmental Panel on Climate Change (IPCC). Professor Auffhammer is the recipient of the 2007 Cozzarelli Prize awarded by the National Academies of Sciences, the 2009 Campus Distinguished Teaching Award and the 2007 Sarlo Distinguished Mentoring Award.

Nils Kok, *Department of Finance, University of Maastricht, the Netherlands***.**

Dr. Nils Kok currently holds a position as an associate professor in Finance and Real Estate at Maastricht University, the Netherlands. He spent the past two years as a visiting scholar at the Haas School of Business, UC Berkeley, and is Affiliated Faculty at the Berkeley Program on Housing and Urban Policy. Nils is the recipient of a prestigious three-year grant from the Dutch National Science Foundation for his work on energy efficiency and sustainability in the real estate sector. He also received awards from the United Nations Principles for Responsible Investment, Investment & Pensions Europe, the European Social Investment Forum, and the Aareal Bank/European Business School for his research. Nils Kok is co-founder of the Global Real Estate Sustainability Benchmark (GRESB) Foundation; an investor-led initiative to assess the environmental performance of the global real estate investment industry. Besides being active as an executive teacher at the Luxembourg School of Finance, the Amsterdam Institute of Finance, and the Amsterdam School of Real Estate, he communicates his ideas and findings in the international arena as a frequent speaker on academic and industry conferences and actively shares his expertise through workshops with investment practitioners and policy makers. His research has appeared in leading academic journals such as the American Economic Review, the Review of Economics and Statistics, the European Economic Review, Real Estate Economics and the Journal of Environmental Economics and Management.

Lutz Kilian, *Department of Economics, University of Michigan, U.S.*

Lutz Kilian, Professor of Economics, received his Ph.D. in Economics from the University of Pennsylvania in 1996 and his M.A. in Development Banking from The American University in 1988. He joined the faculty at Michigan in 1996. Prior to his Ph.D., he worked for the research department of the Inter-American Development Bank in Washington, DC. During 2001-03 he served as an adviser to the European Central Bank in Frankfurt/M., Germany. Professor Kilian has been a research visitor at the Federal Reserve Board, the European Central Bank, and the International Monetary Fund. He has also been a consultant for the International Monetary Fund, the Inter-American Development Bank, the World Trade Organization, the European Central Bank, the Bank of Canada, and the European Parliament, among others. He has published over 50 articles that have appeared in leading general interest and field journals in economics and statistics. His research interests include time series econometrics, empirical macroeconomics, and energy economics. Most of his recent research has concerned itself with the sources of fluctuations in

the price of oil and with the transmission of energy price shocks. He has also published on topics in empirical macroeconomics and in international finance including the specification of monetary policy rules, the quantification of deflation risks, the role of sticky prices in business cycle models, and exchange rate predictability. Finally, he has worked extensively on topics in time series econometrics with a special focus on bootstrap methods of inference for autoregressions, on impulse response analysis, on forecasting, and on testing predictability. Over the years, Professor Kilian has been an Associate Editor of the Journal of Business and Economic Statistics, the Journal of Development Economics, and the Journal of Economic Dynamics and Control, among other journals. He is a research fellow of the Centre for Economic Policy Analysis, the Center for Financial Studies, and the Euro Area Business Cycle Network.

Andreas Löschel, *Centre for European Economic Research (ZEW), Germany.*

Professor Andreas Löschel is head of the department "Environmental and Resource Economics, Environmental Management" at the Centre for European Economic Research (ZEW) and Professor of Economics at the University of Heidelberg. He serves as Lead Author in the Working Group III contribution to the IPCC Fifth Assessment Report (2010-2014) and is Research Associate at the Centre for Climate Economics and Policy, Crawford School of Economics & Government, Australian National University (ANU) in Canberra. Between 2005 and 2007, he was working as Scientific Officer for the European Commission at the Institute for Prospective Technological Studies, Seville, Spain. He was visiting scholar at the Massachusetts Institute of Technology (MIT) (2003), Stanford University (2005) and ANU (2010) as well as visiting professor at the Universidad Pablo de Olavide, Seville (2006-2007). Löschel studied Economics at Erlangen-Nuremberg (Diplom-Volkswirt), the University of California, at Los Angeles (UCLA) and Wayne State University, Detroit (M.A.). He obtained his PhD from the University of Mannheim (2003) and his Habilitation in Economics from the University of Oldenburg. His research interests are international environmental economics, especially the economics of climate change and energy policy, and quantitative economic modeling. He has published widely in these areas. The Handelsblatt ranking of German speaking economists lists him consecutively among the Top-100 Economists under 40 (2007-2010).

Guy Turner, *Bloomberg New Energy Finance, UK.*

Guy Turner is founder and director of the Carbon Markets division in Bloomberg New Energy Finance. With 20 years experience as an analyst and consultant he has worked extensively in the field of environmental economics, climate change, renewable energy and emissions trading. Guy has spent much of his career analysing the theoretical and practical application of market based instruments to promote low carbon investments covering renewable energy and energy efficiency measures. He has advised numerous companies on the business implications of the Kyoto mechanisms and the EU ETS, and has worked for several governments to help design and implement clean energy and low carbon policies. At Bloomberg New Energy Finance he directs the company's research to provide detailed insight into the world's environmental markets including carbon and renewable energy credit trading schemes. He also oversees the company's macro economic analysis and consulting work. In the carbon markets this includes provision of regular forecasts of prices in the European, Global, North American and Australian emissions trading systems as well as the voluntary carbon market. Bloomberg New Energy Finance's clients include many of the world's largest investment banks, energy companies and asset managers, as well as influential governments and NGOs. Guy Turner holds degrees in Economics and Engineering from the University of Birmingham, an MSc in Environmental Policy from Manchester University and is a graduate of the London Business School Corporate Finance Programme. He is also founding participant and active member of the Carbon Market Investors Association and a member of the Barclays Environmental Markets Index Committee.

David Pérez-Castrillo, *Department of Economics, Universitat Autònoma de Barcelona, Spain.*

David Pérez-Castrillo is professor of Economics at Universitat Autònoma de Barcelona, institution that he joined after receiving his PhD from Ecole des Hautes Etudes en Science Sociales (Paris). His main research interests are economics of innovation, economics of information, and mechanism design. He has published on these topics in leading international journals and is associate editor of the Journal of Economics and Management Strategy, and SERIEs: the Journal of the Spanish Economic Association. He is a fellow at MOVE, CESifo, and Barcelona GSE. He received the Distinction of the Catalan Government for Young Researcher in 2001, the Arrow Prize in Theoretical Economics in 2006, and the ICREA Academia Award in 2008. He has been visiting professor at University of California San Diego, University of Copenhagen, Katholieke Universiteit Leuven, Universidade de Padova and Canterbury University. David Pérez-Castrillo is also director of the Master in the Economics of Science and Innovation and has been general secretary of ASSET (South European Association in Economic Theory), director of the International Graduate Program in Economics IDEA, president of the Social Science Committee for the Catalan Committee of Research Evaluation, and officer of the Executive Committee of the European Association of Research in Industrial Economics.

Alex Henney, *EEE Ltd., UK.*

Alex Henney studied engineering at the Universities of Bristol and Virginia, with an English Speaking Union/Du Pont Fellowship and a Fulbright Scholarship, and some economics at the London School of Economics. Had a varied career including time in McKinsey; seconded to the civil service for a while; appointed chairman of the London Electricity Consultative Council and board member of London Electricity. In 1987 published Privatise Power, which was the first report in Britain (Europe?) to advocate a competitive restructuring of the electric industry with a pool. Subsequently, he worked with the government during the early days of restructuring and then advised extensively in Britain, Europe, North America, and ANZAC. He undertook comparative international studies of various facets of electricity industries including "Ensuring generation adequacy"; "The practices and principles of transmission pricing in competitive markets"; "An international assessment of competitive power markets"; "Electric mass marke retailing"; "Smart Metering"; and "The impact of wind on power markets and transmission". Alex was the founding secretary of the international Association of Power Exchanges and has published various articles in the Electricity Journal, Public Utilities Fortnightly, Power UK, and Utilities Weekly and published four books: "The economic failure of nuclear power in Great Britain" (1989); "The electricity industries of eleven west European countries" (1992); "The privatisation of the electricity supply industry in England & Wales" (1994); "The British Electric Industry 1990-2010: the rise and demise of competition" (2011).

Stef Proost, *Department of Economics, Katholieke Univesiteit Leuven, Belgium.*

Stef Proost is professor at the Catholic University of Leuven, where he teaches transport, environmental and energy economics at the Faculty of Economics and Business and at the Engineering Faculty.. He is director of a group of researchers at the Center for Economic Studies that deals with environment, energy and transport topics. He is co-founder of the Energy Institute of the KULeuven and co-founder of the spin-off Transport Mobility Leuven (TML)). Stef is is specialised in using mathematical models to address public policy questions: optimal pricing and investment in transport, choice of policy instruments for environmental policy, energy pricing questions. He is co-author of the models TRENEN, TREMOVE, MOLINO, MARKAL and GEM-E3 that are used widely in the EU. He coordinated and participated in several European research consortia (TRENEN-II, FUNDING, GEM-E3, PRIMES, MARKAL, CAPRI, AUTO-OIL 2, UNITE, MC-ICAM, REVENUE, etc.). He has served as expert for EU Administrations for Transport, Environment, Energy and Economic and Financial affairs, for OECD, UIC, for the Federal and Regional governments of Belgium and for several other national governments as well as for private firms in the energy and transport sector.

Valentina Bosetti,*Fondazione ENI Enrico Mattei (FEEM), Italy.*

Valentina Bosetti holds a PhD in Computational Mathematics and Operation Research from the Università Statale of Milan and a Master Degree in Environmental and Resources Economics from University College of London. She works as a modeler for the Sustainable Development Programme and as Climate Change topic leader at FEEM since 2003, coordinating a research group on numerical analysis of carbon mitigation options and policies. She has published several papers in the field of economics of climate change policy, including some linking forest management to the climate change policies. Valentina is currently the holder of a ERC grant on innovation in energy technologies.

Pantelis Capros, *Department of Electrical and Computer Engineering, National Technical University of Athens, Greece.*

Pantelis Capros is a Professor of Energy Economics and Operation Research at the Department of Electrical and Computer Engineering of NTUA, and heads the E3M-Lab at ICCS. Capros holds an engineering degree from NTUA, three Master Degrees in Economics, Informatics and Operations Research form ENSAE, University of Dauphine and a Doctorat d'Etat (PhD) in Mathematical Economics from University Pierre et Marie Curie. He has widely published (more than 100 publications) in the areas of Energy Modelling, Macroeconomics, Operations Research and Mathematical Programming. He has built and used a variety of large-scale mathematical models and has more than 25 years of experience in research, consultancy and studies. Pantelis has been the first Chairman of the Regulatory Authority for Energy in Greece (2000-2005), member of the Board of Directors of the Public Power Corporation (1995-2000), visiting Professor at University of Paris Sorbonne for 5 years and researcher at CEA in France (1979-1984) and is a founding member of the European Energy Institute.

Ignacio Pérez-Arriaga, *Instituto de Investigación Tecnológica (IIT), Universidad Pontificia Comillas, Spain.*

Ignacio Pérez-Arriaga is MS and PhD in Electrical Engineering from MIT, and Electrical Engineer from Comillas University in Madrid, Spain. Professor and Director of the BP Chair on Sustainable Development at Comillas University (Madrid, Spain), and founder and director of its Institute of Technological Research he is permanent visiting professor at the Center for Energy and Environmental Policy Research (MIT). Ignacio has been Commissioner at the Spanish Electricity Regulatory Commission (1995-2000), and is presently Independent Member of the Single Electricity Market Committee of Ireland and Member of the Board of Appeal of the Agency for the Coordination of Energy Regulators (ACER) in the EU. He is also Director of Training at the Florence School of Regulation, European University Institute, Florence, Italy and acts as consultant for governmental agencies or electric utilities in more than 30 countries. Ignacio is also Member of the Spanish National Academy of Engineering and Fellow of the IEEE, review editor of the 5th Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) and Member of the Advisory Group of the Energy Roadmap 2050 for the Energy Directorate of the European Commission. He has published more than 150 papers and supervised more than 20 doctoral theses on topics related to sustainability, power system regulation and other issues related to engineering and economics.

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