

**Workshop:**  
**The changing role of economics and economists in nuclear  
policy and politics: cross-country and cross-temporal  
comparisons**

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**Abstracts and author bios**

**1. Laurent Joudon, EDF**

**Some insights into the role of economics and economists in nuclear  
policy**

Economists are supposed to help public and private decision-making. It is especially expected when capital-intensive, long timescale investments are at stake. In a field like nuclear power generation (there are many others), where decisions must rely on a democratic process, economists are also invited to feed public debates with quality input and help citizens to build well-educated opinions. Quality input means verifiable data, explicit and challengeable hypotheses and methodologies, systemic approach, as well as carefully described key factors and implications. This is all the more important since uncertainty is a significant characteristic of policymaking in this area. Economists should produce knowledge and material to allow people to agree or disagree with their findings, but they should not deliver opinions in disguise.

This may be illustrated through four examples, which are also four questions and four fields for research (and communication) in energy economics. 1) Is nuclear indispensable in a desirable future energy mix? Accurate scenario modeling is needed, with explicit hypotheses and carefully drawn implications. 2) Is nuclear competitive? Competitiveness is a relative notion, which depends on issues such as externalities, discounting, and the vision of the power generation system. 3) Can we assess the social cost of a nuclear accident? This question is linked to the question of safety governance. 4) Will (liberalised) markets deliver the socially desirable outcome? In other words, how to reconcile social and investors' points of view?

**Laurent Joudon** is the head of long-term economic studies within the EDF strategy & prospective division, conducting studies on supply & demand equilibrium and energy

scenarios, cost and competitiveness of technologies, investment choices, tariffs, public policies, regulation and market design. In his former positions, Mr Joudon has been involved in the implications of power sector liberalisation, the relationship between EDF and the state, and strategic planning. He contributed to studies, debates and projects on nuclear new-build in France in the 2000s. He is also associate professor at Sciences Po Paris. Laurent graduated from École Polytechnique and École des Ponts et Chaussées.

## **2. Nicolas Boccard, University of Girona**

### **Fundamental drivers behind the evolution of nuclear power: from the origins until the current renaissance**

The first part of the presentation examines the economies of scale associated with nuclear power plants – comparing on the one hand the original designs with the current ones, and nuclear with alternative energy sources, notably renewables. The second part focuses on the management of risk and safety, highlighting the ways in which these issues shaped the current framework for nuclear power more than anything else. Time series data is used in order to compare change in the nuclear sector with other human activities, and to assess accident risk of different energy technologies. The presentation concludes by an analysis of the current levelised cost, pinpointing this as the main reason for the difficulties of the nuclear renaissance to materialise.

*Nicolas Boccard* est un ancien élève de l'ENSAE, docteur en sciences économiques de l'EHESS. Il est actuellement professeur associé du département d'économie de l'université de Gérone en Catalogne Espagnole. Il a publié dans le domaine de la compétition imparfaite sur les thèmes de la différenciation et des capacités de production limitées. Depuis une décennie, il travaille sur la régulation des marchés électriques et énergétiques avec une emphase sur les énergies renouvelables. Son CV est disponible à <http://bit.ly/nboccard>.

## **3. Thomas Reverdy, PACTE, Grenoble-INP**

### **How to reduce uncertainties in electricity pricing through market redesign**

Taking into account uncertainties in the governance of a liberal economic reform leads to a challenging paradox. Economic reform requires institutional stability, which is guaranteed by the independence of the regulator from political influence and by loyalty to initial institutional commitments. However, economic reform always entails a degree of uncertainty as to its results. Uncertainties can be reduced during the implementation, and learning from experience may lead governments or national regulation authorities to introduce adjustments. Nevertheless, adjustments are limited by the initial institutional commitments. Institutional stability and coherence issues may prevent political intervention.

The liberalization of the electricity sector in France (implementation of a wholesale market, opening to competitors) is an interesting example of this paradox. After the liberalization, the electricity wholesale price increased 200 % between 2004 and 2008 in the context of a relative stabilization of average production costs. The price increase produced a political crisis and a contestation of the liberal reform by French industrial customers. The French government faced a dilemma between institutional stability and economic stability (political control of the price). An intermediate solution was invented: a redesign of the electricity market, constraining EDF to transfer nuclear power electricity to the other competitors at a tariff based on the average costs and not on the market price.

Our research analyses the institutional dynamics of redesigning the market. It makes a contribution to the sociology of economic regulation, by shedding light on the flexibility of economic institutions (rules, economic models) as an answer to the contradictory demands of economic stability and institutional stability. It highlights the French political compromise around nuclear power: a stable price for electricity, based on a political evaluation of costs.

**Thomas Reverdy** teaches economic sociology, sociology of work and sociology of organizations at Grenoble Institute of Technology. His research (at PACTE – Social Science Research Laboratory) is related to shaping of the market in the energy sector, and the management of technological uncertainty within complex organizations. In the field of sociology of the market, he has published a book about the story of the liberalization of the French energy sector (Sciences Po Press) and various articles on social exchange and dependence relation between energy purchasers (energy intensive industry) and energy traders. He is currently working on the interplay between economic, political and institutional actors in the processes of “valuation” of demand response services through the wholesale electricity market. In the field of sociology of organizations, he is studying technological projects in high-risk industries, seeking to understand the interplay between the practice of forecasting, planning and contracting on one hand, and the need for adaptation and resilience on the other. He has conducted investigations on various projects, including nuclear plant decommissioning, modernization of railway infrastructure and of hydroelectric power sites.

#### **4. Professor Gordon MacKerron, SPRU, University of Sussex Economics and nuclear power in the UK**

Despite one major occasional interruption, the state in the UK, especially via its senior civil servants, has held strongly to the view that nuclear power is an indispensable electricity generation technology. The paper speculates briefly on the reasons for this (for example forming a ‘cordon sanitaire’ around the military uses of nuclear technology as argued by a former UK Secretary of State, Tony Benn). The main body of the paper then argues that state institutions have always regarded it as important to justify support for nuclear power by involving economic arguments in its favour. This goes back as far as the 1950s and the invocation of the apparently high value of the ‘plutonium credit’ to legitimate Magnox

construction. It continued through the first oil crisis, the attempts to introduce a programme of PWRs, an interruption when the electricity industry was privatised, up to recent arguments in favour of EPRs. In pursuit of the economic argument in favour of nuclear investment, many devices have been used to bias the calculations in favour of nuclear power and against alternatives. The role of independent economists in the UK has primarily been to accept dominant orthodox economic framings (e.g. cost-benefit analysis) and to argue with the input assumptions. The current economic and financing problems around the proposed EDF PWRs appear to have led not to official scepticism about the economic status of nuclear power but rather to a renewed interest in relatively exotic nuclear technologies such as small modular reactors and thorium fuel cycles.

**Gordon MacKerron** is Professor of Science and Technology Policy at SPRU (Science Policy Research Unit), University of Sussex and co-Director of its Sussex Energy Group, having previously been Director of SPRU from 2008 until 2013. He was for four years Associate Director, NERA Economic Consulting, London and had an earlier career for over 20 years at SPRU. An economist working mainly in energy and environmental economics and energy policy, he has specialized in the economics and policy issues of electricity and especially nuclear power, as well as energy policy, including climate change mitigation and energy security. He has published and broadcast widely on these subjects. He has frequently been Specialist Adviser or invited witness before Select Committee inquiries on energy subjects; has been expert witness in several national and international public inquiries and court cases. He has served on three Royal Society working parties (on plutonium, geo-engineering and the nuclear fuel cycle). From December 2003 until August 2007 he was the Chair of the UK Committee on Radioactive Waste Management, and was a member of the Royal Commission on Environmental Pollution until its demise in 2011.

## **5. William J. Nuttall**

### **British Nuclear Renaissance 2005-2015 – UK market reforms, technology choices and the EU context**

Prime Minister Tony Blair memorably declared in May 2006 that the building of new nuclear power stations was back on the agenda with a vengeance. Despite such rhetoric and continuous government support, progress has been slow and difficult. Interestingly, British public and political attitudes survived the March 2011 nuclear incidents at the Fukushima-Daiichi power plant in Japan. The main problems faced by UK nuclear new-build have related to project financing and much effort has been devoted to electricity market reform so as to facilitate nuclear new-build. There are also engineering challenges, especially relating to the EPR Pressurised Water Reactor planned for Hinkley near Bristol. The UK is an important member of the European Union, in which nuclear energy issues have a special status, partly as a consequence of the 1958 Euratom Treaty. The presentation will consider the role of UK ideas and policies in a wider EU context.

**Dr William J. Nuttall** is Professor of Energy in the Department of Engineering and Innovation at The Open University, based in Milton Keynes, UK. His career has evolved from experimental physics (PhD MIT USA 1993) to technology policy with an emphasis on nuclear energy policy. His journey to MIT was supported by a Fulbright Scholarship (post-graduate student award 1987-1988) and his PhD was supervised by Professor Robert J. Birgeneau, then Dean of Science. Professor Nuttall is author of *Nuclear Renaissance -Technologies and Policies for the Future of Nuclear Power* (Taylor and Francis, 2005), co-editor of several other books and journal special issues and author of more than sixty journal articles.

In 2011 Professor Nuttall was elected Fellow of the Institute of Physics. In 2012 and early 2013 he served as one of eight experts advising the European Commission on the future of nuclear fission research and training in Europe. He has on several occasions presented oral evidence to the UK Parliament and once appeared before a committee of the French Senate. In March 2015 he delivered the annual Clerk-Maxwell lecture of the Institution of Engineering and Technology in the Royal Institution, London. Professor Nuttall serves on the Nuclear Power Committee of the Institution of Mechanical Engineers; he is a member of the Editorial Board of the *Proceedings of the Institution of Civil Engineers – Energy*; he is a Fellow of Hughes Hall, a college of the University of Cambridge, and is an Adjunct Professor of the City University of Hong Kong.

## **6. Paul Dorfman, Energy Institute, UCL**

### **Implementing EC economic energy policy: Legal Challenge to the EC decision to allow UK fiscal support mechanisms for new nuclear**

The challenge of achieving a transition to sustainable energy will involve different options that will vary in their acceptability to differing sections of EU policy and public energy stakeholders, and will also vary from Member State to Member State - given their differing cultural, industrial, and energy landscapes. So we are faced with collective choices - and the EC decision as to whether UK subsidies for new build nuclear contravenes EC State Aid legislation will directly inform these choices, will set an important precedent, and will have consequences not just in UK but through the EU. Taken across the full range of public and private actors engaged in energy systems, annual commitments worth many billions of pounds rest on the result of this EC appraisal. However, whilst the UK government contend that state subsidies for new nuclear development are aimed at EU energy priorities such as security of supply, diversity of generation, decarbonisation, electricity price stability and affordability - there are substantive doubts that the notified measures can be said to realistically address these issue in a timely or cost effective manner. Further, the creation of targeted State financial structures such as the Investment Contract and Credit Guarantee seems specifically designed to develop new nuclear in the UK at the expense of other low carbon investments. Given this level of financial support is unavailable to other low carbon technologies, it may significantly distort competition and strongly impact on trade between Member States - precisely because it shields the beneficiary from risks that other market

operators are subject to. In addition, the UK governments claim - that State Aid support is necessary in order to address 'market failure', seems open to critique. In short, proposed UK government State Aid for new nuclear may distort the European energy market, and unfairly discriminate in favour of nuclear. The development of sustainable and affordable low carbon energy remains a growing economic sector with huge potential for job creation. To seek to delimit this diversity through particular State Aid support of nuclear power at the expense of other, potentially more flexible, safe, productive, cost-effective and affordable technologies seems, at the very least, unwise. In this context, a series of legal challenges to the EC decision have arisen, not least because the price support mechanism to guarantee profitability may prove incompatible with EU State Aid rules, and the proposed Investment Contract may provide nuclear with a clear selective advantage.

Dr **Paul Dorfman** is Honorary Senior Research Fellow at the Energy Institute, University College London (UCL); Joseph Rowntree Charitable Trust (JRCT) Nuclear Policy Research Fellow; Founder of the Nuclear Consulting Group (NCG); Executive Board member of the International Nuclear Risk Assessment Group (INRAG); Member of the European Network of Scientists for Social and Environmental Responsibility (ENSSER); Advisory Group Member of the UK Ministry of Defence (MoD) nuclear Submarine Dismantling Project (SDP); Member of the European Nuclear Energy Forum (ENEF) Transparency and Risk Working Groups; Member of the Nuclear Transparency Watch (NTW). Paul served as Secretary to the UK government scientific advisory Committee Examining Radiation Risks from Internal Emitters (CERRIE) and led the European Environment Agency (EEA) response to Fukushima in 'Late Lessons from Early Warnings' Vol 2.

## **7. Patrick Momal**

### **Elaborating a cost figure for nuclear accidents in France**

The presentation will explain how IRSN came to conduct studies on the costs of a possible nuclear accident – a subject that had until then not been envisaged in France. First results were presented internally to actors in the nuclear sector in 2007. Further work was conducted before overall results were presented to a technical safety meeting in 2012, and then to the press. Finally, a methodological report was published officially. At present, several organisations are conducting estimates of the costs of a potential accident.

**Patrick Momal** graduated from Ecole Polytechnique, ENSAE (the Ecole nationale de la statistique et de l'administration économique) and obtained a PhD in mathematics from Dauphine University, Paris. He worked as a development project economist for the World Bank from 1976 to 1982, mainly appraising and preparing rural development projects in Indonesia. He then returned to the French Statistical Institute, where his work focused mainly on regional economics. From 2001 on, he specialised on risk analysis, as well as the economics of flood protection and nuclear safety.

## **8. Steve Kidd, East Cliff Consulting, UK; former Deputy Director General of World Nuclear Association**

### **Nuclear opportunity, economics and the paradigm of fear**

Nuclear power should be capable of playing a substantial role within the electricity generation mix of many countries throughout the 21<sup>st</sup> Century. Its USP is its ability to produce huge quantities of power from a very small input of raw materials, with minimal environmental disturbance. Increasing urbanisation in many countries globally with rapid power demand growth will create the need for concentrations of baseload power supplied reliably and without adverse climatic impact.

This is, however, very unlikely to happen unless the industry is able to transition to a new paradigm. The history of nuclear power since 1945 has been dominated by the fact that most people are afraid of it. This is rooted in the link with nuclear weapons but more specifically in lack of understanding of the nature of radiation. Fear of nuclear has become entrenched in popular culture and within the regulatory regimes designed to protect worried populations. It is expressed in nuclear phase-out policies (such as in Germany) but it also has an important economic dimension. The economics of nuclear have come increasingly to the fore in recent times and (in the Western world at least) have become compromised by sharply-rising construction costs (not to mention cheaper natural gas and the rising share of renewable generation in electricity supply). The “paradigm of fear” is an important driver of this and is an increasing factor even in the Chinese nuclear programme (the great hope of the nuclear industry).

The only answer for the industry is to stop wasting its time trying to hitch a ride on the climate change bandwagon, or trying to solve business problems with its usual recourse to technical solutions (e.g. small modular reactors or using thorium). It needs to stop bombarding the world with news, facts, figures and arguments about how wonderful nuclear is (which is actually mainly counter-productive) and take the “bull by the horns”. It needs to work on achieving a paradigm shift – without this, nuclear power is going precisely nowhere. This is actually simple to describe, but may take many years to achieve. The need is to improve the knowledge and understanding of radiation amongst the general public and then tackle the idiocies of the international radiological protection regime which stem from the fear paradigm. Nuclear will never be an “average” industry but neither public acceptance nor economic viability will be achieved whilst people are in fear of it.

**Steve Kidd** graduated from Queens’ College, Cambridge in 1977 and his career since fits neatly into two phases of roughly equal length. During the 18 years to 1995, he worked as a business economist for British industrial companies in the autos, engineering and construction materials sectors. His work focused on market analysis and business appraisals, including due diligence of acquisition targets and liaison with the financial sector. In 1995, he joined the predecessor organisation of the World Nuclear Association, where he worked for another 18 years until 2013, latterly as Deputy (and for a period Acting) Director General. Working with member companies across the globe, he developed a deep knowledge of national nuclear power programme and of the key drivers (and handicaps) affecting these.

He particularly specialises in the international nuclear fuels market, the economics of nuclear and the nuclear programmes of the Asian countries. Since 2013, Steve has been an industry consultant with his own company East Cliff Consulting, working (most recently) on the specifics of the Chinese nuclear industry with interested financial sector parties.

## **9. Yves Marignac, Director of Wise-Paris (World Information Service on Energy); expert at Global Chance**

### **The role of biased economics in the nuclear crisis, and the role of economists in letting it happen: insights from the French case**

Although the use of nuclear energy comes with specific risks – proliferation, major accident, long-lived waste – that irreducibly make the nuclear debate special, economics have long been among the main drivers of nuclear policies. Branded as “too cheap to meter” in the early days, nuclear electricity has all along been described by a majority of economists as competitive, and more recently promoted as the most affordable low-carbon option to meet massive and rising energy demand. No matter that nuclear generating costs have continuously increased, that no reactor has ever been built or run in an open market without significant direct or indirect subsidies, and that nuclear power, running far behind increasingly competitive renewables, is on the decline. Excessive confidence in the economics of nuclear power and its impact on industrial and energy policies are exemplified by the French case: the country’s nuclear programme, which developed to an unique extent and bet on its international expansion, is facing serious setbacks now that promises remained unfulfilled. From too easily accepted policy arguments such as energy independence, through the failure to challenge industry’s over-optimistic cost assumptions, to the misleading use of various cost or price comparisons, some examples will show how economists have failed to raise criticism at the required level to provide more balance in the country’s nuclear policy, and highlight recent progress.

**Yves Marignac** is since 2003 the Executive Director of WISE-Paris, an independent non-profit information, study and consultancy agency on nuclear and energy issues based in Paris, France, which he joined in 1996 after applied studies on nuclear issues and public debate at Paris-XI university, the French nuclear institute CEA, and a position at the French nuclear company STMI. He has since participated, as a contributor or as an advisor, most of the national consultation processes on nuclear issues. In 1999-2000, he participated in the economic evaluation of the nuclear option commissioned by France’s Prime Minister, which resulted in what became known as the Charpin-Dessus-Pellat report. In 2005-6, he was the scientific and technical advisor to the commission running the French national public debate on the Flamanville EPR reactor. In 2012-13, he participated, within the French Environment Minister’s cabinet, to the organisation and coordination of a National Debate on Energy Transition (DNTE). Yves Marignac is not an economist, but is dedicated to developing a systemic analysis that bridges economic issues with safety, waste management, industrial and energy policies, and is committed to contributing to pluralist expertise as a basis of fair

decision-making processes. An active member of independent expert groups Global Chance and négaWatt, he has coordinated the latest sustainable energy scenario.