



THE UNIVERSITY  
OF AUCKLAND

BUSINESS SCHOOL

# The Energy Centre Annual Report 2011



# INTRODUCTION Energy Centre Annual Report 2010



Director and Professor of Energy and Resource Economics, Basil Sharp joined the department in 1991. Basil Sharp's research applies economics to the real world challenges of energy and natural resources. He is particularly interested in addressing energy-related issues that confront New Zealand, engaging industry and policy makers.

## 1. INTRODUCTION

### The Energy Centre's mission

"To provide research policy analysis and educational programmes to help business and government confront energy issues of national significance to New Zealand."

We accomplish our mission by:

- Undertaking independent research and policy analysis on energy-related issues important to New Zealand's future.
- Promoting research that is cross-disciplinary and drawing upon, as appropriate, economics, engineering and the physical, environmental and social sciences.
- Acting as a bridge for open and informed dialogue between the energy industry, government and the community.
- Providing energy-related education that creates future leaders for academia, business and government.
- The Energy Centre's research programme is focused on three broad areas: energy markets, resource and environment markets, and transport economics. The Centre's Advisory Group provides programmatic advice on research priorities for the year ahead.

Research needs and opportunities are also based on conversations with commercial stakeholders, transport organisations and government agencies. The Centre has developed and maintains strong interdisciplinary links with the School of Engineering, Department of Engineering Science, the Transport Research Centre, the Geothermal Group within the Faculty of Science, Architecture, and the School of Environment.

The research-policy nexus is an essential attribute of Centre activities. Meetings and seminars provide a bridge for business and government agencies to engage with the Centre's programme. Stakeholder participation ensures policy relevance. Reports, media releases and submissions to government on proposed policy are underpinned by research.

The Centre has developed a strong presence in education, contributing to teaching energy and resource economics for undergraduate and graduate students, postgraduate research supervision, and the annual Summer School in Energy Economics.

## 2. STAFF

**Dr Anthony Downward**, Research Fellow. Anthony has a PhD in Engineering Science from The University of Auckland. His interests relate to the modelling of energy markets, particularly from a game theoretic perspective.

**Frank Duffield**, Visiting Fellow. Frank has a law degree from The University of Auckland and a masters from London School of Economics. He joined Shell United Kingdom as head of litigation in 1978, managing commercial disputes and litigation arising out of early North Sea developments. Frank went on to a distinguished career with Shell International, working on project development in Brunei, Nigeria, Russia and Venezuela.

**Dr Mark Greer**, Visiting Fellow. Mark is a Professor of Economics at Dowling College, New York. His research interests are in the field of public transport.

**Dr Rob Kirkpatrick**, Department of Chemical and Materials Engineering and the Energy Centre. Rob has a broad interest in “value” across the energy sector, including hydrocarbon exploration and uses for gas; biofuels; lignite potential; water and irrigation; forestry; energy availability, security and reliability; climate change and sustainability.

**Sam Malafeh**, PhD candidate. Sam has an interest in the development of energy resources for Māori communities. He is particularly interested in the development of geothermal resources in the central North Island. Sam has been analysing New Zealand geothermal access policies to identify ways that can optimise the gain for Māori communities. He is also working on contracts that can lead to higher economic benefits for Māori while considering their values.

**Dr Steve Poletti**, Department of Economics. Steve holds a PhD in Theoretical Physics from the University of Newcastle Upon Tyne (1991) and a PhD in Economics from The University of Auckland (2006). He is interested

in understanding electricity markets and the economics of climate change. His current research projects include investigating the welfare implications of consumers switching to real-time pricing with imperfect competition and trying to understand why existing markets may not provide adequate security of supply. He is also involved in a project, with David Young and Oliver Brown, to model the New Zealand electricity market using agent-based computer agents.

**Professor Basil Sharp**, Department of Economics. Basil has a PhD in Resource and Environmental Economics from the University of Wisconsin-Madison. His research applies economics to the real world challenges of energy and natural resources. He is particularly interested in addressing energy-related issues that confront New Zealand, engaging industry and policy makers.

**Bart van Campen**, Research Fellow. Bart has an MSc in Electrical Engineering from Eindhoven University of Technology and an MA in Public Administration from Erasmus University Rotterdam and Université Catholique de Louvain, as well as a Postgraduate Diploma in Renewable Energy Systems Technology from Loughborough University in the UK. He has almost 15 years’ work experience in the energy sector, working for the United Nations in Latin America and Italy as well as in the private sector in the Netherlands and Germany as a consulting engineer; and for The Energy Centre. His research includes electricity, carbon and gas markets, smart metering and demand side response.

**Dr Judith Wang**, Research Fellow. Judith is a researcher who specialises in transport modelling and transport economics. She received an MSc (Eng) in Transport Planning and Engineering from the University of Leeds in 1993 and a PhD from the Hong Kong University of Science and Technology in 2004. Her PhD thesis was on “Strategic gaming analysis of competitive transportation

services”. She arrived in New Zealand in 2004 to take up an academic position at The University of Auckland, where as a lecturer she was responsible for designing new courses and redesigning courses for the Master of Transportation Engineering, particularly in the areas of transport economics and transport planning. She has extensive work experience in the industry, including one year as an associate at Booz & Company in Auckland, and 12 years in Hong Kong with a number of companies in the private and public sectors, with eight years specialising in modelling and planning for transportation systems.

**Dr David Young**, Postdoctoral Research Fellow at The Energy Centre. David holds a PhD in Economics from the California Institute of Technology (2009), where he completed his thesis on firms’ investment behaviour in markets with uncertainty, with a particular application to electricity markets. His research interests include industrial organisation, market design and electricity markets. At The Energy Centre, his research has focused on analysing price formation in the New Zealand electricity market, using a mix of theoretical and computational models. The goal is to identify optimal policies that will improve competition in the market.

**Dr Golbon Zakeri**, Department of Engineering Science and Associate Director of The Energy Centre. Golbon holds a PhD in Mathematics and Computer Science from the University of Wisconsin-Madison (1995). Her interests are in developing mathematical and economic models for the optimisation and interactions of participants in energy markets, with a particular emphasis on the New Zealand electricity market. Golbon’s research ranges from developing individual optimisation models under uncertainty, for firms to use in decision-making, to game theory models that are utilised to investigate optimal regulatory policies.

# 3. RESEARCH

## Research workshops

The Department of Economics runs a series of research workshops aimed at providing an opportunity for researchers to present, and receive feedback, on work in-progress. Three research workshops related to energy were held in 2010:

- Professor Bryce Hool presented an overview of his research on The Role of Royalties in Natural Resource Extraction Contracts. This topic is of great relevance to New Zealand as it seeks to attract exploration and development of energy and mineral resources.
- Professor Tim Hazledine presented preliminary results of his research into urban form and transportation. About one in ten journeys to work by Auckland City residents on Census Day 2006 were “active” – walking or cycling. The paper uses 2006 Census data to explain differences in active journey to work decisions at the area unit (suburb) level in Auckland City. Census-derived demographic and socio-economic variables, as well as average distances travelled to work, are reasonably successful at explaining inter-area unit differences.
- Dr Geoff Pritchard provided an overview of the research underway on wind energy. Wind as a source of electricity comes with numerous challenges. Being able to “predict” wind variability and the distribution of wind sites are major challenges, as is integrating supply into the grid. Bart van Campen outlined the role of gas in providing back-up capacity when the wind doesn't blow.

## Energy

The agent-based modelling programme was used for the first time. Two postgraduate students, Ben Gussen and Kin Chan, ran simulations to predict the effect on electricity prices of extra wind generation and electric cars respectively. Transpower has expressed interest in the model because it can value transmission line improvements to various market players, something that can't be done with their present models.

David Young, Tony Downward and Golbon Zakeri published their paper, “Swapping generators’ assets: Market salvation or wishful thinking?”, in The Energy Journal. This paper contains a theoretical analysis of asset swapping among generators, along with a case study that captures the asset swap proposed by government. The team will continue to work on this topic and is preparing a second paper looking at the idea of “virtual asset swaps”.

## Summer scholarships

Erwann Sabai obtained two Business School scholarships. Anton Samoilenko analysed data on different international electricity markets. Michael Harte collected and analysed data on the European carbon market with the view to comparing it with the New Zealand ETS when it comes online in 2010.

Basil Sharp obtained a Business School scholarship for New Zealand’s forestry opportunities in the transition to a low carbon economy for Karla Gardner. This summer project focuses on the economics of forestry within the context of government policy.

Steve Poletti worked with Robbie Turner on a summer scholarship funded by the Centre

aimed at looking at the options to improve New Zealand’s dry year electrical security, where the present market is unsatisfactory.

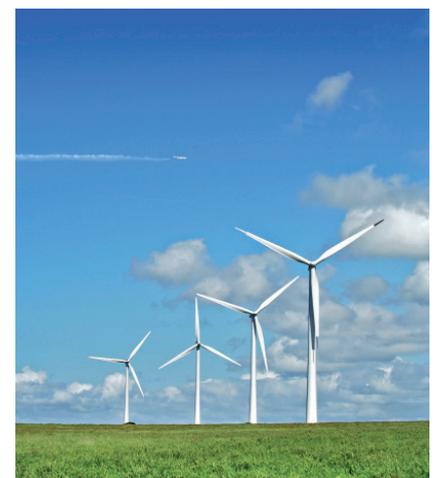
Sam Malafeh obtained a summer scholarship from Mighty River Power to work with Paul Hoskin, Bart van Campen and Dan Hikuroa on “Development and management strategy synthesis for Māori industry geothermal partnerships and taonga resource sustainability”.

## Research grant

Steve Poletti and David Young were awarded a Faculty Research Development Fund grant. The funding was for the project, “Electricity markets with intermittent renewable electricity generation and variable demand for electric car charging: Confronting the challenges of moving towards a carbon constrained world”.

## Transport

Dr Judith Wang, Professor Matthias Ehr Gott (Engineering Science) and Dr Andrea Raith (Engineering Science) were successful in winning a three-year grant from the Marsden Fund, valued at \$585,000. Their project, “Multiobjective network equilibria – from definition to algorithms”, will investigate the more general and more realistic situation where cost and/or benefit is expressed through several incommensurate and conflicting objectives. This is an outstanding achievement because Marsden grants fund “blue sky” research. Competition for these funds is fierce and this year 9.5 percent of the preliminary proposals were successful. Dr Wang’s expertise is in transport economics and modelling and her role in this project is to focus on the development of methodologies and applications in transport and energy.



The Upper North Island Transport Study (UNITS) group incorporates The Energy Centre, the New Zealand Centre for Supply Chain Management in the Department of Information Systems and Operations Management, the Faculty of Engineering and the Department of Geography. Two reviews of publications dealing with transport in the upper North Island region were completed.

A Business School summer scholarship, "Integrating private electric vehicles into the transportation fleet", provided assistance for a postgraduate student in Economics. This summer project focused on the economics of electric vehicles, market potential and implications for electricity demand. Professor Mark Greer started a research project on the economics of electric vehicles in the New York electricity system.

Judith Wang completed a subcontract with the National Institute of Water and Atmospheric Research (NIWA) funded by the Foundation for Research, Science and Technology (FRST). This research is part of a research project funded by FRST titled "Towards sustainable urban form (TOTUS)". The aim of TOTUS is to reduce the environmental impact of New Zealand

cities by enabling planners to quantitatively incorporate environmental information into planning tools and decisions. A new tool will be created that integrates air quality, traffic emissions and energy use with related environmental and local government planning tools. Judith's participation in NIWA's research project continued through 2010, with an additional subcontract being awarded to complete stage three of the project, which involves liaising with Auckland's transport analysis and planning team, and the development of Geographic Information System (GIS) information and its integration into transportation models.

Dr Judith Wang was awarded a grant from The University of Auckland's Transforming Research Initiatives (TRI) for her proposal "Transforming Auckland into a bicycle-friendly city". Valued at \$15,000, the goal of the project is to help improve transport sustainability in the Auckland region by conducting research relevant to transforming Auckland into a bicycle-friendly city. The research question is, "If we were going to transform Auckland into a bicycle-friendly city, how should we invest in bicycle infrastructure and facilities in order to maximise the benefits to society?".

In order to answer this question, a first step is to determine the motivators of, and deterrents to, cycling in Auckland. A comprehensive literature review of the lessons from international experience was undertaken and a survey has been specifically designed to identify the factors influencing the choices of current and potential cyclists in Auckland. This will enable us to understand why the current bicycle modal share is so low, what the motivators that can attract potential cyclists are and, in particular, how their decisions to cycle or not are influenced by the built environment.

The results and tools developed in this study will become the foundation for the development of a decision analysis tool to support policy decisions on bicycle infrastructure and facility investment in the future. With further research, the tools can be applied to perform a more comprehensive travel demand analysis, which will enable the estimation of utilisation of cycling facilities, and a more accurate assessment of the subsequent effect on safety, energy consumption, population health and the environment.



# 4. KNOWLEDGE BUILDING ACTIVITIES

## Student thesis and dissertations completed

**Kin Chan:** "Evaluation of the impact of electric vehicles on the new electricity market"

**Supervisors:** Steve Poletti and David Young; BCom (Hons) dissertation

**Ben Gussen:** "The impact of wind penetration on the New Zealand electricity market"

**Supervisors:** Steve Poletti and David Young; BCom (Hons) dissertation

**John Polkinghorne:** "Factors affecting household demand for energy"

**Supervisor:** Basil Sharp

**Isaac Rolfe:** "Auckland transportation: Rooding, transit and sustainable development"

**Supervisors:** Steve Poletti and Basil Sharp; BCom (Hons) dissertation

**Nada Al Saeed:** "Climate change and the aviation industry: A review"

**Supervisor:** Steve Poletti; BCom (Hons) dissertation

**Tony So:** "Landscape externalities associated with wind farm development"

**Supervisor:** Basil Sharp; BCom (Hons) dissertation

**Robbie Turner:** "Electricity market design: A firm energy market approach"

**Supervisors:** Steve Poletti and Bart Van Campen; MCom dissertation

**Alexander Yap:** "Incorporating electric vehicles into transportation fleet"

**Supervisor:** Basil Sharp; BCom (Hons) dissertation

**Li Ying:** "Impact of wind farms on property prices"

**Supervisor:** Basil Sharp; BCom (Hons) dissertation

## Summer School 2010

The first Summer School in Energy Economics ran from Monday 15 February 2010 through to Friday 19 February 2010 (Appendix A). Around 15 participants attended, including two from the University of Otago's Energy Centre.

## Master of Energy

The Master of Energy was approved in 2010 and will be offered in 2011. Energy Centre staff will contribute to teaching ENERGY 721 Energy Resources as outlined in Appendix D. The course was designed so engineering and economics topics can run in parallel. Cross-disciplinary assignments will link the two courses.

## Teaching grant

Dr Stephen Poletti (Economics) and Dr Golbon Zakeri (Engineering Science) were awarded a teaching improvement grant valued at \$9,900. The project aims to stimulate student interest and learning in the design and implementation of electricity markets, particularly the New Zealand electricity market. The design of these markets is based on economically advanced principles of auction design. A computerised electricity market simulator will be created to allow students to play the role of firms in an electricity market. This software is on track for use in Energy courses in the first semester of 2011.

## Lord Nicholas Stern's lecture series

Lord Nicholas Stern's series of public lectures and seminars were developed with the assistance of Amanda Stanes of the Business School, Petteena McOnie of the Centre for Continuing Education and Bill Williams of Communications and Marketing. This was a massive commitment and attracted considerable public interest. Information on the event is given in Appendix B.

Lord Stern presented three lectures titled, "Managing climate change and promoting development", "Policies for low-carbon growth" and "Progress towards a global deal". Two 500-seat lecture theatres were at capacity and the video link with Victoria University of Wellington attracted a further 200 people.

His itinerary was packed. He gave a presentation to a well attended Trans-Tasman Business Circle lunch and a climate change seminar specifically for business leaders, and also met with staff and graduate students in Economics and Engineering. In addition, Lord Stern gave a radio and television interview and met with the Minister of Science, Dr Wayne Mapp.

Lord Stern's visit enabled Basil Sharp to network with the "100% Plan Group" (Philip Mills, Sir Stephen Tindall, Sir George Fistonich). He also networked with the Hon Nick Smith, the Hon Tim Groser, Dr Roger Blakely (head of planning Auckland City) and Phil Goff (leader of the Opposition). This visit was a huge success and provided an excellent opportunity to lift the profile of The Energy Centre with business and the community.

# 5. EXTENSION AND PROMOTION

Basil Sharp and Rob Kirkpatrick met with Don Elder, CEO of Solid Energy, to discuss the idea of running an industry forum. Rob Kirkpatrick had a follow-up meeting with Brett Gamble of Solid Energy in Christchurch. Brett Gamble reports directly to Don Elder and heads the group which works on “resources” for Solid. This group is supportive of the proposed forum and will be further developed for 2011.

Contact with the University’s representative in Wellington has led to a programme being developed for promoting the Centre and seeking closer engagement with industry and government. Basil Sharp has met with the former CEO of New Zealand Trade and Enterprise, who is seeking to arrange meetings with John Crawford, who will be responsible for energy SOEs when he becomes deputy secretary of the Treasury. Further meetings with team leaders from the Treasury’s infrastructure unit were productive.

Work on the Infrastructure Plan is scheduled to be completed by early 2011 and will focus on infrastructure related to economic growth viz. scale, agglomeration and spatial planning. Infrastructure and spatial planning have implications for transport and energy. Treasury was made aware of our expertise and the Centre will maintain contact with the infrastructure unit. The meeting with Merv English, general manager of the Electricity Commission, occurred when the Electricity Commission was in the process of being reduced in size and restructured. It will become a small regulator of the electricity market. He believed there is a general trend now towards quantifiable research and expressed the view that New Zealand could become a world leader in demand side management, given that it has good technology for load management and it is getting good meter roll-out.

Bob Simpson, Transpower chief engineer, and Cynthia Brophy, Transpower corporate

affairs manager, identified load demand forecasting, evolving technologies and the cost of non-supply as key issues. This includes future customer behaviour and evolving technologies.

Bart van Campen’s visit to Chile in June 2010, on the way to the IAEE conference in Rio de Janeiro, resulted in substantial contacts and interest, especially on geothermal generation and drought management. The prospect of follow-up work looks likely to be in the form of a comparative case study in drought management between Chile and New Zealand. The Electricity Commission and Mighty River Power have a possible interest in this. There is also the possibility of including Chilean representatives in the 2010 Geothermal Workshop at The University of Auckland.

Golbon Zakeri hosted a delegation from Sharif University of Technology on 29 July 2010. Basil Sharp spent the morning meeting the delegation and presenting an overview of The Energy Centre to the delegation. Sharif is Iran’s foremost university of science and technology and this university has now signed a memorandum of understanding with our university. This will facilitate the exchange of students and joint research programmes.

In June 2010, Basil Sharp met with the Prime Minister’s Korean Fellow and his delegation from the Korean consulate. Mr Kim Se-yeon, an economist, was accompanied by the Korean consulate and the New Zealand Ministry of Foreign Affairs and Trade. Korea is keenly aware of the challenges it faces in respect of energy and this initial meeting was followed up with a further visit in August 2010.

Basil Sharp appeared as an expert witness before the Environment Court, representing Trustpower’s application for consent to build five dams on the Wairau River. Consent was granted by the Court in later 2010. Basil

is also advising Environment Waikato on Variation 6, a proposal that will go before the Environment Court in 2011. Competition for Waikato River water is intense, with irrigated agriculture wanting an increasing share of the river water, which can only be met by reducing the allocation to Mighty River Power.

Basil Sharp gave a presentation, “Water through an economics lens”, to the Water Forum organised by the Hawkes’ Bay Regional Council. Like many regions on the east coast of New Zealand, water is becoming increasingly scarce. There is growing interest in multiple use, where water resource development projects can generate electricity and meet summer demand for irrigation.

Basil Sharp advised commercial firm Lanzatech on the development of a model for analysing the economics of “Coal to ethanol” in China. This work was completed, to the satisfaction of the company, by a student from the School of Engineering. Lanzatech will now take the results of the model to market in China.

The Energy Centre participated in an event organised by the University Commercialisation Offices of New Zealand (UNCONZ) at the Business School on 19 October 2010. Commercial units from each university displayed their research capacities. The Centre’s contribution is listed in Appendix C. Auckland mayor Len Brown addressed attendees and the Foundation for Research Science and Technology was available to outline the Government’s new technology development grant initiative.

While the outcome of this event is unclear, it did provide an opportunity to showcase The Energy Centre. In contrast to other University research centres, The Energy Centre occupies a unique position with its emphasis on cross-disciplinary research in the commercial/policy space.

# 6. PUBLICATIONS, REPORTS AND SUBMISSIONS

## Publications

Downward, A., Young, D.\* and Zakeri, G. "Swapping generators' assets: Market salvation or wishful thinking?" (accepted for publication), *Energy Journal*.

Ehrgott, M., Wang, J.Y.T.\*, Raith, A. and Van Houtte, C., 2010. "A Bi-objective Cyclist Route Choice Model", submitted to *Transportation Research Part A*.

Greer, M. and van Campen, B.\* "Influences on public transport utilisation: The case of Auckland", *Journal of Public Transportation* (revise and re-submit), May 2010.

Jiang, N. and Sharp, B.\* 20010. "Potential economic benefits of a Waikato water market", report to Environment Waikato, October 2010.

Philpott, A., Guan, Z., Khazaei, J., and Zakeri, G., "Productive inefficiency in electricity markets with hydroelectricity", (to appear), *Utilities Policy*.

Raith, A., Wang, J.Y.T.\* and Ehrgott, M. "Bi-objective traffic assignment to model network user behaviour in networks with road tolls". Paper presented at Seventh Triennial Symposium on Transportation Analysis, Norway, June 2010.

Sharp, B.\* and Huang, C. "Managing mineral resource development: Neither silver bullet nor immaterial", paper accepted for publication in *The University of Auckland Business Review*, Golden Edition 2010.

Wang, J.Y.T.\*, Raith, A. and Ehrgott, M., 2010. Tolling Analysis with Bio-objective Traffic Assignment in Ehrgott, M., Naujoks, B., Stewart, T. and Wallenius, J. (eds) *Multiple Criteria Decision Making for Sustainable Energy and Transportation Systems*, Lecture Notes in Economic and Mathematical Systems 634, Springer Verlag, Berlin, 117-129

Young, D.\* 2010. "An agent-based model of the New Zealand electricity market", presented at the Department of Economics Workshop in September 2010 and the EPOC Winter Workshop in October 2010.

Young, D.\* (2010). "Endogenous investment and pricing under uncertainty", *The BE Journal of Theoretical Economics*, 10(1), (Topics), Article 1.

Zakeri, G (2010). "A survey of utilization of optimization for generation in wholesale electricity markets", *Encyclopedia of Operations Research and Management Science* (accepted).

Zakeri, G. and Downward, T.\* "Exploring the strategic behaviour of FTR holders with market power", prepared for *Mighty River Power*, 16 July 2010.

Zakeri, G., and Downward, A.\* "A literature survey of financial transmission rights auctions", prepared for *Mighty River Power*, October 2010.

Zakeri G. "Financial transmission rights auctions: Entry and efficiency", *EPOC Winter Workshop* in October 2010.

## Conferences attended

Anthony Downward\* gave a presentation, "Real and virtual asset swaps in the retail and wholesale electricity sectors", at the *INFORMS Annual Conference* in Austin (7-10 November 2010).

Bart van Campen\* presented a paper, "Efficiency and fuel switching in Norway and New Zealand's residential electricity sector during droughts", to the 33rd Conference by the *International Association for Energy Economics* (May-June 2010).

Sam Malafeh\* presented "Property rights of geothermal resources: Access policy in New Zealand and Māori ownership" at *GeoNZ 2010* (23 November 2010).

Steve Poletti\* presented "Welfare implications of consumers switching to real time pricing plans with imperfect competition in electricity markets" at the 11th *International Association of Energy Economists European Conference* in Vilnius (25-28 August 2010).

Steve Poletti\* chaired the session on electricity markets at the *New Zealand Association of*

*Economists Conference* in Auckland (30 June 2010).

Judith Wang\* attended the 24th *European Conference on Operational Research* in Lisbon, Portugal (11-14 July 2010).

David Young\* presented "Swapping generators' assets: Market salvation or wishful thinking?" at the *New Zealand Association of Economists Conference* (30 June 2010).

Golbon Zakeri gave a presentation at the conference in honour of Professor Yves Smeers at the *Center for Operations Research and Econometrics (CORE)* at the *Universite Catholique de Louvain, Belgium* (17 June 2010).

Bart van Campen\* was invited to speak at *Chile's 2nd Annual Conference on Renewable Energy* in Santiago (12 November 2010). The workshop was hosted by *Chile's Economic Development Agency* and was opened by the *Minister of Energy*.

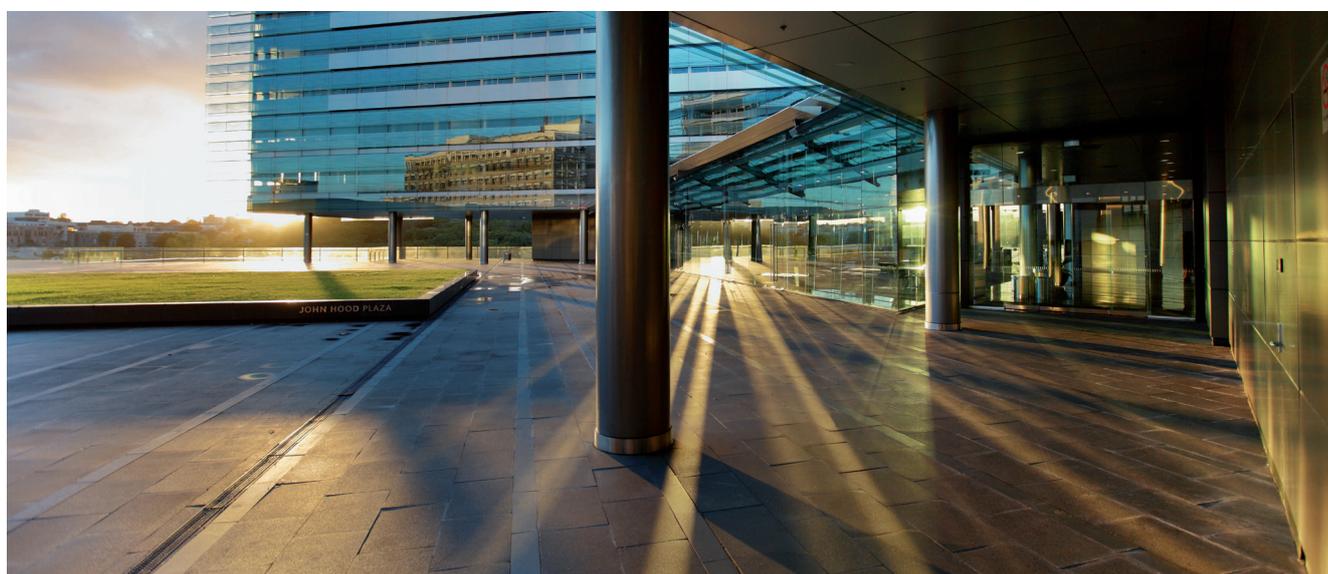
Bart van Campen\*, Rob Kirkpatrick\*, Basil Sharp\* and Golbon Zakeri attended the *New Zealand Petroleum Conference* (20-23 September 2010). Dr Farouk Al-Kasim's presentation on *Norway's experience with petroleum development* was well received. We met with Dr Al-Kasim and further discussed the "Nordic model" of resource development.

Bart van Campen\*, Rob Kirkpatrick\* and David Young\* made a submission on the recent 2010 *Draft SOO (Statement of Opportunities)* put out by the *Electricity Commission*. The submission offered suggestions on modelling transmission alternatives from the lower South Island (where much of New Zealand's low cost energy resources are located) to the upper North Island.

\* Supported by the Energy Education Trust of New Zealand.

# Appendix A: Summer School in Energy Economics Programme

The Energy Centre Summer School 2011					
	Monday 15 February	Tuesday 16 February	Wednesday 17 February	Thursday 18 February	Friday 19 February
9-9.15am	Welcome (Sharp)	Introduction to transport planning and modelling (Wang)	Electricity market models (Young)	Simulation game electricity market (Young)	Energy and environmental policies NZ and abroad (Sharp)
9.15-10.30am	Introduction to economics of natural resources and energy (Sharp)				
10.30-10.45am	Coffee break	Coffee Break	Coffee break	Coffee break	Coffee break
10.45am-12pm	Introduction to Transport Economics (Wang)	World oil and gas markets: peak oil and energy security (Poletti and Kirkpatrick)	Issues in market modelling: vertical integration, forward contracts, supply security (Young)	Simulation game electricity market (Young)	Energy and environmental policies NZ and abroad (Sharp)
12-1pm	Lunch				
1-2.15pm	Sustainability in Transport (Wang)	Electricity markets: regulation and competition (Poletti)	Field visit to Southdown plant and trading room (van Campen and Collet)	NZ electricity and gas market (van Campen)	Energy, water, emissions, forestry (Kirkpatrick and van Campen)
2.15-2.30pm	Coffee break	Coffee break		Coffee break	Coffee break
2.30-3.30pm	Auckland transport challenges and round table discussion Peter Clark)	Carbon markets: uncertainty and investment (Poletti)		Emerging energy technologies, resources and potential for NZ energy future (to be confirmed)	Drinks and nibbles with forum participants
4-5pm		Drinks and nibbles with Energy PhDs, Staff and Researchers at University of Auckland			



# Appendix B:



## Sir Douglas Robb Lectures 2010

A series of three lectures by Lord Nicholas Stern of Brentford

Managing the risks of climate change, overcoming world poverty and creating a new era of growth and prosperity: The challenges for global collaboration and rationality



Formerly Chief Economist of the World Bank, Lord Nicholas Stern is IG Patel Professor of Economics and Government and Chair of the Grantham Institute for Climate Change and the Environment at the London School of Economics. He was author of the influential Stern Review on climate change released in 2006.

### Lecture 1

Wednesday 8 September, 7pm

*Managing climate change and promoting development: Risks, scale and values*

### Lecture 2

Thursday 9 September, 7pm

*Policies for low-carbon growth and development: Creating a new era of progress and prosperity*

### Lecture 3

Friday 10 September, 7pm

*Progress towards a global deal*

Numbers are limited at both venues and you must register to attend.  
Visit [www.auckland.ac.nz/robb](http://www.auckland.ac.nz/robb)

### In person in Auckland

Fisher & Paykel Appliances Auditorium, Owen G Glenn Building, 12 Grafton Road, Auckland.

Numbers limited. Register to attend at [www.auckland.ac.nz/robb](http://www.auckland.ac.nz/robb)

Evening parking available for \$5 in lower levels of Owen G Glenn Building.

### Live video link in Wellington

ROOM, BUILDING, Victoria University of Wellington, Kelburn Parade, Wellington

Further information and inquiries

[www.auckland.ac.nz/robb](http://www.auckland.ac.nz/robb)  
373-7599 ext 87467

# Sir Douglas Robb Lectures 2010

## Itinerary

Lord Nicholas Stern

### Robb Lecture Host

Professor Basil Sharp, HOD Economics, Professor of Energy Resources and Economics and Director of the NZ Energy Centre.

Professor and Head of Department, Basil Sharp joined the department in 1991. His research interests span the field of energy and resource economics. He has a specific interest in developing microeconomic foundations for analysing mechanisms for allocating natural resources. He has also applied econometric methods to a range of resource and environmental problems in New Zealand. His current research focuses on renewable sources of electricity generation and business models for resource development.

### Wednesday 8 September

Time	Venue	Activity	Audience
4 – 5pm	John Hood Plaza, Business School, The University of Auckland	Formal welcome (powhiri) to Lord and Lady Stern, light refreshments	VC, Robb lecture organising committee, invited guests
7 – 8pm	Fisher & Paykel Appliances Auditorium Business School The University of Auckland	Robb lecture – introduced by Professor John Morrow tbc	Public audience
8 – 9.30pm	Spicers Café Business School	Reception hosted by Professor John Morrow Deputy Vice Chancellor Academic	Vice Chancellor's office to confirm invitation list

### Thursday 9 September

Time	Venue	Activity	Audience
9am – 12pm	The University of Auckland Business School case room and board room for one-on-ones	Media Panel interviews with specific one-on-ones	As per attached list
12 – 1.15pm	Decima Glenn Room, Business School	Student/Staff /lunch	Invited staff and students – see attached list of staff
1.30 – 4pm	Case room (seats 70)	Climate Change Seminar	Invited guests
7 – 8pm	Fisher & Paykel Appliances Auditorium Business School The University of Auckland	Robb Lecture – introduced by the Vice-Chancellor	General public
8.30 – 10.30pm	The Pavillion, 19 Aumoe Ave, Kohimaramara or Spicers Restaurant or Dean's boardroom	Dinner	Private dinner at private home with Sir Stephen Tindall, Phillip Mills, Rob Fenwick and Sir George Fistonich

### Friday 10 September

Time	Venue	Activity	Audience
12 – 2pm	KPMG Boardroom	Trans Tasman Business Circle lunch	*Trans Tasman Business Circle members (50 guests max)
4.30 – 5.30pm	tbc	Meeting with Hon Wayne Mapp Minister of Research, Science and Technology	
7 – 8pm	Fisher & Paykel Appliances Auditorium Business School The University of Auckland	Robb Lecture – introduced by Professor Basil Sharp	General public
8.30 – 10.30pm	Northern Club Princes St	Dinner hosted by Professor Basil Sharp	Guest list to be confirmed with Vice Chancellor's office

# Appendix C:

## The Energy Centre

An independent and balanced authority on New Zealand's Energy Priorities and initiatives



The Energy Centre is an interdisciplinary research and education centre. Based in the Department of Economics in The University of Auckland Business School the Energy Centre was established in 2005 to provide research, policy analysis, and educational programmes to help business and government confront energy issues of national significance to New Zealand.

The Energy Centre's mission is to:

- undertake energy research and business and policy analysis and reviews that examine energy related issues important to New Zealand's future
- report results and observations to the energy sector, government and academic communities
- provide energy related education
- offer a neutral venue for dialog about critical issues and problems confronting New Zealand's energy future

The Energy Centre's programme is supported by the Energy Education Trust of New Zealand and several energy sector sponsors.

### Research

The Energy Centre's research programme is focused on three broad areas

- 1) Energy Markets
- 2) Resource and Environment Markets
- 3) Transport Economics

However research priorities can be developed in conversation with partner companies, the energy sector and government about energy related issues facing New Zealand.

With a core team consisting of economists and engineers, the Centre nurtures active cooperation with other University disciplines and centres like the Transportation Research Centre, the Centre for Supply Chain Management, and the Electricity Power Optimization Centre. The Centre's research programme spans the core areas of electricity markets, transportation and climate change. Located in the Department of Economics, the Centre has particular expertise in the parallel areas of public policy, competition and market regulation, (spatial) econometrics and environmental economics.

### Education

Academic staff teach courses in resource and environmental economics; regulation and competition policy, environmental economics, and energy economics and policy. Currently five PhD and eight honours students are working on energy related topics. The Centre contributes to education in energy and environmental economics in the Business school's MBA, Post Graduate Diploma in Commerce, and an interdisciplinary course offered to final year students in the School of Engineering. The Centre provides input on courses run in Continuing Education, Geography and the Civil Engineering.

### Outreach

The outreach programme serves two functions. First, a seminar programme provides a vehicle for disseminating information from energy research. These seminars are open to academic staff, business and government officials. Second, workshops are convened on demand with the view to exploring energy-related issues and assisting with developing the Centre's research programme. Short courses are also offered through the Business School.

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The next conference is planned for early 2011 and it will bring together academics, policy makers and industry representatives to discuss possible mineral development models.

As Professor Sharp said in a recent interview, “We are blessed with water, minerals, land and an equable climate, but we need to manage them smarter. There are possibilities for harnessing new finds in the under-explored Great South Basin, the Taranaki Basin and elsewhere including the development of a liquefied natural gas (LNG) export industry and electricity generation. New Zealand has the world’s fourth-largest exclusive economic zone, but more needs to be done to develop appropriate business models to develop the country’s resources”.

## Features and Benefits of Working with the Energy Centre

Feature	Benefits for Clients
Analysis of economic data relating to cost of different forms of energy and its extraction	Integration of wind energy into the electricity market
Building economic models that analyse data, e.g. on the determinants of passenger use on buses in Auckland	Working with partners such as the NZTA and regional bodies to understand impacts on transport and energy use
Economics of hybrid motor vehicles	Understanding switching costs to use alternative/substitute fuels
Research to inform policy	Seminars and workshops that inform Government and other Energy stakeholders
Analysing the impact of Emissions Trading Scheme	Assisting firms and Governments account for and manage New Zealand’s climate change obligations
Econometric analysis of trends at firm/sector level e.g. energy audits	Provide insights to review policy and help firms meet their commitments to ETS and reduce energy costs

## Key academics working at the Centre include:

**Professor Basil Sharp**, Director and Chair in Energy and Resource Economics

**Bart Van Campen**, Research Fellow

**Dr Judith Wang**, Post Doctoral Research Fellow.

**Dr David Young**, Post Doctoral Research Fellow

**Dr Rob Kirkpatrick**, Manager External Relations

**Dr Steve Poletti**, Department of Economics

**Dr Golbon Zakeri**, Engineering Science

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# Appendix D: Energy Masters

Week		ENERGY 721 Energy Resources			ENERGY 722 Energy Technology		
1	Topics	Introduction to the competitive economic model.			Introduction to thermodynamics		
	Lecture plan and lecturers	Static model	Efficiency and welfare theorems	Comparative statics	1st and 2nd laws of thermodynamics	1st and 2nd laws of thermodynamics	Thermodynamic cycles
2	Topics	Market imperfections and policy			Introduction to thermodynamics		
	Lecture plan and lecturers	Market imperfections	Game theory - Cournot model	Policy instruments	Thermodynamic cycles	Chemical thermodynamics	Biological thermodynamics
3	Topics	Energy resource policy			Geology of oil, gas and coal, exploration		
	Lecture plan and lecturers	Allocating development rights	Resource depletion models	Resource rental and profit regimes	Geology of oil and gas	Geology of coal	Oil and gas exploration Rosalind Archer
4	Topics	Oil markets			Oil and gas drilling and production		
	Lecture plan and lecturers	History of oil	Supply and demand	Oil market, OPEC, oligopoly	Oil and gas drilling Rosalind Archer	Oil and gas production Rosalind Archer	Oil and gas production Rosalind Archer
5	Topics	Coal and gas			Coal production, uses of coal, coalbed methane, coal gasification, gas, LNG, LPG		
	Lecture plan and lecturers	Coal and gas markets	Contracts	New technologies	Coal production and uses of coal Sadiq Zarrouk/ industry	Coalbed methane, coal gasification, Sadiq Zarrouk/ industry	Gas, LNG, LPG Rosalind Archer
6	Topics	Electricity markets			Overview of electricity production. Renewable sources		
	Lecture plan and lecturers	Single node, aggregated industry stack and demand	Market power	Role of transmission	Overview of electricity production Mike O'Sullivan	Wind energy Stuart Bradley	Wind turbines and wind farms Richard Flay
7	Topics	Electricity markets			Geothermal energy		
	Lecture plan and lecturers	Long run marginal price	Electricity game	Reserve and unit commitment	Occurrence, use and types of geothermal systems Mike O'Sullivan	Geothermal power plants Sadiq Zarrouk	Direct use of geothermal energy Sadiq Zarrouk
8	Topics	Electricity markets			Other renewable sources and nuclear energy		
	Lecture plan and lecturers	Different market designs	Vertical integration	Demand response	Tidal energy Richard Flay/ industry	Wave energy Richard Flay/ industry	Nuclear power plants Sadiq Zarrouk
9	Topics	Economics of renewable sources electricity			Energy storage and more on renewable energy		
	Lecture plan and lecturers	Water	Geothermal	Wind	Energy storage: pumped hydro, fly wheels, condensers etc	Solar heating Robert Raine	Photovoltaics
10	Topics	Economics of climate change			Renewables and new technologies		
	Lecture plan and lecturers	Game theoretic analysis of international agreement	Cap and trade, carbon tax	Risk and uncertainty	Batteries	Fuels cells	Bio-energy sources
11	Topics	Economics of transport			Energy efficiency, conservation, life cycle energy use		
	Lecture plan and lecturers	Demand and supply	Congestion pricing and externalities	Public transport	Energy efficiency Robert Raine	Energy conservation Robert Raine	Life cycle energy use Robert Raine
12	Topics	Energy of transport			New fuels for transportation, electric cars		
	Lecture plan and lecturers	Economic evaluation	Sustainable transport	Alternative liquid fuels, electric vehicles	Production of bio-diesel	Production of bio-ethanol	Electric cars

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