



ANNUAL REPORT 2013
THE ANU ENERGY CHANGE INSTITUTE

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MESSAGE FROM THE DIRECTOR



Professor Ken Baldwin
ECI Director

In its third full year of operation, the ANU Energy Change Institute (ECI) has considerably expanded its contribution to energy research, education and outreach. The research programmes now include three new themes in the fields of smart electricity grids, the energy-water nexus, and (shortly) food and energy policy.

The ECI now comprises over 100 research staff, which together with postgraduate research students brings the total complement to more than 200 researchers. With facility investment totalling \$100 million, supported by a major portfolio of external grant funding that embraces research activity across all seven ANU Colleges, Energy Change is one of the key research themes of the University.

The expanded research programme of the ECI covers a complete spectrum – from science and engineering of energy generation and energy efficiency, to implementation expertise in the economic, legal, sociological and policy issues surrounding Energy Change. This broad portfolio of research activity is unique in the country, and has led to a memorandum of understanding with the Spanish renewable energy agency – CIEMAT - to foster closer research collaboration.

The ECI education programme also benefits from this broad spectrum of high-level expertise in energy research. The Master of Energy Change degree is now in its second year and currently has seventeen students enrolled. Over half are from outside Australia, with some joining through the Australia Awards program.

The ECI's location in the national capital provides an excellent position to contribute to public policy and to the wider community. Through the ANU Institute for Public Policy, we now have four ANU Public Policy Fellows to lead the engagement by our academic experts in providing research knowledge to government and industry.

Looking forward, the ECI will be holding its first annual Energy Update on December 5th, where the 2013 World Energy Outlook will be presented by Ian Cronshaw from the International Energy Agency.

In December 2014 the ECI will host the international Congress on Light, Energy and the Environment, with a plenary presentation by the former Secretary of Energy to the Obama administration, Professor Steven Chu.

I hope that you will follow the ECI's progress closely during the intervening time, and join us then.

HIGHLIGHTS

Events from ECI Open Day 29 October, 2012 to ECI Open Day 11 November, 2013

30 October 2012

The ECI hosted the public symposium *Australia's Energy Future* which reviewed the nation's energy prospects, starting with a presentation by the Secretary of the Department of Resources, Energy and Tourism, Drew Clarke. The 2012 ANU / ACT Government annual Solar Oration was delivered by Professor Joachim Luther, former director of the Fraunhofer Institute for Solar Energy Systems in Germany.



Australia's Energy Future (Olivia Wenholz/ANU)



Professor Steven Chu (AP Photo)

23 May 2013

The ECI hosted a roundtable meeting to mark the visit to Australia by Professor Cayetano Lopez – the Director of the Spanish renewable energy research agency CIEMAT. The meeting brought together key energy research institutions from around the country, as well as government agencies and Spanish renewable energy companies.

A key outcome was the signing of a Memorandum of Understanding between the ECI and CIEMAT which will foster closer research collaboration.

December 2012

The ECI was awarded the 2014 Congress on Light, Energy and the Environment by the OSA – the world-wide Optical Society. This Congress will combine four conferences:

- > Optical Instrumentation for Energy and Environmental Applications (E2)
- > Optical Nanostructure and Advance Materials for Photovoltaics (PV)
- > Optics for Solar Energy (SOLAR)
- > Solid State and Organic Lighting (SOLED)

The ECI Director has invited his colleague Professor Steven Chu – the former Secretary of Energy in the Obama administration – to present a plenary talk at the Congress. The Congress will be held at ANU from 2 – 5 December, 2014.



ANU-CIEMAT Roundtable (Adhityani Putri/ANU ECI)



Ken Baldwin addresses guests at the AAS Annual Dinner (AAS)

30 May 2013

The Australian Academy of Science annual meeting this year featured a symposium entitled Power for the People. The ECI sponsored the associated annual dinner, at which the ECI Director gave a speech encompassing the energy theme.

July 2013

In response to the Vice-Chancellor's call to reduce energy costs in the University, the ECI has joined forces with the Facilities and Services Division to reduce energy costs by at least 10% per annum.

This will include energy efficiency and energy saving measures, as well as the installation of cost-effective energy generation systems on campus.

19 August 2013

In the second of two workshops, the ECI met with representatives from the Department of Defence to assess the risks to Defence energy needs, and to provide expertise on options to address such risks. This process will underpin the prospects for future energy engagement with Defence.

Giles Parkinson presents the 2013 Solar Oration (Adam Da Cruz/ANU)



ANU-Department of Defence Workshop (Adhityani Putri/ANU ECI)

18 October 2013

The ANU / ACT Government 2013 Solar Oration was presented by Giles Parkinson of Renew Economy with the title "Why Utilities are afraid of Solar". Held on the day of the Climate and Energy Research Student EXPO seminar competition, the Oration attracted a packed audience of 200 people in the Great Hall at University House. Simon Corbell, the ACT Minister for Environment and Sustainable Development, opened the event.

November 2013

The Director visited the energy research laboratories at the University of Colorado, the Colorado School of Mines and the US National Renewable Energy Laboratories (NREL).

As a result of this visit, the ECI and NREL are developing a Memorandum of Understanding to further opportunities for research collaboration. The Director also participated in the Congress on Light, Energy and the Environment at Tucson, Arizona, in preparation for hosting the same Congress at ANU in December, 2014.



MISSION



A key to addressing many challenges the world is facing today is a world-wide change to carbon-free forms of energy production. Energy Change will offer broader benefits to society by:

- > driving the transformation to a clean economy in response to climate change
- > increasing economic productivity to help ensure long-term growth; and
- > improving energy access and security.

The ECI aims to provide authoritative leadership in Energy Change research and education through a broad portfolio ranging from science and engineering of energy generation and energy efficiency, to energy regulation, economics, sociology and policy.

A defining feature of the ECI is that we are *technology and policy neutral*. That is, we undertake research and education in critical areas of energy technology and energy policy without favouring one particular area over another. This can and should create open forum for good ideas leading to Energy Change.

Photo by Alternative Heat (Flickr)

GOVERNANCE

The ECI comprises more than 100 academic staff and their postgraduate research students, bringing the total complement to over 200 researchers.

The wider ECI membership meets twice a year: at the annual business meeting, which this year occurred in early April, that establishes the activity for the coming year; and at the ECI Open Day in November which presents research highlights to the ECI stakeholder community.

Operationally, the ECI is governed by an Executive comprising representatives from all ANU Colleges:

ECI Executive

Professor Ken Baldwin - Director (ANU College of Physical & Mathematical Sciences)

Professor Andrew Blakers (ANU College of Engineering & Computer Science)

Professor Thomas Faunce (ANU College of Law)

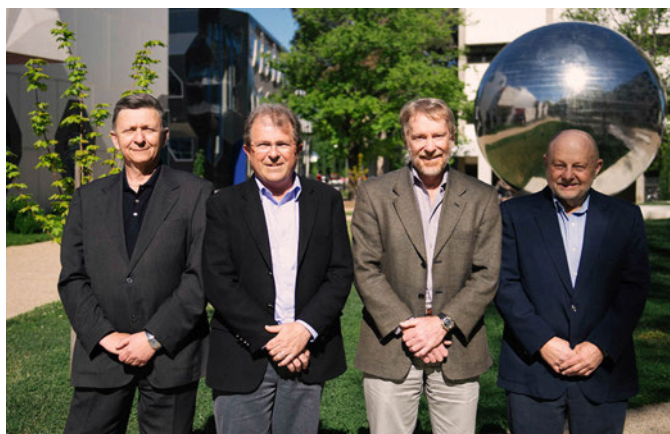
Professor Elmars Krausz - Education Convenor (ANU College of Physical & Mathematical Sciences)

Professor Stewart Lockie (ANU College of Arts & Social Sciences)

Professor Warwick McKibbin (ANU College of Asia and The Pacific)

Dr Igor Skryabin - Business Development Manager (ANU College of Engineering & Computer Science)

Dr Michael Smith (ANU College of Medicine, Biology & Environment)



The Executive meets regularly throughout the year as required.

The strategic directions of the ECI are reviewed each year when the Executive meets with the ECI Advisory Board.

ECI Advisory Board

Professor Armin Aberle, Solar Energy Research Institute of Singapore

Ms Glenys Beauchamp PSM, The Secretary, Department of Industry

Mr Stephen Devlin, General Manager Assets Division, ActewAGL

Ms Dorte Ekelund, Director General of Environment and Sustainable Development, ACT Government

Mr Ian Farrar, Board Member, Centre for Sustainable Energy Systems; former Chair and CEO of the Joint Coal Board

Professor John Poate, Colorado School of Mines; Member of the US National Renewable Energy Laboratory Advisory Board

Professor Michael Raupach, Director, The ANU Climate Change Institute

The Advisory Board meets with the Executive once each year on the occasion of the ECI Open Day.

Members of the ECI Executive (left to right):
Igor Skryabin, Warwick McKibbin, Ken Baldwin, Elmars Krausz (Adam Da Cruz/ECI)

EDUCATION

Master of Energy Change



In 2013 the ECI continues the delivery of its flagship educational program – The Master of Energy Change. Professor Elmars Krausz is the convenor of the program. The program commenced in the first semester of 2012 and now includes 17 enrolled students both from Australia and overseas.

The ANU Master of Energy Change is a multi-disciplinary postgraduate degree, available as a coursework-only option or as a coursework plus research dissertation (advanced) degree.

The need for changes in global energy generation and usage is well established. At present, too few professionals have an effective overview of the many factors involved in these matters. The Master of Energy Change degree is structured to meet the needs and aspirations of professionals, equipping them to engage with the broad spectrum of challenges in Energy Change.

The Program brings together the wide-ranging energy expertise present at ANU. It covers policy, legal, economic, sociological, environmental and regulatory aspects of energy change, and is underpinned by fundamental scientific and technical training. The degree comprises two foundational and 20 elective courses.

The foundation courses are:

- Principles of Energy Generation & Transformation
- Energy Resources and Renewable Technologies

These courses are aimed at providing students who do not have a technical background with an understanding of the principles underpinning energy technologies.

The course “Principles of Energy Generation” was specifically developed for this degree. With the inclusion of a unit from Sociology, the program now involves almost

Photo: Adhityani Putri (ANU ECI)

all ANU Colleges. Considering the strong interdisciplinary nature of this degree, our primary requirement is that candidates possess an undergraduate degree from an accredited institution. No other formal prerequisites are required apart from appropriate numeracy skills and an accredited ability in English.

The remaining subjects are grouped into the key discipline areas of:

- Energy regulation and governance
- Energy economics
- Climate change
- Environmental sustainability
- Specific energy technologies (solar, nuclear etc.)
- Energy sociology and risk

In addition to the formal coursework, MEnCh students have an opportunity to participate in the wider activities of the ANU Energy Change Institute, which includes seminars presented at the ANU and other world leaders in the field, conferences and workshops engaging with government and industry, and other outreach programs with the wider community.

Carefully targeted promotion of the Master of Energy Change remains the key to advancing this program. This year marks the first anniversary of Master of Energy Change and we wish to congratulate all participating students.



“The interdisciplinary nature of the Master of Energy Change has exposed me to leading experts and thought leaders in the fields of engineering, economics, law and public policy.

The flexibility and diversity of study options available has allowed me to tailor a program of study which suits both my academic interests and the needs of my current and prospective future employers.”

Daniel Harding, Master of Energy Change student, is the first graduate of the program.



Chidubem Nwagbara (Glory)

Australian Development Scholarship recipient

Nigerian graduate student, Glory Nwagbara, has been studying the Master of Energy Change program at the Australian National University (ANU) in Canberra. “It was the Energy Change Masters course that attracted me to ANU. This course is quite unique,” explains Glory.

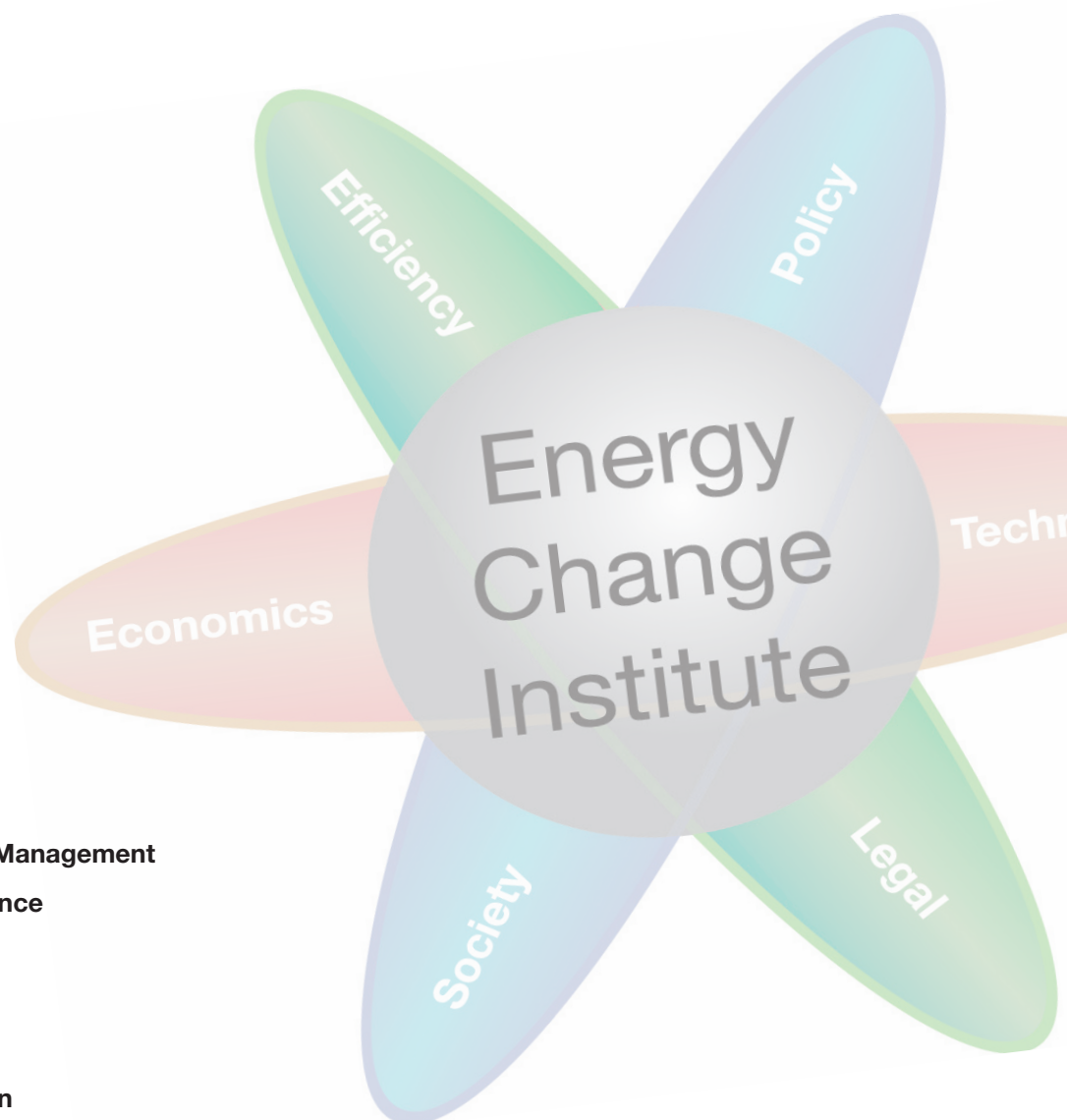
Glory was also the recipient of a prestigious and highly competitive AUSAID scholarship. “We had about 5000 applications from my country and there were just 30 of us selected for a Masters in Australia,” she says. The scholarship pays the University fees and also a fortnightly stipend to pay for accommodation and living expenses for the duration of the course.

The Master of Energy Change program is one year in duration. In addition to one year of coursework students can undertake six months of research, in which they can choose to specialise in a particular field. “You get to choose any subjects that have to do with energy change - policy, efficiency, new technologies etc. For this semester I am doing two engineering courses, one policy course in the Crawford School and one environmental law course,” she says.

Glory is enthusiastic about how the course will help with employment opportunities when she returns to Africa because climate change and energy change is a new area of specialty. “[Carbon] pollution is in the air and the environment is sick, so my studies here will be very applicable back home. We were planning on getting an Energy Research Centre and I realised that there were very few people specialising in that area, so there are real opportunities there.”

(Reporting and Photo by Sophia Callander)

“The expanded research programme of the ECI covers a complete spectrum – from science and engineering of energy generation and energy efficiency, to implementation expertise in the economic, legal, sociological and policy issues surrounding Energy Change. This broad portfolio of research activity is unique in the country.”



Artificial photosynthesis

Biofuels

Carbon Capture and Storage

Energy Economics and Policy

Energy Efficiency and Demand Management

Energy Regulation and Governance

Energy Sociology and Risk

Energy Storage and Recovery

Energy Water Nexus

Enhanced Oil and Gas Extraction

Fusion Power

Nanostructure Photovoltaics

Nuclear Science

Smart Grids

Solar Photovoltaics

Solar Thermal

RESEARCH

This year's Annual Report will concentrate on the new areas of energy research that have developed in the ECI this year, as well as the prospects for new research projects with external organisations.

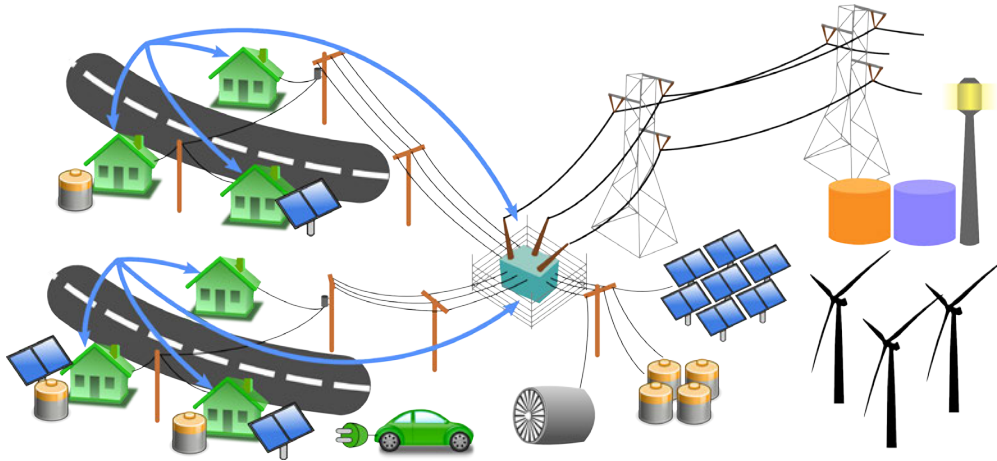


Image: Paul Scott/NICTA

Smart Grids

Renewable energies represent a significant opportunity to meet the world's energy needs while maintaining a viable environment for generations to come. The future electricity grid will feature millions of intermittent and distributed generation sources, will support a significant penetration of electric vehicles, and will give greater incentives and control to consumers to optimise their energy usage. It will also require an unprecedented level of automation, to self-manage, self-reconfigure and self-heal. This vision challenges the human-controlled, top down management style of the current grid which relies on the existence of few, predictable and rapidly adjustable fossil fuel generators. It calls for a fundamental paradigm shift in the way power systems are planned and operated, underpinned by a new generation of communication, control, data analytics, and optimisation technologies.

The College of Engineering and Computer Science at ANU, and the Optimisation Research Group at NICTA, Australia's largest research organisation dedicated to Information and Communication Technologies, are

jointly building new technologies based on mathematical optimisation and artificial intelligence, to support the future of energy systems and the transition from today's power systems. Our group of 15 researchers and PhD students collaborates with Australian and overseas utilities, and with overseas research institutions such as Los Alamos National Research Laboratory.

Research Topics

- **Microgrids:** a vision of the future grid is as a network of carbon neutral communities called microgrids, which balance their own renewable generation, storage, and loads, and provide ancillary services to the grid. We are investigating the optimal design and operations of microgrids.
- **Power systems planning and operations:** we automate and optimise planning and operational decisions to enable the future grid to operate economically and reliably under the dynamic and unpredictable conditions arising with renewable energy.

- Resiliency and self-healing: we automate power system restoration following incidents ranging from minor outages to natural disasters. This reduces outage time, fines for utilities, and costs to society. Our research is used by the US Department of Homeland Security in hurricane response.
- Demand management: we design and evaluate incentive mechanisms that encourage consumers to shift demand and reduce the network's peak load. We also develop optimisation software that help consumers to make optimal decisions about their energy consumption and reduce their bill.

Energy-Water Nexus

Three of the greatest challenges facing society are responding to climate change, meeting expanding energy demand and sustaining freshwater resources. There are crucial and often unacknowledged linkages between policies intended to achieve each of these objectives. For example, all forms of energy to differing degrees draw on water in their production, and so climate change policy choices between energy sources have considerable implications for water resources. Similarly, climate mitigation policies such as carbon sequestration often have implications for water, depending on how, where and when trees are planted and soil is prepared for greater carbon uptake.

Working closely in collaboration with colleagues from the United States, Europe and around the world, the Energy-Water Nexus Group it is an integrative and interdisciplinary endeavour, incorporating scholars, policymakers and industry.

Research Topics

- Energy consumption in the urban water supply chain
- Water demands in the energy sector
- Water and energy for food security
- Water and energy demands in other industrial sectors i.e. chemical production, paper, transport and mining

Other New Projects

New research topics have also been added to Biofuels, Energy Storage and Recovery, Energy Efficiency and Demand Management, and Solar Thermal - the latter area having several new University appointments.

In addition, the ANU Food Policy Institute is establishing a unit examining the relationship between food and energy that potentially could develop into a collaborative program with the ECI.

The unique research capabilities of the ECI were exemplified in a research project for the Department of Regional Australia, Local Government, Arts and Sport that focused on "Opportunities for RDAs to facilitate community engagement in renewable energy initiatives". A team of honours students supervised by researchers from a diverse range of disciplines – economics, engineering, environment and law – combined to examine renewable energy opportunities for regional Australia, using the ACT and surrounding regions as a test study. This combination of education with research across a broad spectrum of complementary fields is an excellent model for synergizing energy expertise across the university – see box for case study.



In a similar project that will examine the prospects for battery storage as an adjunct to domestic rooftop solar electricity generation, the ECI is joining with the ACT Government, ActewAGL and industrial companies to establish a research programme in this area. Again this will involve multi-disciplinary expertise – engineering, economics, sociology – in order to examine challenges impacting the future deployment of solar-storage technologies in the residential sector.

Finally, in a national initiative, the ECI joined with over 100 organisations across the country to form a proposal for an Australian Energy Industry Innovation Precinct (AEIIP). The bid aims to foster a national network of industry, government, peak bodies, and market-driven researchers to support the co-ordinated growth and development of the energy sector. The ECI would act as the hub for the ACT node which itself comprises 20 members.

Project for Regional Development Authorities (RDA)

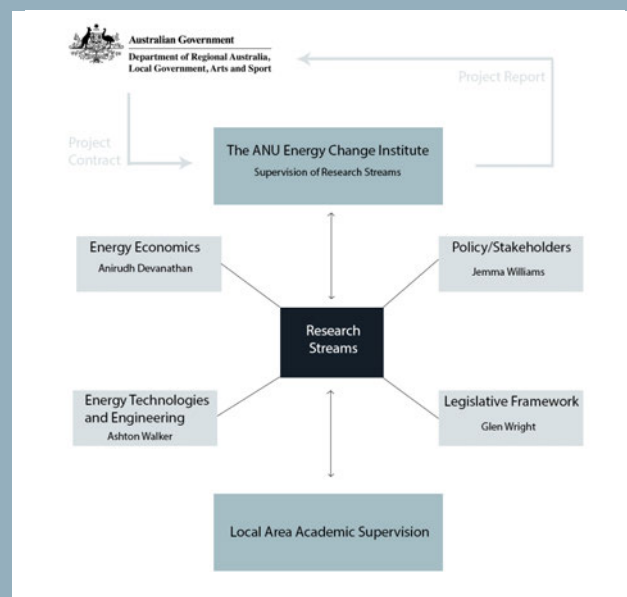
In August 2013 the ECI completed a project for the Department of Regional Australia, Local Government and Sports. The purpose of the project was to identify renewable energy opportunities for Regional Development Authorities arising from the Clean Energy Future package. The package (released in July 2011 and enacted by Parliament later that year), aimed to transform the nation's energy production, distribution and usage systems. The Department asked the ECI to scope opportunities embodied in the package, provide a regional model of an integrated energy system, and facilitate establishment of Community of Practice with Regional Development Authorities.

To address such a broad range of issues where electricity generation and distribution networks are closely interleaved with policy, community engagement, economics and law, the ECI engaged a multidisciplinary team of researchers and research students. The project research team comprised a number of honours and postgraduate students from various ANU Colleges.

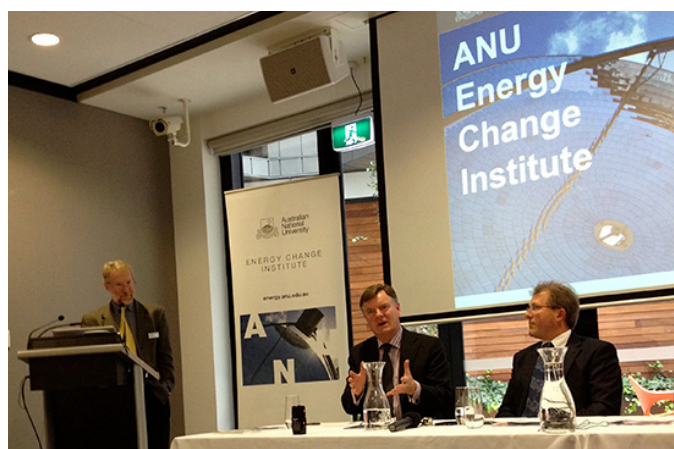
The student were jointly supervised by: Dr. Maria Racionero (ANU College of Business and Economics), Dr. Robert Dyball (ANU College of Medicine, Biology and Environment), Dr Frank Mills (ANU College of Physical and Mathematical Sciences), and Dr. James Prest (ANU College of Law). In the case of the honours students, their contribution to the project became an integral part of their honours research thesis.



From left to right: Project Team Honours students Anirudh Devanathan (ANU College of Business and Economics), Gemma Williams (ANU College of Medicine, Biology & Environment, The Fenner School), Ashton Walker (ANU College of Engineering & Computer Science) ran 4 research streams of the project as shown below, along with PhD candidate Glen Wright (ANU College of Law), who is not pictured.



EVENTS



Shell New Lens Scenario (Adhityani Putri/ANU ECI)

In 2013, the ECI organised and hosted a number of events for ANU, ECI stakeholders and the general public. The events ranged from public lectures and roundtables to academic seminars and symposia. The ECI has also supported events held by ANU local research areas by providing assistance in event organisation and publicity.

Below is a list of the events held during the reporting year:

Meetings

- *The ECI Annual Business Meeting*, 24 April 2013. The meeting was addressed by Mr. Blair Comley PSM, then Secretary of the Department of Resources, Energy and Tourism;
- *The ANU-CIEMAT Roundtable*, 23 May 2013. The meeting hosted Professor Cayetano Lopez, head of CIEMAT as well as senior academics from various Australian universities and government agencies;
- *Defence Energy Integration Workshop*, 19 August 2013. The workshop was attended by ECI participants and senior officials from the Department of Defence.

Conferences/Symposiums

- *Australia's Energy Future*, 30 October 2012. This was jointly organised by the ECI and The Crawford School of Public Policy;
- The Australian Academy of Science Annual Dinner and Symposium, *Science in the Shine Dome – Power to the People: The Science Behind the Debate*, 29-31 May 2013. The ECI sponsored the Annual Dinner, where Director Ken Baldwin presented a speech. Ken also chaired a session at the Symposium;

- Australian National Conference on Resources and Energy (ANCRE), 3-4 October 2013. The ECI was an associate of the event, and ran a display booth.

Seminars and Public Lectures

- *Shell New Lens Scenarios: The Road to 2100*, Panel Discussion featuring Mr Jeremy Bentham, Shell VP for Business, and Professor Ken Baldwin, Professor Andrew Blakers and Professor Warwick McKibbin, 30 April 2013;
- *Reinventing Fire*, Robert "Hutch" Hutchinson, Rocky Mountain Institute, 9 April 2013;
- *Renewable energy technologies: Innovation and commercialisation*, Mr Richard Adams, US National Renewable Energy Laboratory, 18 July 2013;
- *Beyond NIMBYism: Understanding public acceptance of new energy infrastructures*, Professor Patrick Devine-Wright Seminar, University of Exeter, 31 July 2013;
- *Have your research published: A briefing by the editor of Nature Climate Change*, Dr Bronwyn Wake, 28 August 2013;
- *Safety challenges for the Offshore Energy and other Process Safety industries-the UK experience*, Mr Steve Walker, Former Head of UK Health & Safety Executive, 28 October 2013;
- *Why Utilities are Terrified of Solar*, The ACT Government/ ANU 2013 Solar Oration by Mr Giles Parkinson, 17 October 2013.

Student Expo

The ECI and The ANU Climate Change Institute (CCI) jointly organised *The ANU Climate and Energy Research Expo*, 17 October 2013, which showcased postgraduate research on topics related to energy change and climate change, presented by research students from ANU, University of Canberra and UNSW ADFA. The student prize winners were (jointly) Wenjie Wei (ANU) and Nicholas Engerer (ANU). The Expo was addressed by former Climate Commissioner, Professor Lesley Hughes.

Open Day

Each year, the ECI Open Day showcases the latest in energy change research at the ANU, with ECI participants presenting oral and poster papers on their work. The 2012 event, held on 29 October, saw a large attendance from ANU and external stakeholders, including representatives from federal and local government, as well as the private sector.

This year the ECI Open Day was held on 11 November 2013 and highlighted new research areas and new projects in the Institute.

OUTREACH

Part of the ECI's education mission is to disseminate information on Energy Change through outreach activities in the wider community. The following is a partial list of the presentations on general ECI activities. In addition, there were many public presentations undertaken by ECI participants in their specific research areas.

December 2012-February 2013

- Professor Ken Baldwin met with Vietnam National University senior officials in Hanoi, 18 January 2013;
- Dr Igor Skryabin presented at the International Workshop on Renewable Energy, Climate Change & Energy Management, Anna University, Chennai, India, 24-25 January, 2013;
- Professor Tom Faunce presented *An Australian National Artificial Photosynthesis Project* at the ACES Wollongong, 13 February 2013;
- The ECI engaged the ANU community during the ANU Sustainability Day, 20 February 2013;
- Dr Igor Skryabin was a joint panel leader for the session *The Price is Right: How affordable solar PV changes everything* at the Second Australian Summer Study on Energy Efficiency and Decentralised Energy, Sydney, 27 February - 1 March 2013.

March 2013-May 2013

- Professor Ken Baldwin delivered a presentation to CSIRO conference - *Australia in the Anthropocene: Warnings and Options, Australian Science in the Anthropocene*, Sebel Townhouse, Sydney, 13 - 15 May 2013;
- Professor Ken Baldwin delivered a lecture for the University of the Third Age, Southern Highlands branch, 25 May 2013;
- Professor Tom Faunce spoke at the Senior Policy Briefing *Australia in the Asian Century*, Department of Foreign Affairs and Trade, 30 May 2013.

June 2013-August 2013

- Professor Andrew Hopkins, *Piper 25: A conference to reflect, review, reinforce and re-energise* (an offshore safety conference organised by Oil & Gas UK, which marked the 25th anniversary of the Piper Alpha disaster), Aberdeen, 18-20 June 2013;
- Professor Ken Baldwin delivered a presentation and sat in a discussion panel on *How will Australia deploy other renewable and low emission technologies in the overall low emission technology portfolio?* at the ATSE National Conference, "Nuclear Energy for Australia?" Powerhouse Museum, Sydney, 25-26 July 2013;

- Dr Niraj Lal presented *Science of Electricity*, an interactive science education event at the Questacon Science Museum, Canberra, 10 August 2013.

September 2013-November 2013

- Professor Ken Baldwin spoke about *Our Energy Options and Future* at the Australia-China Youth Dialogue, ANU, 25 September 2013;
- Professor Andrew Blakers hosted a visit by Dolf Gielen, Director of IRENA Innovation & Tech Centre, 2 October 2013;
- Dr Igor Skryabin hosted delegates from fourteen Taiwanese photovoltaic companies, ANU Research School of Engineering, 10 October 2013;
- Jan Hayes presented at the Australian Pipeline Industry Association Convention, *The pipeline industry - Critical infrastructure for the national economy*, Adelaide Convention Centre, 12 - 15 October 2013;
- Professor Andrew Blakers and Dr Igor Skryabin hosted a delegation from the Universiti Teknologi Petronas, Malaysia, 17 October 2013;
- Professor Andrew Blakers delivered a presentation on Solar Energy, Tianjin University, China, 25 October 2013;
- Professor Andrew Blakers delivered a keynote speech at the Dutch Embassy lecture lunch, 18 October 2013;
- Dr Igor Skryabin was an invited presenter on the subject of Solar research and education - opportunities for collaborative projects at the *19th Australia-Taiwan Joint Energy and Minerals, Trade and Cooperation Consultations meeting* Newcastle, 31 October- 1 November 2013,
- The ECI participated at the South East Region of Renewable Energy Excellence (SERREE) Renewable Energy Day, 21 November 2013.



The 19th Australia-Taiwan Joint Energy and Minerals, Trade and Investment Cooperation Consultations (JIMTEC)

MEDIA

Media Engagement

ECI participants routinely engage the media, which resulted in significant exposure of research and policy commentary related to Energy Change. Below are a sample of media coverage produced by ECI participants in 2013:

News

AFR, 2013, "Economists back emissions trading over direct action: poll" (Professor Warwick McKibbin);

Alternative Energy News, 2013, "Solar Could Help Australia Phase Out Coal Power by 2040", (Professor Ken Baldwin);

Sydney Morning Herald, 2013, "Solar energy growth could drive out coal by 2040" (Professor Ken Baldwin);

Fairfax News, 2013, "Future looks bright for clean energy" (Professor Andrew Blakers);

ABC, 2013, "Global push for carbon pricing grows" (Associate Professor Frank Jotzo).

Feature/Interviews

ABC 24, 2013, Interview with Professor Ken Baldwin on "Policy changes to the Clean Energy Future Package"

ABC 666, 2013, "Reaching for the Sun" a Flowerside interview with Dr Kylie Catchpole.

Commentary

Professor Tom Faunce, "Artificial photosynthesis could extend rights to nature" The Conversation, 2 July 2013;

Professor Tom Faunce, "Will a new government hand control of our energy to overseas investors?" The Conversation, 6 August 2013

Professor Andrew Blakers, "The north's future is electrifying: powering Asia with renewables", The Conversation, 21 August 2013;

Professor Andrew Blakers, "Lomborg's criticism of current renewables is years out of date", The Conversation, 30 September 2013;

Media Training

The ECI, with the assistance of the ANU Strategic Communications and Public Affairs unit (SCAPA), has organised a media training session for ECI participants. The training, hosted by Dr Ann Jones and Ms Casey Hamilton on 21 August 2013, touched on the latest in the Australian media landscape and strategies on how to engage with various forms of media. It was well attended and well received by participants.



Louise Maher from ABC 666 (left) is pictured talking with Kylie Catchpole (right) (ABC/Radio Marketing)

PUBLIC POLICY

The ECI plays a key role in the Australian National Institute for Public Policy (ANIPP) which provides the ECI (and the rest of the University) with the wider context that policy and decision makers need.

The return to the ANU of Professor Quentin Grafton and his appointment as Executive Director of ANIPP brought to 4 the number of ECI researchers appointed as ANU Public Policy Fellows (along with Professor Ken Baldwin, Professor Andrew Blakers and Professor Warwick McKibbin).

All four participated in the Public Policy Fellows forum on Complexity, Imperfection and the Future of Public Policy as part of ANU Public Policy Week (5 – 7 June):

- Professor Warwick McKibbin: “Designing climate policies in an uncertain world”
- Professor Quentin Grafton: “Resilience and public policy”
- Professor Ken Baldwin: “Complexity and uncertainty in public policy: a scientist’s perspective”
- Professor Andrew Blakers: “Coping with uncertainties and risks in energy security and lower carbon futures: The contribution of renewable energy”



ECI-Department of Defence Workshop (Adhityani Putri/ANU ECI)



Ken Baldwin at the ANU Public Policy Week (Adhityani Putri/ANU ECI)

Many ECI researchers contribute through their individual research expertise to public policy development as part of their everyday activities – particularly in the disciplines of economics, law, sociology and policy.

Amongst many individual contributions throughout the year, ECI researchers participated in the following public policy events through invitation to the ECI:

- The ECI hosted a workshop with the Department of Defence examining options for mitigating risk in Defence energy needs, complementing the first workshop on this subject held in the Department.
- Professor Ken Baldwin continued as a member of the Project Steering Committee for the Australian Energy Technology Assessment (AETA) which this year updated the report initially released in 2012.
- Professor Baldwin also contributed to an evaluation of the role of energy change in climate change by the Office of National Assessment.
- The ECI was invited to participate in the annual workshop of the Bureau of Resource and Energy Economics, and was an associate of the Australian National Conference on Resources and Energy (ANCRE) organized by the Department of Resources, Energy and Tourism.

OUTLOOK



The ECI is moving from strength to strength, with an increase in the number of research areas, research experts, postgraduate students and the number of roles in public policy, industry and the wider community.

We have instituted the first in a series of annual Energy Updates in which the ECI invites international and Australian commentators to discuss the World Energy Outlook (WEO), including a presentation by the International Energy Agency (IEA). This year's one-day forum on the 2013 WEO will take place on December 5th, and will feature a presentation by IEA WEO team member Ian Cronshaw.

Next year the ECI looks forward to hosting the international Congress on Light, Energy and the Environment from 2 – 5 December, 2014. This Congress will provide an excellent opportunity to profile the activities of the ECI to a large international audience, with a key focus provided by the plenary presentation from Professor Steven Chu – former Energy Secretary to President Obama.

The ECI will continue to strive for excellence in education, research and public engagement. We look forward to participating with you in these endeavours in the coming year.

Photo by Vattenfall (Flickr)

Save
the
Date

OSA Light, Energy and the Environment Congress

2–5 December 2014

Canberra, Australia

Energy Change Institute, Australian National University

- ▶ Optics and Photonics for Energy and the Environment (E2)
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GENERAL CHAIR: **Professor Kenneth Baldwin**, *Australian National University*

PLENARY SPEAKER: DR. STEVEN CHU

- ▶ Nobel laureate, 1997, joint award with Claude Cohen-Tannoudji and William D. Phillips "for development of methods to cool and trap atoms with laser light"
- ▶ Former U.S. Secretary of Energy under President Barack Obama
- ▶ Current William R. Kenan, Jr. Professor of Physics and Professor of Molecular and Cellular Physiology at Stanford University



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APPENDIX Advisory Board Membership



Professor Armin Aberle

Solar Energy Research Institute of Singapore

Prof Armin Aberle is the CEO of the Solar Energy Research Institute of Singapore (SERIS) at the National University of Singapore (NUS) and a tenured full professor in the university's Department of Electrical and Computer Engineering.

His research focus is on reducing the cost of solar electricity generated with silicon solar cells, both wafer based and thin-film based. His R&D work has covered the full spectrum from fundamental materials research to the industrial evaluation of novel PV technologies at the pilot line level, including the development of novel solar cells, their fabrication in the laboratory, their characterisation, and their computer modeling. He has published extensively and his work has a high impact on the field.



Ms Glenys Beauchamp PSM

The Secretary, Department of Industry

On September 18 2013, Glenys Beauchamp was appointed Secretary of Department of Industry. Prior to this appointment, she was appointed Secretary, Department of Regional Australia, Regional Development and Local Government on 21 December 2010 after acting in the position since the Department was created on 14 September 2010. Following further machinery of government changes on 14 December 2011, Arts and Sport functions were included in the new Department of Regional Australia, Local Government, Arts and Sport.

Prior to this appointment she was a Deputy Secretary in the Department of the Prime Minister and Cabinet.



Mr Stephen Devlin

General Manager Assets Division, ActewAGL

Stephen Devlin is responsible for ActewAGL's energy networks asset strategy and planning functions. He is also responsible for the gas networks business, technical regulatory standards, major customer connections and smart networks developments. He has a breadth of experience in the energy, water and waste sectors, having worked across many facets of the electricity, water, gas and waste industries for 30 years.

Stephen also holds a Bachelor of Engineering (Electrical), a Master of Business Administration and a Master of Commercial Law.



Ms Dorte Ekelund

Director General of Environment and Sustainable Development, ACT Government

Dorte Ekelund is an urban planner and the Director-General of the Environment and Sustainable Development Directorate of the ACT Government.

She was formerly the head of the Major Cities Unit, the Australian Government's think tank on urban policy issues. Prior to that she held roles as the Deputy Director General, WA Department for Planning and Infrastructure, and Deputy Chief Planning Executive, ACT Planning and Land Authority. Dorte is experienced in urban development coordination, infrastructure planning, statutory planning, planning system reform and governance reform.



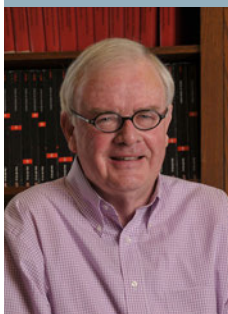
Mr Ian Farrar

Board Member, Centre for Sustainable Energy Systems; former Chair and CEO of the Joint Coal Board

Ian Farrar has a distinguished career in senior management in CSIRO and the coal industry. He has a Bachelor of Commerce from ANU.

From 2002 until his retirement in 2005 he was Managing Director/CEO of Coal Services Pty Limited (CSPL), Coal Mines Insurance Pty Limited (CMI) and Mines Rescue Pty Limited, as well as Chairman of Coal Services Health and Safety Trust and Injury Prevention and Control Australia Limited.

From 1964 to 1992 he held a range of senior management position within CSIRO, including General Manager (Corporate Resources) and Senior Principal Advisor (Special Projects).



Professor John Poate

Colorado School of Mines; Member of the National Renewable Energy Laboratory (US) Advisory Board

John M. Poate is Vice-President for Research and Technology Transfer at the Colorado School of Mines. He previously served as a Harwell Fellow of the UKAEA, Head of the Silicon Processing and Interface Physics Research Departments at Bell Laboratories, Dean of the New Jersey Institute of Technology and CTO of Axcelis Technologies.

John has published extensively in several areas of nuclear physics solid state physics, materials science and engineering. He is a Fellow of the American Physical Society and Materials Research Society, MRS Past-President and the John Bardeen award winner of the TMS. He has served on advisory panels or councils for NATO, US and

overseas universities, NSF, NRC, and DOE.

He currently serves as Chair of the Director's Review Committee for Physical and Life Sciences at Lawrence Livermore National Laboratory and is on the Board of the National Renewable Energy Laboratory.



Professor Michael Raupach

Director, The ANU Climate Change Institute

Michael Raupach was appointed in November 2013 as the Director of the Climate Change Institute, Australian National University. He has worked for most of his scientific career to date in CSIRO, mainly in the Canberra laboratory of CSIRO Marine and Atmospheric Research.

His scientific research interests encompass Earth System science, carbon-climate-human interactions, land-air interactions, and fluid mechanics. He is a Fellow of the Australian Academy of Science, the Australian Academy of Technological Sciences and Engineering, and the American Geophysical Union. Through his scientific career he has published over 150 scientific papers, 50 reports, numerous minor publications, and 2 edited books.

From 2000 to 2008 he was an inaugural co-chair of the Global Carbon Project, an international project studying the natural and human influences on the global carbon cycle, and the interaction of the carbon cycle with climate.

In 2009-2010 he chaired the Expert Working Group on Challenges at the Intersection of Carbon, Energy and Water, reporting to the Prime Minister's Science, Engineering and Innovation Council and Office of the Chief Scientist, Australia.

Starting in 2011, he chaired the Steering Committee of the "Australia 2050" project of the Australian Academy of Science, a multi-disciplinary project examining possible future pathways for Australia over coming decades against criteria of sustainability and equity.

APPENDIX Executive Membership



Professor Ken Baldwin
Director

ANU College of Physical & Mathematical Sciences

Ken Baldwin is the Director of the Energy Change Institute at The Australian National University, where he is also Deputy Director of the Research School of Physics & Engineering. Since 2011 he has been a member of the Project Steering Committee for the Australian Energy Technology Assessment. In 2007, he was awarded the W.H. Beattie Steele Medal, the highest honour of the Australian Optical Society, and in 2010 he was awarded the Barry Inglis Medal by the National Measurement Institute for excellence in precision measurement.

Ken is an ANU Public Policy Fellow, and is a Fellow of the American Physical Society, the Institute of Physics (UK), the Optical Society of America and the Australian Institute of Physics.



Professor Andrew Blakers

ANU College of Engineering & Computer Science

Andrew Blakers is the Director of the Centre for Sustainable Energy Systems at the Australian National University. He was a Humboldt Fellow and has held Australian Research Council QEII and Senior Research Fellow ships. He is a Fellow of the Academy of Technological Sciences & Engineering, the Institute of Energy and the Institute of Physics.

He has published approximately 200 papers and patents. His research interests are in the areas of photovoltaic and solar energy systems; particularly advanced thin film silicon solar cell technology and solar concentrator solar cells, components and systems. He has also interest in sustainable energy policy, and is an ANU Public Policy Fellow.



Professor Thomas Faunce

ANU College of Law

Thomas Faunce is an Australian Research Council (ARC) Future Fellow researching nanotechnology and global public health; That research now focused on governance of global artificial photosynthesis.

He is a project director, ARC Discovery Project Grants on methods to detect fraud and misleading representations in relation to energy policy (with Dr Gregor Urbas) and nanotechnology and security implications of energy policy (with Dr Hitoshi Nasu).



Professor Elmars Krausz Education
Convenor

ANU College of Physical & Mathematical Sciences

Elmars Krausz graduated and received his PhD from the University of Sydney. He has since held positions at The Australian National University (1971-1973, 1978), Oxford University (1974-1975), the University of Virginia (1976-1977), the University of Sydney (1979-1980) before being appointed as Research Fellow at the Research School of Chemistry.

He was awarded fellow of the Royal Australian Chemical Institute and was appointed Professor at the Research School of Chemistry in 2002.



Professor Stewart Lockie

ANU College of Arts & Social Sciences

Stewart Lockie is Head of the ANU School of Sociology and President of the International Sociological Association's Research Committee on Environment and Society.

He is an environmental sociologist whose research addresses environmental governance and risk, the regulation and transfer of environmental and social values through commodity chains, the greening of consumption practices, and the social impacts of resource development.

Stewart is a Fellow of The Academy of Social Sciences in Australia and is also the President of the International Sociological Association Research Committee on Environment and Society (RC24).



Professor Warwick McKibbin

ANU College of Asia and The Pacific

Warwick McKibbin is an ANU Public Policy Fellow in the Crawford School of Public Policy and an Adjunct Professor in the Australian Centre for Economic Research in Health at The Australian National University.

He was foundation Director of the ANU Centre for Applied Macroeconomic Analysis, and is still a Professor with the Centre.

He is a non resident Senior Fellow at the Brookings Institution in Washington D.C.; a Professorial Fellow at the Lowy Institute for International Policy; and president of McKibbin Software Group.

Warwick was a member of the Board of the Reserve Bank of Australia.



Dr Igor Skryabin

Business Development Manager

ANU College of Engineering & Computer Science

Igor Skryabin's career spanned both industry and academia. His interests are in the areas of development and commercialisation of solar energy technologies and their integration into national electricity markets.

His major technical contribution was in the industrialisation of nano-structured dye solar cells. Igor has published more than 100 research papers and is an inventor of more than 30 patents and industrial designs, granted in Australia and overseas. Igor's particular expertise is in business development focusing on creating and industrialising intellectual property.



Dr Michael Smith

ANU College of Medicine, Biology & Environment

Michael Smith has been a Research Fellow at the ANU Fenner School of Environment and Society since 2006 specialising in sustainable energy, sustainable design, energy efficiency and their role in improving national energy productivity.

Michael has co-authored two textbooks, "Whole System Design" and "Factor Five", on how to achieve a step change in energy efficiency through sustainable design co-published by UNESCO and the World Federation of Engineering Organisations. He has recently developed a significant part of the new COAG Energy Efficiency Exchange web portal (www.eex.gov.au) He also works to embed energy efficiency into tertiary education and training at ANU

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