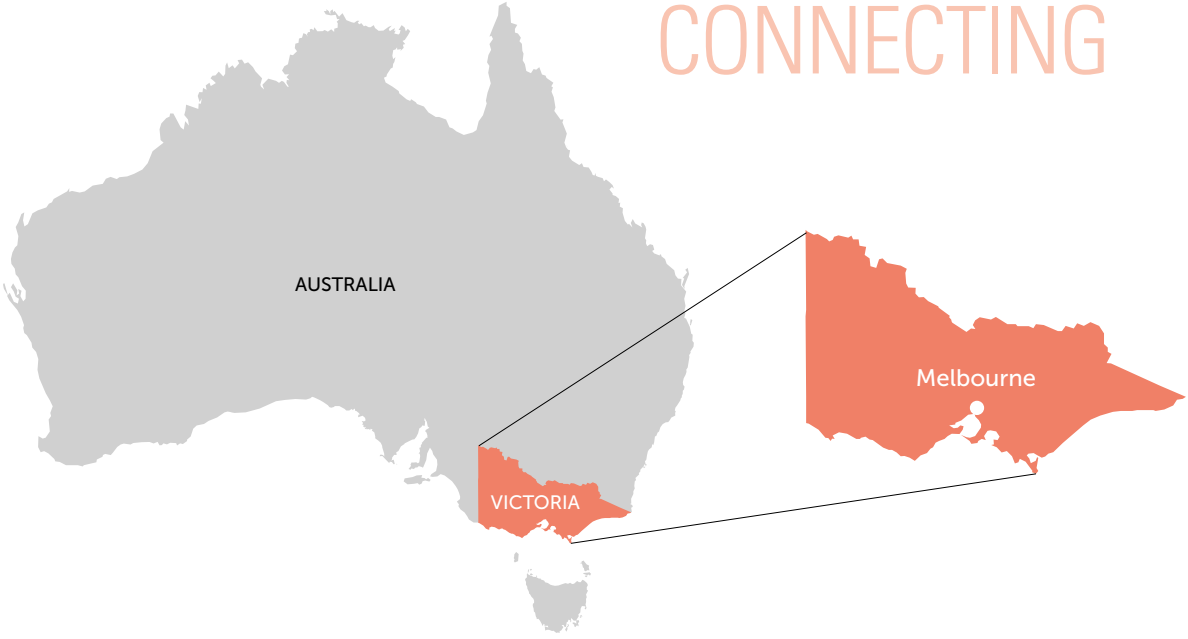
MELBOURNE
RESEARCH, EDUCATION AND TRAINING

CLEAN ENERGY

MELBOURNE
VICTORIA AUSTRALIA

MELBOURNE:
LEADING
INNOVATING
CONNECTING



Melbourne and regional Victoria are a perfect blend of economic strength and dynamism, with a lifestyle that is envied around the world. Talented people, a world-class education system, supportive government and superior infrastructure make the state of Victoria a global leader in research, education and vocational training.

Victoria's research centres, universities and vocational training providers partner with industry, governments, non-government organisations (NGOs) and other educational institutions around the world.

They offer extensive opportunities for partnerships and program collaborations, including joint research initiatives, research and development services, licensing of materials, tailored curriculum development, joint program delivery, staff/student exchange, consultancy services and customised employee development programs.

For more information about Victoria's research, higher education and vocational training capabilities, contact your region's Victorian Government Business Office at: **invest.vic.gov.au/offices**.

CLEAN ENERGY IN MELBOURNE AND VICTORIA

The state of Victoria is an emerging leader in clean energy research and development.

Melbourne and regional Victoria boast a strong mix of renewable energy technologies, including solar, wind and wave power, and world-class research and development (R&D). This expertise, together with the state's ready access to markets, its effective operating environment, and advanced manufacturing facilities, make Victoria an exciting centre of opportunity for all aspects of the growing sustainable energy industry.

Many global companies have already invested in technology development in Victoria to leverage the state's renewable energy expertise in academia and industry.

Emerging low emission coal technologies are also developing rapidly in Victoria. Latrobe Valley in the state's east holds the world's second largest deposit of brown coal and currently still supplies more than 90 per cent of Victoria's base load electricity.

Building upon Victoria's existing robust financial services sector and energy infrastructure, Melbourne is also becoming a hub for Australian carbon services throughout the Asia-Pacific region. Melbourne is home to the national office of the Carbon Market Institute, the peak body for Australian carbon market participants, and the Australian representative offices of the International Emissions Trading Association and the Climate Markets and Investors Association.

Melbourne is also home to over 180 carbon services businesses, with strong skills and capacity in areas such as carbon asset management, measurement and reporting, environmental technology, energy efficiency, project management, trading, and legal and auditing services.

RESEARCH AND DEVELOPMENT

Victoria's energy industry has a strong culture of collaboration, with extensive linkages and partnerships in place between the state's academic, research, industry and financial sectors, with proven capabilities in:

- Energy technology
- New energy sources including solar, wind, wave, geothermal
- Low emission coal technology
- Carbon capture and storage
- Carbon markets.

The Victorian Government, in partnership with industry, is driving investments in advances in low emission coal and renewable technologies, such as solar, geothermal, biomass, and energy storage, so that they are ready for market uptake.

Victoria is home to a thriving clean energy R&D industry, with major initiatives including:

- The Cooperative Research Centre for Greenhouse Gas Technologies' Otway Project in south-west Victoria, which is the country's first demonstration of the deep geological storage, or geosequestration, of carbon dioxide. The project provides technical information on geosequestration process, technologies, and monitoring and verification regimes that will help to inform public policy and industry decision-makers
- The Victorian Organic Solar Cell Consortium, a collaboration between industry and academia, that aims to produce prototype organic solar cells with potential to print directly onto materials such as roofing and windows
- The University of Melbourne industry partnership with Geotechnical Engineering and Direct Energy, which is piloting direct geothermal heating and cooling in around 30 buildings across the state, including residential, industrial and commercial buildings, and providing input to developing standards for installation of direct use geothermal systems
- Hot Dry Rocks research into geothermal heat profiles at shallow depths in the Latrobe Valley in Victoria which may demonstrate the commercial potential of using moderate temperature in shallow wells to generate electricity
- The Solar Systems large-scale pilot demonstration plant in Mildura, which is the largest concentrated photovoltaic facility of its kind in Australia.

Other research centres and facilities with specialised expertise in clean energy include:

- Victoria-Suntech Advanced Solar Facility, a collaborative venture between Swinburne University ans Suntech Power Holdings
- University of Melbourne's Melbourne Energy Institute
- La Trobe University's Centre for Technology Infusion
- Victoria University's Centre for Strategic Economic Studies
- RMIT's Platform Technologies Research Institute
- Centre for Market Design
- Deakin University's Institute for Frontier Materials.

Melbourne also hosts the annual All-Energy Australia Conference, the largest clean and renewable energy event in Australia, and has hosted Carbon Expo Australasia for the past four years.

EDUCATION AND TRAINING

Victoria's education and training institutes provide a wide variety of qualifications at the vocational, undergraduate and postgraduate levels that support the clean energy industry. Close industry links are a characteristic strength of Victoria's higher education and vocational education and training system and ensure that all programs, covering technical skills through to research, reflect the latest developments in this rapidly moving industry.

Melbourne's universities offer programs that provide foundations in specific fields of clean energy expertise as well as broader courses that strategically include clean energy, carbon accounting and energy technology knowledge.

A number of Victorian vocational training institutes offer qualifications with a practical emphasis on the skills for clean energy technology design, installation and management. Institutes offer high quality training and project management consultancies that deliver workforce training and development programs for industry partners.

MELBOURNE AND REGIONAL VICTORIA BOAST A STRONG MIX OF RENEWABLE ENERGY TECHNOLOGIES, INCLUDING SOLAR, WIND AND WAVE POWER, AND WORLD-CLASS RESEARCH AND DEVELOPMENT

CASE STUDY

THE SOFTWARE TOOL DRAWS UPON DATA ABOUT WEATHER VARIABILITY, RENEWABLE AND FOSSIL TECHNOLOGIES, TRANSMISSION AND ECONOMIC MARKET MODELS TO HELP IDENTIFY THE MOST COST EFFECTIVE SOLUTIONS.

CALCULATING THE COST OF CLEAN ENERGY

The University of Melbourne and project partners are developing a software tool that can find the most affordable ways to significantly increase the use of renewable energy in the electricity system.

To achieve a significant reduction in carbon dioxide emissions, fossil fuel-based electricity generation will need to be replaced with a combination of renewable energy sources such as wind, solar photovoltaics, concentrating solar, wave, biomass and hydro power, or by capturing carbon dioxide from fossil fuel-based power stations as well as reducing demand for electricity through efficiency measures.

No single technology can deliver the required emission cuts, meaning a low carbon emission energy system will require a mix of technologies. Each technology has benefits and disadvantages, making it difficult to decide how much of each should be used to achieve the most cost-effective reduction in emissions.

Decision-making requires consideration of a number of factors including the cost of building and operating different renewable energy technologies, the extent to which renewable energy production varies with the weather, how effectively electricity can be stored and the cost of transmission.

Decisions also need to take into account changes in demand for electricity and the differing levels of renewable energy generated over timescales of seconds to decades.

The software tool will assist this decision-making process by drawing upon data about weather variability, renewable and fossil technologies, transmission, and economic market models, to help identify the most cost-effective solution.

By testing different sets of assumptions about technology costs, the software tool will help to identify options for Australia and other nations to move towards a low carbon energy system. The project researchers have made the model open source so that it will be available to the international research community to use and further develop.

HARVESTING ENERGY FROM THE CAR PARK

La Trobe University and Indian electric vehicle manufacturer Mahindra Reva are partnering on an exciting new advanced energy management system.

In the future, when there is a power blackout, workplaces may be able to tap into the energy stored in the car batteries of hundreds of employees, in order to keep the wheels of industry turning.

Joint research by La Trobe University and Mahindra Reva – one of the first companies to introduce electric vehicles worldwide – may not only overcome temporary power interruptions but may also assist in the management of dwindling energy supplies and reduce greenhouse gas emissions throughout the industrialised world.

The advanced energy management system will be developed and trialled by Mahindra Reva at its new electric vehicle plant in Bangalore.

The electric vehicle plant's power supply includes solar panels with a back-up diesel generator, which the company would eventually like to replace by 'harvesting' energy from hundreds of company and employees' cars in their car park.

The project is based on cutting-edge information and communications technology (ICT) developed by La Trobe University's Centre for Technology Infusion and trialled in buildings on the Melbourne campus since 2008.

The La Trobe University system is already used for domestic applications following its successful installation by the University, the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and commercial builders in Australia's first Zero Emission House last year.

Among other features, it enables electric vehicles to be plugged into the home grid, drawing down car battery power, for example during the evening peak, and then, overnight when power is cheaper, recharging the car's battery for the morning.

Mr Chetan Maini, founder and Chief of Technology and Strategy at Mahindra Reva, said his company pursues a low-energy manufacturing process where not only are the cars emissions free but the way they are made is also highly energy efficient.

"This collaboration will make future manufacturing plants a benchmark in energy management," Mr Maini said.

NOT ONLY ARE THE CARS EMISSIONS FREE **BUT THE WAY THEY ARE MADE IS ALSO HIGHLY ENERGY EFFICIENT.**

CASE STUDY

DEVELOPING SUSTAINABLE FUEL SOURCES FOR THE AVIATION INDUSTRY

Monash University has partnered with the Defence Science and Technology Organisation and Boeing to convert algae into a clean and secure fuel source for the aviation industry.

Aviation accounts for two per cent of the world's total greenhouse gases. The International Air Transport Association and its members, such as Boeing, are seeking to reduce the industry's emissions through the development of sustainable alternative fuel, such as bio-derived jet fuel.

A collaboration between Monash University, Defence Science and Technology Organisation (DSTO) and Boeing aims to maximise the yield and the quality of jet fuel products obtained from algae by identifying efficient thermochemical processes for the liquefaction of biomass for conversion into jet fuel or additives.

The advantage of algal sources over other biofuel sources is that they can be produced on a large scale at a compact location, thereby reducing costs associated with the collection and transport of the biomaterial to a central processing plant.

Previous methods to obtain renewable fuels from algae have left behind a large amount of organic material which contains some residual lipids (the oily part of the algae biomass) as well as aromatic compounds that are essential for aviation fuels. The approach developed in this project allows for the conversion and recovery of almost all the organic material present within the biomass, leading to very good yields of liquid products from easily grown algae. The conversion of as much as possible of this crude liquid product into jet fuel is currently being studied.

When sufficient quantities of jet fuel are available, DSTO will evaluate them against stringent international standards. Boeing is able to carry out engine tests if sufficiently large-scale conversions are developed.

In the longer term, this information will also help evaluate the prospects for the introduction of a bio-jet fuel industry in the Latrobe Valley, only 70 minutes away from Melbourne's outer suburbs, where it is anticipated appropriate algae species will grow well.

THE ADVANTAGE OF ALGAL SOURCES OVER OTHER BIOFUEL SOURCES IS THAT **THEY CAN BE PRODUCED ON A LARGE SCALE AT A COMPACT LOCATION, THEREBY REDUCING COSTS.**

RMIT UNIVERSITY PARTNERS IN PRINTABLE SOLAR CELLS BREAKTHROUGH

An RMIT University research collaboration with top scientists in Australia and Japan is advancing the next generation of solar cells.

The development of cheaper and less toxic solar cells using nanotechnology is the focus of a collaborative research project conducted by RMIT, the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the Japan Science and Technology Agency.

The RMIT research team includes leader Professor Yasuhiro Tachibana and Dr Joel van Embden from RMIT's School of Aerospace, Mechanical and Manufacturing Engineering and Professor Kay Latham from the School of Applied Sciences.

Their research into next-generation solar cells is concentrated on discovering cheaper, less toxic 'colloidal nanocrystals'. These can be used as an 'ink', enabling solar cells to be quickly and cheaply fabricated with a printer.

Scientists envisage that printable solar cells could potentially be used as an external building coating that would collect and supply energy for the building. Other possible uses include low-cost solar lighting and water purification.

Cadmium or lead elements are currently the most commonly used materials in colloidal nanocrystals synthesis, despite concerns about their toxicity. The RMIT research team has been exploring using other elements to synthesise nanocrystals.

"We have focused on incorporating the elements copper and antimony into nanocrystals, as they are low-cost, low-toxic and earth-abundant," Dr van Embden said.

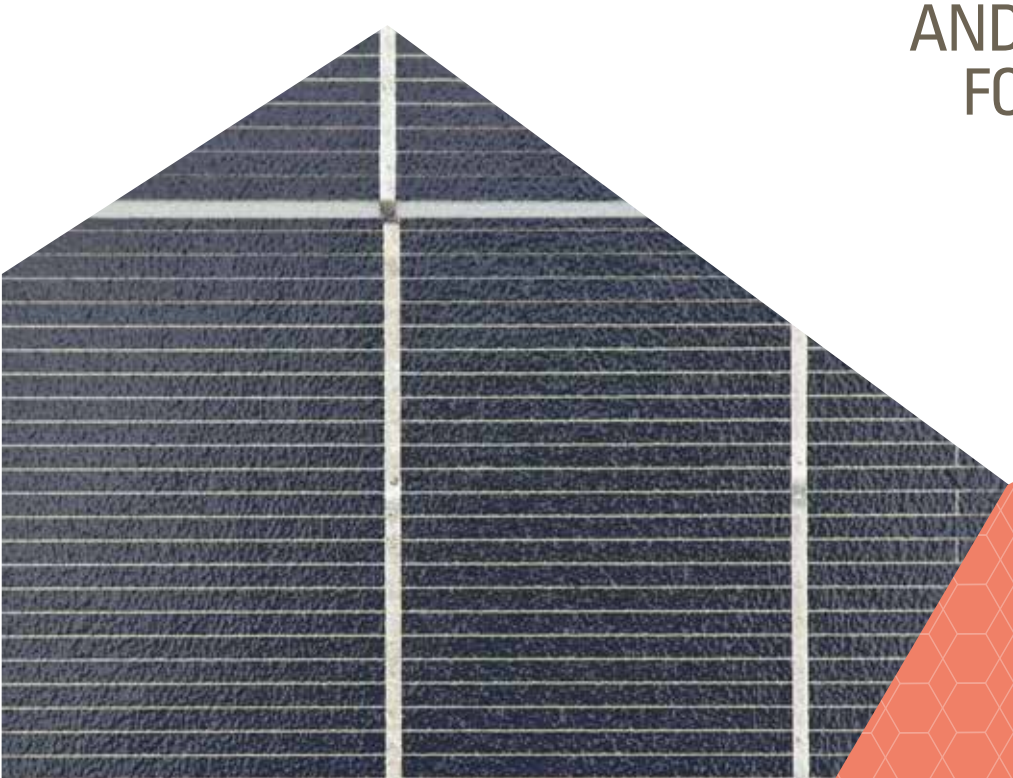
The results have demonstrated strong absorptions of visible and near-infrared light, which indicates they are suitable as a light absorber in solar cells.

Solutions of colloidal nanocrystal solutions can readily be employed to prepare thin films. The research team has already confirmed that electricity can be generated from this film when it is exposed to light.

Professor Tachibana said nanocrystal films could be fabricated on an electrode and applied to photovoltaic devices and thin-film thermoelectric transistors at a comparatively low cost compared with other methods.

The research was recently published in the Journal of the American Chemical Society, the highest ranked journal in the field.

SCIENTISTS ENVISAGE THAT PRINTABLE SOLAR CELLS COULD POTENTIALLY **BE USED AS AN EXTERNAL BUILDING COATING THAT WOULD COLLECT AND SUPPLY ENERGY FOR THE BUILDING.**



CASE STUDY

CAPABILITY STATEMENTS

DEAKIN
UNIVERSITY AUSTRALIA

Key areas of expertise

- Energy Storage Solutions for Renewable Energy Sources
- Material Development for Alternative Energy Capture
- Electrical and Renewable Energy Engineering

Research/program delivery capabilities

Sustainable infrastructure is a key research focus within the **School of Engineering**. Smart technologies are essential for a more sustainable energy system and advanced energy technologies are crucial when fighting against climate change and securing energy supply. Working closely with industry partners and utilising state-of-the-art equipment, the **Sustainable Energy Systems Research Group** looks at how available resources can be used to develop and implement more efficient and sustainable technologies.

DEAKIN UNIVERSITY

Deakin University is one of Australia's largest and fastest growing universities providing learning, teaching and research opportunities across multiple campuses and innovative use of online technology through Cloud Deakin. World university rankings evidence Deakin's well established reputation for excellent teaching, innovative course delivery, high level student satisfaction and world-class research aligned to industry and community needs.

Research and teaching in Clean Energy is through three key groupings in collaboration with industry partners. This involves dynamic and innovative research in renewable energy, energy systems and energy storage.

Deakin University offers relevant study at undergraduate and postgraduate levels including PhDs.

Renewable Energy research themes include photovoltaics, wind energy, concentrated solar energy, bioenergy, geothermal energy, ocean energy and hydro energy.

Energy Systems research themes include smart grids, distribution networks, transmission networks, protection and relaying, and high voltage systems.

Other research themes include buildings, substations, cyber security and power electronics.

deakin.edu.au/sebe/eng/

deakin.edu.au/sebe/eng/research/energy.php

Within the **Institute for Frontier Materials (IFM),** the **Australian Research Council (ARC) Centre of Excellence for Electromaterials Science** group investigates the role of interfacial processes in corrosion and energy storage applications. The research encompasses materials science, electrochemistry and surface science and their application to the problems which occur at a surface where electrochemical processes are taking place. Additionally, the Institute for Frontier Materials has a number of projects focused on developing new materials for clean energy applications including looking at next-generation Dye Sensitised Solar Cells and Fuel Cells.

deakin.edu.au/research/ifm/index.php

Key contacts

Professor Peter Hodgson
Director Institute for Frontier Materials
Office of the Deputy Vice-Chancellor (Research)

T: +61 3 52271251
E: peter.hodgson@deakin.edu.au

Professor Alex Stojcevski
Deputy Head of School, School of Engineering
Faculty of Science Engineering and Built Environment

T: +61 3 5227 1325
E: alex.stojcevski@deakin.edu.au

deakin.edu.au/study-at-deakin/international-students

LA TROBE UNIVERSITY • AUSTRALIA

Key areas of expertise:

- Intelligent Transport Systems
- Energy and the Environment
- Defence and Space Science
- Food Safety and Supply Chain

Research/program delivery capabilities:

Smart Energy Management

The Centre for Technology Infusion (CTI) has strong research capabilities in smart energy management through involvement in various industrial research and development (R&D) projects. CTI has designed and deployed a smart energy monitoring and load management pilot at La Trobe's Research and Development Park. The project is a contribution towards reduction of energy consumption, and also the development of the next-generation smart living environment.

CTI is also a partner in the Australian Zero Emission House project. The objective of the project is to create an integrated technology assessment and a demonstration platform for reducing carbon emissions with the ultimate goal of developing next-generation living solutions that have a zero carbon emissions footprint.

LA TROBE UNIVERSITY

La Trobe University is a multi-campus university ranked 11th in Australia and third in Victoria for research by the Excellence in Research of Australia (ERA); the Times Higher Education Rankings also placed La Trobe University at 88th in the Top 100 Universities under 50.

The Centre for Technology Infusion (CTI) – a Research and Innovation Centre – is located at the La Trobe University's Research and Development Park and is incorporated within the Engineering Department. The Centre focuses on strategic and translational research and innovation through integration of complementary research expertise in micro/nanotechnologies and information and communication technologies.

La Trobe University has developed a highly optimised solution for the complete monitoring, management and control of energy use in the home. The energy management and device control platform uses scalable data management architecture and can be used with a range of web-enabled devices.

La Trobe is also working with Indian car company Mahindra Reva to implement an advanced energy management system for their Bangalore plant. The system will 'harvest' energy from hundreds of electric vehicle batteries.

Energy Generation and Consumption Modelling

CTI has collaborated with the Bendigo Sustainability Group to collect and analyse data from over 1,000 solar powered homes in rural Victoria. The Goldfiel ds Solar Hub was formed with the aim of maximising the collective efficiency of solar photovoltaic generation and energy distribution for the benefit of the community, as well as utility and distribution companies.

Key contact

Dr Peter Cartwright
Associate Dean
(International and Development)

T: +61 3 9479 6562
E: p.cartwright@latrobe.edu.au

latrobe.edu.au

MONASH University

Key areas of expertise

- Energy Storage
- Geothermal Energy
- Brown Coal Innovation
- Biofuel Production
- Solar Energy
- Fuel Cell Technology
- Materials Science
- Efficient use of Energy
- Computer-generated Equilibrium (CGE) Energy and Policy Modelling
- CO_2 Sequestration and Utilisation

Research/program delivery capabilities

Monash University has undertaken an extensive range of partnerships with private business, industry, other leading universities and government on clean energy projects including:

- geothermal energy generators
- manufacture of liquid fuels and chemicals derived from lingo-cellulosic materials (biomass) using second-generation processes
- working on new high temperature materials for use in advanced power generation technologies
- energy-related computer generated equilibrium modelling (e.g. greenhouse gas emissions by fuel, fuel user and region of fuel use)
- wind turbine optimisation
- smart grids.

MONASH UNIVERSITY

Monash University has become the largest university in Australia, renowned for its outstanding teaching, transformative research, international reach and extensive alumni network. Monash is a global university possessing the ambition and ability to address momentous global challenges. Monash has campuses in Australia, Malaysia and South Africa and major partnerships with universities in China, India and the United Kingdom.

Monash has dedicated research teams working on cleaner energy technologies to decrease dependence on fossil fuels and reduce harmful emissions. Monash's researchers have embraced their responsibility to future generations by leading work in geothermal energy, brown coal innovation, biofuels, solar energy and hybrid car fuel cells.

Monash University is currently establishing joint research into algal biofuels at Victorian power stations and is a member of the Victorian Organic Solar Cells Consortium, which is working to develop printable solar cells based on polymer technology. Monash University is also working with generators and process suppliers of coal energy, and industry consulting groups such as HRL Technology Pty Ltd and Brown Coal Innovation Australia (BCIA), on advanced power cycles for cleaner coal technologies.

The University offers a range of research and education possibilities including full academic programs at the undergraduate, graduate and doctoral levels in the relevant fields of engineering and science. These can be packaged with English language and internship opportunities.

In addition to supervision opportunities with leading researchers in Monash's areas of expertise, opportunities also exist within key centres such as the Monash Sustainability Institute, Institute of Transport Studies, Australian Centre for Electromaterials Science, Centre for Green Chemistry, Centre for Power Transformer Monitoring, and the Centre for Regulatory Studies.

monash.edu.au/research/capabilities/leading/energy.html

Key contact

Professor Raman Singh
Faculty of Engineering

T : +613 9905 3671
E: Raman.Singh@monash.edu

monash.edu.au

nmit

Key areas of expertise

- Carbon Trading
- Solar Power and Water Heating
- Wind Power Generation
- Geothermal Exchange Heating and Cooling
- Black and Grey Water Treatment
- Rainwater Harvesting
- Waste Management and Recycling
- Water Resource Management for Horticulture
- Agricultural and Horticultural Land Conservation

Research/program delivery capabilities

NMIT's Diploma of Sustainability provides an opportunity to gain the tools required to be involved in the development of a sustainable society. NMIT's new Green Skills Centre offers students a unique opportunity to acquire these skills by working in and on a building that has been designed and built using a range of cutting-edge sustainable processes. These include solar technology, water management systems, a computerised Building Management System, geothermal air conditioning, passive design and sustainable building materials.

The NMIT Green Skills Centre is registered under the Green Building Council of Australia's industry recognised 'Green Star' assessment tool for a Five Star Rating.

NMIT's Diploma of Sustainability can be completed in conjunction with another diploma or higher qualification to achieve a dual qualification. NMIT also offers a range of pathway opportunities, credit transfers and recognition of prior learning.

NMIT

Located in the northern suburbs of Melbourne, NMIT (Northern Melbourne Institute of TAFE) has been delivering vocational training since 1912 and today offers a diverse range of innovative, hands-on vocational education and higher education programs.

NMIT has achieved international recognition with over 22,000 offshore enrolments in 2011 and 24 educational partnerships across Asia.

NMIT's Epping Campus is home to the Green Skills Centre of Excellence, setting a new standard for training in environmentally sustainable practices across a wide selection of industry sectors including manufacturing, construction, training, retail, installation, repair and maintenance.

The Centre provides learning and skills development in sustainability and environmentally sustainable practices and technologies including carbon trading, solar power and water.

NMIT offers relevant training at diploma level (Diploma of Sustainability).

NMIT provides a wide range of consulting and training that is customised to industry, government and educational sectors in the local community, throughout Australia and internationally, including:

- Consultants and trainers with a vast range of industry experience to suit the needs of individuals and clients
- Customised training with flexible learning solutions
- Skills Audit and Training Needs Analysis to identify skills gaps and define training needs.

nmit.edu.au/campuses/training_centres/green_skills_centre/

Key contact

Mr Timothy Gilbert
Manager International Programs,
International Office

T: +61 3 9269 1666
E: timgilbert@nmit.edu.au

nmit.edu.au/studyareas/sustainability

nmit.edu.au

RMIT UNIVERSITY

Key areas of expertise and capabilities

The College of Science, Engineering and Health

- Transition Fuels
- Green Engine Laboratory
- Biofuels
- Renewable Energy Research for Automotive Systems
- Smart Electrical Energy Conversion using power electronics

Platform Technologies Research Institute

- Platform technologies – focusing on improvements to total system performance including research:
  - Informatics and Networks
  - Innovative Engineering Systems
  - Nano Materials and Devices

Research/program delivery capabilities

The College of Science, Engineering and Health is researching transitional fuels, specifically gaseous fuels, including:

- Emissions reduction technologies
- Characteristics of gaseous fuels, including blending
- Engine testing
- Engine wear caused by fuels.

RMIT's **Green Engine Laboratory** is focused on improving fuel efficiency and reducing emissions for the road transport and aviation sectors. The Lab has two dedicated test facilities – one for multi-cylinder engine testing and one for laser diagnostics, single cylinder research and spray-vessel research.

The research in biofuels is aimed at increasing production and quality, and use of high-value chemicals from sources such as algae, wheat, straw and corn.

rmit.edu.au/seh/transition-fuels

RMIT UNIVERSITY

RMIT University is a global university of technology and design with campuses in Australia and Vietnam, and international partners worldwide. RMIT is ranked 20th in the world among universities less than 50 years old.

RMIT has Clean Energy expertise in its College of Science, Engineering and Health and the Platform Technologies Research Institute.

The School of Aerospace, Mechanical and Manufacturing Engineering has the Energy CARE Group, supporting research relating to energy conservation and renewable energy.

The School of Electrical and Computer Engineering has a Smart Energy Group that offers world-leading research and development capability in electrical energy conversion.

RMIT offers a range of relevant courses at undergraduate and postgraduate level: rmit.edu.au/programs/engineering

The RMIT Energy Conservation and Renewable Energy Group supports research and development in conservation and clean energy. It provides expert consultancy advice on manufacturing and marketing energy efficiency and renewable energy supply technologies.

rmit.edu.au/mae/energy-care

The RMIT Smart Energy Group undertakes cutting-edge research in electrical energy conversion using power electronic technology. To help provide sustainable and clean electrical energy into the future, the Group's current focus is the application of this technology to emerging Smart Grid Electrical Systems.

rmit.edu.au/staff/grahame-holmes

The Platform Technologies Research Institute leads research in the areas of smart materials and systems, linking new discoveries and emerging technologies to application. Bringing together the best researchers from across RMIT's science and engineering areas, the Institute addresses large-scale transdisciplinary research problems. It encompasses a broad range of technology areas, from chemical, mathematical and physical sciences to computer science and engineering, nanotechnology, electrical, aerospace engineering, business IT and logistics.

rmit.edu.au/research/institutes/platformtechnologies

Key contact

Mr Ian Kearney
Assistant Director, Industry Engagement

T: +61 3 9925 5118
E: ian.kearney@rmit.edu.au

rmit.edu.au

Sunraysia INSTITUTE of Technical and Further Education

Key areas of expertise

- Solar Energy
- Sustainability

Research/program delivery capabilities

The National Centre for Sustainability (NCS) operates out of SuniTAFE's Mildura and Swan Hill campuses. NCS works with local stakeholders, community and government agencies to achieve sustainability gains in land and water management. It acts as a project broker, harnessing resources, coordinating teams and project managing initiatives that improve the physical sustainability of natural resources, while developing the capacity of communities to implement positive change.

Relevant research areas include biomass and biofuels.

SUNRAYSIA INSTITUTE OF TAFE

Sunraysia Institute of TAFE (SuniTAFE) is the leading provider of vocational education and training in north-west Victoria, with more than 9,000 enrolments annually. SuniTAFE offers nationally recognised qualifications that offer students a practical emphasis that meets local and international industry demands.

SuniTAFE's teaching cohort are considered leaders in the renewable energy sector and specialise in solar energy. Institute staff have gained international expertise through research grants and industry partnerships.

SuniTAFE offers a Diploma of Sustainability, and a variety of conservation and land management, and renewable energy courses.

SuniTAFE's industry and organisational linkages include the National Centre for Sustainability, Mildura Regional Waste Management Group, Mildura Development Corporation Biofuels Reference Group, Energy Training Network, Bioenergy Australia, Sunraysia Sustainability Network, Bioenergy Network Victoria, and Australian Biogas Group.

ncsustainability.com.au

Key contact

Mr Raymond Cadmore
Teacher/Project Officer, Land & Environment

E: rcadmore@sunitafe.edu.au

sunitafe.edu.au

SWINBURNE UNIVERSITY OF TECHNOLOGY

Key areas of expertise

- Algorithm Analysis and Multi-agent Systems
- Direct Use of Renewable Energy
- Electricity Generation
- Electric Vehicles
- Handling Intermittency
- Impact on Society
- Micro-photonics
- Wave Energy and Bubble Dynamics

Research/program delivery capabilities

Swinburne has strengths in research and development of new intelligent solutions for energy management in smart grids. It also provides demonstration, training and technology transfer of these solutions to business and communities, in Australia and internationally. Bringing together expert industry knowledge and leading research capabilities, Swinburne's research and development provides tangible improvements in energy efficiency for consumers and industry. It also offers value-add solutions that create new business opportunities for Swinburne's partners.

SWINBURNE UNIVERSITY OF TECHNOLOGY

Swinburne is an internationally recognised research-intensive university. Its emphasis is on high quality, engaged teaching and research in science, technology and innovation – teaching and research that makes a difference in the lives of individuals and contributes to national economic and social objectives.

In 2014 Swinburne's new A$100 million Advanced Manufacturing and Design Centre opens. The centre will provide a purpose-built teaching and learning environment for engineering, design, business and information technology students.

In the Australian Government's *Excellence in Research for Australia 2012* report Swinburne was awarded an ERA 4 (above world standard) rating for research in optical physics (the highest rated university in Victoria).

Swinburne offers master, graduate certificate and bachelor-level courses related to clean energy.

Facilities

- Battery-testing facility
- Energy Management Research Centre
- FactSage thermodynamic modelling software
- Offsite wind-wave tank
- Robert Simpson High Temperature Laboratory
- Smart Green Home Laboratory
- Solar concentrator for measuring thermal flux
- Solar simulator
- Victoria-Suntech Advanced Solar Facility (VSASF)
  - Characterisation laboratory
  - Chemistry laboratory
  - Integration laboratory
  - Laser fabrication laboratory
  - Nanofabrication laboratory

Industry and organisational links

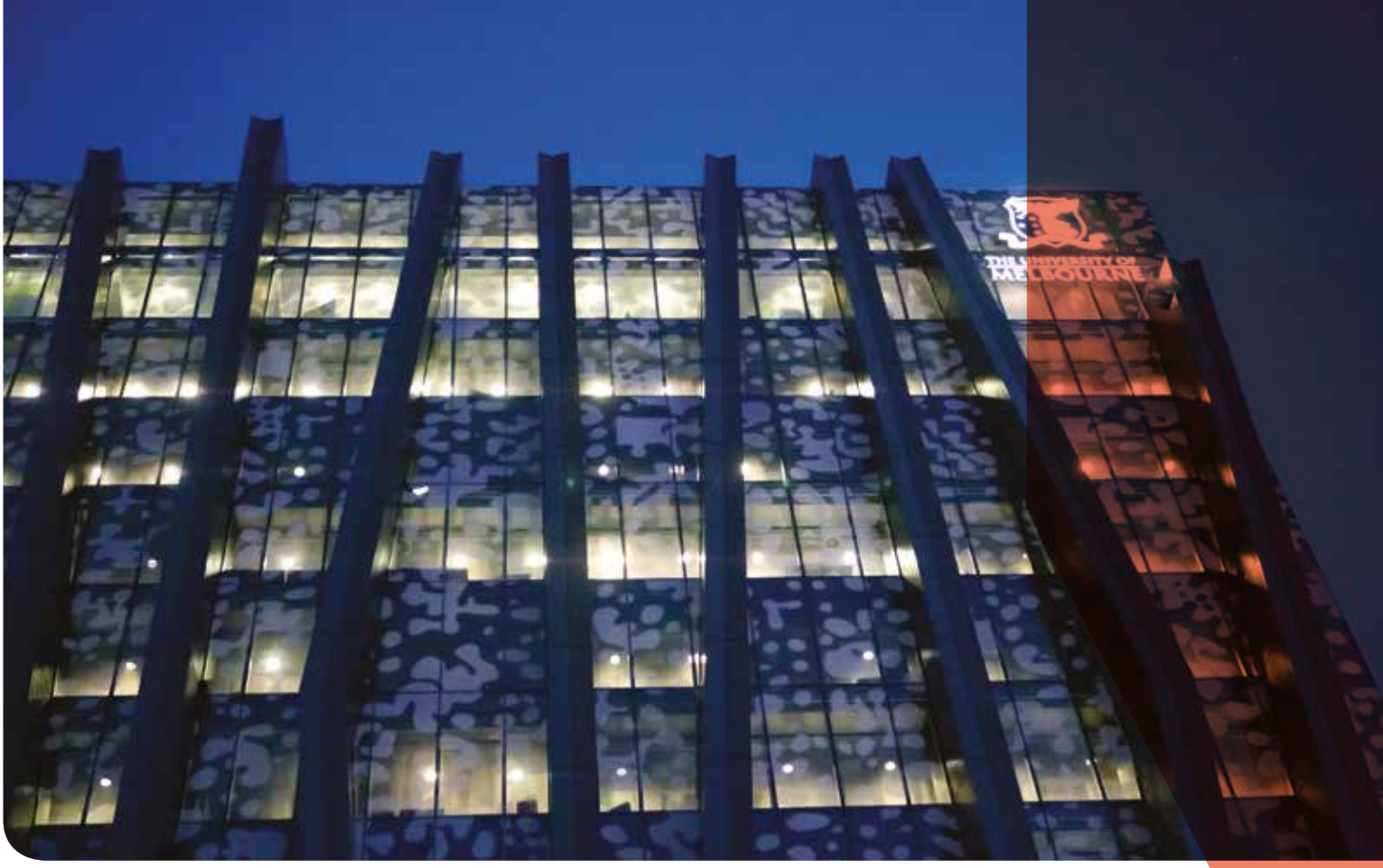
- Biowave
- Greenwave Reality
- OneSteel
- SPausnet
- Suntech (via VSASF)

Key contact

Associate Professor Lachlan Andrew
Faculty of Information and Communication Technologies

T: +61 3 9214 4837
E: landrew@swinburne.edu.au

swinburne.edu.au



THE UNIVERSITY OF MELBOURNE

Key areas of expertise

- New Energy Resources
- Developing new ways to harness Renewable Energy
- Developing more efficient ways to use Energy
- Securing Energy Waste
- Framing optimal laws to achieve Energy Outcomes

Research/program delivery capabilities

Peter Cook Centre for Carbon Capture and Storage Research

The Peter Cook Centre for Carbon Capture and Storage (CCS Research) is a world-class research centre based at the University of Melbourne. The research underpins the development of enhanced technologies for carbon capture and storage in Australia.

The Peter Cook Centre for CCS Research is a collaborative project. The Centre partners are the Cooperative Research Centre for Greenhouse Gas Technologies (CO2CRC), Rio Tinto, the University of Melbourne and the Victorian Department of Environment and Primary Industries.

pcookccscentre.com.au

UNIVERSITY OF MELBOURNE

The University of Melbourne is a public-spirited institution that makes distinctive contributions to society in research, learning and engagement and is ranked number one in Australia and 34 in the world for the quality of its research.

Research across clean energy is both discipline focused and multidisciplinary in nature and includes collaborations with universities, governments, industry and communities worldwide to further developments cooperatively.

Students interested in careers in the clean energy sector may undertake relevant bachelor, master and research degrees across the sciences, environments and engineering.

Melbourne Energy Institute

The Melbourne Energy Institute is an access point for industry, government and community groups seeking to work with leading researchers on innovative solutions in the following areas: new energy resources, developing new ways to harness renewable energy, more efficient ways to use energy, securing energy waste, and framing optimal laws and regulation to achieve energy outcomes.

The Melbourne Energy Institute fosters multidisciplinary research capabilities across all faculties of engineering and science in three main areas:

- Energy Production
- Energy Distribution and Consumption
- Economics and Policy

The Australian-German College of Climate and Energy Transitions is a new international Graduate College jointly instituted by the University of Melbourne and a partnership of German universities in the Berlin-Potsdam area. The College offers PhD candidates the opportunity to pursue research in climate change and energy transitions at a world-class level, complemented by a six-month exchange program to broaden their horizons and expertise at a partner institution overseas.

climate-energy-college.net

Key contact

Ms Kate Cornick
Director, Industry and Innovation

T: +61 3 9035 5785
E: k.cornick@unimelb.edu.au

unimelb.edu.au

VICTORIA UNIVERSITY
MELBOURNE AUSTRALIA

Key areas of expertise

- Solar and Wind Energy
- Biofuels from Algae
- Energy Storage
- Renewable Energy Systems
- Sustainable Buildings
- Distributed Generation
- Energy Efficiency
- Microgrids
- Membrane Distillation
- Thermal Desalination
- Industry Wastewater Processing and Recovery
- Environmental Protection

Research/program delivery capabilities

Victoria University's reputation in multi-disciplined energy research is supported by the multitude of commissioned research and consultancies undertaken for a variety of industry and government partners.

Victoria University's Institute of Sustainability and Innovation's research primarily focuses on water treatment, water management, water economics, environment sustainability, and social and policy research on water use, and provides industry and community with solutions in these areas.

The Institute's local water supply partners include GWMWater, Melbourne Water, City West Water, Central Highlands Water, Western Water and Barwon Water. Offshore research collaborators include the University of California, Los Angeles (USA); Sunchon National University (South Korea); University of Texas, El Paso (USA); Nanjing University of Technology (China); and Fudan University (China).

VICTORIA UNIVERSITY

Victoria University was established as a university in 1990, but its predecessor institutions date back to 1916. Today, more than 51,000 students are enrolled at Victoria University, including more than 4,000 international students studying at its Melbourne campuses and 9,000 studying at offshore partner institutions.

Victoria University provides world-class education, research and training, with an international reputation for its expertise in engineering and science, as well as business, and transport and logistics. The University have over 100 exchange partners across Asia, Europe, Oceania, Africa and the Americas.

Victoria University courses that have a clean energy focus include bachelor and master degrees, as well as PhDs.

Since 2009, the Centre for Strategic Economics Studies has collaborated with China's Energy Research Institute on research to guide policies for reducing China's energy use and emissions. Other Victoria University research collaborations and partnerships in sustainable environment include Arizona State University, Beijing University of Technology and China's Yellow River Conservancy Commission.

Victoria University Alternative Energy Group undertakes a variety of research on biofuels, wind and solar energy, desalination techniques, environment protection and wastewater treatment.

The Smart Energy Unit provides extensive expertise to the electricity supply industries to design, assess and implement smart grid programs in all the major power markets in Australia. The Unit is supported by a number of specialist research laboratories across the University, such as the Renewable Energy Research Laboratory and the Power System Laboratory.

Key contact

Ms Bronte Neyland
Associate Director, International Marketing, Recruitment and Admissions

T: +61 3 9919 1424
E: Bronte.neyland@vu.edu.au

vu.edu.au/international

The Melbourne: Research, Education and Training series profiles the capabilities of Victorian education providers across 13 sectors:

Advanced Manufacturing
Agriculture and Food Security
Business, Governance and Finance
Clean Energy
Creative Industries
Education and Development
Health and Communities
ICT
Infrastructure and Urban Design
Mining
Tourism and Hospitality
Transport
Water Management

For more information on Melbourne's research, education and training capabilities contact your local Victorian Government Business Office at: invest.vic.gov.au/offices

Produced by International Education Unit
Department of State Development, Business and Innovation

Level 33, 121 Exhibition Street
Melbourne Victoria 3000

T: + 61 3 9651 8109
F: + 61 3 9651 9701

investvictoria.com

STUDY MELBOURNE VICTORIA AUSTRALIA

State Government Victoria AUSTRALIA

DTPLI813Z/14