MONASH University

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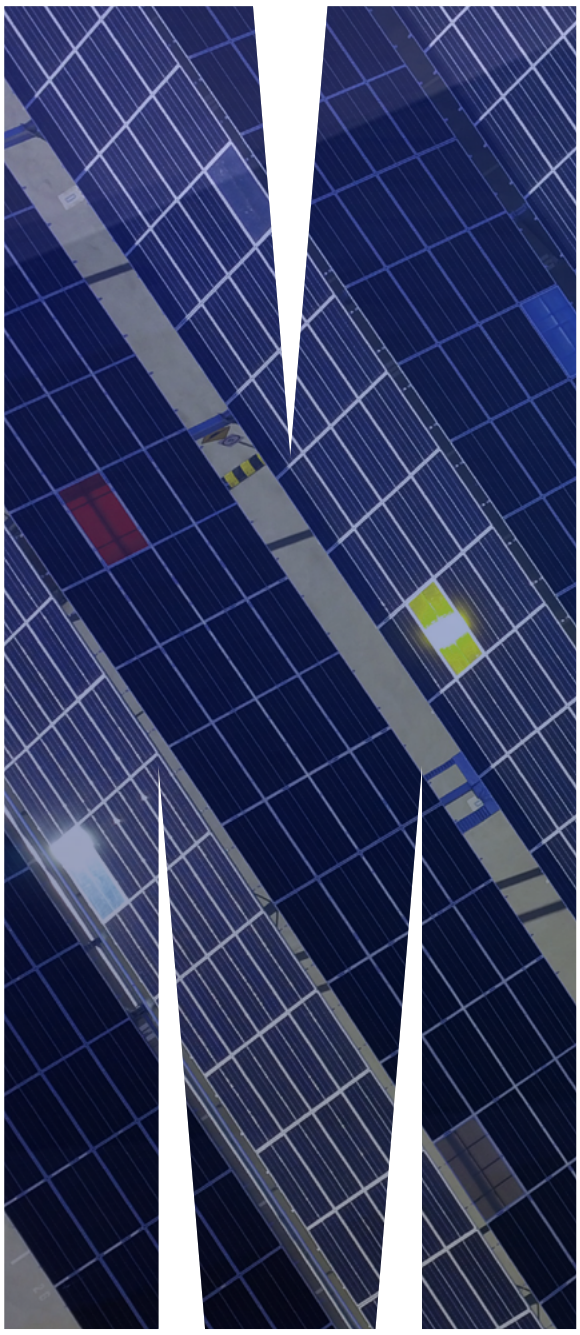
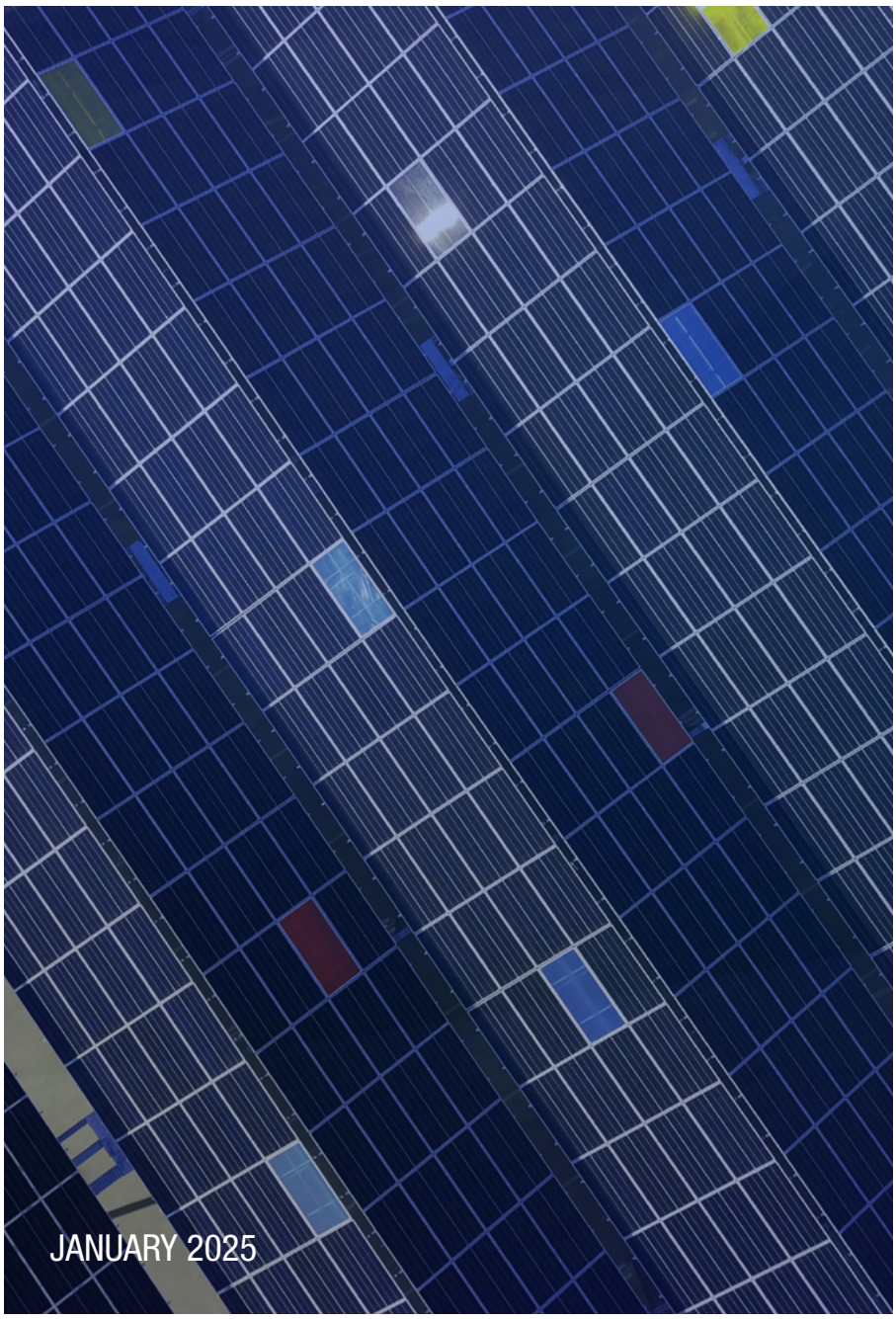
MONASH ENERGY INSTITUTE COMMUNITY HIGHLIGHTS 2024





JANUARY 2025

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MESSAGE FROM THE DIRECTOR

Realising Australia's vision for a cheap, clean, and reliable energy system remains a challenge. Increasing extreme weather events are causing power outages, communities are resisting new transmission projects, energy costs are rising, and there is a critical shortage of skilled professionals to manage the energy transition. Universities are uniquely positioned to address these complex issues through expertise and unbiased perspectives for the public good.

At the Monash Energy Institute, a dynamic community of energy researchers and practitioners at Monash University, we are committed to tackling these challenges through impactful research, professional training, and informing policy design.

As a community, our impact depends on the diverse leadership, engagement, and support from our internal academic leaders and sponsors, as well as our external advisors and funding partners. This collaborative approach ensures that our work remains relevant, innovative, and aligned with Australia's energy needs.

This report highlights the Monash Energy Institute's work in 2024, showcasing key achievements by the Monash energy research community supported by the Institute.

Collaborative initiatives, including the Grid Innovation Hub and the RACE for 2030 CRC, drive innovation in technology, social issues, and market design policy to support the energy transition. Our partnership with government bodies like AEMO enables programs such as the Zema Energy Studies Scholarship, reinforcing our commitment to developing future energy leaders. Additionally, our support for the student energy club helps nurture industry-ready, highly skilled graduates.

Looking ahead, we invite you to engage with us through our events, collaborative research, and professional training opportunities.

Shreejan Pandey
Director, Monash Energy Institute

2024 SNAPSHOT

The Monash Energy Institute is a vibrant network of energy experts and researchers at Monash University, dedicated to advancing the University's contribution to energy transition research and education, particularly within the electricity value chain.

By harnessing Monash's multidisciplinary expertise across social sciences, technical innovation, and market economics, the Institute fosters impactful research, strengthens industry partnerships, and delivers professional training programs. It also translates research-driven insights into actionable strategies to inform and shape energy policy.

A YEAR OF TRANSFORMATIVE IMPACT

2024 was a year of bold initiatives and remarkable achievements for the Monash Energy Institute Community. From groundbreaking research to global collaborations, the Monash Energy Institute community advanced the energy transition with bold initiatives, innovative solutions, and meaningful partnerships. Here's a snapshot of how Monash's energy community shaped the future of energy.

2024 MONASH ENERGY COMMUNITY ACCOMPLISHMENTS

80+

publications in leading journals and repositories

4

transformative partnership agreements were signed

300+

participants engaged in workshops and events

$5M+

in research grants awarded

POWERING PROGRESS: KEY RESEARCH PROJECTS AND INNOVATIONS

The following projects represent a selection of the outstanding work of the Monash Energy Community, supported by the Institute, undertaken in 2024, showcasing advanced research and collaborative efforts toward a clean energy future.

Accelerating EV Adoption through Commercial Radio ET8. Integrating Electric Vehicles with the Grid

This project has the potential to increase EV adoption and reduce CO2 emissions through a) greater public understanding of the EV transition, including why it is required, the urgency, and the means for transitioning, and b) wider knowledge of the practical aspects of EV ownership including affordability, accessibility and reliability, which will assist in addressing the barriers of misinformation and uncertainty.

Greater public understanding is also likely to lead to more timely, understood and accepted decision-making in relation to the green energy transition and other infrastructure requirements for net zero. Read more about this project.

Award: $360,000
Project Lead: Prof Libby Lester
Completion date: June 2026

Scenarios for Future Living: Putting People at the Centre of the Energy Transition

This project aims to support better decision-making capacity for the Australian energy sector through scenarios, models, tools, and design innovations that centre people's everyday lives and expectations alongside emerging technology trends and collective industry foresight.

Award: $4,200,000
Project Lead: Prof Yolande Strengers
Completion date: January 2027

Assessing the Impact of Network Exchanger (NEx) on Power Quality in Distribution Networks

This 6-month project will evaluate the potential of Third Equation's Network Exchanger (NEx) to improve power quality and CER hosting capacity in LV and MV networks. Building on findings from a previous RACE 2030 project, the study involves simulations and laboratory tests.

Award: $334,297
Project Lead: Dr Reza Razzaghi
Completion date: May 2025

Australian Research Planning for Global Power System Transformation (Stage 4) – Topic 1

This project seeks to address technical challenges posed by the increasing penetration of IBRs in power grids, ensuring a smooth and stable transition toward renewable energy. Read more about this project.

Award: $350,000
Project Lead: Dr Behrooz Bahrani
Completion date: May 2025

Advanced Network Modelling for Informed Demand Management

Demand response programs offer numerous benefits to various stakeholders within the power industry. Among these stakeholders, commercial and industrial (C&I) customers wield significant influence on power networks compared to residential consumers.

This initiative seeks to address challenges related to demand response with a focus on C&I customers. Specifically, it aims to tackle issues surrounding demand response baseline calculations and the integration of backup generators into the distribution grid.

Award: $480,000
Project Lead: Dr Reza Razzaghi
Completion date: May 2025

AEO8 Capacity Building: Enhancing System, Infrastructure and Societal Resilience

As the flagship publication of ACE, the ASEAN Energy Outlook (AEO8) complements and supplements the ASEAN Plan of Action for Energy Cooperation (APAEC), providing an overview of the current energy landscape and exploring pathways of the achievement of regional and national energy targets and beyond. The ASEAN Centre for Energy (ACE), supported by the Australian Government through the Partnerships for Infrastructure (P4I) and the Monash Energy Institute, organised the AEO8 Capacity Building Workshop in Jakarta, Indonesia.

This capacity building is aimed to increase understanding among AMS on the role of climate resilience in long-term planning and emerging issues in gender equality, energy storage and supply chain, electricity infrastructure resilience, and disaster risk reduction. Moreover, this capacity building intends to strengthen ACE's team understanding, enabling a more comprehensive analysis in AEO8, especially regarding the new Carbon Neutrality Scenario (CNS). It also seeks to deepen knowledge of emerging themes and technologies to improve the resilience of energy systems, infrastructure, and society towards a just and equitable energy transition in the region. Read more about this project.

Award: $330,000
Project Lead: Dr Emi Gui
Completion date: February 2025

RECOGNISING EXCELLENCE

The Monash Energy Institute is proud to celebrate the prestigious recognition achieved by members of the Monash Energy Community:

Good Design Australia 2024 Gold Award:
Professor Sarah Pink and her team at the Emerging Technologies Research Lab were honored with this prestigious award for their Digital Energy Futures: Foresights for Future Living report and their article on Design Anthropological Foresighting. Read more.

Australian Financial Review Awards – Innovation Category:
Dr Chang Wang, Dr Stuart Walsh, and their team were shortlisted for their groundbreaking work on the Monash University – Geoscience Australia Economic Fairways Initiative. Read more.

BREAKTHROUGH INNOVATION

The Monash Energy Community continues to lead the way in breakthrough innovations that redefine the future of sustainable energy.

One remarkable example of this innovation comes from the work of Professor Mainak Majumder and his team, who have made a groundbreaking discovery in lithium-sulphur (Li-S) battery technology inspired by household antiseptic chemistry.

Published in Advanced Energy Materials, their innovation uses an iodine-based catalyst to overcome charging speed and degradation issues, enabling batteries with energy densities of up to 400 Wh/kg. This advancement could transform electric vehicles and aviation, providing an additional 1,000 km range for EVs and lightweight, high-performance solutions for demanding applications. Monash has launched Ghove Energy to commercialise this green, scalable alternative to traditional lithium-ion batteries. Read the full text here.

Image left to right: Dr Mahdokht Shaibani, Prof Mainak Majumder, Prof Matthew Hill and Yingyi Huang

BUILDING STRATEGIC PARTNERSHIPS FOR IMPACT

In 2024, the Monash Energy Institute expanded its collaborative efforts through key partnerships and agreements, reinforcing its commitment to driving impactful research and industry engagement.

1. Advancing offshore wind development

The Institute signed Memorandums of Understanding (MOUs) with Oceanwind, RWE, and Corio Generation to support offshore wind development in Gippsland. These partnerships will focus on research and training initiatives to meet the sector's evolving needs.

2. Strengthening collaboration with the Australian Energy Market Commission (AEMC)

The MOU signed between the Monash Energy Institute (MuEI) and the Australian Energy Market Commission (AEMC) represents a significant milestone in fostering a deeper partnership. This agreement formalises a commitment to joint research and the translation of findings into practical applications for industry, addressing key challenges in Australia's energy landscape.

The MOU will also facilitate broader engagement between staff at Monash University and AEMC. By combining academic expertise with regulatory insights, this collaboration aims to deliver innovative, impactful solutions that advance the energy transition and enhance industry practices.

3. Developing a partnership with Indonesia's electricity utility PLN

Recent engagements have included high-level discussions in Indonesia and a follow-up visit by PLN's senior HR executive to the Monash Clayton Campus. These interactions have focused on collaborative opportunities in professional development, education, and sustainability initiatives, highlighting the Institute's commitment to supporting PLN's strategic objectives and driving impactful outcomes.

As part of this partnership, the first cohort of PLN staff has completed the Master of Business Innovation program and will commence the Master of Engineering program in 2025.

ENERGISING THE CONVERSATION: KEY EVENTS

In 2024, the Monash Energy Community played a pivotal role in advancing dialogue, collaboration, and innovation in the energy sector by hosting and participating in a series of impactful events. Below is a selection of these activities that strengthened partnerships, shared expertise, and addressed critical energy challenges on both regional and global scales.

1. AIM (Maths and AI Industry Meet) Day

Led by Professor Markus Wagner, the Institute spearheaded engagement for AIM Day, held at Monash University in November. The event saw robust participation from industry representatives and featured the CEO of RACE for 2030, strengthening connections between academia and industry.

2. ASEAN Energy Outlook Workshop

Dr Sarah Goodwin and Dr Bruno Mendivez conducted a three-day Data Visualisation and Storytelling Workshop for professionals involved in the ASEAN Energy Outlook (AEO8). The workshop combined theoretical insights, design principles, and practical sessions using Power BI and Tableau. This initiative, funded by DFAT and secured by Dr Emi Gui, aligned with the Institute's strategic plan and enhanced capacity-building in the ASEAN region.

3. Impedance Analysis Tool Launch

A/Prof Behrooz Bahrani and his team hosted a hybrid event on 18 October 2024 to introduce the Impedance Analysis Tool for Blackbox PSCAD Models. Enabled by the Grid Innovation Hub and funded by ARENA, the event attracted strong industry interest, with over 65 in-person attendees and 250 joining online.

4. ASEAN Energy Supply and Demand Webinar

Emi Gui participated in the AEO8 Monash Webinar: A Technical Exploration of ASEAN Energy Supply and Demand on 28 October 2024. The event, featuring panellists from the ASEAN Centre for Energy, Asia Clean Energy Partners, and Mitsubishi Research Institute, was attended by over 350 government officials and professionals across the region, fostering dialogue on energy challenges and solutions.

5. Energy Storage Market White Paper Launch

The Institute launched the Energy Storage Market White Paper on 14 November 2024. The event featured distinguished speakers, including the Chair of the Australian Energy Market Commission (AEMC), the Energy Australia Markets Executive, the Dean of Monash Business School, and A/Prof Guillaume Roger (author). The AEMC Chair publicly endorsed the Monash partnership, highlighting its critical role in shaping Australia's energy future.

6. COP29 Participation

At COP29, Emi Gui represented the Institute as a panellist in sessions funded by the UN Sustainable Development Solutions Network. Emi spoke on topics including the expansion of energy storage and grid solutions at the UNIDO pavilion and contributed to the launch of the Energy Efficiency Council's R&D Statement, developed jointly with the Energy Research Institute's Council of Australia.

7. ASEAN Energy Outlook (AEO8) Capacity Building Workshop

The Monash Energy Institute, alongside the Australian Government and ACE, supported the AEO8 Capacity Building Workshop in Jakarta (28-30 May 2024). This workshop aimed to enhance understanding of climate resilience, gender equality, energy storage, electricity infrastructure resilience, and disaster risk reduction. It also provided an opportunity for ASEAN Member States (AMS) to deepen their knowledge on emerging technologies for a just and equitable energy transition.

8. Leading Conversation on the Future of Energy Retail

Shreejan Pandey, Director of the Monash Energy Institute, chaired the first day of the Energy Retail Excellence Conference in December 2024. The event brought together industry leaders to explore cutting-edge strategies for the future of energy retailing. Key topics included customer-centric innovation, digital transformation, progressive energy policies, and unlocking the potential of behind-the-meter assets to drive the energy transition.

View all 2024 news and announcements here.

Dr Emi Gui at COP29 session

MEDIA SPOTLIGHT

In 2024, members of the Monash Energy Community attracted attention for their expertise and insights across various media platforms. Through interviews, articles, podcasts, and books, they shared their perspectives on key energy topics, including grid stability, energy storage, and hydrogen exports. Below are some highlights of their contributions to public discussions.

Read

A/Prof Behrooz Bahrani spoke to ESIG Blog about the role of grid-forming inverter-based resources in stabilising renewable energy power systems, highlighting their unique capabilities and the challenges they pose for transient stability in evolving grid architectures.

A/Prof Scott Hamilton wrote into The Conversation and highlighted the critical role of energy storage in supporting Australia's renewable energy transition. He discussed advancements in storage technologies, the need for both short- and long-duration solutions, and the importance of policy support to maximise the potential of renewables, reduce reliance on traditional infrastructure, and empower communities.

The book Energy Justice: Affordable, Reliable, Sustainable and Modern Energy for All (Springer Nature, 2024) features a chapter co-authored by Dr Diane Kraal and Richard Taylor titled "Hydrogen Exports and Energy Justice: The Case for Australia." The chapter critically examines Australia's push for large-scale hydrogen production for export, applying the principles of energy justice, including recognition, restorative, distributive, and cosmopolitan justice. Highlighting the need for a just energy transition, the authors contrast the rapid investment in hydrogen technologies with the sustainable resource use practices of Australia's First Nations people, as explored in Bruce Pascoe's Dark Emu. They propose an alternative strategy of using locally-produced hydrogen for energy-intensive product manufacturing, contributing to a more equitable and sustainable energy future.

Listen

Dr Kari Dahlgren and Prof Yolande Strengers engaged in a captivating discussion with David Leitch and Giles Parkinson on the Energy Insiders podcast. The conversation delved into strategies for effectively involving people in the ongoing energy transition.

Prof Yolande Strengers was invited to speak on an Inspiring Design podcast with Melissa Gregg, where they explore the energy impacts of AI. Hosted by Rashan Senanayake AFHEA, the discussion offers advice for high school teachers and students navigating this emerging field.

Watch

Dr Sarah Goodwin spoke with PSC Consulting podcast host Marie Slako about her research on future control rooms, visualisations for effective decision making for the energy sector and their joint interest in the use of geospatial data.

ADVANCING KNOWLEDGE THROUGH PUBLICATIONS

Monash researchers contributed significantly to energy research in 2024, producing over 80 publications across leading online repositories, websites, journals and books. These works highlight advancements in sustainable energy technologies, policy frameworks, and societal implications of energy transitions.

Read through the publications here.

SHAPING POLICY THROUGH EVIDENCE

In 2024, the Monash Energy Institute significantly amplified its influence on energy policy and strategy through 20+ high-impact submissions, reflecting the Institute's commitment to driving evidence-based decision-making.

Submissions to Federal departments:
Including Treasury, Department of Industry, and DCCEEW, addressing critical areas like hydrogen certification, carbon leakage, and green metals decarbonisation.

- Unlocking green metals opportunities for a Future Made in Australia: consultation paper. Dr Changlong Wang, Associate Professor Stuart D.C. Walsh, Dr Yuxiang Wu, Dr Graham Palmer, Adjunct Associate Professor Scott Hamilton, Dr Hao Wang, and Associate Professor Roger Dargaville. July 2024

- Submission to the Treasury's Hydrogen Production Tax Incentive Consultation. Dr Changlong Wang, Dr Graham Palmer, Associate Professor Stuart Walsh, Adjunct Associate Professor Scott Hamilton and Associate Professor Roger Dargaville. July 2024

- Submission to Carbon Leakage Review Consultation. Dr Changlong Wang, Dr Graham Palmer, Adjunct Associate Professor Scott Hamilton, and Associate Professor Roger Dargaville. July 2024.

- Submission to the Australia's Guarantee Prioritisation Survey (Part I: Ammonia). Dr Changlong Wang, Associate Professor Stuart D.C. Walsh, Dr Yuxiang Wu, Dr Graham Palmer, Adjunct Associate Professor Scott Hamilton, Dr Hao Wang, and Associate Professor Roger Dargaville. July 2024

- In response to the Victorian Government's Request for Information (RFI) on the Wind Worker Training Centre and Renewable Hydrogen Worker Training Centre, the Monash Energy Institute has actively engaged in the process. Our input aims to support the government in making informed policy and program decisions, helping to ensure that the upcoming open competitive selection process aligns with the needs of both industry and workers.

- Submission to the Australia's Guarantee Prioritisation Survey - (Part 2: Iron/Steel). Dr Changlong Wang, Associate Professor Stuart D.C. Walsh, Dr Yuxiang Wu, Dr Graham Palmer, Adjunct Associate Professor Scott Hamilton, Dr Hao Wang, and Associate Professor Roger Dargaville. July 2024.

Parliamentary engagement:
Recommendations on energy planning and underground infrastructure featured in government responses.

- Submission to the select Committee on Energy Planning and Regulation in Australia. Dr Ron Ben-David. October 2024

- Evidence of the impact of our academics expert advice on government policy. Associate Professor Roger Dargaville and Professor Yolande Strengers appeared before the Select Committee on the Feasibility of Undergrounding the Transmission Infrastructure for Renewable Energy Projects. Their recommendations, particularly #7 and #8, showed a significant correlation in their approach to enhancing the feasibility and implementation of underground transmission lines.

- Associate Professor Roger Dargaville, along with representatives from RACE for 2030 and iMOVE, appeared as expert witnesses before the Australian Parliament's Standing Committee on Climate Change, Energy, Environment and Water. The committee sought written submissions providing recommendations relating to the inquiry into the transition to electric vehicles (EVs) and its broader implications.

Market Reforms:
Dr Ron Ben-David's papers tackled consumer-centric electricity pricing and the future of retail energy markets.

- Electricity pricing for a consumer-driven future. Dr Ron Ben-David. November 2024.

- On borrowed time? The future of the retail energy market. Dr Ron Ben-David. December 2024

- Submission responding to the commission's draft terms of reference for a proposed review into: Electricity pricing for a consumer-driven future. Dr Ron Ben-David. August 2024

A full list of submissions can be found on the Monash Energy Institute website.

EMPOWERING STUDENTS

Monash Energy Institute's support for the Monash Energy Club

The Monash Energy Institute (MuEI) has proudly supported and sponsored the Monash Energy Club (MEC) since its inception. In 2024, MEC experienced significant growth and revitalisation, driven by the enthusiasm and dedication of its new committee members. Their dynamic initiatives have contributed to a major uplift in the club's activities and impact. Learn more about their new members.

2024 Highlights

Global Representation

- MEC President Kaaviyansiri Pathmasiri and incoming (2025) President Maddy Neaves represented the club at COP29 in Azerbaijan. Their participation highlighted the critical role of young voices in shaping discussions at global forums, emphasising the importance of youth perspectives in addressing energy and climate challenges. Read their summary here.
- Kaaviyansiri Pathmasiri and Maddy Neaves have been selected by the ASEAN-Australia Strategic Youth Partnership as Australian delegates to attend their forum in Vietnam. The forum, supported by DFAT, focused on the future of technology.

Key events

- MEC Annual Industry Night 2024 at AEMO's head office
- Women in Energy Night 2024
- MEC Ideathon 2024 "WATT and Waste Highlights"
- Monash Energy Club's Energy Graduate Panel Session

ZEMA ENERGY STUDIES SCHOLARSHIP ROUND 4

Monash University, in collaboration with the Australian Energy Market Operator (AEMO) announced the 2024 recipients of the prestigious Zema Energy Studies Scholarship. This scholarship, established in memory of AEMO's founding CEO Matt Zema, supports PhD students who are pioneering research to address Australia's energy challenges.

This year, the scholarship has been awarded to three exceptional candidates: Eric Liu, Merry Hoang, and Jaleel Mesbah, whose projects promise to contribute significantly to the energy transition. Read more about the recipients.

The Zema Energy Studies Scholarship award ceremony, in partnership with AEMO, was held on 11 November 2024. The event was attended by senior leaders from AEMO, including its CEO, Monash University's Provost, Deans, and other distinguished guests.

ORGANISATIONAL UPDATES: DRIVING PROGRESS

The Monash Energy Institute has undergone several key developments in 2024, marking significant progress and growth:

5-Year Review:

The Institute successfully completed its 5-year review, receiving positive feedback from the Deputy Vice-Chancellor (Research) office. The review highlighted the Institute's achievements and its alignment with strategic goals.

Leadership Appointments:

- Professor Yolande Strangers will join as the new Director of Research in March 2025. Read the announcement.
- Dr Julie Karel starts the role of Deputy Director (Research) in February 2025. Read the announcement.
- Shreejan Pandey was appointed as Director of the Monash Energy Institute.

Energy Transition Lead Appointment:

Dr Emi Gui has joined the Institute as the Energy Transition Lead, bringing extensive expertise to drive initiatives in this critical area.

Prof Yolande Strengers
Director (Research)

Dr Julie Karel
Deputy Director (Research)

Shreejan Pandey
Director

Dr Emi Gui
Energy Transition Lead

GRATITUDE TO THE TEAMS OF FUNDING FACULTIES, OUR LEADERS, PARTNERS AND COLLABORATORS

We thank the teams and leaders from our funding faculties for their ongoing support. Their guidance and help have been key to the success of our activities and achievements. We especially appreciate the contributions from the following faculties:

- Faculty of Information Technology
- Faculty of Business and Economics
- Faculty of Engineering

We would also like to acknowledge the Advisory Council members for their guidance and support in advancing the mission of the Monash Energy Institute. Their insights, expertise, and connections have been vital in shaping our strategy, strengthening collaborations, and addressing key challenges in the energy sector.

We extend our gratitude to our partners and collaborators for their invaluable support in driving energy innovation. Their contributions have been essential in driving our shared mission forward. We particularly acknowledge the significant role played by:

AEMC AUSTRALIAN ENERGY MARKET COMMISSION

AEMO AUSTRALIAN ENERGY MARKET OPERATOR

Australian Government Australian Renewable Energy Agency ARENA

RACE for 2030 RELIABLE AFFORDABLE CLEAN ENERGY

CSIRO

PSC

X-ELIO

SDSN

CONCLUSION

As we move through 2025, the Monash Energy Community remains dedicated to making a positive impact, shaping the future of energy, and empowering the next generation of energy leaders.

For more details and stories, visit the Monash Energy Institute website.

A LIVING TRIBUTE TO ARIEL LIEBMAN: CHAMPION OF RENEWABLE ENERGY

November 2024 marked one year since the sudden passing of our dear colleague and friend, Professor Ariel Liebman.

In August 2024, family, friends, and colleagues gathered to honour his memory with the planting of an Apple Myrtle tree (Angophora costata). This living tribute commemorates his leadership as Director of the Monash Energy Institute, his passion for renewable energy, and the profound impact he had on the field and all who knew him.

Plaque reads:
In memory of Professor Ariel Liebman (1968-2023), Director of the Monash Energy Institute and passionate advocate for a renewable future. A visionary researcher, dedicated mentor and beloved colleague, Ariel's work in sustainable energy systems mobilised generations to chase ambitious goals like solving the climate crisis, one of the great challenges of our time. Known for his wit and warmth, he delighted in debates ending in 'furious agreement' and had this way with enthusiasm and expertise. His energy, whether measured in karma or kilowatt hours, still resonates with all who knew him, forever connected to the grid.

Planted on 12 August 2024 by the family of Professor Ariel Liebman and his friends and colleagues from Monash University, and the energy sector.

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