MONASH University

MONASH ENERGY INSTITUTE

Monash Energy Institute Response to the ACOLA

Australian Energy Transition Research Plan Design Issues Paper

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1. Context

The Australian Council of Learned Academics (ACOLA) is consulting a broad range of stakeholders from across Australia's energy sector to inform the development and design of an **Australian Energy Transition Research Plan** (the Research Plan).

This paper presents a response by the Monash Energy Institute to questions embedded in the *Australian Energy Transition Research Plan Design Issues Paper* released in April. Table 1 presents a general response to all questions and Table 2 focuses on the scope of the Research Plan (Question 2). The response introduces initial feedback from the Monash Energy Institute leaders and the scope of the research plan is structured across five thematic areas; **energy resources**, **materials and devices**, **smart energy systems**, **markets and policy** and **consumers**.

Key questions and concepts explored are in support of a research agenda that ultimately enables the Australian energy sector to transition to net zero emissions while encompassing both economic efficiency and social equity dimensions.

2. Response

Table 1 Monash Energy Institute's response to the ACOLA Australian Energy Transition Research Plan Design Issues Paper

ACOLA Questions	ACOLA Comment	Monash Energy Institute Response
1) *Would you or your organisation be **willing to participate** with ACOLA in the development and ongoing support of a Research Plan?*	ACOLA is seeking to gauge the level of interest from stakeholders in the development and support of an Australian Energy Transition Research Plan.	The Monash Energy Institute, as the University's cross disciplinary virtual institute, is willing to participate and coordinate Monash University's contribution and ongoing engagement with ACOLA.
2) *What should be the **scope of the Research Plan** (how should we define 'energy', 'transition' and 'research')?*	The research being undertaken around Australia's energy transition should be aligned with national priorities, have a coordinated approach to implementation, be effectively translated, and optimise the economic, social and environmental impact. It is therefore proposed that Australia's research priorities for the energy transition are multidisciplinary in nature and focus.	**Research** should be defined as necessarily interdisciplinary and multi-stakeholder: It would be advisable to go beyond the notion of a multidisciplinary approach to energy transition to work towards an interdisciplinary approach, whereby the work of different disciplines (and thematic areas) is brought together to create new and innovative insights. **Transition** should be defined through a systematic consideration of how this might be articulated as an interdisciplinary concept: different disciplines treat transition differently – where do they provide examples of good practice, how does this connect to theory, and how can these be brought together? Research organisations listed under question 4 below offer previous examples. **Energy:** might be seen as a dynamic concept, that is, if energy is to be seen as something that is in transition, we need new ways of understanding it and we need to promote new understandings to the public and industry. **Diverse and marginalised perspectives:** The scope of the research plan should prioritise and seek to elevate the voices and perspectives of diverse groups in the energy transition. This might include defining what an energy transition means for people for different perspectives. Key questions and concepts to define the scope of the Research Plan are outlined in Table 2 (below). Monash's response to this question is structured across the five key thematic areas of the Monash Energy Institute; **energy resources, materials and devices, smart energy systems, markets and policy, and consumers**.
3) *What **processes and products** should the Research Plan **deliver**?*	Proposed deliverables: ● Map and continuously monitor energy transition-related research activity. ● Focus on the gaps between the research that is currently being undertaken and the research that is needed. ● Address the need for periodic research and dialogue into community and business attitudes towards aspects of the energy transition. ● Bring together the sector on a regular basis to explore, communicate and evaluate the progress of the Research Plan. ● provide an annual progress statement and scorecard of the Research Plan and the extent to which it has been successfully translated into action, through an annual conference, such as the ERICA State of Energy Research Conference ● Undertake annual revisions of the Research Plan, through ongoing consultations and engagement.	● An annual Energy Research Outlook that provides historic and projected overview of key areas including research needs, impact, key risks and uncertainties, funding, critical drivers, and segmented sectoral and thematic areas of research focus. ● Translation pathways, opportunities and incentives. ● Segregation of research and development needs across different stages of technology or commercial readiness. ● A set of clear research practical and "moonshot" targets across each outlined thematic area and process to periodically update progress towards these. ● The research plan should actively contribute to identifying and encouraging funding pathways to support the energy transition in Australia. ● The research plan should follow an iterative process with the research community to reassess priorities, or identify new ones.
*4) What **existing research plans** and design approaches can ACOLA draw on for the proposed Research Plan?*	Case examples: ● German Federal Government's Innovations for the Energy Transition Energy Research Program ● The European Network of Transmission System Operators-Electricity R&D roadmap for 2017-26 ● The Commonwealth Technology Roadmap ● ARENA experience and many others.	● National Energy Research Institute (New Zealand) ● ENA – CSIRO Electricity Network Transformation Roadmap (ENTR) ● Public funded major research programs concerning energy e.g. CRCs / CRC-Ps in the areas of buildings, electricity, and transport. ● Research Councils UK (RCUK) ● Engineering and Physical Sciences Research Council (EPSRC) ● Economic and Social Sciences Research Council (ESRC).

ACOLA Questions	ACOLA Comment	Monash Energy Institute Response
		• The Durham Energy Institute (Durham University UK) is a good example of an Institute involved in exemplary interdisciplinary projects • Energy Consumers Australia grants program
*5) How would you or **your organisation** like to be **engaged** in the development of the Research Plan?*	To be successful, there needs to be a strong sense that a Research Plan is designed by the energy community and for the benefit of energy users.	The Monash Energy Institute is well positioned to make significant contributions by; • Providing a coordinated Monash University input and response towards the initial development and annual updates of the Research Plan, • Working with the ACOLA Steering Committee to develop the draft Research Plan, • Taking on a role to coordinate key aspect(s) of the Research Plan development, for instance being involved in identified working groups. • Enabling a broader reach to public funded major energy research programs that Monash University is participating in. Note: The Monash energy research community comprises over 150 leading academics working in areas spanning from consumers' response to emerging technologies through to energy market economics and fundamentals of new fuels. Flagship energy activities that Monash researchers are currently engaged in include the three Australian Research Council funded fundamental research Centres of Excellence (FLEET, ACES, and ACEx), and impactful industry partnerships including the Woodside Monash Energy Partnership and the Reliable Affordable Clean Energy CRC.
*6) How should ACOLA **govern and fund the development** and ongoing support of the Research Plan?*	ACOLA has formed a Steering Committee comprising leading experts from Australia's learned academies. The role of the Steering Committee is to provide strategic oversight, expert analysis and provocative thinking. It is envisaged that ACOLA will continue to provide the leadership and administration of the Research Plan to ensure a long-term focus on independent, transparent, robust evidence-based and multidisciplinary advice. The purpose of the Research Plan is not to explicitly address the funding of the actual research being undertaken; rather, it is envisaged that it may be used in advocacy and applications for research funding by interested parties.	• Energy Research Institutes Council for Australia is well positioned to take on a leadership role within the governance structure to provide strategic oversight, and operational coordination across the energy research community. • Targeted committees / workgroups comprising experts that can provide diversity of thought may be formed on a needs basis to develop, review and/or spearhead the implementation of the Research Plan. • Commitment of funds for administering the Plan is seen as critical to its successful implementation. This could come from COAG or relevant state/federal funding mechanisms.
*7) What do you see as the **key risks** that ACOLA will **need to manage** in the development of the Research Plan?*	Identified risks: • The identified research priorities are incorrect, or the process surrounding the Research Plan is not robust. • The Research Plan lacks influence on the allocation or quantum of research funding, and fails to create impact. • The research itself is not successfully translated.	• Insufficient research funding available to support the implementation of the Research Plan. • Skilled resources required to implement the Research Plan are not available due to immigration policy changes or otherwise. • Consultation fatigue faced by the energy research community. • COVID-19 impact on the University sector reducing academics' capacity and good-will to participate. • Research Plan is not implemented because there is insufficient funding to resource ongoing monitoring and proactive facilitation. • Discipline siloing, as is currently common in energy research
8) Are there any other issues that ACOLA should be considering in the design of the Research Plan?		

*Question 2: What should be the **scope of the Research Plan** (how should we define 'energy', 'transition' and 'research')?*

Table 2. Scope of the Research Plan: Monash Energy Institute Response

Thematic Area	Monash Energy Institute Thematic Leader(s)	Scope of the Research Plan
Energy Resources	Dr Roger Dargaville	The research plan should consider; ● Challenges faced by the uptake of utility scale renewables. Working out which are the best wind and solar resources to access, and the optimal combination of transmission upgrades/extensions and access to the highest quality renewables, remains a complex area. ● Storage is a key area of research, and storage is vital to balance a high penetration renewable energy system. A range of storage technologies will be required, with different characteristics such as fast response (i.e. Lithium Ion) to balance grid frequency, and bulk storage (such as pumped hydro) to cater for synoptic scale variability in wind and solar resources. ● Determining the role of gas into the future as a potential transition fuel while more sustainable long term solutions for dispatchable renewables are found is a critical area of research. ● Production of H2 with Australia's plentiful renewables and export of this energy vector to countries that lack the renewable resources necessary requires further investigation. ● The potential for refinement of natural resources such as iron ore, bauxite, copper, gold and uranium oxides using in situ renewables.
Materials and Devices	Prof. Mainak Majumder	The research plan should consider: ● Energy generation and storage technologies such as photovoltaics, batteries & super capacitors, and fuel-cells should be within the context of the broad acceptance base in the consumer and industrial markets and the opportunity they present for next generation energy paradigms. ● Fundamental research into energetic materials as one of the pillars of the research into the future. Advanced materials are poised to remain at the heart of these technologies and should be supported generously in order to have a steady flow of highly skilled work-force of Australia in the present and into the future. ● Collaborations between organizations of higher education and research with local industries need to be viewed with the hindsight that around one third of Australia's GDP is contributed by small and medium scale enterprises. The plan should look into strategies and incentives to carefully nurture the commercialisation of energy-related technologies especially utilizing Australian intellectual properties to ensure longer-term benefits to the economy. ● Evaluation of energy technologies within the context of sustainability, and how they contribute to circular economies, recycling opportunities and efficient utilization of Australia's resources.
Smart Energy Systems	A/Prof. Ariel Liebman	The research plan should consider both strategic (5 - 40 years) and operational (1 - 5 years) needs for the system as it evolves. Strategic needs questions include: ● How can the system be planned for economic efficiency, reliability and security on the way towards 100% renewables? ● What is the mix of grid-side and consumer side technologies needed in the distribution grid and how do you formulate policy and markets to economically adapt these grids to the rapid investments by consumers in storage and DER? Operational needs questions include; ● How do you operate the bulk power system with large penetration of variable renewables securely? ● How do you integrate new digital technologies, small scale storage while absorbing large amounts for rooftop PV with existing investment? ● How can the electricity sector work collaboratively with consumers as they become empowered prosumers enabled by the distributed energy revolution in ways that maximise societal value, consumer experience, and shareholder value?
Markets and Policy	A/Prof Guillaume Roger	The research plan should address policy impasse and consider: ● What does the "first-best" look like? On the presumption that the economy must transition to renewable energy, irrespective of lobbying efforts, how should this transition be orchestrated? This would clarify the role of decentralised investments like private solar PV and microgrids, and whether subsidies are desirable anywhere. ● A transition implies winners and losers, hence lobbying by both. How does one navigate a transition that is bound to be subject to these lobbying efforts? This is a problem of political economy, where we at Monash can help. ● How do we address inadvertent market consequences arising from subsidised and rapid uptake of distributed energy technologies? ● Market reforms are essential to deliver the correct price signals to guide the wave of investment that is impending. Concepts such as the Locational Marginal Pricing (LMP) and the introduction of a day-ahead market require serious consideration. ● As we transition to new sources of energy, that is, to new geographic sources of energy, new transmission investments may also be required. The joint optimisation of transmission and generation requires an accurate model of competition in generation. ● Firming dispatch of intermittent renewable energy is presently complemented by thermal and hydroelectricity. In the short run, as thermal generators are progressively displaced, the market power of the remaining generators increases. In the longer run, batteries will replace thermal generators. The speed of the transition cannot be faster

Thematic Area	Monash Energy Institute Thematic Leader(s)	Scope of the Research Plan
		than the pace at which the storage technology develops. A plan would be cognisant of the market power implications of this transition and suggest mitigation measures. It would also evaluate whether the transition should be slowed to accommodate technological development, or the converse.

Consumers	Prof. Sarah Pink, A/Prof Yolande Strengers	• The Research Plan should take a generous view of people and households that expands beyond the roles of the consumer (who consumes energy) or the customer (who buys energy). This means a wider acknowledgement of the complex lives and contingent situations of people who consume/use energy, which goes beyond the notion of people as simply consumers or users. Other potential perspectives include:
		  ○ Children and teenagers, who are unlikely to see themselves as either consumers or customers of energy.
		  ○ People who use energy but don't care about it as a unit of consumption or a commodity (e.g. someone who enjoys high-energy hobbies or likes taking long showers).
		  ○ Households that include pets which influence energy consumption (Australia has one of the highest pet ownership rates of anywhere in the world and a significant proportion of dogs and cats are kept indoors during the day).
		  ○ People with disabilities or chronic health conditions, who consume energy in order to maintain critical life support and health.
		  ○ Viewing future energy through the prism of emerging technologies, lifestyles and question about how other possible future trends might be experienced in everyday life
		• The Research Plan should consider what an energy transition means for consumers (and other people or household perspectives). This may include defining the terms 'energy' and 'transition' from their perspectives.
		• The Research Plan should be careful to avoid embedding specific theories of consumption and change into its research scope and plan. For example, questions that ask about consumer behaviour, technology adoption and acceptance, or decision-making are already imbued with conceptual assumptions about how to understand social life and change. This means that future research should create dialogue between the different academic disciplines involved in energy research from the people perspective – including anthropology, sociology, human geography and psychology.
		• The Research Plan needs to allow for research that avoids replicating the dominant assumptions of the industry about people and how they use energy and technology. This requires encouragement of innovative (qualitative and ethnographic) methodologies that prioritise new knowledge and insights from people.
		• The Research Plan should emphasise and prioritise currently marginalised and diverse perspectives, such as those from Culturally and Linguistically Diverse (CALD) communities, low-income households, different genders, and children.
		• The Research Plan should consider how the energy transition and energy futures are likely to evolve in relation to other societal, digital and technological transformations. Questions about scenario planning, forecasting and 'future-proofing' energy futures must also be considered alongside these other socio-technical changes and complementary transitions occurring in other sectors.