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Dr Marisa Paterson MLA
Standing Committee on Environment, Climate Change and Biodiversity
ACT Legislative Assembly
GPO Box 1020
Canberra ACT 2601

Re: Inquiry into renewable energy innovation in the Australian Capital Territory

Dear Dr Paterson,

Please find enclosed a submission by the ANU Institute for Climate, Energy and Disaster Solutions (ICEDS) on Renewable energy innovation in the Australian Capital Territory.

The ICEDS connects industry, governments and broad communities with climate, energy & disaster-risk research from the Australian National University. Our goal is to advance innovative solutions to address climate change, energy system transitions and disasters. We facilitate integrated approaches to research, teaching and policy engagement across disciplines. We also lead the ANU Below Zero Initiative, which is working to reduce the University's greenhouse gas emissions to below zero.

Our Institute consolidates and builds on the activities of the former ANU Climate Change Institute, Energy Change Institute and Disaster Risk Science Institute.

As an interdisciplinary institute with more than 500 members, our research covers six overarching themes of climate, energy and disaster risk solutions:

- Net zero technologies
- Policy, economics, law and governance
- Earth sciences
- Land, water, food, energy & biodiversity nexus
- Culture & society
- Health & security

The following Institute members have contributed to this submission (in alphabetical order) Prof Xuemei Bai, Prof Ken Baldwin, Prof Lachlan Blackhall, Dr Yuan Peng, Dr James Prest, Dr Igor Skryabin, Assoc Prof Matt Stocks.

Please contact us at the above address should you have any queries regarding this submission. We are ready to give evidence in person to the Committee to elaborate.

Sincerely,

Prof Mark Howden

Director, ANU Institute for Climate, Energy & Disaster Solutions



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Submission on renewable energy innovation in the Australian Capital Territory

General: Opportunities and Challenges

The ACT has the following advantages:

- A large, diverse and international-level research and education sector;
- A highly educated population with strong buy-in to renewable energy;
- Good connections to international stakeholders, including through foreign embassies;
- A potential for integration with international research activities through the Australian National University (ANU); and
- Has a small but growing renewable energy innovation ecosystem, having succeeded in attracting several energy companies, consulting businesses and industry peak bodies to locate their Australian HQ in Canberra. These bodies are already collaborating with the ANU, University of Canberra, UNSW, CIT and CSIRO on a number of energy projects.

It also has the following disadvantages:

- The ACT does not have sectoral complexity and governmental resources of larger states;
- It has no major manufacturing plants and is, therefore, difficult to connect research with actual industrial needs;
- It has no R&D centres run by global manufacturing companies;
- It does not have a complete high technology ecosystem; and
- Despite its great potential for innovation, the ACT is generally a follower rather than a creator of most new technological solutions.

a) Opportunities and challenges to boost renewable energy research, technology development and new zero emissions industries in the ACT.

Innovation ecosystem

Within a context of policy advice to a government dominated by officers trained only in neo-classical economics, often the starting point is to reject requests to support innovation with policy measures¹ unless a specific market failure can be easily identified (e.g. principal-agent problem affecting energy efficiency measures in leased buildings). Broader measures to support and encourage innovation are seen as an unjustifiable intervention in the free market, despite the fact that successful advanced economies (e.g. Japan, South Korea, Singapore, Denmark) have sought to craft and guide the development of an R&D and innovation ecosystem. This hesitancy can limit the scope of activities that the government contemplates. However, as experts in innovation policy have identified for some time, lack of success in encouraging innovation and creating self-sustaining momentum can result from system failures, not

¹ Trevor Matthews and John Ravenhill, *The Neo-Classical Ascendancy: The Australian Economic Policy Community and Northeast Asian Economic Growth* (1995) at 27.

just market failure². Appropriate policy initiatives could be devised in order to grow and develop the energy innovation ecosystem in the ACT. These activities include consideration of the social and socio-technical aspects of the energy transition³.

The ACT must focus on options within its power. Part of the innovation ecosystem is governed by national frameworks and factors plus international parameters over which the ACT does not have significant influence. For example, the National Electricity Law and National Electricity Rules are not set by ACT Assembly, although the ACT can have input via the National Cabinet's Energy Council.

Sector-specific measures:

An obvious point is that initiatives and measures need to be sector-specific in their design. For example, interventions to encourage urban energy-efficiency retrofitting are likely to be different to policy measures designed to reduce emissions in the transport sector. On this basis, we encourage sector-specific consultations with stakeholders – including consumer representative organisations and community energy organisations⁴ - with a view to strategic interventions and measures (through a process of 'co-creation') that will have a significant impact⁵. Part of this will require an honest appraisal of the effectiveness of the legislative and policy framework surrounding particular issues and sectors such as energy efficiency in buildings⁶ and sub-sectors such as commercial property or residential rental properties⁷.

Broad suggestions

We recommend the ACT should:

- (i) Examine measures to reduce the transaction costs for all participants associated with leveraging of locally-sourced research and development funding by federal funding agencies such as ARENA and the Australian Research Council;
- (ii) Encourage research into the potentially disruptive net-zero and below-zero emission technologies that draw from renewable energy;
- (iii) Support the demonstration and local implementation of new technologies; and

² Mark Dodgson, Alan Hughes, John Foster, Stan Metcalfe, (2011) "Systems thinking, market failure, and the development of innovation policy: The case of Australia", 40(9) *Research Policy* 1145-1156, <https://doi.org/10.1016/j.respol.2011.05.015>; Mercedes Bleda, Pablo del Río, (2013) "The market failure and the systemic failure rationales in technological innovation systems", 42(5) 1039-1052, <https://doi.org/10.1016/j.respol.2013.02.008>.

³ Phil Johnstone and others, 'Waves of Disruption in Clean Energy Transitions: Sociotechnical Dimensions of System Disruption in Germany and the United Kingdom' (2020) 59 *Energy Research & Social Science* 101287.

⁴ Elisabeth Dütschke and Julius P Wesche, 'The Energy Transformation as a Disruptive Development at Community Level' (2018) 37 *Energy Research & Social Science* 251.

⁵ Anatol Itten and others, 'Co-Creation as a Social Process for Unlocking Sustainable Heating Transitions in Europe' (2021) 74 *Energy Research & Social Science* 101956.

⁶ Paula Kivimaa, Hanna-Liisa Kangas and David Lazarevic, 'Client-Oriented Evaluation of "Creative Destruction" in Policy Mixes: Finnish Policies on Building Energy Efficiency Transition' (2017) 33 *Energy Research & Social Science* 115.

⁷ Tim Dixon, Simon Lannon and Malcolm Eames, 'Reflections on Disruptive Energy Innovation in Urban Retrofitting: Methodology, Practice and Policy' (2018) 37 *Energy Research & Social Science* 255.

- (iv) Coordinate government and university renewable energy initiatives, both in research and the adoption of renewable energy technologies.

Specific suggestions

- (i) Energy sector employee mobility and exchange program;
- (ii) Government-sponsored innovation support including regular network building events;
- (iii) Consideration of design of ACT Government procurement to reward and encourage innovative approaches to procurement actions that raise significant energy and climate aspects⁸;
- (iv) Regulatory 'sandbox' within ACT energy laws to enable innovation and experimentation in consultation with ICRC (in consultation with AER and IPART (NSW)⁹; and
- (v) Regulatory alignment with NSW in electricity and gas law.

b) Opportunities and challenges to establish the ACT as a national hub for renewable energy technologies and industries, including zero emissions vehicles.

We recommend the ACT should:

- (i) Create research and demonstration facilities that are nation-leading, such as the hydrogen test facility and hydrogen vehicle refuelling station;
- (ii) Support the creation of renewable energy start-up companies and build the local high technology ecosystem, following the examples like Windlab;
- (iii) Coordinate government and university renewable energy initiatives, both in research and the adoption of renewable energy technologies, including zero emissions vehicles;
- (iv) See also: e) (ii)

c) Opportunities and challenges to innovatively finance and/or manage renewable energy in the ACT

- (i) ACT has led the country in the transition to 100% renewable energy, pioneering the reverse auction process that has since been adopted in other jurisdictions. The surrender of renewable energy certificates (RECs) from this scheme has enabled ACT to claim it is 100% powered by renewable energy. However, businesses in the ACT cannot benefit from the ACT 100% renewable electricity in their emissions reporting. The surrender of certificates is considered a voluntary action and liable entities need to report their SCOPE 2 emissions at the same intensity as NSW businesses. Therefore, there is no reporting benefit for a liable entity to operate their business in the ACT. This reduces the potential desirability of the ACT as a low emissions base for businesses. **We**

⁸ Government Procurement Act 2001 (ACT)

⁹ Competition Policy Reform Act 1996 (ACT), National Competition and Consumer Act; Independent Competition and Regulatory Commission Act 1997;

recommend the ACT should explore if changes could be made to NGERs reporting to reflect the ACT's low emissions electricity status.

- (ii) Green Goods certification is emerging as a methodology for demonstrating that a product is produced with low consequential emissions. RECs are the most likely mechanism to demonstrate that a product is produced from low emissions electricity (e.g. hydrogen). **We recommend the ACT should** consider whether they wish to transfer RECs to the producer of the Green Goods for the producer to surrender to demonstrate low emissions electricity use. This would have the advantage of attracting green manufacturing to the ACT; however, there is a risk of significant additional demand that would require the additional purchase of renewable electricity by the ACT and associated costs for the ACT.
- (iii) To manage the uptake of renewable energy in the ACT, barriers to the efficient use of flexible electricity demand should be minimised. ACT's low emissions targets will require the electrification of most transport and the displacement of fossil gas for space and hot water heating. **We recommend the ACT should** consider potential actions, including:
 - Subsidies for installation of equipment for directing rooftop solar to charging electric vehicles or hot water heating rather than export. This would encourage the establishment of businesses and technologies in the ACT to deliver this service.
 - Trials and promotion of results for solar photovoltaics driven heat pumps with thermal storage (water, phase change or ground based) to determine the suitability of these technologies in Canberra's climate. This would create business opportunities for delivering these services in Canberra which could then expand into other cool climate regions.
 - Accelerate the availability of low-interest loans (or other finance mechanisms) for gas to electricity conversions, in combination with good calculations of relative running costs. Capital cost is a major barrier to changes in technology, while clearly lower annual cost (loan + running) would encourage a more rapid switch. Much of this equipment has multi-decade life, so purchasing decisions today will likely have a significant impact on the ability to meet 2030 to 2040 emission reduction targets.
 - Conduct a study into the relative merits of sector coupling /sector integration as compared to the all-electric approach, which would involve restrictions on new or replacement gas heaters.

d) Strategies to address limitations to collaboration and innovation between renewable energy stakeholders.

We recommend the ACT should:

- (i) Promote and establish renewable energy clusters using the example of the NERA hydrogen technology hub;
- (ii) Continue to use the research and education local co-investment requirements for future renewable energy reverse auctions (as will be needed for increased electrification) and

- (iii) Continue to involve the common energy provider/energy infrastructure combination of ActewAGL/Evoenergy in engagement between key stakeholders and the research sector to help co-design future energy systems.

e) The effectiveness of administration and funding of Australian Capital Territory Government policy and regulatory settings relating to renewable energy, climate action and emissions reduction.

- (i) **We recommend the ACT should** examine the effective emissions reductions associated with the renewable energy supply given the different temporal and spatial (interconnector constraints) aspects to determine if additional renewable electricity purchases should be made to justify the zero emissions electricity assumption with 100% renewable offsets, particularly given the large fraction of generation in South Australia.
- (ii) To achieve 2045 targets, the transition to low emissions vehicles in the ACT must be accelerated. The average age of vehicles on the road in Australia is more than ten years, with the average life of vehicles at retirement more than 20 years, consistent with an annual attrition rate of 5%. Hence, vehicle purchases made today are affecting the emissions profiles in 2040. If 50% of new vehicle purchases are low emission in 2030 and 100% in 2040 (as per figure 7 in the ACT Climate Change Strategy 2019-2025) then approximately 45% of vehicles in the ACT fleet would not be low emission vehicles in 2040. **We recommend the ACT should** consider a greater range of incentives and penalties to accelerate the uptake of low emissions vehicles to meet the interim and 2045 targets. Locally tailored policy support for EV adoption needs to be based on a deeper understanding of the concerns and demand of stakeholders, e.g. customers and businesses.

Similar issues exist with gas heating, the next largest sector contributing to emissions. The transition to low emissions heating for all new and replacement heating installations must occur rapidly, or the future legacy emissions associated with gas heating will make it impossible to meet future ACT targets. **We recommend the ACT should** accelerate the development of the plan to achieve zero emissions from gas to avoid installations of gas systems that will need to be decommissioned to meet the 2045 target.

f) Opportunities and challenges in battery storage, including neighbourhood-scale batteries and vehicle-to-grid technologies.

The Australian electricity system is currently transitioning from largely fossil fuel-fired generation to renewable generation backed by energy storage, and this trend is set to accelerate over coming decades. The ACT Government has already demonstrated a strong commitment to renewable generation and battery storage through their reverse auction processes and the Nextgen Battery Storage Program.

Going forward there is clear evidence of the need for a diversity of energy storage, including residential, community and utility scale storage. Through the Canberra Big Battery initiative, **we recommend the ACT should** ensure that there is:

- (i) Diverse uptake of battery storage (residential, community, and utility scale) within the ACT in order to support the broader energy transition;
- (ii) A strong focus on ensuring that battery storage is deployed to support positive outcomes for the ACT community which include economic, social, community and decarbonisation objectives;
- (iii) Recognition of the value and importance of supporting education and training initiatives around battery storage that can contribute to a thriving industry sector to install, maintain, operate, and recycles battery storage throughout its lifetime; and
- (iv) Recognition of the value of research and development related to battery storage that may lead to the development of new companies and capabilities related to the design, manufacturing, operation, market participation and recycling of battery storage.

Beyond stationary battery storage, it is important to recognise the value of adding additional energy storage capacity through electrifying our transportation sector. In particular, there is significant potential for electric vehicles (cars, buses and trucks) to contribute to energy reliability and energy security through their participation in markets for energy, ancillary and networks services. Collectively, these capabilities are referred to as vehicle to grid (V2G) capabilities and should be a key focus of the ways in which ACT Government can proceed to meet their ambitious decarbonisation goals over the decades ahead.

g) Any other relevant matters.

- (i) A key to successful innovation policy is creating conditions attracting and retaining scientific, engineering and entrepreneurial talent. **We recommend the ACT should** develop a formalised 'mobility program for energy/climate professionals' that aims to overcome the barriers for staff of any organisation moving across to spend time in another organisation to collaborate on some broadly shared objective or project. The key obstacle to a mobility programme is that high-tech businesses are keen to retain personnel and avoid sharing know-how. One advantage of Silicon Valley is that local companies voluntarily agree to waive restraint-of-trade provisions in employment contracts. Consequentially, talent moves between companies to the benefits of the region and all local businesses. **We recommend the ACT should** encourage local high-tech enterprises (members of the regional mobility programme) to agree not to restrain energy/climate professionals from moving between the programme members within the ACT. In particular, ACT innovation funding should be preferentially directed to the members of the mobility programme.
- (ii) **We recommend the ACT should** promote cross-city learning and establish ACT as an international front-runner city in renewable energy and low emissions transition. Over 1000 cities in the world have joined the Climate Emergency Declaration, and more than 800 cities have set a time-bound, net-zero carbon goal. These cities have been and will be the hotbeds for technical, social, cultural and policy innovations towards renewable energy and zero emissions transition. In-depth case studies in the ACT and selected cities in other regions,

comparative analysis, and benchmarking studies will provide important insights into ACT's policy design.

- (iii) **We recommend the ACT should** boost research aiming at understanding stakeholder interest, perception and expectations towards renewable energy innovation and adoption. Non-government stakeholders such as research institutes, industries and communities are critical in building a national and global renewable energy innovation hub in the ACT. A supportive local policy environment may facilitate this process by orchestrating various players' efforts and assisting the innovations. A tailored policy framework for this goal requires integrating localised conditions in policymaking, such as ACT's economic and emission structure, and understanding stakeholders' diverse interests, benefits and expectations towards renewable energy innovation and adoption. Stakeholder analysis is a prerequisite for gaining such an in-depth understanding for policymaking¹⁰. The stakeholder research can explore possible pathways that can facilitate the formation of actor networks in the ACT to support renewable innovations and industries.

¹⁰ Dodgson M (2014) Collaboration and innovation management. In: Dodgson M, Gann DM, Philips N (eds) *The Oxford Handbook of Innovation*, vol Chapter 23. Oxford University Press, Oxford, pp 462–48

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