Response to National Battery Strategy Issues Paper

The Battery Storage and Grid Integration Program (BSGIP)[1] is grateful for the opportunity to engage on a national strategy for integrating batteries into Australia's energy future.

The development of this strategy is a significant opportunity for Australia to leverage our resource wealth, grow our manufacturing sector, develop world-leading capabilities and market models, and ensure batteries are integrated into our grid, economy and lives in ways that benefit everyone.

The Battery Storage and Grid Integration Program is a transdisciplinary, industry-focussed research, development, and demonstration program based at The Australian National University. We take a transdisciplinary, socio-techno-economic approach to our work in the energy system. In this context, our submission provides perspectives on how governments, industry and researchers can work together to create and support a sustainable energy future that better serves all Australians. In writing this submission we have drawn on experience from some our recent research and development projects on battery materials, technology, and characterisation; energy system modelling, analysis, control and coordination; and social science, economics and policy.

Four themes in particular stand out in response to the Issues Paper:

1. Need for Government support to **develop and deploy grid integration technologies and capabilities**.
2. Strong **socio-techno-economic focus** needed in the battery strategy, to ensure holistic and just decarbonisation transition.
3. More **support for R&D in post-lithium storage** – focus investment and manufacturing efforts on sodium-ion, potassium-ion, vanadium, and other novel stationary battery technologies, along with their **supply chains and markets**.
4. Ensuring **coordination** within and across sectors, and **strengthening supporting institutions**.

Support for grid integration

Grid integration is the enabler for battery storage and electrification, and government must therefore support the development and deployment of grid integration technologies and capabilities as well as physical batteries. These enabling grid integration technologies and capabilities include software systems, optimisation and control algorithms, operating models, interoperability standards, market participation models and social license. For all of these capabilities it is critical to look at the implications for both distribution and transmission networks.

It will be of central importance to develop simplified regulatory, connection and market participation models for energy storage when participating in the operation of the electricity system and markets for energy, ancillary and network services. BSGIP is working on potential simplified models at the household level, including meter unbundling, this work will need to be extended nationally given that storage will be connected at residential, community and utility scale.

The introduction of large amounts of energy storage into our grid will also require operational technologies and open interoperability standards to ensure the connection, operation and management of energy storage. For examples of how this type of technology and standards are being developed and demonstrated in the distribution context, see BSGIP's work on:

[1] Battery Storage and Grid Integration Program – An initiative of the Australian National University (bsgip.com)

- **evolve**: Developing smart software for the orchestration of 21st century electricity systems[2]
- **Converge**: Exploring the grid participation of Distributed Energy Resources[3]

Socio-techno-economic focus

Taking a socio-techno-economic approach within the National Battery Strategy will be critical to ensuring all people, their values and their aspirations, are heard as part of the energy transition.

BSGIP's research has shown that Australians care about more than just affordability when it comes to energy storage.[4] Householders hold strong concerns over battery life-cycle, promoting local energy use, reducing carbon emissions, questions of fairness and how this technology would fit in the broader energy transition to renewables.

Our work in Victoria on the qualitative consumer experience of new energy products and services revealed that consumers felt there was a lack of leadership from government and industry, with some technology providers failing to provide adequate information to users.[5] Our research has also revealed that a key challenge will be developing community energy models that are based on engagement and transparency, and that address concerns about fairness and environmental impact.[6]

Support for research, development and demonstration

More support is needed for research, development and demonstrate of post-lithium energy storage. Two key elements in lithium batteries – lithium and cobalt – are relatively expensive due to their associated mining costs. By contrast sodium-ion and potassium ion batteries are made from elements that are plentiful and cheap and can be sourced almost anywhere. They are proving their viability in a growing number of world-wide demonstrations as a safe and sustainable alternative to lithium batteries. In particular, they are well-suited to stationary energy storage, for example storing surplus renewable energy as well as other grid-related energy storage applications.[7]

Focusing investment and manufacturing efforts on sodium-ion, potassium-ion, vanadium, and other novel stationary battery technologies, along with their supply chains and markets, can help to provide Australian-made batteries with a competitive advantage and strategic market. Supporting research and development of ways the batteries can be manufactured using renewable energy and low impact mining and processing techniques can also provide a competitive export advantage, along with ensuring high quality products and supporting circular design principles.

Another key aspect of supporting R&D is supporting the people who undertake it. At Australian universities, much research is undertaken by PhD students, many of whom are international students. Slow visa processing and onerous conditions are currently barriers to Australia's capability in electrochemical research and batteries. In turn, this limits our ability to engage with industry, and to ensure that collaboration is cost-effective for both parties. There is a role for a future industry Growth Centre in quantifying these issues and their impact on the sector, as well as acting as an advocate and facilitator in industry-research collaborations.

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[2] evolve - Battery Storage and Grid Integration Program. https://bsgip.com/research/evolve/
[3] Converge - Battery Storage and Grid Integration Program. https://bsgip.com/research/converge/
[4] Ransan-Cooper, H. 2020. *Stakeholder views on the potential role of community-scale storage in Australia* www.arena.gov.au/knowledge-bank/stakeholder-views-on-the-potential-role-of-community-scale-storage-in-australia.
[5] Battery Storage and Grid Integration Program, *Victorian Energy and Water Ombudsman's Investigation of Consumer Experiences (VOICES)*. 2020. https://www.ewov.com.au/reports/voices
[6] Battery Storage and Grid Integration Program, *Implementing community-scale batteries*, December 2020. https://arena.gov.au/assets/2020/12/implementing-community-scale-batteries-bsgip.pdf
[7] Sodium-ion and potassium-ion batteries – Battery Storage and Grid Integration Program. https://bsgip.com/research/sodium-ion-and-potassium-ion-batteries/

Ensure coordination

It is clear that the energy sector is planning for deployment of batteries and there are various process underway, but coordination of this effort and across other related sectors will be key to a successful energy transition. The sectors need focus and a plan in order to transition and integrate with the grid well to produce good outcomes for consumers, the grid, and the Australian economy.

The future Powering Australia Growth Centre could play a role in realising synergies and bringing together organisations that are already in place to contribute to policy outcomes. This would include playing a coordination role between government, industry and research, facilitating collaboration and effort toward a shared vision. This should go beyond the traditional growth centre model of grant-based coordination, and extend to meaningful ecosystem coordination, network facilitation, and outcomes-focused policy roadmaps. The Growth Centre should coordinate in the national interest and support policy that benefits the entire value chain, as well as holistically looking across sectors at Australia's future needs and opportunities.

To achieve this, the Powering Australia Growth Centre should be:

- **Independent** – It is critical that the Growth Centre is not conflicted, particularly commercially or jurisdictionanally.
- **Impartial** – willing to incorporate views from government, industry, and the research sector.
- **Connective** – willing to act as a single point of contact but then refer onwards to existing expertise.
- **Holistic** – working across sectors with a socio-techno-economic systems approach to promote Australia's national interest.

Further information

Once again, BSGIP is sincerely grateful for the opportunity to contribute to Australia's National Battery Strategy, through this consultation process and in dialogue with the Department of Industry, Science and Resources. We would be pleased to discuss any aspect of this submission, please feel welcome to contact Professor Lachlan Blackhall (Lachlan.blackhall@anu.edu.au).

Also see BSGIP's work on:

- Battery chemistry, technologies and characterisation, including:
    - Hybrid energy storage. Improving hybrid capacitors through increased energy density and new, sustainable chemistries.
    - Dual-ion batteries. A high voltage energy storage system made from organic materials or carbon.
    - Benchmarking lithium-ion battery electrode materials. Comparative assessments of the electrochemical performance and quality of the candidate electrode materials versus state-of-the-art commercially available standards.
- Big batteries: Analysis of how grid-scale batteries can support Australia's energy transition.
- Neighbourhood Battery Initiative: investigating the diverse contributions and impacts of neighbourhood batteries, providing data and tools for understanding and monitoring these impacts, and providing leadership in the development and implementation of neighbourhood batteries including 'how to' guidance, capacity and models that will meet diverse community needs.
- Yarra Energy Storage Systems: Using our expertise in energy algorithms to develop and deploy a software package for Australia's first inner-urban community battery.