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Australian Academy of Science submission on the National Electric Vehicle Strategy Consultation Paper

The Australian Academy of Science welcomes the opportunity to comment on the National Electric Vehicle (EV) Strategy. The Academy views the transition to low-emissions vehicles as an integral part of our national emissions reduction imperative.

The question for Australia is whether we choose to be an innovative contributor value-adding to a supply chain, or once more an exporter of raw products and an importer of expensive manufactured products because we don't have the will or the policy settings to be different.

The Academy asserts that:

- The need to transition to lower-emitting vehicles for road transport in Australia is urgent and requires national ambition and buy-in to achieve.
- The role of fundamental research should be included as a foundation for achieving the goals set out in this Strategy, particularly in materials science and crystallography.
- Australia is well-positioned to focus on building scientific and industrial capabilities for the next generation of low-emission vehicles—including battery technologies.

Fundamental science creates the future

Sophisticated new ventures will have fundamental science at their core, and that science will emerge as a result of decades of patient research investment.

Low-emission technologies are an example: they rely on an understanding of how materials and devices function at the atomic scale. This understanding comes from applied analytical science, such as crystallography, which is used to determine the identity and arrangements of atoms in materials. Understanding the crystal structure of a material leads to an understanding of the physical properties of the material. The ability of materials to absorb and release energy by moving atoms in supercapacitors, the presence of open channels for the movement of lithium in solid-state batteries or oxygen/hydrogen in fuel cells, the capture of pollutants like CO2, or the storage of fuels such as hydrogen, are critical to future sustainable developments.

Australian crystallographic facilities, such as the Australian Synchrotron and the Australian Centre for Neutron Scattering, can add much value to the technology development agenda. The facilities and expertise are widely used by researchers, however, there is a low level of awareness in industry of this capability. Policy settings that allow for Australian research capability to connect successfully with relevant industry stakeholders could significantly accelerate Australian innovation and deliver tangible outcomes.

Research translation & commercialisation

To scale up innovative ideas building on fundamental science, research and industry must be supported to interact and collaborate. As with the broader issue of research translation in Australia, focusing on small and medium enterprises (SMEs) will be critical. They are also the most likely to develop and keep in intellectual property (IP) in Australia, allowing for increased capability in entrepreneurship and research translation and more jobs for retaining and repatriating highly skilled workers.

There remains a roadblock for researchers engaging with SMEs in that there is a lack of any distinct knowledge brokering programs that can connect organisations, industries, and researchers. A knowledge brokering organisation would also assist with harmonising partnership enablers, including IP arrangements. Successful models such as Interface in Scotland, or the Small Business Innovation and Research program in the United States, provide proven models for developing relationships between businesses and academics.

Building an industry ready for the next generation of battery technologies

Batteries are a core part of the technology required for the transition to EVs. Currently, these batteries are predominantly lithium-ion; however, lithium-ion batteries come with disadvantages such as the environmental costs of lithium extraction, vulnerability to ageing and risks from overheating. There are technologies that may be alternatives to lithium-ion batteries, such as sodium-ion batteries, fibre batteries and liquid solar-generated fuels such as hydrogen, which Australia should pursue.

Australia's EV strategy should take advantage of new technologies, not only in battery technology but also in other software and hardware components essential to a modern EV - through all stages of the process from extraction and refining of minerals, to the manufacturing of components, consumption and recycling.

The Academy is pleased to see recognition of opportunities to add value by the inclusion of mineral processing. Australia has an abundance of mineral resources, and we should develop production capabilities rather than buy our minerals back as expensive finished products – ones that we could develop here.

Australia can develop an end-to-end battery production supply chain, from fundamental research, built in Australia, for the benefit of Australians and the world.

Emissions and other environmental considerations

Significant resources will be required to build the EVs and batteries required, and mineral extraction will be a constraint. More research for alternatives to current solutions will be required, along with sourcing more sustainable materials and finding new strategies to recycle existing resources.

The transition to low-emissions vehicles, including EVs and batteries, will also come with the emission of greenhouse gases. New technologies for low-cost and efficient production of EVs will reduce these emissions.

To discuss or clarify any aspect of this submission, please contact Mr Chris Anderson, Director Science Policy at Chris.Anderson@science.org.au.