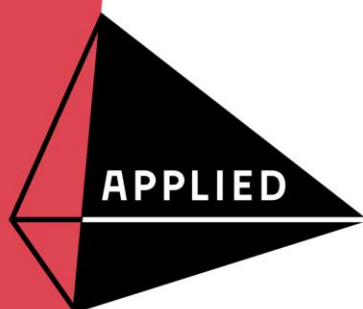


Input into

The Australian Renewable Energy Agency's investment priorities

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Input to ARENA's investment priorities

The Australian Academy of Technology and Engineering (the Academy¹) welcomes the opportunity to provide input to the question posed by ARENA:

“Given ARENA's remaining time and funding, are the suggested investment priorities the right ones for ARENA to focus on in order to maximise its impact?”

The Academy agrees that the proposed priority areas are the right focus for ARENA, with some additions as proposed below. However, it is not clear that the proposed shift in priorities will make a difference in practice. The draft priorities are written in general terms and need to be more specific to maximise their impact.

Integrating renewables into the electricity system

In terms of integrating renewables into the electricity system, the draft can be more specific, especially in the following three technologies²:

1. Energy storage

Energy storage is an important priority area that ARENA should include. Storage is a key priority area for Australia if intermittent energy producing technologies are to be effectively used³. The Academy recommends specific research and development (R&D) into optimal energy storage technologies at building scale, precinct scale and network scale⁴. The storage should support reliable and sustainable renewable energy supply chains and renewable end-use technologies.

2. Efficient and secure transmission

Australia requires electricity grids that can readily integrate and efficiently transmit energy from all sources including low- and zero carbon sources⁵. This will create demand for renewable-related technologies. This is also an area where technology improvements such as high-voltage, direct current voltage source converters (HVDC VSC) transmission can help to improve the efficiency security of energy supplies at lower costs. For efficient and secure transmissions, the Academy proposes R&D into the application of HVDC VSC interconnection to Australia's main transmission network.

¹ The Academy is an independent think tank that comprises the leaders in the fields of technology and engineering, who gain Fellowship to the Academy in a highly competitive process. The Academy is one of Australia's four national Learned Academies but uniquely its 900-strong Fellowship come from industry, government and research organisations, as well as academia. Our Fellowship develops trusted, informed and visionary views to persuade decision-makers to implement the most progressive policies on the development of technology for the betterment of Australia and its people.
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² The Australian Academy of Technology & Engineering, 2017, [Submission to the Standing Committee on the Environment and Energy Inquiry into modernising Australia's electricity grid](#)

³ The Australian Academy of Technology & Engineering, 2015, Action Statement, [Advancing energy storage for Australia](#)

⁴ The Australian Academy of Technology & Engineering, 2015, [Input to ARENA's future research and development priorities](#)

⁵ The Australian Academy of Technology & Engineering, 2015, Action Statement, [Enhancing Australia's solar photovoltaic advantage](#)

3. Visibility and constraint management of distribution networks

Increased penetrations of distributed technologies including photovoltaic, electric vehicle charging and battery storage can only be achieved efficiently, safely and securely by providing visibility and constraint management of medium voltage and low voltage distribution networks. The Academy recommends specific R&D into:

1. Use of distribution state estimation to monitor and manage constraints in distribution networks
2. Load shaping and end use energy efficiency (buildings, appliances and systems)⁶
3. Digital technologies (e.g. smart meters, IoT, and energy management systems) ability to facilitate renewable integration by assisting total system approaches to supply and demand, and improve supply security

Accelerating the uptake of renewable hydrogen

Acceleration of the uptake of renewable hydrogen technology would be aided by demonstrations of that technology to create demand for hydrogen and related end-use technologies. This priority should include a focus on 'greening' gas networks by mixing in hydrogen.

Specific issues should include R&D:

1. to develop a detailed technical and economic model of a hydrogen industry, including its costs, benefits and implications⁷
2. into measures to help ensure the safety of hydrogen production and use⁸
3. into the production, storage and use of hydrogen⁹

Helping industry transition to renewables

The International Energy Agency recently argued that energy efficiency could provide 40 per cent of global emissions reduction targets¹⁰. Energy efficient end-use technologies will be crucial to enable an increase in distributed energy resources and help to reduce energy demand.

The focus for ARENA's support for industry to transition to renewables should be on research and development rather than demonstration as the latter, particularly of high heat uses (for larger industrial users), would be very expensive. The focus of any demonstration support should be on the use of lower grade heat by industry, such as solar water heating in food processing.

Other areas where researchers and industry could collaborate effectively to achieve a commercial outcome include storage, efficiency, advanced photovoltaics, and organic photovoltaics¹¹.

⁶ The Australian Academy of Technology & Engineering, 2015, [Input to ARENA's future research and development priorities](#)

⁷ The Australian Academy of Technology & Engineering, 2019, [Response to the COAG Energy Council National Hydrogen Strategy Discussion Paper, March 2019](#)

⁸ The Australian Academy of Technology & Engineering, 2019, [Response to the COAG Energy Council National Hydrogen Strategy Discussion Paper, March 2019](#)

⁹ The Australian Academy of Technology & Engineering, 2019, [Response to the COAG Energy Council National Hydrogen Strategy Discussion Paper, March 2019](#)

¹⁰ IEA Market Report Series: Energy Efficiency 2018, <https://www.iea.org/efficiency2018/>

¹¹ The Australian Academy of Technology & Engineering, 2015, [Input to ARENA's future research and development priorities](#)