

INNOVATING ENERGY ARENA'S INVESTMENT PLAN

2021



ARENA



Australian Government
Australian Renewable
Energy Agency

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INVESTING IN AUSTRALIA'S NET ZERO FUTURE

Australia's energy transition is underway, with consumers, governments and industry increasingly recognising the value of renewable energy and low emission technologies.

Australia's electricity system is rapidly evolving. In 2020, renewables accounted for approximately 28% of Australia's total electricity generation. Solar photovoltaics (PV) and wind are now the cheapest sources of new electricity supply, and more Australian consumers and businesses are installing distributed energy technologies.

Clean hydrogen is emerging as a solution for energy uses that are not well suited to electrification. We are at the start of what will be a multi-year journey to clean hydrogen becoming commercially viable. While there are deployments of hydrogen produced from renewable energy in Australia, support is needed to realise the vision outlined in the National Hydrogen Strategy announced in November 2019.

On the demand-side, fuel switching in industry and transport has lagged supply-side progress in shifting to renewables, with these sectors accounting for approximately 80% of final energy use in Australia. A key challenge for industry is the need for high-temperature heat, with the required technologies still some way from commercialisation.

Carbon capture and storage (CCS) could also play an important role, addressing hard-to-abate emissions where other decarbonisation levers are prohibitively expensive or technically impractical. Likewise, soil carbon sequestration could help to improve the productivity of agricultural lands and provide a large atmospheric carbon dioxide (CO₂) removal opportunity.

As the penetration of renewable energy increases, the challenges become more complex.

ARENA's expertise, deep understanding of the energy sector and willingness to fund innovative and ground-breaking projects means we provide a pathway to commercialisation for many new technologies and businesses that might otherwise struggle to get off the ground or be potentially lost to overseas markets.

Our Investment Plan sets out our approach, our strategic priorities and how to apply for ARENA funding.

You can also read about our:

- › purpose, operating context, key activities and performance measures for the next four years in our **Corporate Plan 2021-22 - 2024-25**
- › principal objectives for the provision of financial assistance, including our strategic priorities, in our **General Funding Strategy**
- › achievements and outcomes to date in our latest **Annual Report**.

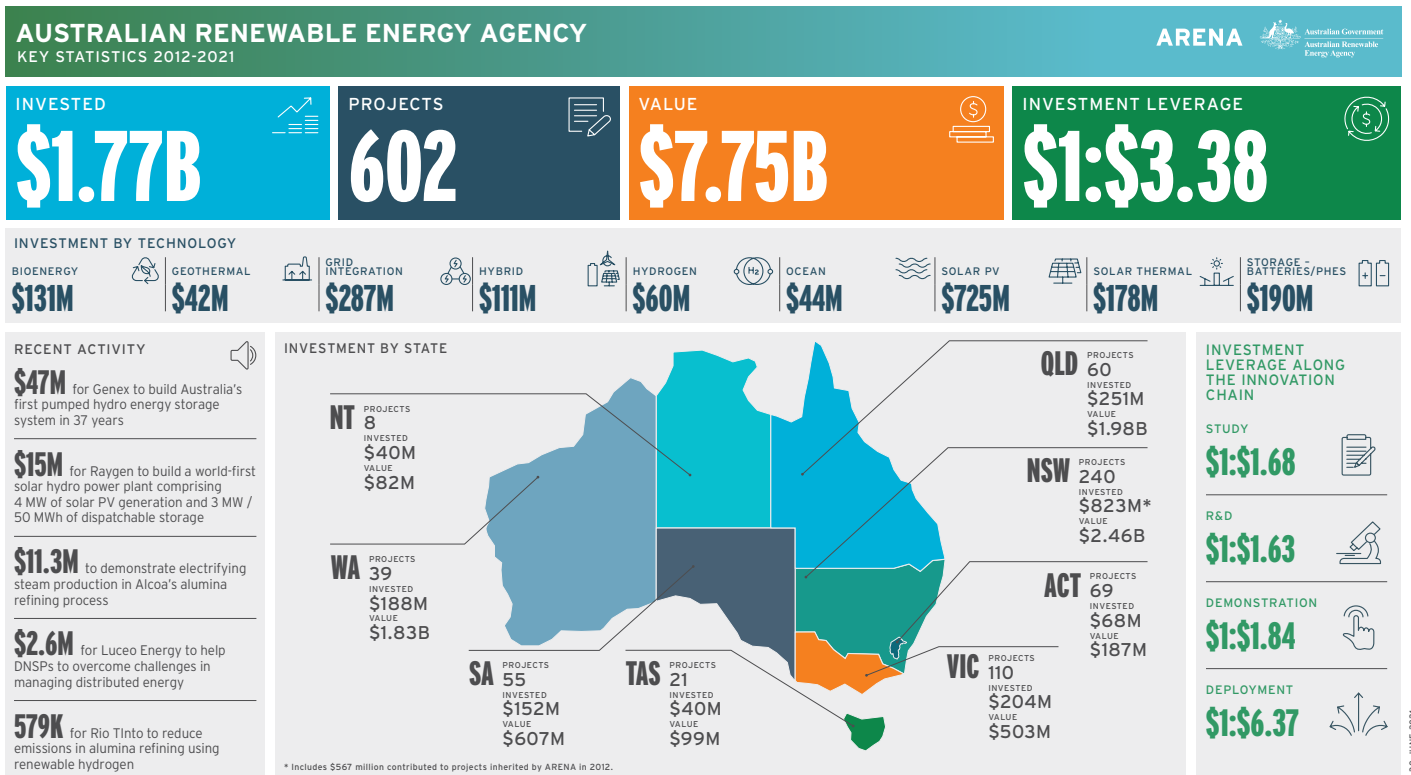
ABOUT ARENA

The Australian Renewable Energy Agency (ARENA) was established by the Australian Government in July 2012 under the *Australian Renewable Energy Act 2011*.

Our purpose is to support the global transition to net zero emissions by accelerating the pace of pre-commercial innovation, to the benefit of Australian consumers, businesses and workers. We achieve our purpose by providing financial support to innovative projects and companies, and by sharing knowledge with the industry and the public.

The impact of our work is significant. Since 2012, we have been instrumental in building the foundation of the renewable energy ecosystem in Australia. ARENA has invested over \$1.77 billion in 602 renewable energy projects to date, with a total project value of \$7.75 billion, meaning that for every dollar of Commonwealth funding third-parties have invested \$3.38.

FIGURE 1 ARENA AT A GLANCE - FUNDING COMMITMENTS TO PROJECTS 2012-21



In September 2020, ARENA received additional funding of \$1.62 billion, made up of baseline funding of \$1.43 billion over the next 10 years and \$193 million to deliver targeted programs announced in the 2020-21 Federal Budget.

As expressed in the first Low Emissions Technology Statement (LETS), released in September 2020, the Australian Government planned to introduce a legislative and regulatory reform package to expand ARENA's functions.

The ARENA (*Implementing the Technology Roadmap*) Regulations 2021 came into effect on 30 July 2021. These regulations expand ARENA's functions to include investment in projects that will support the achievement of the stretch goals for the priority low emission technologies set out in the first LETS (including low emissions aluminium and steel, carbon capture and storage (CCS), clean hydrogen, energy storage and soil carbon technologies) and provide the statutory power to deliver the programs announced in the 2020-21 Federal Budget.

ARENA will continue to support innovation and commercialisation of renewable energy technologies in Australia. We will also play a broader role in Australia's emissions reduction journey, using our expertise in grant funding to support low emission technologies that align with our strategic priorities and deliver the targeted programs announced in the 2020-21 Federal Budget.¹

To stay up to date on ARENA, visit arena.gov.au.

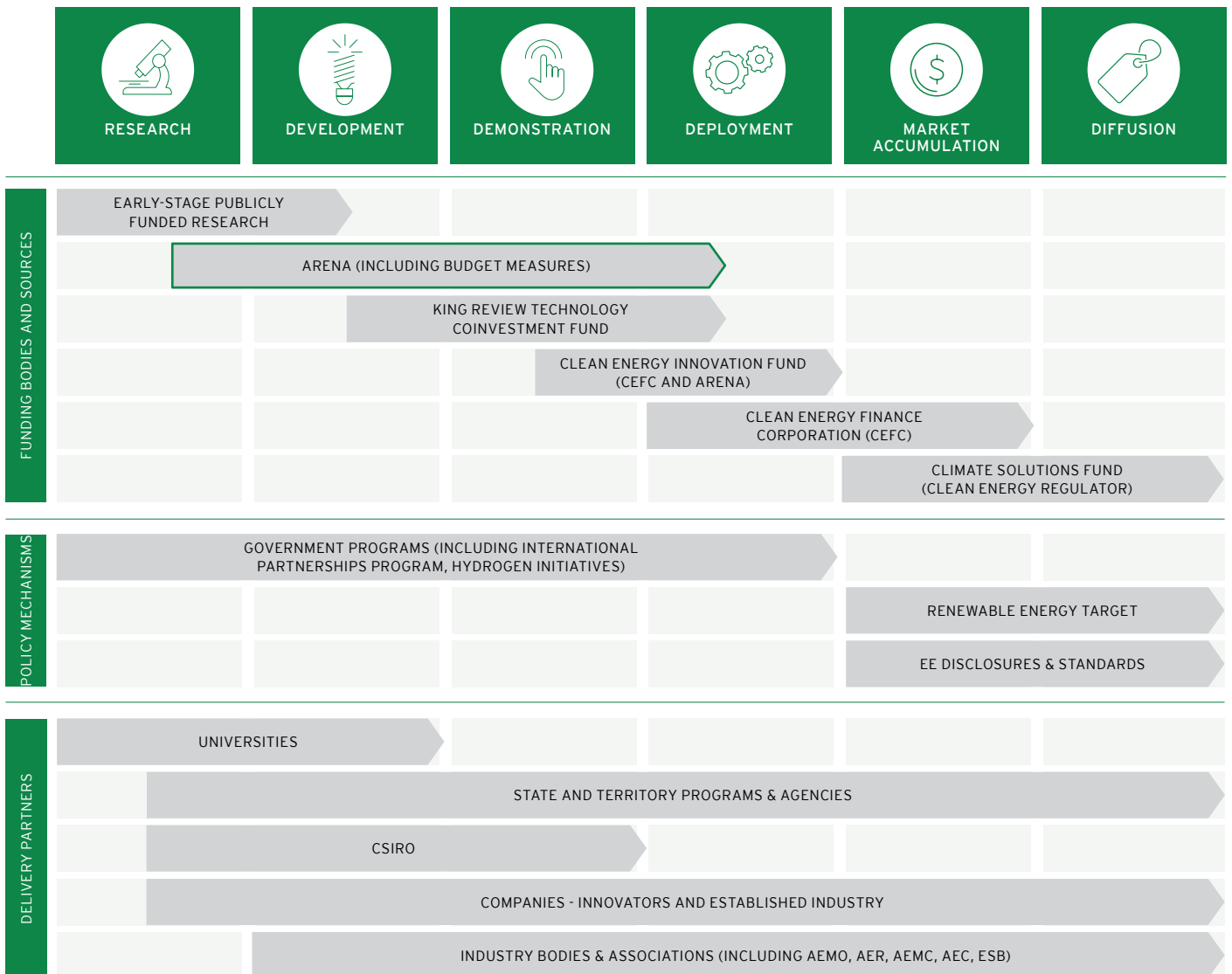
¹ The expansion of ARENA's functions to permit investment in priority low emission technologies and fully deliver the Budget programs is conditional on the ARENA (*Implementing the Technology Roadmap*) Regulations 2021. Please visit arena.gov.au to stay informed of all announcements.

OUR INVESTMENT APPROACH

ARENA is committed to achieving maximum impact and value from the projects we fund.

We invest in projects across the innovation chain, from research through to pre-commercial deployment. Our funding is focused on finding and demonstrating technology solutions that reduce technical and commercial risks and improve Australia's knowledge and expertise.

FIGURE 2 COLLABORATION ACROSS THE INNOVATION CHAIN



When making funding decisions, we consider:

- › Is the project technically or commercially innovative?
- › Will it advance knowledge in the market?
- › Is there a pathway to commercialisation?
- › Will the project help unlock future investment?

OUR INVESTMENT APPROACH

OUR FUNDING PROGRAMS AND INSTRUMENTS

ARENA's baseline funding is provided through a number of programs:

- › The Advancing Renewables Program (ARP) funds renewable energy projects at various stages of development and is continuously open for applications.
- › Research support is available periodically through specific research and development programs and strategic research initiatives.

We also actively engage with the marketplace, seeking specific projects through targeted funding rounds for projects not eligible for funding under the ARP.

In addition to committing our baseline funding to eligible projects, we will administer the targeted programs announced in the 2020-21 Federal Budget. See 'Deliver the targeted programs from the 2020-21 Federal Budget' (page 12) for more details.

In the lead up to the 2021-22 Federal Budget, the Government also announced that ARENA will be able to provide financial assistance in the form of debt and equity for up to \$50 million. This decision expands the types of funding that ARENA is able to provide beyond grants. We intend to use these instruments alongside, or in addition to, grants to provide the most appropriate type of funding to innovative projects.

See 'Before applying for ARENA funding' (page 13) for more details. We also encourage you to go to arena.gov.au/funding to stay informed about funding announcements.

CLEAN ENERGY INNOVATION FUND

ARENA works collaboratively with the Clean Energy Finance Corporation (CEFC) to administer the Clean Energy Innovation Fund (Innovation Fund).

The Innovation Fund is a \$200 million program that provides both debt and equity finance for innovative clean energy projects and businesses that support renewables, energy efficiency and low emission technologies. Investments from the Innovation Fund help eligible projects and businesses get to the next stage of commercialisation. The Innovation Fund does not provide grants.

More information on the Innovation Fund is available at: cefc.com.au/innovationfund.

OUR STRATEGIC PRIORITIES

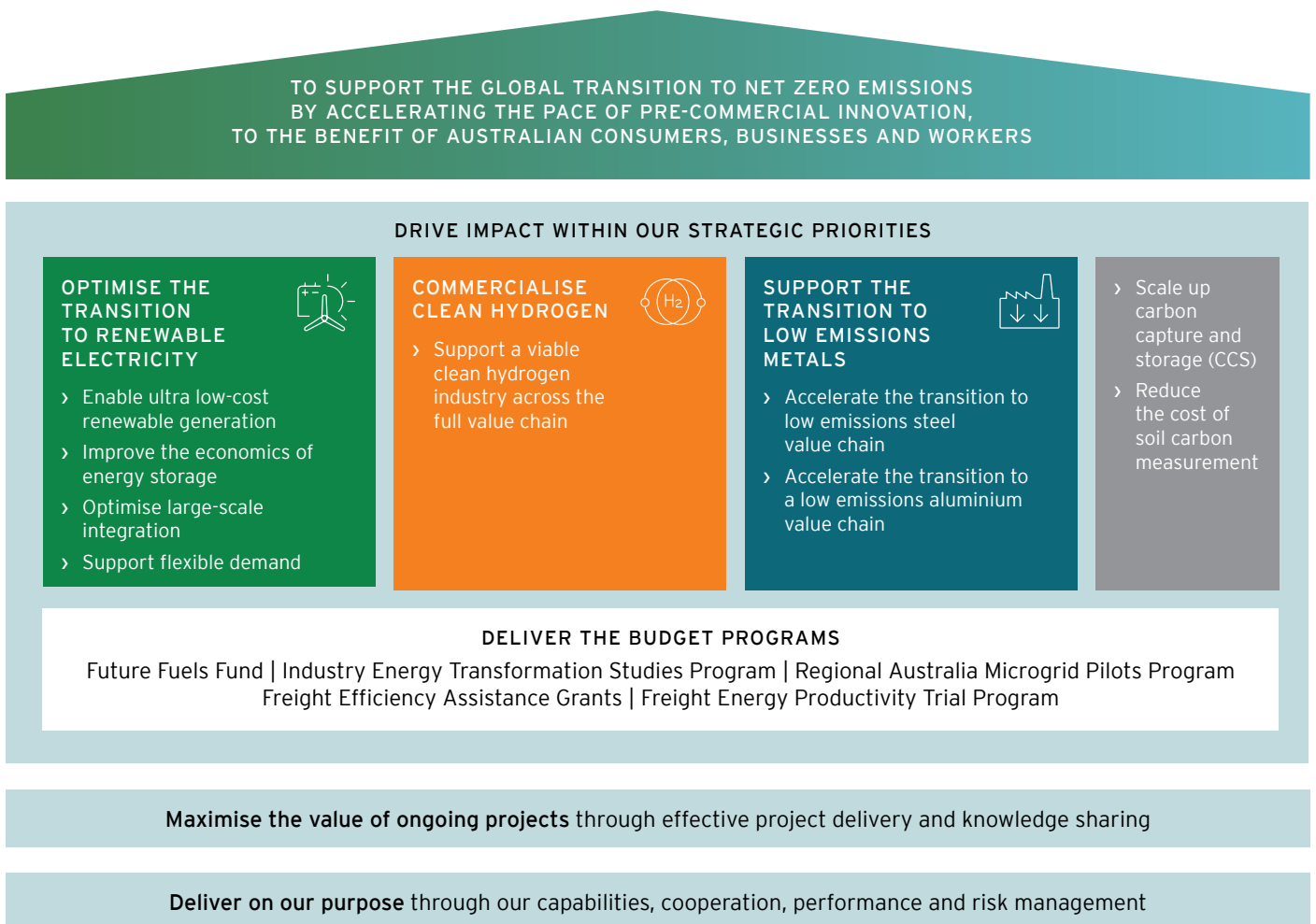
Our focus is now on the next phase of technology research, development, deployment and commercialisation:

- › We will support the transition to an electricity system powered by renewables through investment in technologies that enable ultra low-cost generation, support flexible demand, improve the economics of energy storage and optimise large-scale integration of renewable energy
- › We will support research, development and deployment of technologies that drive the commercialisation of clean hydrogen for both domestic and export applications

- › We will support the transition to low emissions metals focusing on the steel and aluminium value chains
- › We will develop our approach to scaling up carbon capture and storage (CCS) and reducing the cost of soil carbon measurement, through consultation with industry, researchers and the Government
- › We will use our expertise in grant funding to deliver the targeted programs announced in the 2020-21 Federal Budget.

These priorities reflect an overarching vision to reduce emissions by growing the share of renewables in the electricity mix, electrifying where possible, becoming more flexible about when we use electricity, and developing solutions for hard-to-abate sectors where electrification is expensive or currently not feasible.

FIGURE 3 ARENA'S STRATEGIC PLAN



OPTIMISE THE TRANSITION TO RENEWABLE ELECTRICITY



Australia's electricity system is rapidly evolving. Solar and wind are now the cheapest sources of new bulk electricity supply, and significant numbers of Australian households and businesses are installing rooftop solar and other distributed energy technologies. Grid-scale innovations are also driving the transition, including increased use of grid-scale batteries.

Demand for renewable energy generated electricity is expected to increase significantly as Australia moves towards a net zero economy. Key drivers of this demand will be greater electrification of sectors such as transport and heavy industry, as well as the development of an industry for renewable energy export, in particular for hydrogen.

Further technical and commercial innovation, as well as market reforms, will be critical to ensure the electricity system can transition efficiently and cost-effectively.

OUR ROLE

ARENA will play an integral role in this next phase of Australia's electricity transition. We can help Australia move towards a lower-cost, largely renewable electricity system, both on and off the grid, that is able to meet significantly higher domestic and export demand. To do so, we will commit funds to support innovation that will help to:

- › enable the **ultra low-cost renewable generation** required for the viability of future industries such as clean hydrogen and low emissions metals
- › support **flexible demand** to reduce system balancing costs and help to optimise the transition to a renewable energy-based grid
- › improve the **economics of energy storage** to allow for low-cost firming of electricity supply
- › address the **integration challenges** of new grid-scale supply and demand to ensure secure and reliable operation at high levels of instantaneous renewables penetration.

OUR FOCUS

Within each of these focus areas, we will provide funding to support the following high-impact innovations:

ENABLE ULTRA LOW-COST RENEWABLE GENERATION

- › **Increase solar module efficiency** by considering the four key elements of solar cell design: materials abundance, low toxicity, stability in the field and efficiency. Increased module efficiency would reduce balance of system (BoS) costs for the same output, which would further reduce total installed costs
- › **Reduce solar PV BoS costs**, through improved module design, solar farm architecture, the use of automation to reduce labour costs in the field and other innovations.

Although our focus is on ultra low-cost solar PV, we may consider support for other renewable energy technologies where they provide a different or complementary generation profile at lower cost than current methods.

SUPPORT FLEXIBLE DEMAND

- › Demonstrate the **potential value of flexible demand to the electricity system**, including through the avoidance of additional network and storage build costs

- › Demonstrate the **technical and commercial viability of a range of novel flexible demand options**, including managed charging of electric vehicles, flexible operation of hydrogen electrolyzers, and other load shifting technologies in industrial, commercial and residential settings
- › Effectively **integrate and orchestrate novel sources of flexible demand and supporting infrastructure and services**, such as demand management systems, dynamic operating envelopes and virtual power plants
- › Support projects and knowledge sharing that will **inform the regulatory framework** on flexible demand, such as how it can best support two-sided markets.
- › Provide specific **technical improvements, such as faster ramping and improved support for inertia and system strength**
- › Support projects and knowledge sharing that will **inform rule makers, regulators and system operators** about the value that storage assets can provide, thereby enhancing the revenue streams and underlying economics of these technologies.

Our past investments in storage technologies highlight the role ARENA can play in supporting technologies as they progress toward commercialisation.

OPTIMISE INTEGRATION OF LARGE-SCALE RENEWABLE ENERGY INTO THE ELECTRICITY SYSTEM

- › Provide low-cost, **reliable system strength services and lower grid connection risks**. This can be achieved through new technical solutions, such as advanced inverters, to ensure the stability of the grid as traditional generators retire or run less frequently
- › **Inform regulatory reform processes** to accelerate investment in new generation capacity. For example, by improving grid connection processes and reducing transmission constraints.

IMPROVE THE ECONOMICS OF ENERGY STORAGE

- › **Deliver electricity storage solutions at a lower cost** and with lower emissions compared to alternative dispatchable energy options through pilot projects, commercial demonstration and deployment projects

COMMERCIALISE CLEAN HYDROGEN



Clean hydrogen is emerging as a decarbonisation solution for energy uses that are not well suited to electrification. Hydrogen, and its derivatives such as ammonia, can be combusted to produce heat, used as a chemical feedstock, stored for long periods and transported long distances.

Global demand for clean hydrogen is expected to grow significantly over the decades ahead.² Australia is well positioned to meet this opportunity, given our abundance of renewable energy resources, land availability, good export capabilities and infrastructure, and strong trading relationships.

While there are deployments of hydrogen produced from renewable energy in Australia, support is required to secure a competitive delivered cost and prove the technical feasibility and commercial viability of hydrogen use cases.

OUR ROLE

We will support industry to find innovative solutions that can help Australia establish a viable clean hydrogen industry and realise our potential as a significant exporter of clean energy. This will require innovation across the full hydrogen value chain including cheap, firm renewable electricity, a step change in electrolyser technology, as well as rapid proving and scaling of hydrogen use cases.

OUR FOCUS

Our long-term aspiration is to scale low-cost production of renewable hydrogen. We will look at projects that prove the technical feasibility and commercial viability of technologies along the entire hydrogen value chain. We are also open to clean hydrogen sources for projects downstream from hydrogen production - in storage, compression, transport and demand use-cases.

Under this investment priority, ARENA will provide funding to support the following high-impact innovations:

- › **Reduce the cost of hydrogen produced from renewable energy** through technologies and commercial innovations that materially lower electrolyser costs, balance of plant (BoP) costs and reduce the cost of capital. This includes projects that help to unlock the next wave of at-scale renewable hydrogen production, moving from the ~10 MW scale to the ~100 MW scale, and enabling a reduction of electrolyser capital expenditure (CapEx).
- › Research and development to **demonstrate technologies** that address technical challenges along the rest of the hydrogen value chain, including **storage, compression and transport** (including for hydrogen carriers).
- › Prove the **technical feasibility and commercial viability of hydrogen use cases** through innovations and activities that replace traditional fuels with hydrogen. Projects we fund should help to increase the diversity and volume of hydrogen use cases in Australia, such as:
 - › **industrial deployments** - supporting the transition of domestic ammonia manufacturing, natural gas uses and other existing industrial hydrogen uses, to clean hydrogen
 - › **transport** - demonstrating the viability of hydrogen trucks and other modes of transport suitable for conversion to hydrogen fuel cells, including technologies that mitigate switching costs
 - › **remote area power systems** - scaling the deployment of clean hydrogen to provide power in remote areas, for example projects proving the security of energy supply
 - › **export** - developing overseas markets, understanding key supply chain issues and validating the scale of potential overseas buyers.

² The expansion of ARENA's functions to permit investment in priority low emission technologies and fully deliver the Budget programs is conditional on the ARENA (Implementing the Technology Roadmap) Regulations 2021. Please visit arena.gov.au to stay informed of all announcements.

SUPPORT THE TRANSITION TO LOW EMISSIONS METALS



Australia is a major global player in the steel and aluminium value chains, with the iron ore and bauxite mining industries forming a significant part of our economy. These value chains are, however, emissions intensive.

With increasing global demand for low emissions materials and end products, Australia faces both a challenge and an opportunity to meet that demand. We can lower emissions by decarbonising the steel and aluminium value chains through technological innovation.

OUR ROLE

We will help Australian industry to reduce emissions by investing in innovative and replicable technologies, processes and commercial models that have the potential to lower emissions.

In particular, we will fund innovation that demonstrates options to lower emissions in the following Australian value chains:

- › **steel** - iron ore mining and processing, iron making and steel making
- › **aluminium** - alumina refining and aluminium production.

The transition to low emissions metals is closely linked to our other strategic priorities. It will require the use of clean hydrogen in a number of hard-to-abate industrial processes. Low emissions metals will also rely on the integration of low-cost renewable energy and have the potential to provide load flexibility to support the transition in the electricity system.

OUR FOCUS

We are looking for projects that evaluate and demonstrate the technical and commercial viability of technologies, processes and pathways that will support low emissions metals.

We will therefore provide funding to support the following high-impact innovations:

ACCELERATE THE TRANSITION TO A LOW EMISSIONS STEEL VALUE CHAIN

- › Evaluate and demonstrate the potential emissions reduction impact of **upgrading Australian iron ore using renewable energy and novel low emissions iron and steel making processes and technologies** using renewable electricity or fuels, including clean hydrogen
- › Reduce barriers to the **use of renewable energy and clean hydrogen in Australian iron and steel** production, including innovative technologies and commercial models.

ACCELERATE THE TRANSITION TO A LOW EMISSIONS ALUMINIUM VALUE CHAIN

- › **Decarbonise alumina refining** through electrification and fuel switching to clean hydrogen through demonstrations and scale-ups
- › Reduce barriers to the **use of renewable energy in the aluminium smelting process**, including through innovations that enable smelting to be a form of industrial load flexibility
- › Demonstrate the use of other technologies to **electrify and decarbonise aluminium smelting**, such as inert anodes.

We are also interested in innovation across different metals value chains and in the mining and metals processing sectors, especially where technologies may be replicable or applicable to the steel and aluminium value chains.

SCALE UP CARBON CAPTURE AND STORAGE (CCS) AND REDUCE THE COST OF SOIL CARBON MEASUREMENT

Technologies that capture and sequester CO₂ could play a critical role in global efforts to achieve net zero, addressing hard-to-abate emissions where other decarbonisation levers are prohibitively expensive or technically impractical.

Potential solutions include capturing emissions at source in industry, power generation or fuel production through carbon capture and storage (CCS) and atmospheric carbon removal methods, through both technical processes such as direct air carbon capture and storage (DACCS) and natural processes such as soil carbon sequestration.

OUR FOCUS

We plan to consult with industry, researchers and the Government to build our understanding of these technologies and to develop our approach to supporting research, development and demonstration projects that have the potential to:

- › Scale carbon capture and storage (CCS), including scaling cost-effective compression, transport and storage of CO₂.
- › Catalyse innovation in soil carbon sequestration, including bringing down the cost of soil carbon measurement and verification.

For more information on activities and future funding programs, see arena.gov.au/funding.

DELIVER THE TARGETED PROGRAMS IN THE 2020-21 FEDERAL BUDGET

ARENA is recognised for our expertise in providing grant funding to improve the competitiveness and supply of renewable energy in Australia. As part of the 2020-21 Federal Budget, the Government provided ARENA with \$193 million³ to deliver the following targeted programs:

- › **Future Fuels Fund (\$62.4m)** to address barriers to the rollout of new vehicle technologies
- › **Industrial Energy Transformation Studies Program (\$43m)** to provide grant funding for engineering studies and associated metering to accelerate projects which can deliver:
 - › transformational change in industrial energy use compared with baseline or business as usual emissions
 - › significant reduction in greenhouse gas emissions below baseline or business as usual emissions.
- › **Regional Australia Microgrid Pilots Program (\$50m)** to support feasible pilot projects for renewable microgrids in regional Australia, including the deployment of equipment and technology solutions that demonstrate improved resilience and reliability of microgrids in regional areas and are capable of resolving remaining barriers to final investment and full deployment
- › **Freight Efficiency Assistance Grants and Freight Energy Productivity Trial Program (\$15.9m)** to address barriers to the adoption of freight productivity technologies to support industry to reduce emissions.

Targeted funding rounds for these programs will be designed and launched periodically. For more information on key dates and guidelines see arena.gov.au/funding.

³ \$193 million to deliver the targeted programs includes \$171.3 million in grant funding.

BEFORE APPLYING FOR ARENA FUNDING

Our funding is usually provided as a grant. Where a proposal has the potential for significant commercial success, ARENA funding may include recoupment rights contingent upon future outcomes. We will provide further guidance to applicants on which type of funding is appropriate to your project.

TO FIND OUT MORE ABOUT THE FUNDING OPTIONS AVAILABLE:

- ✓ Check whether your project aligns with the funding program announcements on our website and review the current program guidelines at arena.gov.au/funding
- ✓ Complete the Eligibility and Alignment Tool at arena.gov.au/eligibility-alignment to check whether your project is eligible.

BEFORE APPLYING, APPLICANTS SHOULD:

- ✓ Develop a plan to demonstrate that your project contributes to one of our strategic priorities
- ✓ Consider the potential knowledge value of your project, either to fill knowledge gaps or progress innovation in Australia
- ✓ Assess where your project fits in the innovation chain to see if ARENA is the right place for you to seek funding.

If you've worked through these steps, and want to apply for ARENA funding, get in touch via our website arena.gov.au or reach out to our business development team at proposals@arena.gov.au.

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