ARENA CORPORATE PLAN

2018/19 – 2021/22

Australian Government
Australian Renewable Energy Agency

ARENA

Contents

From the Chair

Australia is in the midst of a profound transformation in the way in which we produce, distribute and use energy. We are not alone, the transformation is a global phenomenon.

Since its inception, the Australian Renewable Energy Agency (ARENA) has been at the forefront of energy change. We see enormous potential to unlock value through smarter, more efficient ways of producing and using energy. Realising this potential means being prepared to challenge and re-imagine established ways of thinking about and working with energy.

ARENA supports Australian research and early stage businesses take the leap from the lab into our energy supply system, as well as helping more developed technologies and business models get onto a commercial footing. Importantly, our investment of $1.19 billion has generated an additional $2.82 billion in third-party investment.

The final report of The Independent Review into the Future Security of the National Electricity Market (the Finkel Review) found that industrial consumers, businesses of all sizes, householders, electricity market participants and industry regulators are calling for an electricity system that can cope with emerging technologies and commercial models. The Finkel Review identified the need for continuing proof-of-concept testing of innovative grid-scale solutions for as long as technology is continuing to rapidly evolve.

ARENA is meeting this need by supporting projects that are finding affordable solutions for improving the reliability of a more decentralised and renewables-based electricity system. This is complemented by three other strategic priorities:

- Accelerating solar photovoltaic research and development to lower costs,
- Improving energy productivity to help manage demand and costs in the energy system, increase the share of renewable energy and reduce the cost of lowering emissions and,
- Helping lay the foundations of supply chains for exporting renewable energy.

ARENA has built strong partnerships with other key players in the energy sector. This partnership approach is fundamental to making the most effective use of public funds.

This Corporate Plan sets out how ARENA will support the development of a more affordable and reliable low emissions energy system.

Mr Martijn Wilder AM, Chair

Statement of preparation

I, as Chair of the Board of the Australian Renewable Energy Agency (the accountable authority) present our four-year Corporate Plan as required under paragraph 35(1)(a) of the *Public Governance, Performance and Accountability Act 2013*.

Mr Martijn Wilder AM
Chair

August 2018

Period of coverage

The Corporate Plan is prepared for the reporting period 2018/19 to 2021/22.

About ARENA

ARENA's purpose is to accelerate Australia's shift to affordable and reliable renewable energy.

ARENA was established on 1 July 2012 by the *Australian Renewable Energy Agency Act 2011*, and is funded to 2022.

Our overarching objectives are set out in this Act. They are to:

- **Improve the competitiveness of renewable energy technologies**
- **Increase the supply of renewable energy in Australia**

We operate at the leading edge of new energy solutions where both risk and potential reward are high. We aim to bring about transformational change by supporting innovation in energy products, services and business models.

We do this by providing grant funding to projects, sharing knowledge from these projects and facilitating collaboration in the energy sector.

ARENA has supported 396 renewable energy projects, driving innovations in solar PV, batteries, biofuels, hydrogen, solar thermal, tidal energy, pumped hydro, distributed energy and demand response. We have provided over $1.19 billion in funding, which has been matched by $2.82 billion in private investment.

To learn about our achievements and outcomes to date, read our Annual Report. For more information about our investment priorities, read our Investment Plan.

To find out more about ARENA, go to **www.arena.gov.au**.

OUR VALUES

Values shape the culture, define the character of an organisation and help drive organisational change.

At ARENA, we uphold the values of the Australian Public Service and we strive for an approach that is:

1. Impact-driven

We make a significant positive impact on Australia's energy sector, economy, environment and society. We take a bold, innovative approach to give us the best chance of achieving our goals.

2. Stakeholder-focussed

We deliver excellent service. Our approach is marked by responsiveness, clarity and flexibility.

3. Collaborative

We collaborate across teams and with our partners to achieve our goals.

4. Accountable

We are accountable to each other and, in following our processes, to the Minister, the Parliament and the Australian public. We work transparently to ensure public funds are spent in a responsible and efficient manner.

5. Respectful of people

We support and respect each other. We cultivate a diverse team to access the best talent, broaden our thinking and foster a culture of innovation.

Achieving our purpose

The shift to a radically different energy system is underway and unstoppable, driven by technological change, the declining cost of technologies such as solar panels and wind turbines, government policies, new business opportunities and the choices of consumers and businesses in how they produce and use energy.

An energy system that has remained relatively unchanged for decades is now shifting to one that is much more decentralised and in which new forms of energy production are rapidly entering the mix.

The potential benefits of this shift are many – more affordable and reliable energy, more choice and control for energy users, new sources of jobs and growth and lower emissions.

However, capturing these benefits is not easy or certain, and transformation of this complex and vital sector is difficult. These challenges are contributing to concerns about energy security, reliability and affordability.

ARENA is helping Australia manage this energy sector transformation more smoothly, and achieve the benefits faster. Our work is targeted at ensuring:

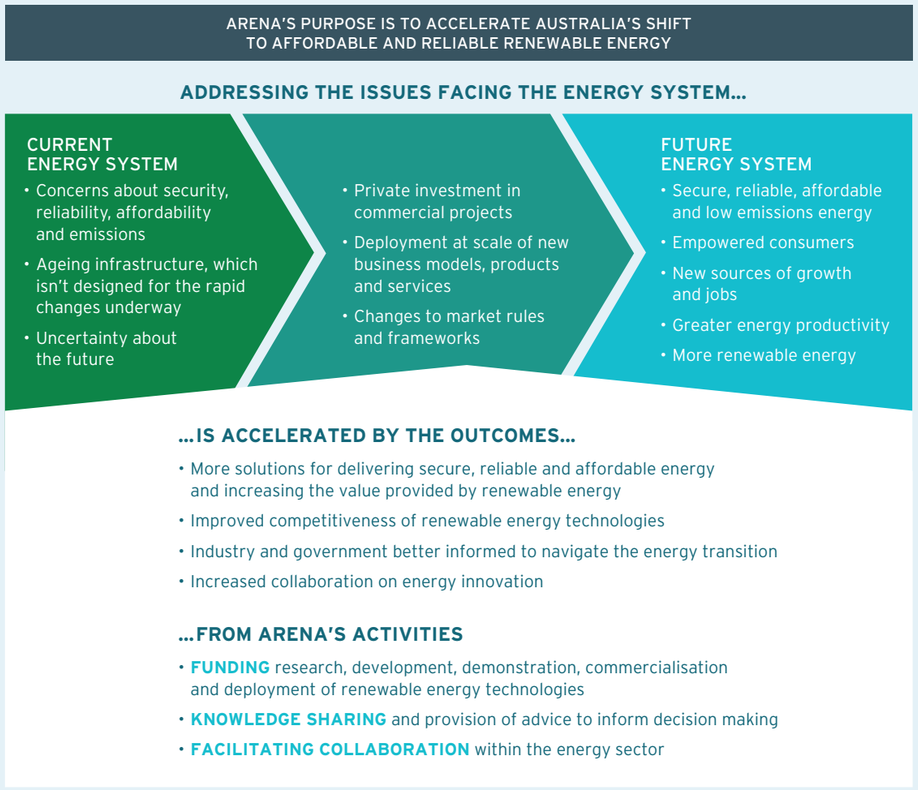
- The private sector has the technology options and business models it needs for delivering secure and reliable renewable energy.
- These technology options perform better, at lower cost and deliver more value. In particular, this applies to enabling technologies, like batteries and demand response, that help the energy system work better as the share of renewables grows.
- Decision makers in government and in the private sector have the knowledge, data and skills to navigate the challenging energy system transformation.
- There is increased collaboration in the energy sector, to enable systemic change.

ARENA targets these outcomes through its core activities:

- We fund research, development, commercialisation and deployment of renewable energy technologies. This helps promising technologies that are too high risk to rely solely on private sector investment move towards commercial readiness.
- We place a great emphasis on knowledge sharing and providing advice to government to make decision makers aware of and have access to the large quantities of valuable data and insight created through the projects ARENA funds, at the right time and in ways that are useful to them. By enabling the lessons from one project to be learned by the entire industry, ARENA can move new technologies towards commercial readiness more quickly, and use our funds more effectively.
- We facilitate collaboration in the energy sector. Achieving transformation of this complex sector requires coordination between many different players across government, industry and the research sector. ARENA's innovation lab, A-Lab, is one of the ways we catalyse this coordination and collaboration.

Figure 1 summarises how ARENA addresses the issues facing the energy system, which is accelerated by the outcomes from ARENA activities.

Figure 1 – Shaping Australia's future energy system



ARENA is an important part of how the Australian Government is supporting clean energy innovation and reforming the energy sector (Figure 2).

We work at the early end of the innovation chain, where there is a high risk of project failure, but also the potential for large rewards and public good spill-overs when projects succeed.

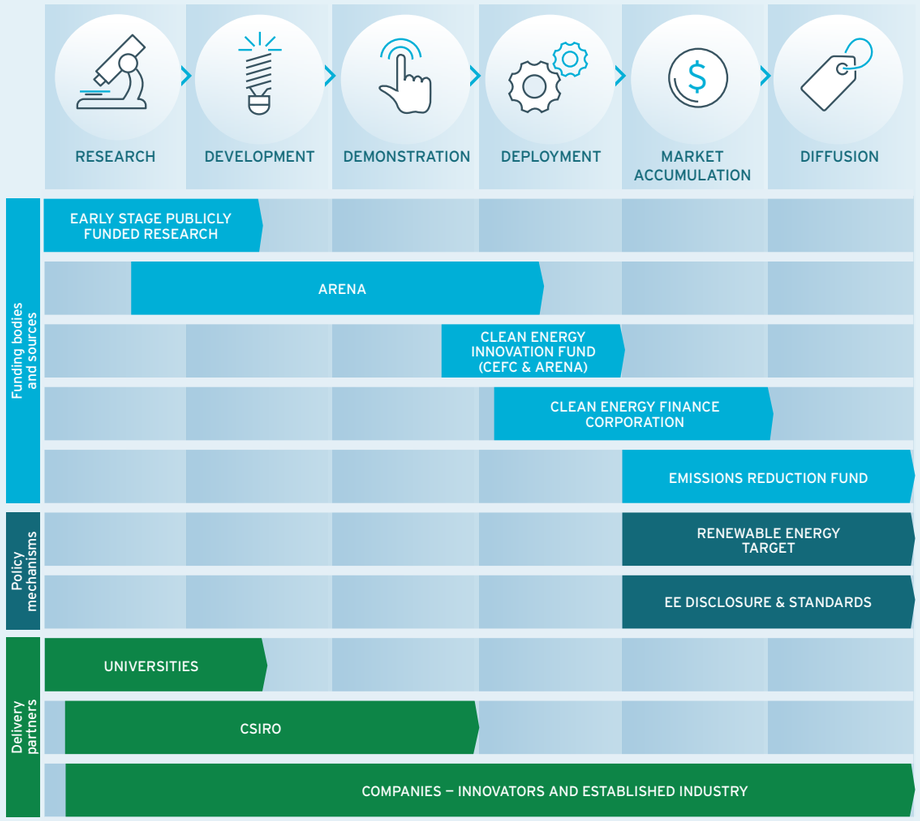
The grant funding provided by ARENA enables these types of projects to go ahead, and our knowledge sharing helps maximise the public good created.

It is our job to find and support Australia's most promising renewable energy innovations and help move them towards commercial readiness.

We have the capabilities and connections with the energy sector that enable us to find the best ideas, and work with proponents to develop them into projects and fund and deliver them, and then share the knowledge and insights gained with the rest of the sector.

In carrying out our role we work alongside partners such as the Clean Energy Finance Corporation, the CSIRO and innovators in industry, as well as alongside other Government policy such as the Emissions Reduction Fund and the Renewable Energy Target. For further detail, see 'How we work', 'Operating environment' and 'Our capabilities' below.

Figure 2: ARENA's role across the innovation chain



This approach has enabled us to achieve significant outcomes in accelerating the shift to affordable and reliable renewable energy.

Figure 3 (overleaf) summarises our activities, outcomes and impact to date.

As at 30 June 2018, ARENA had invested approximately $1.19 billion of funding and had a total of 175 active projects. ARENA has funded 396 projects since its inception in July 2012 through to 30 June 2018. For the $1.19 billion of ARENA funding invested, $2.82 billion of third party funding has been invested.

For more examples and further detail of ARENA's impact and information on our performance please see our Annual Performance Statement which is contained in our Annual Report.

In addition to achieving impressive statistics, ARENA has helped enable a number of sectoral breakthroughs – including:

Sector	Project
Energy	Large Scale Solar round
Manufacturing	Creating a better solar cell
ICT	CSIRO Virtual Power Plant Decentralised Energy Exchange (deX)
Mining / Fringe-of-grid	DeGrussa Solar Project Weipa Solar Farm ECLIPS' Container Roll Out Solar System (CROSS)
Transport	Evenergi electrical vehicle trial
Waste	Goulburn Abattoir Bioenergy Project
Network	Hornsdale Wind Farm Short-term forecasting round

Our impact across Australia has also been significant. Leading projects have included:

State	Project
SA	ESCRI Large Scale Battery
NSW	Demand Response
TAS	Musselroe Wind Farm
QLD	Kennedy Energy Park
NT	Northern Territory Solar Energy Transformation Program (SETuP)
WA	Perth Wave Energy Project
VIC	Large Scale Batteries
ACT	Reposit's GridCredits

Figure 3: ARENA at a Glance (30 June 2018)

ARENA AT A GLANCE

$1.19B INVESTED **396** PROJECTS **$4.01B** VALUE **$2.82B** INVESTMENT LEVERAGE

SOLAR PV	SOLAR THERMAL	GRID INTEGRATION	HYBRID	BIOENERGY	STORAGE – BATTERIES/PHES	WAVE/TIDAL	GEOTHERMAL
$634M	$145M	$111M	$98M	$59M	$52M	$48M	$41M

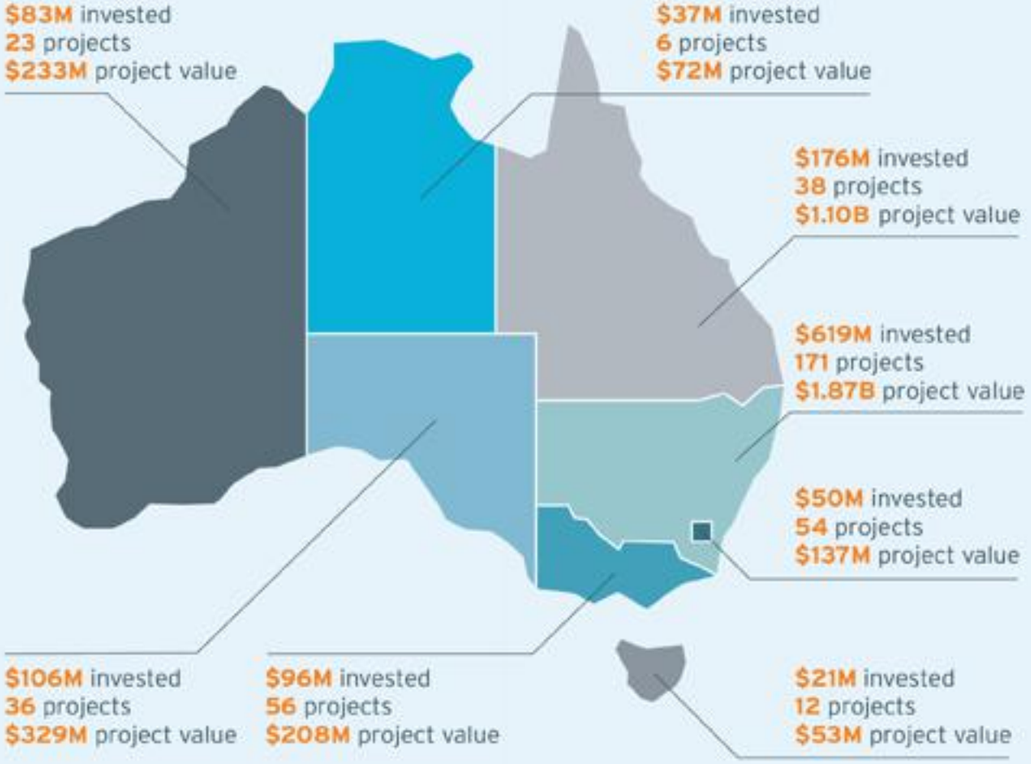
50%
Reduction in large-scale solar construction costs – $2.50/W to $1.25/W

$1: $2.37
Average investment leverage

Study	R&D	Demo	Deploy
$1: $1.57	$1: $1.71	$1: $1.78	$1: $3.59

Investment leverage across innovation chain

797MW
Total capacity created through investment



25%
Contribution to the Government's Mission Innovation targets

A-Lab
14 collaborative events attended by a total of **159** organisations
15 Ideas funded

270 Researchers supported
90 PHD students supported
Renewable Energy efficiency improvements and cost reduction research

In 2016/17 renewable energy jobs grew by **1/3 to 14,820**

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ARENA

Our plan-on-a-page

Our plan for 2018-19 to 2021-22 builds on the foundations laid by our 2017 Investment Plan, Innovating Energy, which laid out our four investment priorities:

- Delivering secure and reliable electricity
- Accelerating solar PV innovation
- Improving energy productivity
- Exporting renewable energy

We have defined a number of focus areas within the investment priorities, where we are working to achieve specific outcomes.

See 'Our planned activities' for further details.

OUR PURPOSE	**To accelerate Australia's shift to affordable and reliable renewable energy**							
HIGH LEVEL OUTCOMES	More solutions for delivering secure, reliable and affordable energy		Improved competitiveness of renewable energy technologies		Industry and government better informed to navigate the energy transition		Increased collaboration on energy innovation	
OUR ACTIVITIES	**Funding** research, development, demonstration, commercialisation and deployment of renewable energy technologies				**Knowledge sharing** and provision of advice to inform decision making		**Facilitating** collaboration within the energy sector and with energy users	
OUR PRIORITIES 2018-19 – 2021-22	Making new investments	DELIVERING SECURE & RELIABLE ELECTRICITY Delivering affordable low emission electricity solutions that keep the lights on		ACCELERATING SOLAR PV INNOVATION Making solar PV more efficient and affordable through research and development		IMPROVING ENERGY PRODUCTIVITY Helping reduce energy cost and emissions in the transport, building and industry sectors		EXPORTING RENEWABLE ENERGY Creating new, scalable export value chains in renewable energy
		FOCUS AREAS	**OUTCOMES**	**FOCUS AREAS**	**OUTCOMES**	**FOCUS AREAS**	**OUTCOMES**	**FOCUS AREAS**	**OUTCOMES**
		Reliability	Innovative technologies and approaches demonstrated for operating the electricity system reliably and affordably with high shares of renewable energy	Solar PV R&D	Improvement in solar PV cost and performance through R&D	High performance buildings	Exemplar buildings and developments demonstrated in select market segments	Renewable hydrogen	Innovations for hydrogen supply chain progressed towards commercial readiness
		System security	Innovative technologies and approaches demonstrated for affordably maintaining system security with high shares of renewable energy			Industrial heating and cooling	Demonstrations of high energy productivity, renewable solutions across a range of sectors and technologies	Minerals processing	Identification of viable renewable energy pathways for minerals processing in Australia
		Distributed energy resources (DER) integration & demand response	Innovative technologies and approaches demonstrated for maximising the value DER provide to their owners and to the electricity system			Electric and fuel cell vehicles	Innovations supporting uptake and integration of EVs and fuel cell vehicles with renewable energy advanced		
		Market data & information	Granular, up to date data on renewable energy resources and technology options is available						
		Concentrated solar thermal Large-scale battery storage Pumped hydro energy storage	Technologies advanced towards commercial readiness through feasibility studies, R&D and/or demonstrations, and sharing of resulting knowledge						
		Cross-cutting focus area Bioenergy and energy from waste		**Outcomes** Range of bioenergy and energy from waste technologies advanced to commercial readiness					
	Managing previous investments	Integrating Renewables & Grids	Fellowships	Strategic Research Initiatives	Regional Australia's Renewables	Large-scale solar			
		Knowledge sharing across our major focus areas		Improving collaboration in electricity sector innovation					

Our performance framework

Figure 4 sets out our performance framework, which describes the outcomes we are aiming to achieve, the activities we plan to undertake to deliver these outcomes and how we will measure these outcomes and activities.

Our measures of success draw on a mix of quantitative and qualitative performance information.

The performance framework also shows the long term impact and transformational change in the energy sector we are ultimately targeting.

Figure 4 – Our performance framework

ACTIVITIES: What we do to achieve our purpose and how efficiently we do it *All timeframes FY18-19 to FY21-22 except where stated*	**OUTCOMES:** The direct results that our activities will produce *All timeframes from FY18-19 to FY21-22*	**IMPACT:** The enduring, positive change that we will contribute to *Timeframes as stated*[1]
Provide financial assistance and leverage private investment[2] • $m ARENA funds approved [$281m total in FY18/19][3] • Investment leverage[4] by innovation stage [5] • Total third party funds invested • Number of projects approved • Commitments to contribute to Australia's Mission Innovation target [ARENA FY20/21 R&D expenditure at least doubled from FY15/16]	More solutions for delivering secure, reliable and affordable energy and increasing the value provided by renewable energy • Number of completed proofs of concept, pilots and demonstrations • Improvements in technological readiness of R&D Improved competitiveness of renewable energy technologies • Cost and/or revenue improvements for renewable energy technologies	Increase in supply of renewable energy *From 2018* Ongoing improvements in the competitiveness of renewable energy technologies *From 2018* Secure, reliable and affordable electricity system with a significantly higher share of renewable energy *From 2018* Increase in employment in renewable energy activities *From 2018* Improvements in energy productivity enabling achievement or exceeding of targets in the National Energy Productivity Plan *From 2022* Commercial scale export value chains in renewable energy established *By 2030*
Administer financial assistance • Number of projects managed • Number of projects closed[6] • $m payments made		
Jointly manage Clean Energy Innovation Fund with the Clean Energy Finance Corporation • Number of projects funded by Clean Energy Innovation Fund; number originating from ARENA • $ value of projects funded • Investment leverage[7]		
Provide information, advice and knowledge to advance renewable energy • Number of knowledge sharing products, by type (includes reports, presentations, blog posts, videos, policy submissions etc) • Number of knowledge sharing events delivered (includes virtual events e.g. webinars) • Number of ministerial and departmental briefs prepared	Industry and government better informed to navigate the energy transition • Third party recognition of value of ARENA knowledge sharing (e.g. citations of ARENA-provided information and supported projects in publications by relevant bodies (e.g. AEMO, AEMC), inclusion of ARENA in relevant working groups) • Number of users of knowledge sharing products (includes data on downloads, requests for products, reach of knowledge sharing events etc.) • Proponent and other stakeholder feedback on value of ARENA knowledge sharing (via annual survey, and feedback from specific knowledge sharing events)	
Collaborate with, and facilitate collaboration between, other persons, organisations and governments (including international collaborations) • Number of joint activities/arrangements undertaken or supported by ARENA including A-Lab activities • Number and type of meetings with governments	Increased collaboration on energy innovation • Number and quality of new partnership arrangements in the energy sector (including collaborations entered into by participants in ARENA-funded projects)	

Note: Activities and outcomes to be reported by investment priority, focus area, technology, location, sector, innovation stage, proponent type (where relevant).

1 Specified timeframes indicate when we would expect to see impacts occurring. Includes impacts from ARENA activities and outcomes prior to FY18-19

2 Black text describes an activity, outcome or impact

3 Blue text describes a performance measure; [Square brackets] describe targets

4 Ratio of ARENA funds committed to third party funds invested

5 Innovation stage denotes studies, R&D, demonstration, deployment

6 Reported as projects completed or terminated

7 Ratio of CEFC funds invested to third party funds invested

How we work

The principles that guide how ARENA provides financial assistance are laid out in our General Funding Strategy (GFS). ARENA's approach is:

- Targeted for maximum impact
- Technology neutral
- Responsive and agile
- Diverse
- Commercially focused

OUR INVESTMENT APPROACH

Identifying and funding projects that offer the greatest prospect of providing proof of concept or accelerating the commercial deployment of better products, services and business models is the foundation of ARENA's work.

ARENA's financial assistance is provided through grants (which may be recoupable or convertible under certain circumstances)[1]. Grant funding fills an important need in clean energy innovation, allowing projects to proceed that are too early stage or high risk to attract private sector funding. ARENA provides funding to the Renewable Energy Venture Capital (REVC) Fund[2] to make equity investments.

ARENA is committed to achieving maximum impact and value from the projects it funds, with minimal capital investment. For this reason we carefully assess just how much investment is required from ARENA in order to achieve sustainable outcomes, that is, for the new products, services or business models that we support to be able to continue to develop without the need for further ARENA grants. An example of this is how we defined our ultimate objectives and measured whether targets have been met in relation to ARENA's support for large scale solar.

We fund projects across the innovation chain – from research and development (R&D) to pre-commercial deployment. Support for R&D is important to help create solutions for the long-term, while supporting later stage projects allows us to create the solutions to the challenges the energy sector is facing today.

Our funding is focused on finding and demonstrating first-of-a-kind renewable energy solutions, which reduces technical and commercial risks and grows Australia's renewable energy knowledge and expertise. The renewable energy technologies we support include hybrid, related or enabling technologies. This means ARENA may fund technology solutions such as storage, demand response, energy efficiency, electrification and fuel switching where they could help grow the supply of renewable energy in the long-term.

Our approach to investment is set out in detail in our Investment Plan, which describes our funding programs and initiatives and our four investment priorities. We expect to invest the bulk of our funds in accordance with our investment priorities.

Within each of our investment priorities, we have defined focus areas to target investments to achieve specific outcomes, as shown on our 'Plan-on-a-page'. Focus areas also inform our knowledge sharing strategies and the design of the performance measures that will enable our stakeholders to assess ARENA's impact. These focus areas may evolve as our operating environment changes, as we achieve our goals, and as we learn from our current and planned activities.

ARENA has deliberately limited the number of programs that it operates. This reduces administrative overheads but, more importantly, simplifies the application process for project proponents.

We provide funding through two distinct channels:

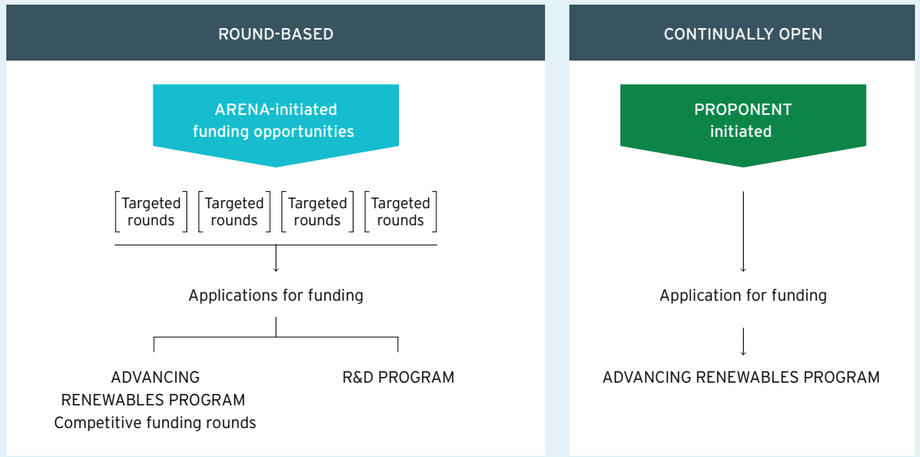
- Time-bound, round-based targeted funding opportunities under the Advancing Renewables Program and the R&D Program
- A continually open application process available under the Advancing Renewables Program

Each approach offers specific benefits.

1 The ARENA Act Section 4 defines financial assistance as a) grants; or b) any other kinds of assistance specified by the Minister by legislative instrument.

2 Managed by Southern Cross Venture Partners

Figure 5: ARENA's funding channels



TRL: Technology Readiness Level is a globally accepted benchmarking tool for tracking progress and supporting development of a specific technology through the early stages of the technology development chain, from blue sky research (TRL1) to actual system demonstration over the full range of expected conditions (TRL9).

Round-based funding opportunities are best suited to creating competitive tension and supporting price discovery. They are also a good way for ARENA to pursue specific outcomes within focus areas. Rounds are developed in consultation with stakeholders across industry, government and the research sector.

Our continually open stream under the Advancing Renewables Program was designed in response to stakeholder feedback to provide support to innovators and entrepreneurs at the time that best meets their needs and the needs of the market. We work with project proponents to set the size and nature of funding and to adjust the scope to improve a project's value – this includes collaborating with industry, researchers and government to achieve specific outcomes that can be replicated for future projects.

ARENA supports each funding channel with appropriate levels of funding, specialist staff and other resources. In both cases ARENA seeks to maximise impact for minimum ARENA cost.

WORKING IN PARTNERSHIP

ARENA achieves impact by working in partnership with individuals and organisations across the research sector, industry and government to transition Australia's energy system. Our work addresses the technical, regulatory and commercial factors that play a major role in enabling or resisting change.

By working in close consultation with other leading energy sector bodies we ensure that support for clean energy innovation is collaborative, efficient and effective.

ARENA's innovation lab, A-Lab, is one way we bring together a diverse network of people, expertise and passion to drive systemic change in the electricity sector. We are also building partnerships to coordinate innovation in the shift towards distributed electricity.

We work closely with the Clean Energy Finance Corporation (CEFC) and the Department of the Environment and Energy to make an effective contribution to the Australian Government's desired renewable energy innovation outcomes. We are also helping deliver the Government's priorities in the area of vehicle emissions and electric vehicles.

ARENA and the CEFC jointly manage the Innovation Fund, which makes debt and equity investment in emerging clean energy projects and businesses, using CEFC financing. This investment is designed to deliver a financial return to taxpayers from projects at the later end of the innovation chain and boost the competitiveness of renewable energy and related technologies.

ARENA has a memorandum of understanding (MOU) with the Australian Energy Market Operator (AEMO) to develop better ways to operate the electricity system with more renewable energy. This initiative includes joint activities to ensure electricity system security, reliability, forecasting and demand response, discussed further under 'Our planned activities' below.

ARENA supports projects that provide knowledge and information relevant to deliberations on energy policy, market rules, regulation or network practices and procedures. An increasing focus for ARENA, through various consultations and submissions is ensuring that knowledge generated through our investments is available to energy policy makers.

We work collaboratively with state and local governments including on joint initiatives in which we have pooled resources and shared expertise to increase the scope of pilots to test new solutions and business models in areas such as energy storage.

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AEMO

CEFC
CLEAN ENERGY FINANCE CORP

Operating environment

Over the course of 2017 a series of reviews and inquiries drew attention to areas where there is a pressing need for innovation in Australia's electricity system.

However, innovation in the energy sector requires significant capital and has long development timelines. A recent study[3] of venture capital investment in the United States' cleantech sector found that it "...suffers especially from a dearth of large corporations willing to invest in innovation" and that "...cleantech companies developing new materials, hardware, chemicals, or processes were poorly suited for VC investment..."

It is for these reasons that the kind of public funding provided by ARENA fills a critical gap. ARENA helps offset the uncertainty and risk inherent in the research, development and commercialisation of new energy solutions.

ARENA's work is informed by, and responds to, significant public policy initiatives and reviews. These include the Finkel Review and the 2017 Review of Climate Change Policies as well as the priorities of energy market bodies such as the Energy Security Board.

The Energy Security Board's inaugural Health of the National Electricity Market[4] report described a power system where "...reliability risks are increasing, electricity bills are not affordable, and future carbon emissions policy is uncertain". The report noted large additions of utility scale solar and wind generation to the National Electricity Market (NEM) in the last five years and that the cost of constructing wind and solar plants has been falling substantially and rapidly. However, the report goes on to say that while this development is positive for emissions reduction "there has been insufficient recognition that when sun and wind are not available the power system must have dispatchable powers."

ARENA recognised early on the need to integrate renewable energy into grids and, through its investment priority – delivering secure and reliable electricity – is supporting trials and other activities that are developing solutions to the problems raised by the variability of wind and solar energy sources.

We also consider closely various scenarios for technology development, market evolution and emissions reduction trajectories, drawing on initiatives such as the Low Emissions Technology Roadmap and CSIRO/Energy Networks Australia Electricity Network Transformation Roadmap.

We work with those responsible for technology and market development, such as CSIRO, AEMO, universities and industry to ensure that our investment will contribute to the competitiveness of renewables under at least one scenario. These scenarios inform the potential value of our investment, as reflected in the intended results for each investment priority.

ARENA is also guided by the Minister's Statement of Expectations which emphasises the importance of collaboration across government and the potential to contribute to emerging opportunity areas such as energy-from-waste.

Pursuant to Section 64 of the *Australian Renewable Energy Agency Act 2011*, ARENA has available funding to FY2021-22. ARENA can continue to spend retained funds or funds received from other sources after this time.

We take into account significant market trends as part of our planning, such as those described in transitioning energy systems and the global context below.

3 Venture Capital and Cleantech: The Wrong Model for Energy Innovation?, MIT Energy Initiative Working Paper, 2016

4 The Health of the National Electricity Market, 2017 Annual Report, Energy Security Board

TRANSITIONING ENERGY SYSTEMS

Renewable energy is an essential part of the energy transition. Its role in the energy mix in Australia and globally continues to grow as a result of technical, economic, social and policy developments. Australia has set a target to reduce emissions by 26-28 per cent below 2005 levels by 2030 as a party to the Paris Agreement, which requires all parties to the agreement to take action on climate change from 2020.

One of the most significant changes occurring in the energy system is the shift towards more distributed energy, driven by falling technology costs and consumer choices. Bloomberg New Energy Finance estimates that by the mid-2030s, around 45% of Australia's electricity generation capacity will be provided by rooftop solar. This change is occurring faster and to a greater extent in Australia than in other large economies.

Other major technological changes occurring in the energy system include:[5]

- The share of variable renewable generation (solar PV and wind) is increasing
- Digital technologies are enabling greater automation and decentralised decision-making, while increasing the vulnerability of the electricity system to cyber-attacks
- Electric vehicles are expected to disrupt the transport sector, and link it much more closely with the electricity sector
- Concentrated solar thermal is beginning to emerge internationally as a commercial, large-scale electricity generation technology

The changes underway aren't driven solely by technology. Increasing energy prices are changing the way energy is used. Australia has recently seen increased interest in integrating hydrogen into the energy system to support long-term reductions in carbon emissions.

ARENA's focus is on developing the energy options that will enable Australia to prosper through the energy transition. Our support of innovative Australian companies and researchers will contribute to domestic and global improvements in the competitiveness of renewable energy and its integration with our energy system.

GLOBAL CONTEXT

The International Energy Agency (IEA) projects that global energy needs will rise more slowly than in the past but will still expand by 30% between 2017 and 2040 – the equivalent of adding another China and India to today's global demand[6]. Overall, countries in Asia account for two-thirds of global energy growth, with the remainder coming mainly from the Middle East, Africa and Latin America.

Meeting this demand and implementing the Paris Agreement will require massive global investment in low emissions technologies and energy efficiency. The IEA projects that renewables will capture two-thirds of global investment in power plants to 2040 as they become the least-cost source of new generation.

There is also increasing global attention on hydrogen as a fuel and energy storage medium.

ARENA investment will increase the take-up of Australian-developed technology and intellectual property to help meet this global demand. Our exporting renewable energy investment priority has the potential to create markets for Australian energy resources.

The Australian Government has also committed to double Australia's R&D investment in clean energy by 2020, from a 2015 baseline. Australia is a signatory to the global Mission Innovation initiative which will dramatically accelerate global clean energy innovation, and ARENA is a major contributor to our implementation of this commitment.

5 CSIRO Low Emissions Technology Roadmap, 2017

6 World Energy Outlook 2017

Our planned activities

PRIORITY 1: DELIVERING SECURE AND RELIABLE ELECTRICITY

MAXIMISING BENEFITS FROM EXISTING INVESTMENTS

We have a strong portfolio of projects already underway, which is helping in the overall quest to provide affordable, secure and reliable electricity to more Australians into the future.

Improvements in technology and an increased understanding of its potential will help increase confidence in this endeavour. ARENA intends its investments to complement broader efforts on electricity reliability and security underway across agencies, flowing from the Finkel Review.

With respect to electricity system security, ARENA has funded projects such as:

- The demonstration of the frequency control capability of distributed resources, large intermittent renewable generators and batteries
- Improved short-term forecasting to identify the extent of need for short-term frequency response capability as the share of renewable energy grows

ARENA's partnership with AEMO is an important part of delivering the benefit from these projects. AEMO is using the results to adapt its systems and to provide more clarity to market participants about how they can interface with AEMO's systems.

The involvement of regulatory agencies such as the Australian Energy Market Commission (AEMC) and the Australian Energy Regulator (AER) also helps to maximise the market-wide learning benefits.

ARENA will continue to engage with these and other agencies in projects where there are policy implications or a lack of clarity on how policies and management systems apply to new technologies.

With respect to electricity system reliability, ARENA is funding a wide range of approaches such as:

- A demand response trial in partnership with AEMO
- A wide range of distributed energy resource trials, demonstration projects and innovative businesses
- Feasibility studies and support for demonstration and early project experience in flexible resources like pumped hydro, battery storage and concentrated solar thermal (CST) technology
- Research and development into technology improvements for flexible resources, such as batteries and, through the Australian Solar Thermal Research Initiative (ASTRI), concentrated solar thermal
- Analysis and early deployment project experience in hybrid approaches to improving reliability such as co-locating solar, wind and batteries

Many benefits will flow directly from the practical experience of industry participants in new types of projects, allowing them to make more informed investment decisions and reduce costs over time.

Maximising the benefits from projects related to reliability also benefits from communicating technology potential to key electricity sector decision-makers, financiers and policy-makers. ARENA will continue to provide opportunities for such parties to hear project results and trends. We will support this with analysis of project results and implications.

MAKING NEW INVESTMENTS

ARENA has built a strong portfolio of projects across technologies contributing to both reliability and security and will continue funding projects that support these outcomes and help maintain affordability. We will continue to support high merit, innovative projects across key technologies such as concentrated solar thermal, large-scale batteries and pumped hydro energy storage, where these provide knowledge sharing benefits incremental to projects already funded.

We will continue to look for opportunities to fund innovative technologies and approaches that demonstrate how system security can be maintained affordably, in an electricity system with higher shares of variable renewable energy.

Given the major shift to distributed energy currently underway, a particular focus of future funding is on projects that help manage the transition to higher shares of distributed energy resources, and that maximise the benefits these resources provide to their owners and to the energy system.

Given the range of organisations such as network operators, market bodies and retailers that are part of this transition, we are also working to improve collaboration on the innovation required to manage the transition successfully.

Projects to improve demand-side flexibility are also a priority. This is an area of strong complementarity between the delivering secure and reliable electricity and improving energy productivity priorities.

Through funded projects, we aim to increase confidence among system operators and service providers that the electricity system will be able to deliver reliable and affordable electricity under a range of scenarios for an increased share of renewable energy.

Our new investments will focus on demonstrating new ways to deliver security and reliability in grids with higher shares of renewable energy and on preparing these prospective technologies for commercialisation. We will also target our R&D investment – in CST, for instance – to best support the delivery of competitive, secure and reliable electricity for the longer term.

These investments will be a high priority for ARENA, given the need to transition Australia's electricity system to a higher share of low or zero emissions electricity. We aim to bring forward investment in Priority 1, with a large share of our commitments to be made in 2018-19.

ARENA's innovation lab, A-Lab, will support the development of new projects and provide opportunities to collaborate, improve industry dialogue and share ideas.

A-LAB

PRIORITY 2: ACCELERATING SOLAR PV INNOVATION

MAXIMISING BENEFITS FROM EXISTING INVESTMENTS

Australia's capability in solar PV research and development is world-leading, and ARENA will continue to prioritise support for solar PV innovation to help maintain this position.

Our R&D funding program generates a range of benefits for Australia including supporting exports through education, licensing of intellectual property and contract R&D activities. Our support for R&D bolsters Australia's standing as a "clever country" as well as highlighting our contribution to global emissions reductions efforts.

In 2017-18, $29.22 million in funding was awarded to 20 projects that aim to increase the competitiveness of solar cells and modules.

ARENA's support for the Australian Centre for Advanced Photovoltaics (ACAP) underpins the development of Australia's ongoing research excellence in solar PV, and retains world-class solar PV research talent. Ultimately, the fruits of PV research benefits Australia in the form of cheaper solar systems.

MAKING NEW INVESTMENTS

During the next two years, ARENA expects to implement two targeted funding initiatives to accelerate solar PV innovation and we will continue to work in consultation with the research sector to develop these initiatives.

The first initiative will focus on supporting the commercialisation of research and increase the proportion of solar PV technology that is able to attract wider sources of investment.

The second is expected to support solar PV research and development that contributes to an increase in the competitiveness of and/or the share of solar PV energy in Australia.

Projects that are further along the development scale as well as feasibility and desktop studies that meet the objective of this investment priority will also be able to apply for funding under the Advancing Renewables Program. Envisaged outcomes for these projects include:

- Increases in the lifetime and reduction in the degradation of cells and modules
- Increases in the reliability of both cells and modules and solar assets as a whole
- Improvements and reduced costs in manufacturing techniques
- Innovations in integration and applications of PV materials
- The identification of opportunities for recycling and resource recovery pathways for solar PV panels

PRIORITY 3: IMPROVING ENERGY PRODUCTIVITY

MAXIMISING BENEFITS FROM EXISTING INVESTMENT

Improving energy productivity is a key strategy in accelerating Australia's shift to affordable and reliable renewable energy. Energy productivity is simply a measure of economic value per unit of energy used. Improving energy productivity therefore reduces the demand for energy for a given output and reduces the scale of investment and cost required to reach a low carbon energy future.

The International Renewable Energy Agency (IRENA) has found that when pursued together, renewable energy and energy productivity result in higher shares of renewable energy, a faster reduction in energy intensity, and lower energy system costs, than pursuing either strategy alone.

ARENA's existing work related to energy productivity includes the Regional Australia's Renewables (RAR) initiative and a number of micro-grid projects such as Alkimos Beach and Narara Ecovillage. Lessons from the RAR mid-term evaluation completed in early 2018 will be leveraged to ensure maximum benefits are gained from these investments and also to help shape future investments. ARENA also has a number of transport-related projects, such as supporting enablers of EV uptake.

MAKING NEW INVESTMENTS

ARENA's investments in energy productivity will be focused on activities that fulfil ARENA's objectives related to innovation and energy system transformation, that significantly boost energy productivity and that use, enable or support greater deployment of renewable energy.

Under the *ARENA Act 2011*, ARENA's financial assistance must be for research, development, demonstration, commercialisation and deployment of renewable energy technologies. These technologies can include ones that are related to energy productivity, such as energy storage, load shifting, electrification, fuel switching and energy efficiency, where these technologies use, enable or support greater deployment of renewable energy.

For further guidance on the types of energy productivity activities and technologies that ARENA funds, please refer to the ARENA website.

ARENA will initially target funding in three areas:

- High Performance Buildings
- Industrial Heating & Cooling
- Electric & Fuel Cell Vehicles

While these are the first three areas targeted, ARENA recognises that there are other areas of energy productivity that warrant targeted attention, and ARENA may develop further funding initiatives in these areas over time. Furthermore, support for innovative projects is not limited to these targeted areas and ARENA will consider eligible and high merit proposals in other areas of energy productivity submitted through the open stream of the Advancing Renewables Program.

The first of the three initial targeted areas recognises the importance of the built environment in the energy system – buildings are a major energy use sector and account for almost one quarter of Australia's carbon emissions. ARENA will support the development of zero energy, low peak demand and energy efficient detached or semi-detached homes, which optimally utilise renewable energy. The planned outcome of the initiative is upskilling the industry and informing regulatory change, such that zero energy and low peak demand homes become the norm for new housing in future.

The second and third areas address two major fossil fuel consuming uses – natural gas for industrial heating and petroleum products for transport. The industrial heating and cooling area will incorporate heat recovery and optimisation initially focused on the "low temperature mass market" (predominantly food and beverage sector, but also wood, paper, textiles and a range of other industries, typically using heat below 250°C), and will continually adapt to identify and fund projects across higher temperature ranges and additional industries as technologies mature. The planned outcome of this focus area is the demonstration of innovative renewable energy technologies to replace gas, effective heat recovery, integration and storage, and upskilling industry to implement and de-risk these solutions.

The electric and fuel cell vehicles area will encompass battery electric, plug-in hybrid and fuel cell electric vehicles powered from renewable sources. Our initial focus will be on driving uptake in fleets of passenger and light commercial vehicles, developing charging networks and improving integration with the electricity system.

PRIORITY 4: EXPORTING RENEWABLE ENERGY

MAXIMISING BENEFITS FROM EXISTING INVESTMENTS

Australia has vast renewable energy resources, good export capabilities and strong relationships with key international markets. As the global economy transitions to low emissions energy, Australia will be well positioned to export renewable energy as primary energy (for example as hydrogen or ammonia) or embodied in processed raw materials.

ARENA will help drive innovation in Australia's renewable export industry and position the industry for long-term growth.

This investment priority comprises two focus areas:

- The export of renewable hydrogen and related commodities (such as ammonia) and
- Renewable energy embodied in processed minerals

In 2017-18, $20 million was made available for research and development projects that contribute to the acceleration of a renewable hydrogen export supply chain. Specifically, projects will focus on achieving cost reductions and/or efficiency improvements in all stages of the supply chain. ARENA will monitor outcomes and the progress of projects under this funding round to leverage opportunities for future investments.

Under the Regional Australia's Renewables (RAR) initiative, ARENA has supported trials of renewable energy solutions, including hybrid systems, which have the potential to increase the proportion of renewable energy in the supply chains of traditional resource exports. The mid-term evaluation of the RAR initiative will be used to inform the way we manage our existing projects to create export value chains based on the greater use of renewable energy.

MAKING NEW INVESTMENTS

ARENA will build on advancements made in the research and development of technology in renewable hydrogen export chains, with an additional funding round likely to be conducted in 2019-20, dependent on outcomes from the first round.

Demonstration and deployment projects will also be able to apply under the Advancing Renewables Program. Specific outcomes under the hydrogen focus area of this investment priority include informing business models and use cases of hydrogen production from renewables and the identification and removal of regulatory barriers.

Given the strong link between the domestic and international hydrogen markets, projects that contribute to the uptake of renewable hydrogen for injection into the Australian gas grid, storage of electricity and transport will also be sought. Funding will be informed by CSIRO's National Hydrogen Roadmap, and ARENA's companion report on opportunities for exporting hydrogen and related commodities, released in August 2018.

Within the minerals/metals processing focus area, investment will be informed by an industry roadmap that ARENA has commissioned. The roadmap will examine the opportunity for embedding renewable energy into processed minerals and metals in support of Australia's exports of these commodities.

PROJECTS SPANNING PRIORITIES 1 TO 4

ACROSS INVESTMENT PRIORITIES: BIOENERGY AND ENERGY FROM WASTE

Bioenergy and energy from waste projects fit across a number of ARENA's investment priorities. For instance, supporting municipal solid waste projects will help deliver secure and reliable electricity while improving energy productivity.

ARENA funds bioenergy and energy from waste projects through the Advancing Renewables Program, focusing on projects that demonstrate commercial and technical innovation, sufficient net environmental benefit, sustainable feedstock and offtake agreements and sufficient commercial potential. ARENA's work in this area contributes to the Minister's request that energy from waste be prioritised.

How our priorities have evolved

ARENA operates in an environment that is undergoing fundamental and increasingly rapid change. It is, therefore, essential that our priorities are well aligned to broader policy, technology and commercial developments. In this way we can be confident that our activities will contribute most effectively to enabling the energy transformation.

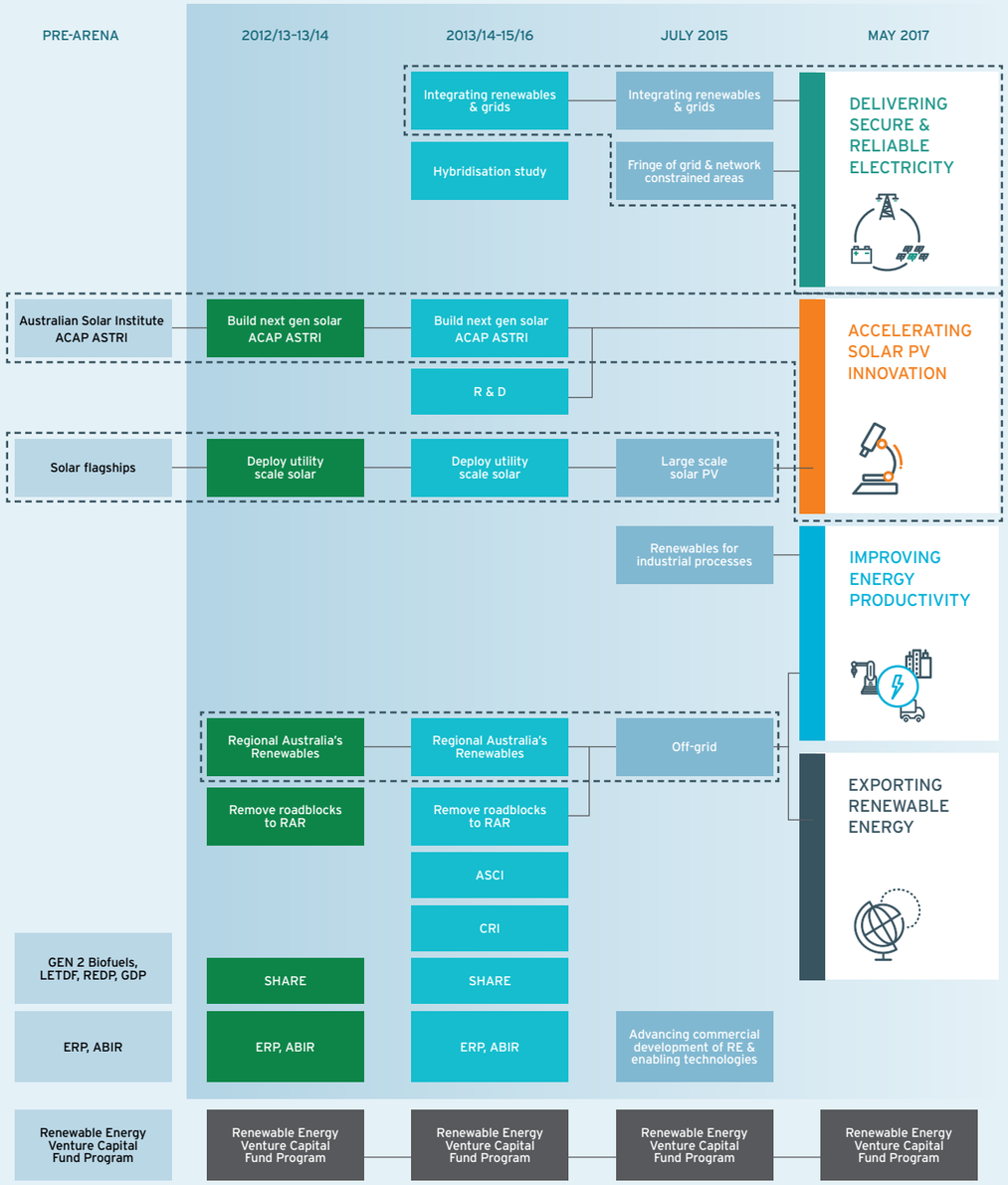
Our annual review of ARENA's General Funding Strategy and close consultation with key industry participants informs changes to our investment priorities.

Our priorities are also revised when ARENA judges that it has achieved its objectives and brought about sustainable change in a specific area.

This is best exemplified by large scale solar.

Figure 6 shows how our current investment priorities have evolved and how they build upon ARENA's, and others', earlier efforts.

Figure 6 – How ARENA's investment priorities have evolved



ASCI: Australian Step Change Initiative **SHARE:** Supporting high-value Australian Renewable Energy Knowledge Initiative **CRI:** Commercialisation Readiness Index **ERP:** Emerging Renewables Program **ABIR:** Advanced Biofuels Investment Readiness Program **GEN 2 Biofuels:** Second Generation Biofuels Program **REDP:** Renewable Energy Development Program **GDP:** Geothermal Drilling Program **LETDF:** Low Emissions Technology Demonstration Fund **RAR:** Regional Australia's Renewables **RE:** Renewable Energy

Our capabilities

OUR BOARD

Mr Martijn Wilder AM (Chair)
Ms Samantha Hogg
Ms Susan Jeanes
Ms Meg McDonald
Mr Dougal McOmish
Mr Finn Pratt AO PSM,
(as represented by Ms Jo Evans)
Ms Stephanie Unwin

ARENA's Board sets investment strategies and priorities, oversees the running of the organisation and approves funding for projects up to $50 million.

Board members have experience or knowledge in renewable energy technology, commercialisation, business investment and/or corporate governance.

The Secretary of the Department of the Environment and Energy is a member ex officio and may nominate an alternate to attend Board meetings.

OUR PEOPLE

The agency's values (see page 5) empower our people to take an agile, commercially-oriented and outcome-driven approach to achieving our purpose.

ARENA has a skilled, productive and highly motivated team drawn from diverse backgrounds in the business, industry, finance, research and government sectors. We work with innovators in support of projects that generate the knowledge needed to bring about transformative change.

ARENA blends public and private sector expertise to ensure that it appropriately balances innovation and accountability in the design and delivery of its activities.

ARENA's leadership team and staff have expertise and experience in energy policy, Australia's electricity market, energy technology and project finance.

A strong culture of mutual support, teamwork and collaboration built on expertise in stakeholder engagement has been central to ARENA's success.

As a small organisation we have developed a highly effective team-based way of working that enables us to make best use of complementary skills and Agency resources and to maintain high efficiency in our business activities.

Our open and collaborative approach enables us to build strategic partnerships and pursue joint initiatives that draw on the complementary strengths of key players in the Australian energy system.

INSTITUTIONAL CAPABILITIES

ARENA is an integral part of the Government's innovation agenda and a key actor in Australia's innovation ecosystem. We identify where, and what kind of, innovation is necessary for delivering the Government's microeconomic reform agenda for the energy system.

To deliver on this role, we have the people, systems and processes in place to identify the innovation needs of system operators, regulators, consumers and industry and to design and deliver financial assistance mechanisms and knowledge sharing that addresses those needs.

A consultative approach to identifying innovation needs

We are experienced in identifying innovation needs, in consultation with industry, government and the research community. We are able to find influential innovators and other key energy sector participants, bring them together, and make projects happen.

Through A-Lab in particular, ARENA creates cross-sector partnerships and world first projects that draw on a network of people with a wide range of expertise and passion to drive systemic change in the electricity sector.

A-Lab brings together Australia's top researchers, energy industry leaders, cleantech innovators, regulators, and energy consumers to design new projects and programs that break ground in energy innovation and lead to real-world solutions, in an environment that encourages constructive engagement and innovative thinking.

We believe A-Lab can enable breakthrough creative thinking on some of the most exciting and complex challenges facing the electricity sector.

Rigorous project assessment and selection

ARENA's people have built a strong and recognised capability in project origination and selection. We are able to balance technology-based assessment with a holistic consideration of non-technical factors and projects' potential for impact and contribution to achieving the Agency's purpose.

We have robust processes for working with proponents as project proposals are being developed, to ensure that the Government funding ARENA is responsible for dispensing is used as effectively as possible.

ARENA workers are empowered to take innovative approaches to finding and funding high-quality and potentially transformative projects and to pursuing opportunities that are not being adequately pursued by either the private sector or other funding agencies.

ARENA draws on the technical expertise of the ARENA Advisory Panel. The Panel's expert members provide advice to support the development and selection of projects and initiatives for funding by ARENA.

Risk-based approach to project management

ARENA's client managers are focussed on managing projects to success. Our people are strongly customer and outcome-focused. We work closely with project proponents to ensure that each project delivers value for money.

One size fits all approaches to contract negotiation and management can be onerous for funding recipients and inefficient for ARENA. To ensure that we properly balance rigour and efficiency, our client managers are highly skilled at risk-based approaches to project management.

ARENA's entire project portfolio is risk-rated and managed accordingly. This maximises the chances of each project succeeding and ensures that we can quickly terminate non-performing projects.

Increasing impact through knowledge sharing

ARENA has been at the forefront of forging a new approach to getting the most impact from publicly-funded innovation projects. This involves sharing the knowledge generated by each project out to those who need it and can best use it to help ARENA achieve its purpose.

ARENA has a dedicated team of people with a mix of analytical, engagement and communication skills that is now delivering an ambitious knowledge sharing strategy that is breaking new ground for public sector agencies.

A learning organisation

ARENA invests significant effort in ensuring that it is optimally structured to achieve its strategic objectives. ARENA is committed to providing a supportive and stimulating work environment that recognises and rewards high performance and enables continuous improvement.

Risk oversight and management

ARENA operates at the leading edge of new energy solutions and is responsible for the efficient and effective use of public monies. This demands a rigorous and balanced approach to managing risk.

Our approach to risk covers three core themes:

1. Safety, Compliance and Scope of ARENA's investment mandate (areas of low tolerance to risk)
2. People, Environment and Operations (areas that balance risk and reward outcomes)
3. Innovation, Technology and Project Outcomes (areas of increased appetite for risk taking; high rewards)

One of the central means by which ARENA achieves its purpose is funding high quality projects across our investment priorities. ARENA controls for the risks inherent in project selection include having an appropriately skilled and resourced business development and transactions team that has in-depth industry knowledge in priority areas for new investment.

The ARENA Advisory Panel, composed of qualified experts, provides advice to the ARENA Board and staff to inform project selection and decisions regarding the provision or termination of funding.

We acknowledge that some of the projects we invest in may not succeed; failures will occur and we accept this as a risk we are willing to take in the pursuit of innovative, enhanced renewable energy outcomes.

All current ARENA projects have undergone a risk-rating, which includes Workplace Health and Safety (WHS) risk, enabling resources to be allocated appropriately to monitor legal, reputational and WHS risks at sites.

Environmentally, we seek to minimise negative impacts from the projects we support through risk assessment at the project application stage and management of risks throughout the grant management life cycle.

ARENA strives to be at the forefront of national efforts to understand and mitigate the environmental impacts of renewable energy projects. For example, ARENA has developed and implemented a life-cycle assessment approach for bioenergy that evaluates whether a new technology will deliver a net benefit in environmental terms.

The health, welfare and safety of our workforce and the people involved in our projects is an absolute priority, especially since new and innovative processes may have unfamiliar risks. Therefore, we will strive to continuously improve safety standards and systems.

Over the period covered by this Corporate Plan, we will maintain our internal control framework, including:

- Policies and procedures that support compliance with legislative and policy requirements
- A positive compliance and management environment, with an effective schedule of delegations
- An internal audit function that seeks to appropriately balance performance and compliance audits
- A risk management framework, including fraud control, risk management plans, security and business continuity management and disaster recovery
- Compliance with Australian Public Service values and Code of Conduct
- Monitoring controls through effective planning and reviews at all levels of the organisation, and ongoing budget management
- Accountability mechanisms, including reports, reviews and individual performance management arrangements.

Further information is available at
arena.gov.au

Australian Renewable Energy Agency

To discuss potential for funding:
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ARENA