ANNUAL REPORT
2017-18

Accelerating Australia's shift to affordable and reliable renewable energy

Australian Government
Australian Renewable Energy Agency

ARENA is the Australian Renewable Energy Agency.

The Agency was established by the Australian Government in July 2012 to improve the competitiveness of renewable energy technologies and increase the supply of renewable energy in Australia.

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

Australian Renewable Energy Agency

NewActon Nishi
2 Phillip Law Street
CANBERRA ACT 2601
GPO Box 643
Phone: 1800 804 838

Contact person for this report: General Manager, Corporate Affairs
Content: Australian Renewable Energy Agency
Design: Design by Pidgeon
Printing: CanPrint Communications Pty Ltd
Indexing: Libraries Alive! Pty Ltd

Email: arena@arena.gov.au
Website: arena.gov.au
Web address of this report: arena.gov.au/about/publications/

Australian Government
Australian Renewable Energy Agency

ARENA

OFFICE OF THE CHAIR

14 September 2018

The Hon Angus Taylor MP
Minister for Energy
PO Box 6022
Parliament House
CANBERRA ACT 2600

Dear Minister

ARENA ANNUAL REPORT 2017-18

I am pleased to present to you the annual report of the Australian Renewable Energy Agency (ARENA) for the financial year 2017-18, in accordance with the requirements of the *Australian Renewable Energy Agency Act 2011* (ARENA Act) and the *Public Governance, Performance and Accountability Act 2013* (PGPA Act).

The ARENA Board is responsible for preparing the report and providing it to you in accordance with s46 of the PGPA Act. The report was approved by a resolution of ARENA's Board on 14 September 2018.

This report incorporates ARENA's Annual Performance Statement (APS) for 2017-18, as required by s39 of the PGPA Act. In the opinion of the Board, the APS accurately presents information about ARENA's performance for the reporting period and complies with s39(2) of the PGPA Act.

The report also includes ARENA's audited financial statements prepared according to s42 of the PGPA Act.

Yours sincerely

Martijn Wilder AM
Chair

CONTENTS

Letter of transmittal 5

About this report 8

1. 2017-18 in review 9
- Chair's report 10
- CEO's report 12
- ARENA highlights 2017-18 14

2. About ARENA 21
- Our role and activities 22
- Our investment approach 24
- Our complementary role 26

3. Performance 27

4. ARENA showcase 55

5. Management and accountability 85
- Our Board 86
- Our people 98
- Engagement with our Portfolio Minister 102
- Engagement with our stakeholders 103
- Other events and activities 104
- Other reporting requirements 105

6. Financial statements 107

7. Appendices and glossary 131
Appendix 1: Financial assistance agreements and progress 132
Appendix 2: Index of compliance with annual report requirements 163
Appendix 3: List of figures and tables 168
Appendix 4: Glossary 169

8. Index 173

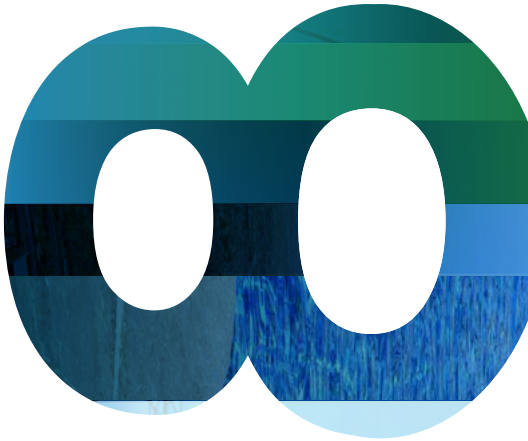
ABOUT THIS REPORT

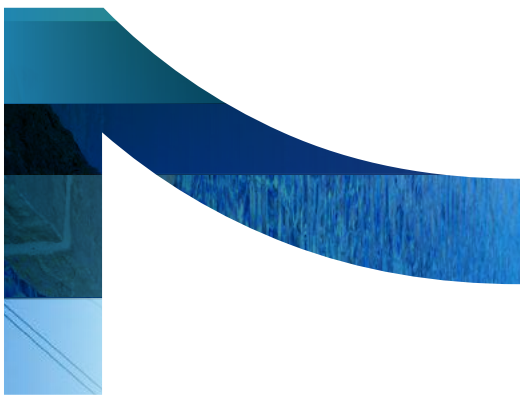
This annual report provides information about ARENA's activities and achievements in 2017-18 to give readers a better understanding of our purpose, priorities, and how our work matters. It has been prepared in accordance with section 46 of the *Public Governance, Performance and Accountability Act 2013*.

Section 1 - 2017-18 in review	Provides a review of ARENA's impact in 2017-18.
Section 2 - About ARENA	Explains ARENA's role, activities and investment approach.
Section 3 - Performance	Describes ARENA's activities for 2017-18, indicating whether they met the performance measures identified in the ARENA Corporate Plan for the year.
Section 4 - Showcase	Provides case studies that demonstrate how ARENA's work makes a difference.
Section 5 - Management and accountability	Explains ARENA's governance arrangements and management practices.
Section 6 - Financial statements	Provides ARENA's audited financial statements for 2017-18.
Section 7 - Appendices and glossary	Provides a list of projects that received ARENA funding during 2017-18, a compliance index, and a glossary of terms, acronyms and abbreviations.
Section 8 - Index	Alphabetically lists the topics covered in this report.

2017-18 IN REVIEW

This section provides reports from the ARENA Chair and CEO on our performance for 2017-18, as well as an overview of our highlights for the year.





CHAIR'S REPORT

This year ARENA has broadened and deepened its work across the renewable energy sector and our efforts are helping to forge pathways for Australia's energy transformation.

Over the past 12 months, ARENA's financial assistance to a range of projects has unlocked value through smarter, more efficient ways of producing and using energy. This is helping to reduce costs, boost efficiency and increase the uptake of renewable energy.

Accompanying this, there has been unprecedented interest in co-investing with ARENA to keep pushing the frontiers of innovation and test new markets and technologies.

Since its inception, ARENA has provided $1.2 billion of targeted financial assistance, which has helped unlock almost $3 billion in additional private and public sector investment. This partnership approach has helped accelerate Australian innovation and provided the means by which the benefits and outcomes of ARENA's work are being felt across the economy.

Australia's energy transformation is dynamic and gathering pace. Solar and wind are the cheapest forms of new generation available, rapidly bringing renewable capacity online and with it a wave of other technological advances. As the private sector's appetite for investment in the sector accelerates, ARENA is supporting innovations that connect the elements of this new energy system to make our energy transition stable and affordable. We have also broadened our work to inform the regulatory and market reforms necessary for Australia to benefit most from these new technologies.

For example, ARENA has continued to focus on the transition of grid-scale generation and storage like big batteries and pumped hydro. At the same time we have increased our support for projects that meet the new challenges and opportunities of distributed energy, which is the other major shift underway as Australian households and businesses rapidly change the way they source and use energy.

Large numbers of Australian households and businesses continue to invest in their own solar systems and, in increasing numbers, battery systems. This collection of small-scale energy assets known as distributed energy resources (DER) creates unique opportunities and challenges. If these consumer energy assets can be orchestrated and optimised to work harmoniously, DER could save consumers money on their power bills.

ARENA is playing a critical role in ensuring this part of the energy system delivers secure and reliable supply, and the DER 'revolution' is successful for consumers and producers by delivering a full range of economic benefits. Our work in the DER space has been at the cutting edge, including the program of work we commenced this year in collaboration with the Australian Energy Market Operator, the Australian Energy Market Commission and the distributed energy sector to overcome technical, economic and regulatory challenges for DER.

As part of the Board's ongoing review and recalibration of the Agency, our priorities have evolved to better anticipate and address the needs of Australia's changing energy system. We launched a new Investment Plan in 2017, which sets out four investment priorities and outlines the fundamental characteristics that ARENA seeks in the projects we support. These are:

- Is the project innovative or novel?
- Is there a pathway to commercialisation?
- Will the project help unlock future investment?
- Will it deliver maximum impact and value?

ARENA-supported projects are developing a range of technologies, including batteries and pumped hydro, to store renewable energy for later use or to help stabilise a renewables-powered grid. We have continued our important work in examining the expansion of some of Australia's existing pumped hydro assets including the Snowy and Tasmanian schemes. This year ARENA supported world-leading efforts to identify and develop off-river pumped hydro storage such as using old mine pits or the ocean as reservoirs, identifying some 22,000 potential pumped hydro sites across Australia.

As the global economy becomes increasingly focused on low emissions energy, it is important that Australia is well-positioned to export renewable energy as primary energy (e.g. as hydrogen or ammonia) or embodied in processed raw materials. With the right investment and innovation, Australia will be able to satisfy demand for low emissions energy in countries with limited renewable resources of their own. Through our investment approach, ARENA is helping to drive innovation in Australia's renewable export industry and position it for long-term growth.

In 2018 we said farewell to our CEO Ivor Frischknecht. Ivor had led ARENA since it began in 2012, building a strong, successful and commercially-driven government investment organisation that is helping to shape Australia's energy future. I would like to take this opportunity to thank him on behalf of the Board for his leadership, counsel and hard work and wish him every success in the future. We also look forward to continuing this work with ARENA's new CEO, Darren Miller, who commenced in August.

I wish to thank those members of the ARENA Board whose terms concluded this year – Maria Atkinson AM, Jonathan Jutsen and Dr Katherine Woodthorpe AO – for their valuable contribution to ARENA's strategic direction and work. We also welcomed the appointment of three new Board members – Samantha Hogg, Dougal McOmish and Stephanie Unwin – who bring with them experience and knowledge from across the energy sector.

Thank you to our Minister during the reporting period, the Hon Josh Frydenberg, for his support throughout the year and his strong interest in ARENA projects and initiatives. We look forward to working with our new Minister, the Hon Angus Taylor.

Finally, I would like to acknowledge the contribution of ARENA workers and that of the large number of individuals, businesses and organisations that have worked with ARENA during the past 12 months. Their enthusiasm, innovation and commitment is critical to the success of Australia's exciting energy transformation.

Martijn Wilder AM
ARENA Chair

CEO'S REPORT

On behalf of the Australian Government, ARENA collaborates with the research community, business, energy market bodies and state and territory governments to identify and unlock the benefits of renewable energy for the Australian people and economy. It is a unique role as we help to deliver what renewable energy developers cannot do on their own, due to the early stage of the technology, the high cost of pilot projects, a lack of local know-how or immature supply chains.

ARENA's most high-profile achievement to date has been to help reduce the cost of utility-scale solar so rapidly that it is now commercially competitive with wind energy. We did this by running a competitive auction to establish 12 Australian large-scale solar (LSS) farms in just two years.

The LSS funding round was one of the primary factors that drove the cost of solar so low that more than 20 gigawatts of capacity is in advanced development, which at peak output will be about half the existing capacity of the national electricity market. Most of the 12 LSS projects will be operational by the end of 2018, tripling the amount of large-scale solar electricity generation in Australia.

At the small end of the spectrum, record solar panel installations on the rooftops of Australian households and businesses is propelling Australia's transition not only to a more renewable energy system, but a more distributed one.

To assist policy-makers along with the developers and users of distributed energy resources (DER) with this transition, ARENA has expanded its range of DER projects accordingly. These now include projects that use rooftop solar, batteries in homes, smart inverters and even an 'intelligent' pool pump to help make the electricity system more reliable while saving households money.

The grid could get substantial amounts of energy from DER, although more demonstrations and trials are needed to overcome technical, commercial and regulatory barriers. For example, two ARENA projects involve linking households that have rooftop solar and battery storage to create virtual power plants that can not only power individual homes but could also send power into the grid during periods of high demand.

ARENA also collaborated with the Australian Energy Market Operator (AEMO), the Australian Energy Market Commission and network companies this year to launch a $12.5 million funding round to support pilot projects and studies focused on integrating DER into Australia's electricity system. Last summer we worked with AEMO on a demand response trial to take pressure off the electricity grid during times of peak demand.

We also worked with the market operator to determine whether wind farms can provide the grid stability services typically provided by traditional sources of electricity. We also supported projects that use smart devices to better integrate renewables into the grid.

ARENA continued its long-standing work demonstrating the value of renewables to communities and businesses in regional and remote Australia. As a result, it is now normal practice for off-grid energy projects to consider and use renewables as part of their energy mix, albeit often at low levels to begin with.

Waste-to-energy is another opportunity that ARENA has been helping to realise. During the year we worked on a number of proposals that use waste otherwise destined for landfill as feedstock for energy projects. We funded a feasibility study into an energy from waste facility at EnergyAustralia's Mount Piper power station. We also completed a project that converts effluent and organic waste at an abattoir into biogas that is being used to produce electricity for the facility.

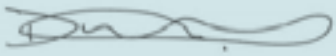
ARENA continued to foster innovative research and development during 2017-18, providing $29.2 million to support 20 new solar research projects and approving $22.1 million for 16 hydrogen projects that could pave the way for Australia to be one of the world's leading renewable energy exporters.

We used knowledge and projects to identify regulatory challenges to the increased uptake of renewables and help energy market regulators update the rules. Learnings from the demand response program, for example, helped AEMO develop rule change requests to enable the creation of reserves to ensure greater system reliability. ARENA's support also directly contributed to the final design of the Australian Energy Regulator's Demand Management Incentive Scheme.

In partnership with the Clean Energy Finance Corporation (CEFC), we also continued to collaborate on the Clean Energy Innovation Fund, making nine investments to date in groundbreaking clean energy projects to help them reach the next stage of commercialisation.

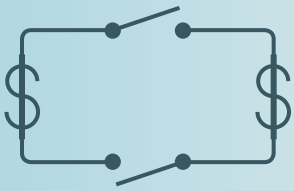
Finally, I am honoured to join ARENA as the new Chief Executive Officer to continue the groundbreaking work started by the inaugural CEO, Ivor Frischknecht. This year ARENA delivered an outstanding range of renewable energy projects, which has only been possible due to Ivor's entrepreneurial leadership and drive, the hard work, passion and talent of the ARENA team, and the input of our advisory panel.

I look forward to continuing ARENA's work, bringing Australia's nascent renewable energy industry closer to the economic and environmental powerhouse that it is destined to become.

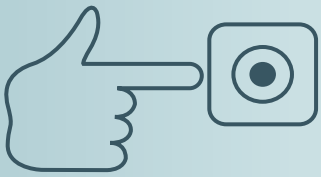


Darren Miller
ARENA CEO

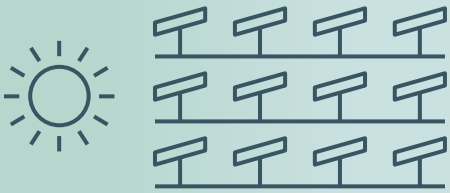
ARENA HIGHLIGHTS 2017-18



$265.3 million of financial assistance approved for new projects by the Board and CEO

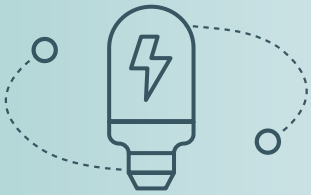


Demonstrated how innovative demand response can support the electricity market, working with AEMO to create an emergency reserve of power with a three-year demand response trial and helping to inform market rule changes

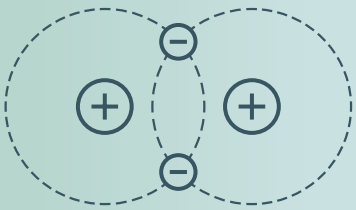


Supported 12 large-scale solar farms that have helped to drive down construction costs by 50%

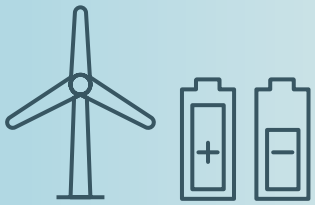
Committed $29.2 million to 20 new solar R&D projects worth $102 million



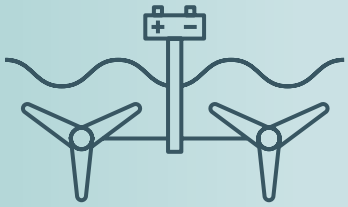
Invested $31.5 million setting up remote Indigenous communities to run on solar and save diesel, with one community achieving a 50% reduction



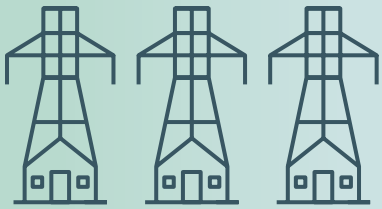
Funded Australia's first green hydrogen innovation hub in WA to evaluate the potential for renewable hydrogen to be generated, stored and used at a larger scale



Demonstrated how wind farms and big batteries can stabilise the grid



Explored using pumped hydro to create energy storage to support the grid, including Snowy 2.0, Tasmania's hydro scheme, and innovative reservoirs such as old mine sites and the ocean



Announced $12.5 million to find the best ways to add large amounts of renewable energy generated by homes and businesses to the grid

Trialled sustainable modular classrooms that generate their own energy and, if successful, could be adopted nationwide

Committed $11.9 million to support development and demonstration of a groundbreaking advanced biofuel technology

Demonstrated that waste from a meat processing plant can be turned into gas to power the facility

ARENA'S INVESTMENT FOOTPRINT

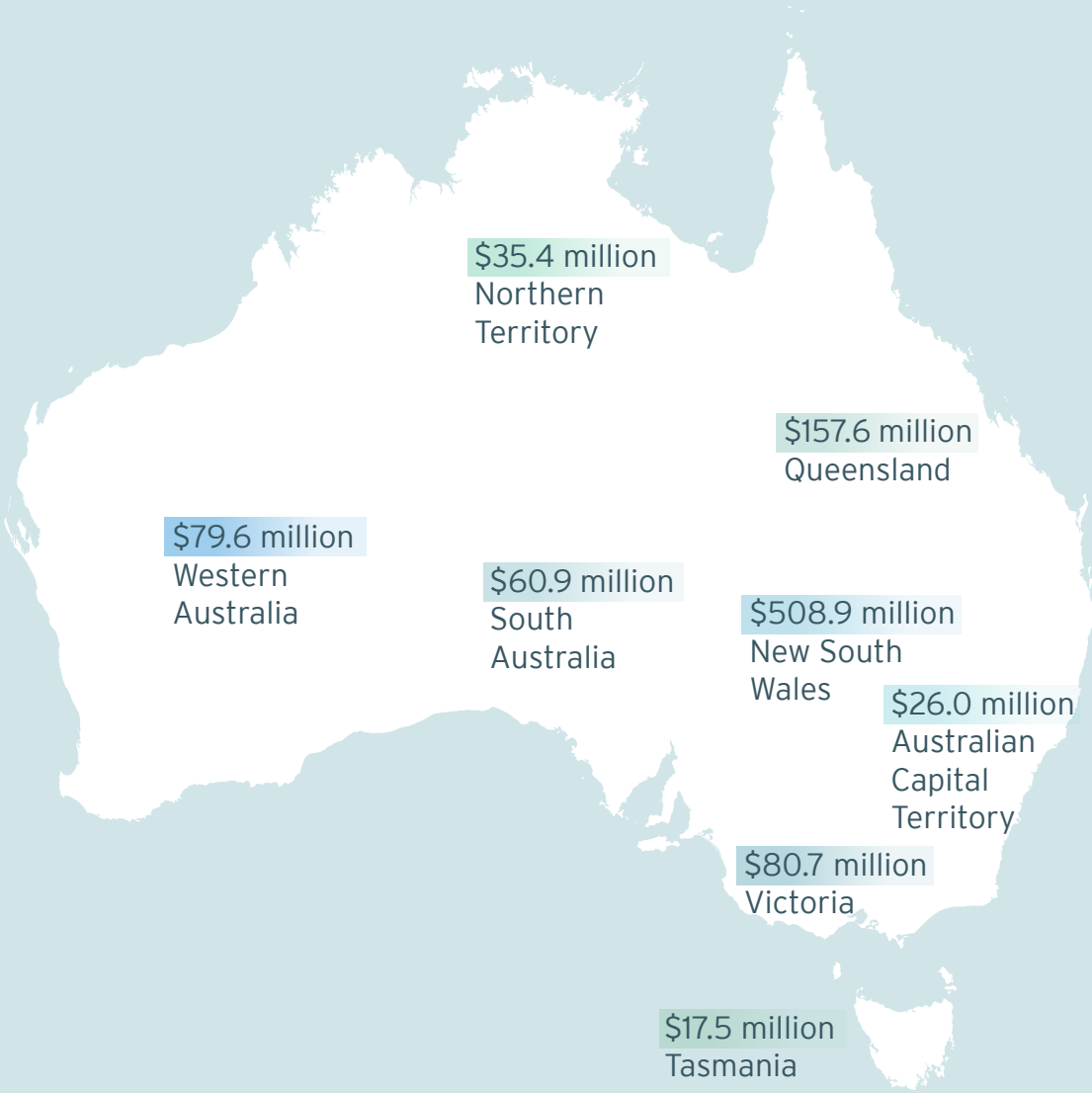


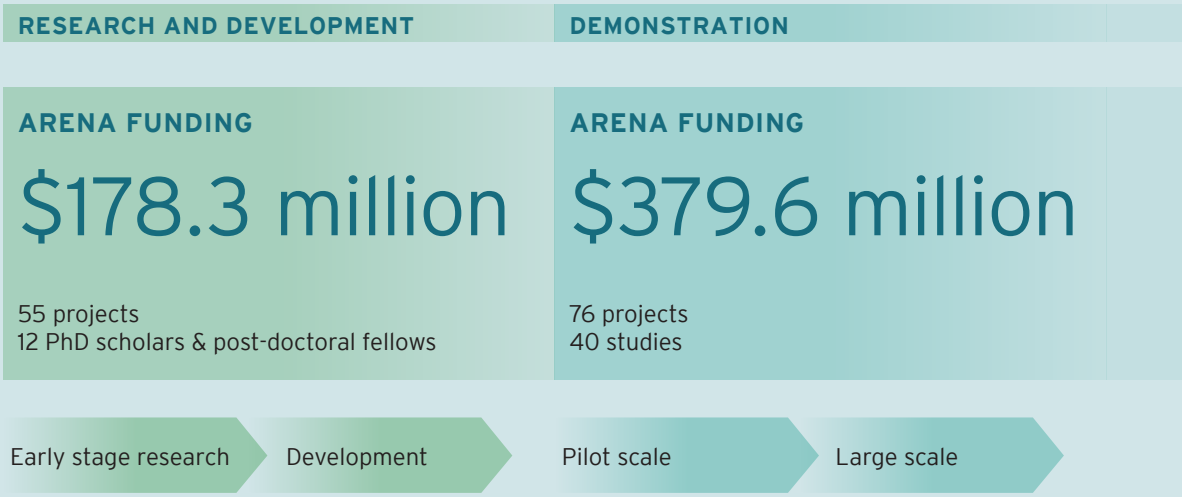
FIGURE 1: ARENA'S INVESTMENT ACROSS AUSTRALIA 2017-18

FUNDS COMMITTED TO NEW OR ONGOING PROJECTS DURING 2017-18

STATE	ARENA GRANT (MILLION)	TOTAL PROJECTS
ACT	$26.0	24
NSW	$508.9	84
NT	$35.4	2
QLD	$157.6	26
SA	$60.9	18
TAS	$17.5	12
VIC	$80.7	30
WA	$79.6	15

FIGURE 2: ARENA'S INVESTMENT ACROSS THE INNOVATION CHAIN 2017-18

FUNDS COMMITTED TO NEW OR ONGOING PROJECTS DURING 2017-18



ARENA FUNDING

ARENA provides funding to projects across the innovation chain from early-stage research to pre-commercial deployment.

DEPLOYMENT

FULLY COMMERCIAL

ARENA FUNDING

$408.8 million

28 projects

Pre-commercial

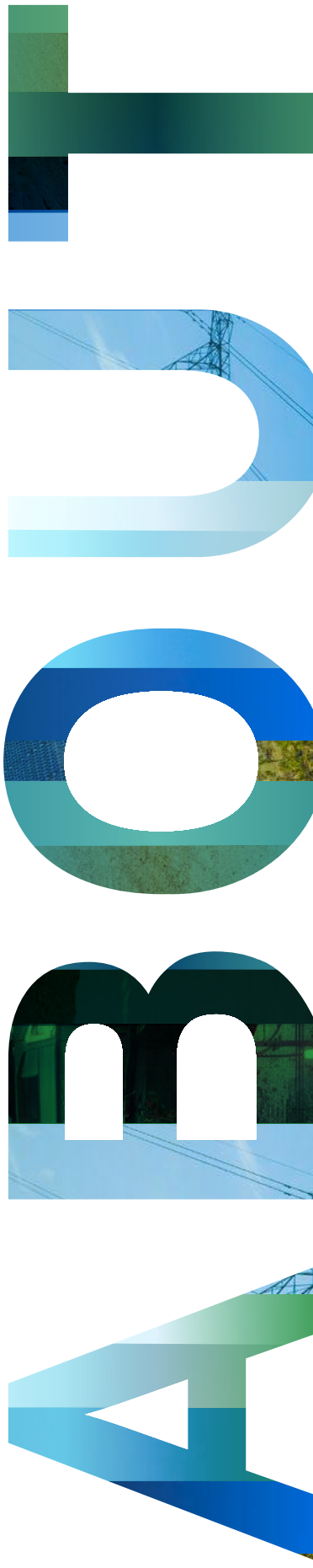
Commercial

Fully commercial

Image: Genex Power Limited

ABOUT ARENA

This section explains ARENA and what we do. It covers our objectives, function and purpose, as well as how we responsibly invest taxpayers' funds.



OUR ROLE AND ACTIVITIES

ARENA is the Australian Renewable Energy Agency, established by the Australian Government in July 2012. The Agency is a corporate Commonwealth entity under the *Public Governance, Performance and Accountability Act 2013* (PGPA Act).

ARENA was created by the *Australian Renewable Energy Agency Act 2011* (ARENA Act), which sets out the Agency's objectives and functions.

Objectives

ARENA's objectives are to improve the competitiveness of renewable energy technologies and increase the supply of renewable energy in Australia.

Function

ARENA's function is to provide financial assistance to projects that accelerate the transition of renewable energy technologies along the innovation chain, from research and development to demonstration and large-scale pre-commercial deployment activities. We also develop analysis and advice, and share information and knowledge on renewable energy and related technologies.

ARENA also provides advice to the Portfolio Minister on renewable energy and related technologies.

Purpose

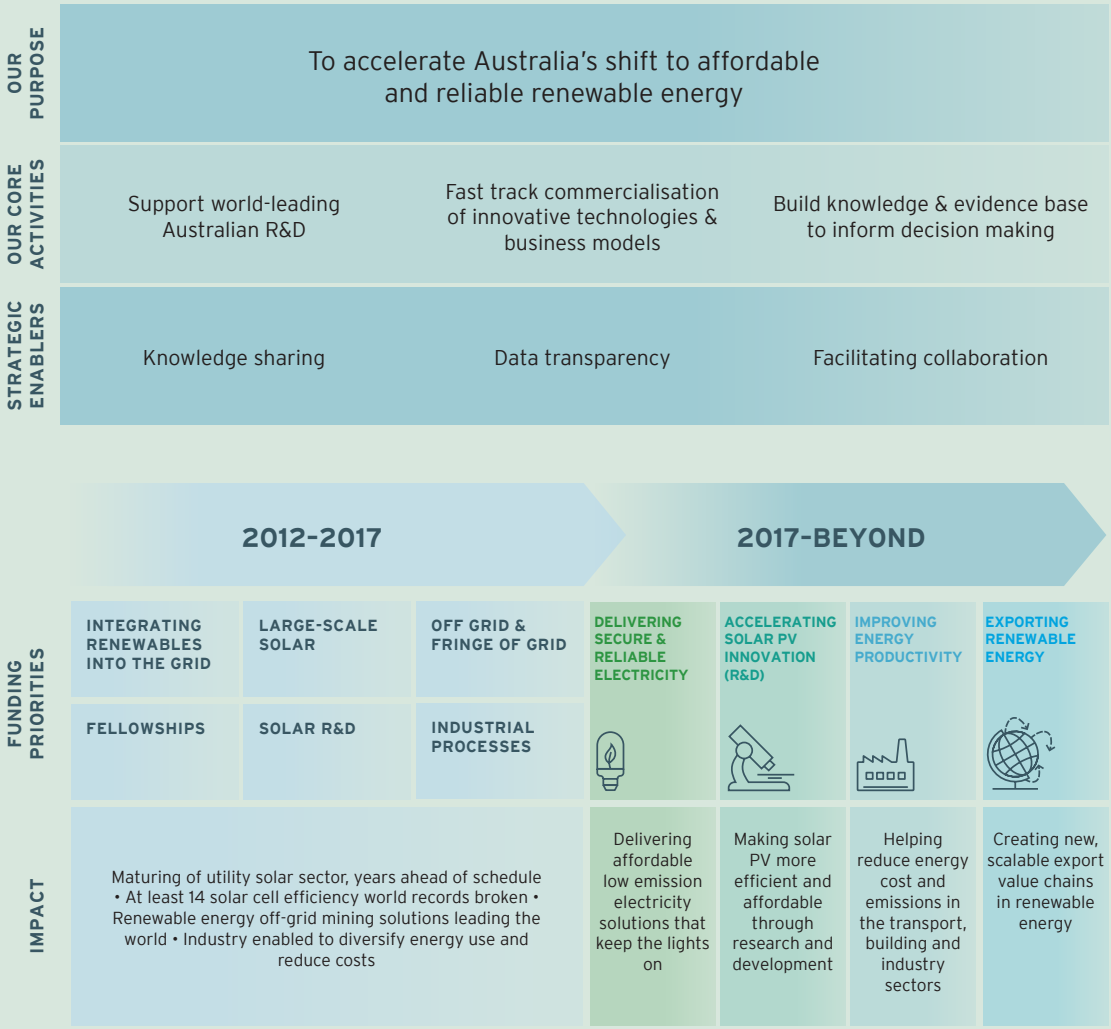
ARENA's purpose is to accelerate Australia's shift to affordable and reliable renewable energy. The Agency's core activities in 2017-18 to achieve that purpose fell into three categories:

- supporting world-leading Australian research and development
- fast tracking commercialisation of innovative technologies and business models
- building knowledge and evidence to inform decision making.

In short, ARENA finds and funds the renewable energy innovations that have the best chance of guaranteeing Australia's power supply for the future, helping to bring those projects to life, and then sharing the knowledge gained through the projects to inform and grow the whole industry.

ARENA's objectives, function, purpose and activities for the reporting period are detailed in the Corporate Plan 2017-18 (Figure 3).

FIGURE 3: SUMMARY OF ARENA CORPORATE PLAN 2017-18



OUR INVESTMENT APPROACH

ARENA is committed to achieving maximum impact and value from the projects it funds. The Agency does this by focusing its efforts on ways ARENA can make a critical difference for innovators, policy-makers, the energy industry and the broader Australian community.

ARENA's activities are designed to produce results that will enable and encourage investment in future commercial projects; investment that will lead to lasting change in Australia's energy system.

ARENA funds projects across the innovation chain from research to pre-commercial deployment. This funding is focused on finding and demonstrating first of a kind renewable energy solutions, which reduce technical and commercial risks and grow Australia's renewable energy knowledge and expertise.

Renewable energy technologies 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.

The Agency works with project proponents to set the size and nature of funding and to scope a project's value. This includes collaborating with industry, researchers and government to achieve specific outcomes that can be replicated for future projects.

ARENA currently has legislated funding available until 2022. The 2017 Investment Plan sets out ARENA's four investment priorities, which are shown in Figure 4.

FIGURE 4: ARENA'S INVESTMENT PRIORITIES

1 DELIVERING SECURE & RELIABLE ELECTRICITY

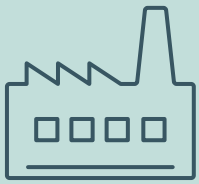
Delivering affordable low emission electricity solutions that keep the lights on.

2 ACCELERATING SOLAR PV INNOVATION

Making solar PV more efficient and affordable through research and development.

3 IMPROVING ENERGY PRODUCTIVITY

Helping reduce energy cost and emissions in the transport, building and industry sectors.



4 EXPORTING RENEWABLE ENERGY

Creating new, scalable export value chains in renewable energy.

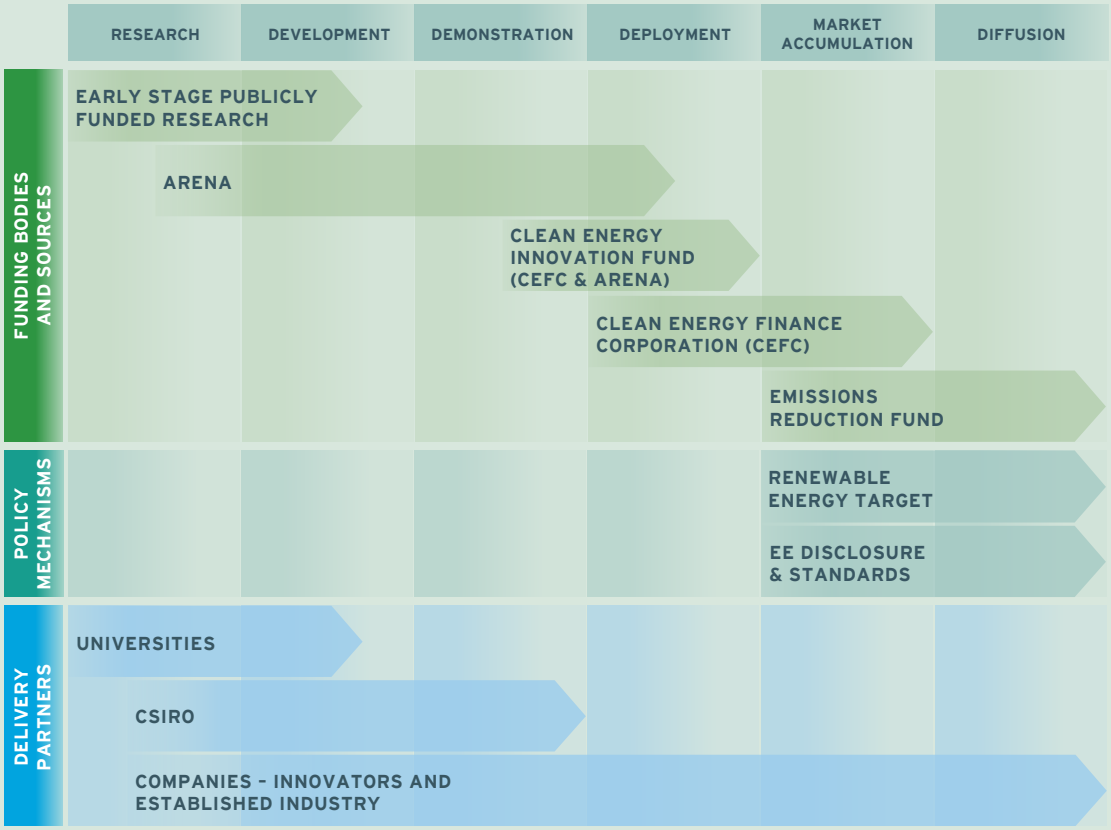
OUR COMPLEMENTARY ROLE

To ensure ARENA's activities have the greatest impact, the Agency works to complement other government programs and initiatives that operate along the innovation chain such as those shown in Figure 5.

ARENA and the Clean Energy Finance Corporation (CEFC) work collaboratively on the Clean Energy Innovation Fund (Innovation Fund), investing CEFC finance in innovative clean energy projects and businesses that involve renewable energy, energy efficiency and low emissions technologies. The Innovation Fund is a specialist financer created to invest $200 million in early-stage clean energy companies. It targets technologies and businesses that have passed beyond the research and development stage and that can benefit from early growth capital to help them progress to the next stage of development. (See page 42 for more information).

ARENA contributes to implementing policies for the research, development, demonstration, deployment and commercialisation of clean energy technologies. These policies are developed by the Portfolio Department. Further information on ARENA's collaborative work is provided in the Annual Performance Statement.

FIGURE 5: ARENA'S COMPLEMENTARY ROLE



PERFORMANCE

This section provides ARENA's annual performance statement for 2017-18, which is required by the *Public Governance, Performance and Accountability Act 2013* (PGPA Act) and the Public Governance, Performance and Accountability Rule 2014 (PGPA Rule).

ARENA ANNUAL PERFORMANCE STATEMENT 2017-18

Statement of preparation

I, Martijn Wilder AM, on behalf of the Board, and in my capacity as the accountable authority of the Australian Renewable Energy Agency, present the annual performance statement of the Agency covering the 2017–18 financial year as required under paragraph 39(1)(a) of the *Public Governance, Performance and Accountability Act 2013* (PGPA Act).

In my opinion, the annual performance statement is based on properly maintained records, accurately reflects the performance of the entity, and complies with subsection 39(2) of the PGPA Act.

ARENA purpose

ARENA was established by the *Australian Renewable Energy Act 2011* (ARENA Act) to improve the competitiveness of renewable energy technologies and increase the supply of renewable energy in Australia. Our purpose is to accelerate Australia's shift to affordable and reliable renewable energy.

Performance framework

ARENA's performance is assessed against the measures published in its key corporate documents, including the Portfolio Budget Statement and Corporate Plan. The following text, tables and case studies provide detailed performance results for each measure and an analysis of how these results support the assessment of ARENA's performance in achieving its purpose.

PERFORMANCE CRITERION 1 – STRATEGIC INVESTMENT

ARENA's Corporate Plan identifies four priority investment areas to achieve ARENA's purpose. The four priority investment areas are:

- delivering secure and reliable electricity
- accelerating solar PV innovation
- improving energy productivity
- exporting renewable energy.

To deliver secure and reliable electricity, ARENA set out to fund projects that demonstrate new ways to adapt our electricity grid to increase productivity, make the grid more flexible and better integrate renewable energy so it can be stored and shared when and where it is needed.

As part of this priority, ARENA aims to fund a range of flexible capacity technologies and mechanisms - from energy storage to demand response - that will allow us to match electricity supply and demand at all times. This priority area also encompasses technologies that control voltage or frequency to make the grid more stable, or capture real-time data to detect and respond to power issues.

To accelerate solar photovoltaic (PV) innovation, ARENA-funded projects contribute to a global effort to substantially reduce the cost and increase the efficiency of solar power.

To enhance energy productivity, ARENA aims to demonstrate the benefits of adopting different technologies and approaches, such as energy efficiency, electrification and fuel switching to renewable energy sources in the building, transport and industrial sectors.

Beyond improving Australia's own energy supply, ARENA also aims to fund projects that can keep Australia at the forefront of exporting renewables into the future.

Viewed holistically, the intended result of our investment activity is to make it easier and quicker for Australia to access the benefits of renewable energy by funding innovative renewable energy solutions that reduce technical and commercial risks and grow Australia's renewable energy knowledge base and expertise.

ARENA's financial assistance helps scientists, engineers and businesses meet the high costs of discovering, developing and building renewable energy technologies.

Our performance indicators support the delivery of the Corporate Plan by:

- ensuring the alignment of financial assistance to ARENA's investment priorities
- setting an ambitious target of financial assistance to be provided to high quality projects
- maintaining a focus on accelerating innovation in research and commercialisation.

Results

Performance indicator	Source	Achieved?
Financial assistance to one or more new projects in accordance with the principles and priorities outlined in ARENA's General Funding Strategy and Investment Plan	Portfolio Budget Statement Outcomes, p. 103	**MET** **122 projects** Financial assistance committed to 83 new projects, including in each priority area. 39 additional projects approved by the Board and CEO, subject to final contract negotiations.
$200 million of ARENA funds committed to new grants	Corporate Plan, Performance measures p. 10	**MET** $265.3 million of ARENA funds approved for new grants by the Board and CEO. $165.7 million of ARENA funds contractually committed to new grants (which includes $33.1 million approved by the Board and CEO in prior years).[1] $132.7 million of approved projects not contractually committed in 2017-18.
Innovation in research and commercialisation: › World-leading research and development › Fast track commercialisation - making new investments in new business models and innovative technologies	Corporate Plan, Performance measures at p. 10	**MET** $29.2 million to solar PV research and development. ARENA also invested in a wide range of new business models.

[1]Our assessment of performance reflects the decision point of funds approved by the Board and CEO, which is consistent with our planning assumption for this performance measure. To improve clarity and consistency of terminology between the annual performance statement and financial statements we will be amending the terminology of this performance measure for future years to refer to 'funds approved'.

Detailed results

During 2017-18 ARENA contractually committed $165.7 million of ARENA funds to 83 projects designed to produce transformative results. The Board and CEO approved funds for new grants totalling $265.3 million. Of this amount, $132.7 million for 39 projects was subject to commercial negotiations on 30 June 2018, and are likely to lead to contractual commitments in 2018-19. As with previous years, some of the projects contractually committed during 2017-18 were approved by the Board or CEO in the previous financial year, while other projects approved by the Board or CEO during 2017-18 will be contractually committed in 2018-19. This is reflective of ARENA's approval processes.

Within each of our priority investment areas, ARENA has defined focus areas as a way of structuring our activities in a more granular way. Focus areas may include more specific approaches to project selection, project management, knowledge sharing and performance monitoring. Activities in each focus area are expected to make a contribution to the intended outcomes of an investment priority, and in turn to ARENA's purpose. These focus areas may evolve as our operating environment changes, we achieve our goals, and we learn from our current and planned activities.

To scale up project selection processes to meet our performance target, ARENA worked collaboratively across all functional teams to deliver a range of competitive rounds, targeted funding announcements, A-Lab events and applications under ARENA's Advancing Renewables Program. This saw a significant increase in grants made to new projects, together with an increase in Board and CEO approved commitments that are expected to result in new grants next year. ARENA also has a strong pipeline of projects under development.

During this year, ARENA's priority investment areas and focus area strategies guided our project selection processes. We funded a wide range of future commercial projects and renewable energy technologies in each of the four priority areas. A further four funding announcements or program rounds were launched that are expected to lead to contractual commitments in 2018-19.

Table 1 sets out how ARENA's financial assistance aligns with its investment priorities. Table 2 indicates the range of renewable energy technologies supported by the Agency. Details of funding proposals that received Board or CEO approval, but were not yet contractually committed during 2017-18, are set out in Table 3.

TABLE 1: 2017-18 ARENA FUNDING COMMITMENTS BY INVESTMENT PRIORITY

Investment priority	Number of projects	ARENA funds contractually committed in 2017-18
Delivering secure and reliable electricity	40	$101.7 million
Accelerating solar PV innovation	25	$44.7 million
Improving energy productivity	13	$12.1 million
Exporting renewable energy	4	$6.9 million
Other	1	$0.3 million

TABLE 2: 2017-18 ARENA FUNDING COMMITMENTS BY TECHNOLOGY

Technology	Number of projects	ARENA funds contractually committed in 2017-18
Solar PV	24	$36.8 million
Concentrating solar thermal	3	$1.2 million
Marine	1	$0.3 million
Bioenergy	6	$8.1 million
Wind	2	$0.8 million
Enabling technologies	36	$63.0 million
Storage	6	$47.8 million
Electric vehicles	1	$0.2 million
Hydrogen	3	$7.0 million
Geothermal	1	$0.5 million

TABLE 3: 2017-18 BOARD AND CEO APPROVALS NOT YET CONTRACTUALLY COMMITTED, BY INVESTMENT PRIORITY

Investment priority	Number of projects	ARENA funds approved but not contractually committed in 2017-18
Delivering secure and reliable electricity	11	$53.8 million
Accelerating solar PV innovation	3	$5.5 million
Improving energy productivity	8	$43.8 million
Exporting renewable energy	17	$29.6 million

The case study below illustrates how ARENA integrates its focus area strategy and financial assistance process to help fast track innovation in renewable energy technologies.

CREATING A HYDROGEN ECONOMY

Recent innovations in hydrogen generation, storage, transport and use could transform it into a flexible source of clean energy and a highly prospective future export industry for Australia. Recognising this opportunity, ARENA has undertaken a series of activities directed towards the long-term goal of creating an end-to-end renewable hydrogen supply chain for a future renewable energy export market.

This year ARENA completed a Request for Information (RFI) to gather information from across Australia on hydrogen-related research and projects currently being undertaken, assess Australia's expertise, and hear a wide range of views about the sector.

In early 2018, ARENA opened a competitive research and development funding round to support hydrogen innovation. The ARENA Board approved 16 projects aimed at accelerating the development of the Australian hydrogen sector. These contracts were entered into shortly after the end of the reporting period.

To build on the funding round, ARENA commissioned a study focused on opportunities for exporting hydrogen to complement CSIRO's National Hydrogen Roadmap. Information from the RFI, roadshow, funding round and study were provided as input to the Hydrogen Strategy Group's briefing for the COAG Energy Council, led by the Chief Scientist Dr Alan Finkel AO. ARENA's CEO and General Manager, Strategy are members of the Hydrogen Strategy Group and supporting Taskforce, respectively, and provided significant input into the drafting of the advice.

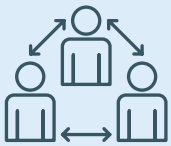
ARENA also funded two hydrogen demonstration projects this year, including the ATCO H2 Microgrid Project, which received $1.5 million in financial assistance.

The project aims to demonstrate renewable hydrogen production and use for electricity generation, fuelling gas appliances and injection into the existing natural gas pipeline. The concept of a 'hydrogen city' in an Australian context will also be studied.

By investing across the innovation chain, we hope to reduce supply chain costs for the medium and long term, stimulate investment and support near-term domestic hydrogen projects that can supply international markets.

Throughout the year, ARENA's in-house innovation program, A-Lab, continued to play a key role in generating new ideas, new business models and new collaboration partnerships. A-Lab is an innovation laboratory that uses design thinking methodologies to identify ideas to solve energy system problems. It is designed to create cross-sector partnerships and world-first projects to transform Australia towards a clean energy future.

CREATING SYSTEMIC CHANGE THROUGH PEOPLE



Since its creation, A-Lab has brought together more than 400 participants from all areas of the energy system. A-Lab sessions are based on the Dyer, Gregerson and Christensen innovator's DNA model with participants encouraged to challenge the status quo, take risks, apply patterns of questioning, observing, networking and experimenting, and use cognitive associational thinking. Participants consistently rate A-Lab sessions highly.

ARENA has now worked with a number of other organisations to draw the A-Lab approach into their own operations.

The Australian Energy Market Operator (AEMO) has been a strong supporter of A-Lab since its inception. It currently has the highest representation of any organisation with 21 AEMO representatives participating in one or more A-Lab sessions. AEMO used the 'A-Lab approach' to help develop its renewable energy zones workshop. It wanted to create an efficient and interactive forum where a diverse group could form a collective understanding of what they were trying to achieve, while also working through the opportunities and barriers.

Using an A-Lab style of thinking successfully enabled AEMO and the Australian Energy Market Commission to receive bulk feedback from network service providers, generation developers, consumers and industry bodies, accelerating stakeholder engagement and delivering the respective projects within short timeframes.

Energy Networks Australia (ENA) approached the A-Lab team in July 2017 to see if the approach could help accelerate action in response to its Energy Network Transformation Roadmap. Working in close partnership with the A-Lab team, ideate and incubate sessions were run in September and October 2017, which aimed to generate new project ideas that supported grid orchestration of renewables. Both events were over capacity with 72 participants in total and seven project ideas reaching the incubation stage. The engagement ENA received over its roadmap was hugely beneficial and is helping to shape ARENA's distributed energy strategy.

Many of the projects worked up through this process are still in the development pipeline and have been identified as addressing critical gaps in the current electricity transformation knowledge base.

While ARENA favours investments with the potential to deliver near-term impacts, it also takes account of the potential for larger long-term impacts from investments that could take time to pay off. ARENA takes a long-term view of its legislative objective, aiming to have maximum impact between 2020 and 2040. The projects ARENA has contractually committed to funding span the innovation chain from research and development to demonstration and deployment. Table 4 shows ARENA's 2017-18 new funding commitments across the innovation chain.

TABLE 4: ARENA NEW FUNDING COMMITMENTS IN 2017-18 ACROSS THE INNOVATION CHAIN

Innovation stage	Number of projects	ARENA funds contractually committed in 2017-18
Research and development	20	$29.2 million
Study	31	$28.9 million
Demonstration	26	$82.7 million
Deployment	6	$24.8 million

Image: APA Group

Research and development

ARENA provides research support through its Research and Development (R&D) Program funding rounds and strategic research initiatives. During this financial year, ARENA significantly increased its year-on-year financial commitment to supporting world-leading research and development and accelerating clean energy innovation. The increased financial commitment also contributed to the Australian Government's Mission Innovation goals.

ARENA ran three competitive research and development funding rounds targeting solar photovoltaic research, international collaboration and hydrogen research. As a result of ARENA's funding rounds, we committed funding to:

- 20 new research projects into a range of promising new technology innovations in solar PV
- participation in 12 International Energy Agency Technology Collaboration Programs and Mission Innovation Challenges.

The ARENA Board and CEO approved a further $22.1 million to fund 16 projects developing promising hydrogen technologies.

ARENA's two flagship strategic research institutes, the Australian Centre for Advanced Photovoltaics (ACAP) and the Australian Solar Thermal Research Institute (ASTRI), continued to provide stable research funding to constituent institutions, fostering national collaboration to achieve jointly-agreed research outcomes.

The commitment of funds to research and development is expected to have long-term benefits for Australia as illustrated by the following case study.

Image: University of Wollongong

AUSTRALIAN RESEARCH IS BRINGING DOWN THE COST OF SOLAR PV

Australia has provided more than $290 million to around 300 solar research and development projects since 2009 through programs either transferred to ARENA, or run by ARENA since 2012. This funding has supported new technologies to reduce the installed cost of PV systems, improve system reliability and develop materials for new market applications.

Efficiency improvements have a cascade effect, flowing through as per kilowatt cost savings from cells to modules, to distribution and final system costs. Every one percentage point efficiency improvement in module performance (e.g. from 20 per cent to 21 per cent) reduces the cost of the module by approximately five per cent. This means that solar modules that were selling at 60 cents/watt can then sell at 57 cents/watt. For each one gigawatt of solar installed in Australia each year, this step change alone would deliver savings of $30 million in the cost of modules. Higher solar cell efficiencies also mean that the same electricity output can be achieved from a smaller number of modules. The environmental impact is therefore reduced through less material required for 'balance of system' components, such as support frames and cables and transport costs. The rapidly falling cost and increasing efficiency of PV cells and modules contributes significantly to making renewable energy technology more competitive.

Australian technology is expected to dominate the PV market over the next decade with key contributions from ARENA-funded solar research undertaken by Australian universities:

- University of New South Wales (UNSW) developed the passivated emitter rear cell (PERC), currently used in more than 60 per cent of commercial PV cells available in the global market, achieving world record efficiencies of up to 25 per cent compared to standard solar cells (~20 per cent). An estimate made by the Australian National University (ANU) of the potential benefits of the PERC solar cell technology indicates that a five per cent relative efficiency improvement on 50 per cent of Australian PV systems installed over the ten-year period 2018 to 2028, with average annual installation rates of two gigawatts per year and average area-related costs of $1500 per kilowatt, translates to savings of $750 million. Worldwide, the savings could be 50 times larger, or more than $37 billion.
- New hydrogenation technology developed by UNSW and expanded by ANU has been demonstrated to increase the performance of low-quality / low-cost solar-grade silicon wafers. This technology can be incorporated into current standard cell manufacturing lines with minimal equipment change and has 22 industry partners interested in further development prior to commercial adoption. Its deployment over the coming decade could result in global savings of some US$7.5 billion each year, with Australia to directly benefit through lower module costs and royalties feeding back into the economy.

Research into new materials and technologies, including perovskites, tandem cells and copper-zinc-tin-sulphide, will help to ensure Australian research remains at the forefront of these new technologies as they reach commercial production. This will include new, high-efficiency, low-cost, flexible and non-toxic materials which could be integrated into buildings and other new products within a decade.

This year, an evaluation of ARENA's solar research projects by ITP Renewables found ARENA's funding has significantly boosted Australia's solar research capability and played a critical role in keeping Australia in the forefront of the international solar industry.

ARENA's support for research and development contributes to Mission Innovation, a global initiative to accelerate clean energy innovation. As part of its commitment to Mission Innovation the Australian Government has committed to doubling its 2015-16 research and development expenditure in 2020-21. ARENA has committed to at least double its research and development expenditure in line with these targets, and is on-track to meet this commitment.

Studies

In addition to its commitment to funding research and development, ARENA funds a wide range of studies including desktop analysis, feasibility studies, modelling, mapping and data analysis.

This year, ARENA commissioned 31 studies to support ARENA's program outcomes. Some of the key studies undertaken this year with ARENA support include:

- Snowy 2.0 Feasibility Study
- IT Power Open Source Grid Integration Model for the National Electricity Market
- Studies into Tasmania's Battery of the Nation initiative investigating and developing pathways for future development opportunities for Tasmania to make a greater contribution to the National Electricity Market.

PUMPED HYDRO ENERGY STORAGE

With the continued growth of variable renewable technologies in Australia, the need for sufficient storage to maintain a secure and reliable network becomes increasingly vital. ARENA has funded a series of projects aimed at exploring storage options. Pumped hydro energy is one of Australia's oldest forms of energy storage and it offers a pathway to significantly increase the amount of solar and wind energy feeding into the electricity system while keeping it stable.

Pumped hydro energy has a rapid response capability, making it possible to meet peaks in consumer demand for electricity or maintain energy supply when the wind drops or a cloud passes across the sun. It is also a way to store excess energy for later use. Pumped hydro energy storage (PHES) currently accounts for 97 per cent of global energy storage, with three pumped hydro facilities in Australia (Tumut 3, Wivenhoe Dam and Shoalhaven) providing stability support to the National Electricity Market.

ARENA has supported the ANU to develop an Atlas of Pumped Hydro Energy Storage. The study aims to assess the potential for Short Term Off-River pumped hydro Energy Storage (STORES) to provide cost-effective storage on a large scale in Australia. STORES sites typically involve a pair of reservoirs, with one located at a higher elevation to the other. When joined by a pipeline, the water can be released from the upper reservoir, running down to the lower reservoir through turbines in order to generate electricity. The water can then be pumped back up to the higher reservoir, using solar or wind power.

Researchers at ANU located 22,000 potential pumped hydro sites with the potential to provide up to 67,000 gigawatt hours of energy storage. Further, ANU estimates Australia only requires 450 gigawatt hours of energy storage to support a 100 per cent renewable electricity system. The number of potential sites enables great flexibility in the location of storage sites that would best support the network and create renewable energy zones. The abundance of sites generated significant interest including from energy companies, government and the community. The work has greatly increased confidence that a future low emissions energy system can be affordable. ANU is in the process of finalising a cost model to assist developers to obtain pre-feasibility cost estimates prior to expenditure of funds for detailed feasibility studies. This aims to substantially lower the barriers to mass deployment of pumped hydro, photovoltaics and wind.

Demonstration and deployment

2017-18 saw ARENA's continued focus on easing Australia's energy transition by funding projects which explore options for addressing some of the challenges faced by the electricity sector including potential flexible capacity and grid stability technology to help balance the electricity system with higher shares of renewable energy. These projects included:

- ten projects focussed on providing demand response services across Victoria, New South Wales and South Australia, with $28.6 million in ARENA funding committed along with $7.2 million in matching funding from the NSW Government
- two projects in Victoria installing utility-scale batteries, with $25 million in ARENA funding committed together with co-funding from the Victorian Government. Both batteries are currently under construction. This follows ARENA providing $12 million to the Energy Storage for Commercial Renewable Integration (ESCRI) project on the Yorke Peninsula in South Australia, which is currently being commissioned
- a distributed energy project in Carnarvon in Western Australia to help transform Horizon Power from an energy supply business to an energy services business, with $1.9 million in funding committed
- a trial at Neoen's Hornsdale Wind Farm to test the ability of the wind farm to provide frequency control ancillary services to the grid, with $300,000 in ARENA funding committed
- a trial of two self-powering modular classrooms, manufactured by Hivve, that could drastically cut power costs for Australian schools, with $368,000 of ARENA funding committed.

To read more about these projects, see the Showcase section of this annual report.

ARENA also funded a range of projects to demonstrate innovative renewable technologies as illustrated by the following case study, which demonstrates how drinking water can be created from sunlight and air to benefit off-grid and self-contained locations.

SOURCE HYDROPANELS: RENEWABLE, INFRASTRUCTURE-FREE WATER SOLUTION FOR THE DRIEST INHABITED CONTINENT ON EARTH

Zero Mass Water was awarded $420,000 in ARENA funding for Australia's first trial of SOURCE hydropanels. The project demonstrates a technology not yet seen in Australia – a product that produces clean, renewable, infrastructure-free drinking water extracted from the air using solar energy.

SOURCE hydropanels are infrastructure free with no external electricity or water required for operation, and reduce energy involved in pumping and transporting water to remote locations. Instead of filtering or distributing groundwater, SOURCE produces pure water by harnessing the power of the sun and moisture in the air.

Under the trial, SOURCE hydropanels are being rolled out in 150 sites across Australian cities as well as regional towns and remote communities. The SOURCE hydropanels are installed by pre-qualified distribution and installer contractors, providing training and market awareness to support the adoption of this technology throughout Australia. With the combination of solar PV with solar thermal technology, SOURCE's ability to create clean drinking water is being utilised in a variety of locations including schools, airports, cafes, community centres, commercial buildings and sustainable properties.

On a typical day, SOURCE hydropanels can produce up to five litres of clean drinking water, depending on the climate. Each SOURCE hydropanel produces enough water to displace more than 20,000 plastic water bottles over 15 years. With more than 50 per cent of consumers reporting decreased consumption of bottled water in a survey conducted by Zero Mass Water, the project is reducing the amount of plastic bottles that end up in landfill by eliminating the production, delivery, collection and recycling process and produces reliable water sources to communities.

Building innovative business models

ARENA continued to deliver the Renewable Energy Venture Capital Fund Program during the year. The Program aims to foster skills and management capability for early-stage Australian renewable energy companies and assist them to forge international connections. ARENA's $60 million commitment to the Southern Cross Renewable Energy Fund, established under the program, is matched by Softbank China Venture Capital, creating a $120 million fund. The Fund Manager of the Southern Cross Venture Capital Fund works closely with each investee management team in a mentoring and oversight capacity, leading to overall growth of the portfolio of investments and increased co-funding of investees with new and existing investors.

Of particular note was the launch of the Decentralised Energy Exchange (deX) by Greensync that allows customers, communities and utilities in Australia to trade distributed energy.

In 2017-18, the Southern Cross Renewable Energy Fund made two new investments, one of which was to provide support to BenAn Energy to develop intellectual property, knowledge and experience for manufacturing a cost-effective, reliable and environmentally friendly sodium-ion battery.

ARENA and the Clean Energy Finance Corporation (CEFC) also worked collaboratively on the Clean Energy Innovation Fund (Innovation Fund), investing CEFC finance in innovative clean energy projects and businesses that involve renewable energy, energy efficiency and low emissions technologies. The Innovation Fund is a specialist financer created to invest $200 million in early-stage clean energy companies. It targets technologies and businesses that have passed beyond the research and development stage and that can benefit from early growth capital to help them progress to the next stage of development.

The Innovation Fund has already made a substantial impact in a short period, investing some $55 million in nine transactions in its first 18 months. These investments are across a diverse range of technologies, from second life batteries to smart meters, state-of-the-art car wheels to the Internet of Things, and many more. They demonstrate the potential of Australian innovators to lead our transition to a low carbon economy, helping to lower carbon emissions and deliver on the benefits of clean energy. They also demonstrate the potential for innovative companies to capitalise on the new business opportunities emerging from our clean energy transition.

The Innovation Fund made the following investment commitments during the financial year:

- $2 million into Wattwatchers to expand the production of its technology to better manage energy use and costs
- $10 million into Thinxtra to build essential support technology for devices collectively known as the Internet of Things
- $5 million into Sea Electric to ramp up its conversion of medium-duty trucks and commercial vans to electric vehicles
- $750,000 into Relectrify to prove its lithium ion battery repurposing business, with further development of the technology and initial trials
- approximately $6 million (US$5 million) into Redback Technologies to expand its resourcing and accelerate the deployment of its smart hybrid system
- $5 million into Zen Ecosystems, for the further development and deployment of its intelligent energy management products.

PERFORMANCE CRITERION 2 – STRONG PROJECT ASSESSMENT, NEGOTIATION, DELIVERY AND KNOWLEDGE SHARING

ARENA is committed to achieving the best value from the projects it funds. ARENA's performance indicators were selected to:

- ensure focus on the impact of projects through the measurement of project outcomes
- achieve results with the optimal mix of industry funding and Australian Government financial assistance and the design of well targeted outcomes
- effectively share knowledge from the projects ARENA funds, improve data transparency and build networks and platforms to inform decisions.

Results

Performance indicator	Source	Achieved?
Significant project outcomes and lessons learned disseminated	Portfolio Budget Statement Outcomes, p. 103	**MET** This year saw enhanced knowledge sharing outcomes including the launch of ARENAWire and a focus on industry engagement. ARENA representatives presented at 34 conferences and 11 industry forums. Details are set out below.
Total value of funding leveraged from all third-party sources for new commitments	Corporate Plan p. 11	**MET** This year $2.02 leveraged for every ARENA $1.00 contributed.
Stakeholder feedback on ARENA knowledge sharing activities	Corporate Plan p. 11	**MET** Stakeholder feedback has been captured across a wide range of activities and used to improve ARENA knowledge sharing activities. Systematic data capture has commenced and this will be reported in more detail in 2018-19.

Detailed results

The intended result of our project selection process is to select the best projects and achieve the optimal mix of industry funding and Australian Government financial assistance. Performance against this objective is measured by the extent to which ARENA is able to leverage capital from industry partners to increase the impact of Australian Government investment.

During 2017-18, every dollar invested by ARENA saw an average co-investment of $2.02 contributed from partners. Our $165.7 million commitment saw third-party contributions committed of more than $330 million. This leverage is achieved across the innovation chain, from research and development through to demonstration and deployment projects. Table 5 sets out the leverage ratio by project innovation type.

TABLE 5: LEVERAGE RATIO BY PROJECT INNOVATION TYPE

	ARENA funds committed	Third-party investment	Leverage
Research and development	$29.2 million	$72.7 million	$1 : $2.49
Study	$28.9 million	$57.7 million	$1 : $1.99
Demonstration	$82.7 million	$131.8 million	$1 : $1.59
Deployment	$24.8 million	$72.9 million	$1 : $2.94

The leverage achieved for the solar research and development projects funded in 2017-18 is higher than the average achieved across the rest of ARENA's portfolio, which sits at $1:$1.92. The higher leverage seen in 2017-18 is due to funding in this year being targeted at innovation to deliver cost reductions in solar cells and modules. There was strong interest and a high level of competition in this round, from both academia and industry, which has translated into higher cash and in-kind commitments to projects.

ARENA works collaboratively with industry, researchers and governments to shape the proposals we invest in and add value by providing guidance, feedback and expertise throughout the application, assessment and negotiation stages. This active approach to investment allows us to craft and deliver specific outcomes that can be replicated in future projects.

BRINGING THE BEST IDEAS TO LIFE

ARENA employs a highly-skilled team of business specialists to help proponents bring the best ideas to life. The business development and transactions team takes projects from the concept stage to a fully developed proposal, with the best projects receiving a commitment of funding from ARENA. We undertake robust financial and technical due diligence. The ARENA Advisory Panel (AAP) provides independent merit assessment. This year, the AAP provided advice and recommendations on 196 expressions of interest (EOIs) and 127 full applications.

Consistent with ARENA's risk-based approach, our due diligence activities were commensurate with the value, size and complexity of each proposal. Due diligence activities include the commissioning of independent research, feasibility assessment, analysis and modelling to support ARENA's assessment and facilitate consultation with our stakeholders.

Table 6 sets out the number of proposals ARENA worked on during the reporting period, from EOI, consideration by the AAP, through to full application and funding approval.

TABLE 6: NUMBER OF PROJECTS SUBMITTED TO, AND CONSIDERED BY, ARENA IN 2017-18

	EOIs submitted	EOIs considered by AAP*	Full applications submitted**	Full applications considered by AAP	Funding approved by Board/CEO***
Number	182	196	169	127	111

*The number of EOIs considered by the AAP is higher than the number of EOIs submitted, as a large number of EOIs considered were submitted in 2016-17.
**Proposals may pass through a two-stage process (EOI and full application), or single-stage process (full application only), depending on a number of factors. Single-stage applications include feasibility studies, projects where the ARENA grant funding sought is less than $500,000, or where ARENA has waived the requirement to submit an EOI (for instance, in the case of well-developed projects) may proceed directly to full application.

***The proposals move through each stage of the process at different rates, and some of the proposals that received funding approval from the ARENA Board/CEO do not necessarily incorporate the same proposals listed elsewhere in the table. For example an application may have been submitted in 2016-17, but be captured in this table if the AAP consideration occured in 2017-18.

During 2017-18, 211 projects were actively managed by ARENA. The Agency paid $176 million to 140 projects for delivery of 269 milestone reports as required under funding agreements. ARENA takes a flexible, agile approach to respond to contingency events in order to support innovation projects to meet their objectives within a fast paced technological and market environment.

This year 28 ARENA-funded projects reached completion, which is fewer than last year due to the high number of scholarship and fellowship recipients completing work in 2016-17.

ARENA seeks to ensure that all projects deliver value for money. The decision to terminate projects reflects a judgment that a project is not meeting, or is unlikely to meet, its intended outcomes, or has achieved its objectives prior to completion of all milestones for the project.

Seven projects were terminated during the course of the year, including two projects where no funds were paid prior to the closure of the projects. Unspent funds were returned to ARENA or released for other commitments.

Strong contract management has contributed to the successful delivery of outputs from funding rounds like the 2016-17 large-scale solar (LSS) round, which was intended to commercialise utility-scale solar PV in Australia. At 30 June 2018, five of the 12 solar projects were fully operational, three were in the commissioning phase and four were still under construction.

The majority of projects are being delivered on budget, with time and cost overruns relatively contained and with all projects consistently delivering project outcomes. The installed capacity of LSS farms has now exceeded one gigawatt. The construction of these farms is providing a significant boost for Australia's regional economy with more than several thousand construction jobs created and many spin-off benefits for nearby communities.

ARENA's LSS portfolio projects were the catalyst for what is now a significant pipeline of solar PV projects in Australia and presents a unique opportunity to gather feedback to improve the grid-connection process.

The following case study illustrates how ARENA's commitment to knowledge sharing enhances the impact of its financial assistance by ensuring the data captured, lessons learned and industry experience provides insights that lead to better decision making by policy makers, market operators and other important stakeholder groups.

Image: APA Group

INSIGHTS FROM ARENA'S LARGE-SCALE SOLAR ROUND

ARENA provided $91.7 million funding to 12 LSS projects through a competitive funding round. You can read more about the objectives and impact of this round in the Showcase section of this report.

The round quickly drove down the cost of LSS so that it became commercially viable and companies are now entering the market without ARENA support. Through strong relationships with this cohort of pioneering projects, ARENA has been able to pinpoint key challenges to project delivery beyond price. These implementation barriers have the potential to impede the companies that are now entering the market without ARENA assistance. Using these insights, ARENA is working with key stakeholders to create and deliver solutions.

This year, ARENA worked with its funding recipients to track their experiences across the construction process to identify opportunities for improvement. In late March, ARENA surveyed the projects in its LSS portfolio to understand their experience with construction and commissioning. Grid connection emerged as a topic for further discussion, and as such ARENA hosted a one-day workshop for all participants of the LSS funding round in Brisbane on 16 May 2018. The objective was to share grid connection experiences and brainstorm initiatives to improve the process for future projects. Potential solutions were developed to the issues raised, which will be used to further reduce barriers to deployment.

ARENA has also partnered with the Clean Energy Council on a social licence program to ensure the long-term viability of the industry. This has included a number of best practice workshops including an event at the Australian Clean Energy Summit. ARENA produced a public report that provides analysis and insights on the levelised cost of energy of the 12 projects funded in the LSS round.

ARENA invested significant resources this year into improving management tools to allow greater visibility of overall performance and effectiveness of its investments.

ENHANCING OUR BUSINESS PROCESSES

During 2017-18 ARENA committed to a program of organisation improvement aimed at enhancing and streamlining our business processes and ensuring that individual grant management is proportional to the risk and benefit of a project.

The Agency developed new simplified funding agreements, which were used in our funding rounds. In the next reporting period ARENA will have the data to determine whether this has resulted in reduced contract negotiation periods. ARENA's new program funding guidelines have led to new programs being designed and delivered more quickly. This year, the Agency substantially completed implementation of a new risk-based contract management system that has shortened assessment and payment turnaround times and made it simpler for recipients to meet their obligations.

A new internal Project Portfolio Management Committee (PPMC) was created to review the performance of ARENA-funded projects; ensure that projects are governed in a manner that is consistent with Australian Government expectations in relation to governance, compliance and risk management; monitor project performance; and maximise knowledge sharing outcomes.

The PPMC met quarterly throughout the year. Portfolio areas reviewed by the Committee to date include ARENA's solar research and development projects, utility-scale battery projects, demand response, distributed energy and grid security. Regular portfolio review is proving invaluable in surfacing key lessons from the portfolio such as challenges in grid connection, demand response baselines and customer behaviour. It also highlights lessons learned from our contract management approach, used to inform future funding rounds and negotiations.

The next phase of grants management efficiency improvements will involve technological enhancements delivered through an IT transformation program.

Knowledge sharing

ARENA shares the information and insights generated by the projects we fund to improve data transparency and build networks and platforms to inform decisions.

Every newly-contracted project during 2017-18 included knowledge sharing outcomes relevant to the project and its desired outcomes. These are set out in a Knowledge Sharing Plan that constitutes part of the funding agreement between ARENA and the funding recipient. This year, ARENA funding recipients continued to deliver on knowledge sharing obligations built into existing funding agreements.

During the reporting period we transformed our approach to the design, scheduling and management of our knowledge sharing activities, creating a dedicated team to ensure that knowledge is shared in a way that creates maximum impact within the industries we fund.

Stakeholder feedback is ARENA's key indicator for measurement of whether its knowledge sharing activities are valued by proponents and other stakeholders. This year, ARENA transitioned from its annual external stakeholder survey in order to develop a more targeted approach to performance feedback. Stakeholder feedback was sought in a number of ways throughout the year, including knowledge sharing event surveys, project closure surveys and through formal evaluation. Feedback demonstrated that knowledge sharing is highly valued by industry and opportunities to collaborate and share knowledge directly in peer-to-peer forums is viewed as useful and important.

Highlights of ARENA's knowledge sharing activities included:

- 23 new reports added to the Knowledge Bank, and promotion of the online resource through our digital platforms helped to boost its audience. As a result, 1182 unique downloads were made, with more than 3700 unique Knowledge Bank page views over the three months from May to June 2018 alone
- seven A-Lab workshops were held with more than 200 participants collaborating across five focus areas. This year, A-Lab developed 264 ideas for new projects, trials or experiments
- presentations by ARENA senior management and subject area specialists to 34 industry conferences, including giving two keynote speeches
- 11 industry events, including two site visits and seven workshops attended by more than 220 stakeholders across four states and territories. These events included collaborative forums for ARENA's large-scale solar projects, demand response projects, virtual power plants, international collaboration participants and energy market regulators
- seven publications including the *Hybrid generation for Australian off-grid mines* handbook
- three new partnerships to better leverage knowledge sharing outcomes and facilitate networks that increase the scope and range of ARENA's knowledge impact
- more than 400 delegates met at Parliament House in August 2017 for ARENA's principal knowledge sharing event, the Innovating Energy Summit
- monthly ARENAWire blog and podcasts continued to obtain high engagement with audiences, with stories shared across social media platforms. The top five stories had almost 160,000 views.

HYBRID POWER GENERATION FOR AUSTRALIAN OFF-GRID MINES

From volatile fuel and commodity prices through to an increasing need for energy security, a growing number of mining companies around the world are turning to renewable energy to help solve these challenges. Global expectations on carbon pricing and the increased importance of social licence are also pushing industry leaders to pursue renewable energy options.

During the past five years, ARENA has invested more than $30 million in demonstration projects and feasibility studies to understand how hybrid power generation at mine sites can become a reality. As wind and solar prices continue to decline, the economic case for deploying renewables has become more compelling.

The *Hybrid power generation for Australian off-grid mines* handbook was published in June 2018 through an electronic newsletter to a targeted list of 100 key stakeholders. In the two weeks following, this newsletter had been forwarded and opened more than 1300 times.

By combining subject matter expertise with industry engagement and real life case studies, the handbook presents a practical guide for the mining and power industry sectors on the opportunities, challenges and key determinants of the commercial and technical viability of hybrid power generation.

Evaluating ARENA's program outcomes

This year, ARENA commissioned a series of independent evaluations, including a formal evaluation of the Regional Australia's Renewables (RAR) initiative and the Advancing Renewables Program (ARP), an evaluation of A-Lab, and a comprehensive review of the impact of our funding for solar research. Details of the findings of these evaluations are set out below.

Regional Australia's Renewables initiative

RAR and ARP were evaluated by Clear Horizon consulting, a specialist independent evaluator.

Clear Horizon found that the rationale for, and design of, RAR was sound and reflected best advice and knowledge available at the time. There were factors outside ARENA's control that altered some fundamental assumptions (notably about diesel prices and financial stress on the mining sector) and affected the number and quality of projects. Nevertheless, the programs have supported the delivery of 78 megawatts of new renewable energy generation capacity, demonstrated the viability of integrating renewable energy into fringe-of-grid and off-grid systems and identified and addressed some of the roadblocks to the uptake of renewable energy. Clear Horizon reported that ARENA's business development and application assessment processes are robust and effective. However, a number of opportunities for administrative improvement were identified.

Advancing Renewables Program

The ARP is continuously open for applications that address ARENA's investment priorities. It also has a mechanism for competitive funding rounds, which ARENA runs from time to time. The evaluation focussed on the design and delivery of the open stream aspect of the program and areas for improvement. Clear Horizon considered the open program design and delivery is fundamentally sound and adaptable. It was too early to draw conclusions about the projects funded under ARP to date as none had been completed at the time of the evaluation. The core concerns noted during the evaluation interviews related to: the capability of some proponents to enter into more complicated funding arrangements; a need for further investigation into how these alternative funding arrangements would work in practice; what impact they would have on ARENA's capability needs; and the possible impact on knowledge sharing.

A total of 18 recommendations were made by the evaluators. The majority of recommendations relate to matters that ARENA had already addressed or was addressing as a result of other reviews or its continuous improvement process. At the end of the reporting period, work to implement 13 of the recommendations had been completed and work was underway to address the remaining five recommendations.

A-Lab Impact

The A-Lab Impact Report was delivered in December 2017, which evaluated the progress of A-Lab against its three objectives:

- a balanced portfolio of ARENA-funded projects which have the potential to create systemic change
- a new collaborative community co-creating and sharing knowledge
- build innovation capability within ARENA and the industry more broadly.

The report found that A-Lab further developed through 2017 as an important component of ARENA's engagement with industry, and was utilised to assist us with the design of a number of strategic funding programs and partnerships (e.g. demand response, batteries, Energy Networks Australia). Furthermore, the program has developed a reputation for offering participants excellent facilitation, high quality thinking, networking and the chance to work on innovative projects.

In the spotlight: Australian solar energy R&D outcomes and achievements in a global context

During this year, ARENA also commissioned a review of its solar research and development portfolio, which includes more than 300 solar and associated enabling research projects supported by ARENA (including those projects inherited from the Australian Solar Institute).

The evaluation by ITP Renewable Energy Consulting systematically reviewed the projects and provided a critical assessment of the outcomes of the research both for Australia and within the global context. The report concludes that funding provided by ARENA (and predecessor agencies) over the past decade has resulted in Australian research being globally recognised and responsible for many of the PV technologies in commercial production.

The report highlighted that Australian-developed technology is expected to dominate the global PV market over the next decade, with the PERC[2] cell developed under ACAP expected to be used in more than 60 per cent of commercial cells[3]. For concentrating solar thermal (CST), Australia is recognised as a world leader in high temperature sodium receivers.

ARENA funding has significantly improved Australian solar research facilities, maintaining Australia's world-leading role and bringing research and pre-commercial industrial demonstration facilities up to world class. This has facilitated a wider range of research projects and assisted in enhancing research-industry collaboration including:

- Trina Solar has worked with ANU to develop high-efficiency IBC solar cells[4] - a technology now in mass production.
- Fulcrum 3D developed CloudCAM, which uses remote sensors to monitor solar irradiance and clouds to predict energy output. They are installed in Australia, the UK, US and other markets.
- Solar Analytics, creators of software for household energy system monitoring, was a spin-out from the solar PV research and industry. Solar Analytics provides consumer-oriented dashboard software and an associated rooftop solar generation monitor.

[2]Passivated Emitter Rear Contact solar cells have a layer of oxidised material on both the front and back of the cell that reduces recombination losses and increases the amount of light reflected from the bottom of the cell back into the cell for use. Both features deliver a boost in efficiency.

[3]*International Technology Roadmap for PV* (ITRPV), Ninth Edition 2018, http://itrpv.net/Reports/Downloads/.

[4]Interdigitated back contact (IBC) solar cells eliminate shading losses by putting both contacts (negative and positive) on the rear of the cell.

Funding for early career researchers has been critical in keeping high achievers in Australia, which has further enhanced research outcomes. ARENA-funded researchers and associated projects have led to 140 patents, more than 800 peer-reviewed journal articles, and demonstration in Australian research laboratories of world-leading solar resource conversion technologies.

Commercialisation will be facilitated by the improved efficiency and capability fostered from research through development and demonstration, and the strong links to the market and the key industry players, which have now been established.

Research and development funding has also resulted in significant knowledge creation and extensive knowledge sharing as well as important skills development, and will contribute to Australia's continued contribution to future commercial solar technology developments.

TABLE 7: SUMMARY OF SOLAR RESEARCH AND DEVELOPMENT REPORTED PROJECT OUTPUTS

Project outputs	Patents filed	Licences entered into	Journal publications	Other publications	Presentations	PhDs	Postdocs and other researchers
PV	139	19	1183	163	890	183	158
Enabling	3	0	31	54	97	11	51
CST	6	2	167	95	248	26	132
Total	**148**	**21**	**1381**	**312**	**1235**	**220**	**341**

Image: Conergy

ARENA SHOWCASE

Each year ARENA showcases a number of projects in its annual report to highlight its impact in helping Australia shift to affordable and reliable renewable energy.

The ARENA projects detailed in this year's showcase are identified by location, making it easy for readers to discover ARENA activities in their own state or territory. An interactive map displaying the location of all ARENA projects is also available on the Agency's website (arena.gov.au/projects-map).

Additional case studies can be found in the Annual Performance Statement.

DEMAND RESPONSE – A COOL SOLUTION FOR THE ENERGY GRID

It only happens a few times each year, but when Australia's summers sizzle, households and businesses send electricity demand sky high by simultaneously switching on their air conditioners. When this happens, we use 46 per cent more electricity than average.

The challenge for the Australian Electricity Market Operator (AEMO) is to find the most cost-effective way of meeting the occasional spike in the demand for electricity.

DEMAND RESPONSE INITIATIVE

Size: 143 MW by Dec 2017, 200 MW by 2020
ARENA funding: $28.6 million for 10 pilot projects
NSW Government matching funding: $7.2 million
Locations: NSW, VIC and SA

Diesel generators or gas-fired peaking power stations have often been used for this. ARENA is helping develop and commercialise newer technologies and approaches that can fill a similar 'flexible capacity' role in a lower-emissions electricity system.

A cost effective way to reduce demand during peak periods, and relatively quick to implement, is to pay some energy consumers to voluntarily cut or shift their use of power to better match supply.

This 'demand response' approach lowers the amount of electricity required from the grid during peak periods to reduce the likelihood of a blackout, and can ramp up demand during off-peak periods, or when renewable energy output is high, to use excess electricity more efficiently. It can even help to bring down wholesale electricity prices, which increase when demand is high.

Demand response is a proven method that is successfully and cost effectively used elsewhere in the world, such as in some parts of the United States, as well as in Taiwan and Korea.

One of ARENA's investment priorities is to deliver affordable low emission electricity solutions that keep the lights on as we shift to a higher share of renewable electricity. As part of our work on this priority, we teamed with AEMO and the NSW Government to fund a $35.7 million, three-year trial featuring ten creative demand response projects from eight companies across Victoria, New South Wales and South Australia. ARENA's share of the funding is $28.6 million with $7.2 million provided by the NSW Government.

Together, these projects will help change behaviour and shift electricity use, freeing up around 200 megawatts of capacity by 2020.

Businesses, large companies and individual householders participating in the projects will have the opportunity to receive incentives in exchange for limiting or shifting their electricity use during peak demand times such as heatwaves, when the grid is under stress and at risk of blackouts. The economy overall will also benefit from a more efficient electricity system that has avoided the cost of having to build unnecessary new infrastructure.

The ten projects span a diverse range of technologies, innovative ideas and geographic locations. They include electricity retailers such as AGL and Powershop, poles and wires businesses like United Energy, the smart thermostat maker Zen Ecosystems, the demand response aggregator EnerNOC, and the Adelaide-based metals manufacturer Intercast and Forge.

DEMAND RESPONSE: HOW IT WORKS

Demand Response, a joint initiative of ARENA and the Australian Energy Market Operator, aims to ensure stable energy supply during times of peak demand.

ARENA has contributed $28.6 million to the initiative and the NSW Government provided matching funding of $7.2 million.

STEP 1

Energy users such as companies, factories or even individual consumers sign up to voluntarily reduce energy usage in times of extreme demand

STEP 2

Electricity demand surges

STEP 3

Users reduce their energy consumption

STEP 4

Reduced demand helps to balance supply and demand, and stabilises grid

STEP 5

Users are paid for their reduced demand

'SMART' POOLS TO CUT ENERGY USE AND SUPPORT THE GRID

Lead organisation: Pooled Energy
ARENA funding: $2.5 million
Total project cost: $5.0 million
Locations: Sydney, NSW

Another project addressing demand response in a novel way is a pilot being run by Pooled Energy, which aims to slash the energy consumption of household swimming pools while reducing stress on the nation's electricity grid.

Swimming pools are notoriously power hungry, with residential pools typically using 30 to 40 per cent of total household energy consumption.

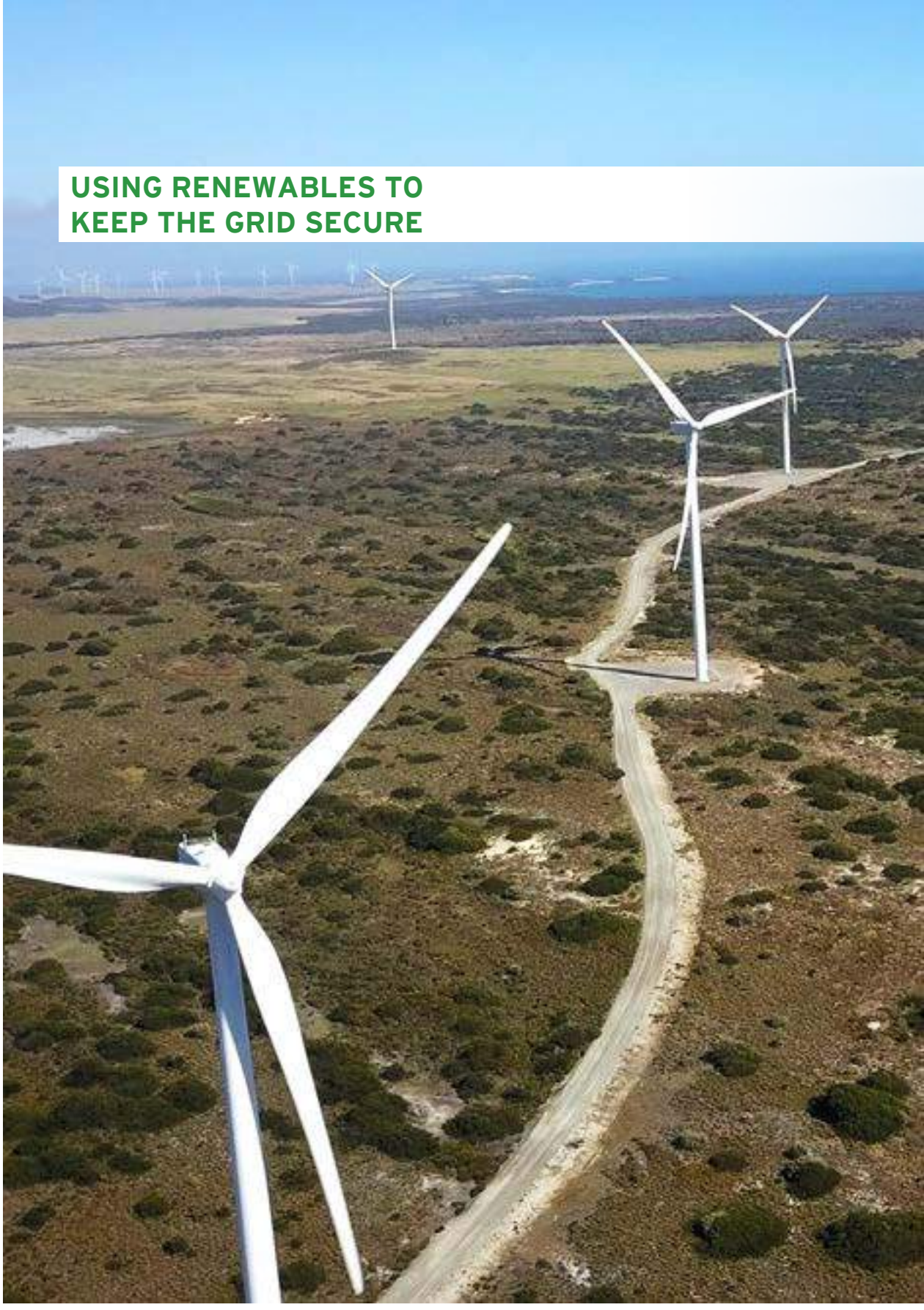
Under the Pooled Energy pilot project being supported by ARENA, the pools of up to 5000 participating homeowners are being made 'smart'. This involves connection to the internet and the installation of an intelligent controller that manages the pool's pump and the dispensing of chemicals.

This allows the control system to not only monitor the pool's water chemistry and temperature, but also the local weather, electricity prices and the state of the grid to deliver the best possible pool management system. An average pool's energy use can be reduced by up to 50 to 70 per cent using this system.

In addition to providing a financial benefit to pool owners through reduced energy costs, the trial will also test the smart pool system's ability to respond to requests from AEMO to cut or shift energy use during spikes in demand.

If proven to be viable, the technology could reduce demand for electricity from the grid during peak demand by up to 3.7 gigawatts using Australia's 1.4 million swimming pools. That is the equivalent of two Liddell-sized power stations running at full capacity.

USING RENEWABLES TO KEEP THE GRID SECURE



To be secure, Australia's electricity grid needs to be able to cope when a part of the network or a power plant breaks down. A number of tools are used by the Australian Energy Market Operator (AEMO) to keep the grid secure, including a toolkit known as Frequency Control Ancillary Services or FCAS. (See "What is FCAS?" to learn how FCAS works).

AEMO buys FCAS from providers, which can include power generators, big electricity users, and other organisations. Providers that generate or store electricity help to make the grid secure by rapidly injecting more power into the system when it is needed. Others FCAS providers such as energy-intensive businesses can achieve the same effect by shutting down some or all of their operations for an agreed period.

In Australia FCAS has traditionally been provided by mostly coal and gas electricity generators; however overseas experience has shown that renewable energy providers can also supply FCAS to help keep the grid secure and stable.

ARENA has been working with AEMO and the renewable energy industry to explore how to make renewables-based FCAS not only technically possible but also commercially attractive in Australia. ARENA has also invested in a range of projects to develop renewables-based FCAS.

During 2017-18 ARENA supported additional projects to explore the potential of renewables to provide FCAS and grid security in the future. These include utility-scale renewables such as wind farms and big batteries as well as distributed energy resources such as household solar with battery storage, which was a recommendation of the Finkel Review.

MUSSELROE WIND FARM FCAS TRIAL

Lead organisation: Musselroe Wind Farm Pty Ltd, a subsidiary of Shenhua Clean Energy and Hydro Tasmania
ARENA funding: $499,000
Total project cost: $1.0 million
Location: Woolnorth, TAS

ARENA's most recent FCAS project is a ground-breaking grid stability trial at the Musselroe wind farm located in windswept north-east Tasmania. With 56 turbines capable of generating 168 megawatts, the Musselroe facility provides five per cent of Tasmania's yearly electricity needs.

The $1 million trial, to which ARENA is contributing $499,000, is investigating the technical capability as well as the economic and commercial potential of wind farms in Australia to provide FCAS to stabilise the national grid.

Wind power is playing a big part in Australia's transition to renewable energy, so it makes good sense to explore how it could provide essential grid stability services. If the project finds that wind farms would commercially benefit from selling frequency control services in Australia, this could lead to more wind farms providing FCAS, which would bring down the cost of FCAS and in turn lower electricity bills.

HORNSDALE STAGE 2 WIND FARM FCAS TRIAL

Lead organisation: HWF2 Pty Ltd, a subsidiary of Neoen
ARENA funding: $300,000
Total project cost: $600,000
Location: Hornsdale, SA

The Musselroe project builds on the findings of an earlier project at South Australia's Hornsdale stage 2 wind farm, where ARENA partnered with AEMO to test the technical feasibility of wind farms providing a type of FCAS called inertia.

The project involved AEMO having remote control over the facility's wind turbines so that the market operator could adjust the amount of electricity being generated to maintain the grid's stability.

By confirming that wind generation has the potential to help with system stability, the project was another important step towards demonstrating renewable energy's potential role in the NEM. It also provided proof of concept to the energy market and investors on the ability of wind farms to provide FCAS.

ELECTRANET BATTERY STORAGE PROJECT

Lead organisation: ElectraNet
ARENA funding: $12.0 million
Total project cost: $30.0 million
Location: Yorke Peninsula, SA

The speed with which a battery can be switched on or off makes this form of energy storage an ideal way to help keep the grid secure by providing renewables-based FCAS.

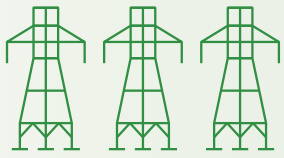
ARENA is helping to demonstrate that potential by supporting ElectraNet's construction of a large-scale battery near the Dalrymple substation on South Australia's Yorke Peninsula.

This is the second stage of the Energy Storage for Commercial Renewable Integration (ESCRI) project, following a study into the potential for such storage to benefit the state's electricity network. The 30 megawatt, eight megawatt hour facility will store energy generated by AGL's Wattle Point wind farm to demonstrate how energy storage can strengthen the grid and improve local reliability.

When completed in mid-2018, it will be the first large-scale, grid-connected battery to be designed, built and commercially operated in Australia largely with private investment from energy providers. It will also be one of the largest batteries in the world, in terms of megawatt capacity, behind the Tesla/Neoen battery located in the same state.

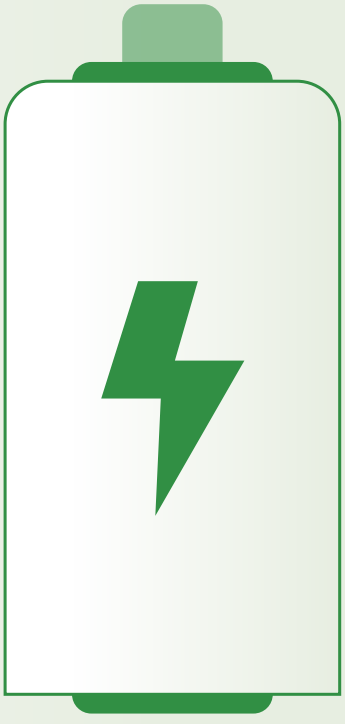
ESCRI BATTERY PROJECT

The first large-scale, grid-connected battery to be designed, built and operated in Australia largely with private investment from energy providers. The Energy Storage for Commercial Renewable Integration (ESCRI) project will provide grid stability in multiple ways.

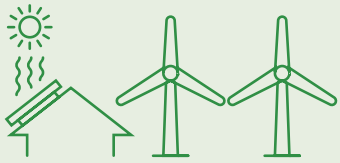


- Provides fast-acting power response, keeping grid in balance when generators or transmission lines fail

- Reduces constraints on Heywood interconnector with Victoria (should place downward pressure on SA wholesale power prices)



30 MW / 8 MWh utility-scale lithium-ion battery



- Improves supply reliability by operating as microgrid with Wattle Point wind farm and rooftop solar when main grid supply is lost

- Retailer operates battery under agreement with ElectraNet, providing additional market services without compromising security and reliabilitiy services

GANNAWARRA ENERGY STORAGE SYSTEM

Lead organisation: Edify Energy
Size: 25 MW / 50 MWh
ARENA funding: $25.0 million (with Victorian Government)
Total project cost: $34.3 million
Location: Gannawarra, VIC

With ARENA's support, the Gannawarra Energy Storage System project is helping to demonstrate how battery storage can be fitted to an existing solar farm. It will help to pave the way for similar battery extensions to be made to the dozens of solar farms already built or underway in Australia.

The project is co-located with Edify Energy's 60 megawatt (DC) Gannawarra Solar Farm. As it involves the first solar farm of its size in Australia's electricity market to include a battery, the project will demonstrate how the combined technologies can provide flexible dispatchable energy and improve grid stability.

With very few projects of this nature in Australia, successful completion of the project will create investment confidence for similar projects in the future. It will also be the first retrofit of a battery to an existing or under-construction solar farm in Australia, the first battery integrated with renewables in Victoria, and among the first of its kind in Australia. It will also be among the largest integrated battery with renewables systems in the world.

SIMPLY ENERGY VIRTUAL POWER PLANT

Lead organisation: Simply Energy
Size: 6 MW storage + 2 MW demand response
ARENA funding: $7.7 million
Total project cost: $23.5 million
Location: Adelaide, SA

A virtual power plant (VPP) is created by linking households with rooftop solar and battery storage to a central control system so that the benefits of renewable energy can be shared within that network or with the broader national grid.

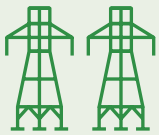
ARENA has supported Simply Energy's VPP project to deliver up to 1200 Tesla Powerwall batteries to Adelaide households. The project will also install batteries in ten commercial businesses to give them the ability to participate in demand response activities.

This is the second VPP to be created in South Australia following the AGL VPP, which was also supported by ARENA. Households participating in the project will be able to use more of their solar energy, reducing their power costs and have backup power in the event of an outage.

They will also be able to participate in Greensync's innovative distributed energy exchange (deX), which was initially developed with ARENA's support. The deX online platform will provide an energy marketplace where electricity can be bought and sold by businesses, households, communities and power utilities.

By integrating the VPP with deX and linking it to the national grid, there will be lower demand for electricity at peak times, which can ease pressure on the grid and reduce network costs. Power companies will also have more electricity sources to draw on, which will improve grid security and power reliability.

WHAT IS FREQUENCY CONTROL ANCILLARY SERVICES (FCAS)?



To be secure, an electricity network needs two things.

Firstly it needs enough power, supplied by electricity generators, to meet the needs of electricity users. That need, or 'demand', changes over the course of the day from the time we make our first coffee or toast in the morning, until we switch off the lights at bedtime.

Why balance keeps the grid secure

The second thing needed for a secure grid is not as obvious or well known. That secret ingredient is balance - at all times the amount of electricity being sent into the grid by generators must match the amount needed by electricity consumers. When the balance is right, electricity flows through the grid at a 'frequency' of 50 hertz or cycles per second. When the frequency moves away from 50 hertz because there is too much power being generated, or a sudden change in demand, the grid becomes unstable and will start to shut down to protect its equipment, leading to blackouts.

The Australian Energy Market Operator (AEMO) is responsible for adjusting the amount of power being generated or being used to make sure the grid always stays in balance. It is also AEMO's job to restore the balance when a blackout does occur.

Role of FCAS in achieving balance

AEMO uses Frequency Control Ancillary Services, or FCAS, to maintain or restore the balance in our electricity network's frequency. The market operator buys these services when it needs them from power generators, big electricity users, and other organisations.

FCAS providers that generate or store electricity help to rebalance the grid by rapidly injecting more power into the system, while others are energy-intensive businesses that can achieve the same effect by shutting down some or all of their operations for an agreed period.

Renewables can provide FCAS

While FCAS is already a critical part of our current electricity network, the importance of FCAS is growing with the rapid development of Australia's renewable energy sector. As increasing amounts of wind, solar and other variable forms of clean energy are fed into the grid, additional FCAS will be needed to stabilise it.

In Australia FCAS has traditionally been provided by mostly coal and gas electricity generators; however, overseas experience has shown that renewable energy providers can also supply FCAS to help keep the grid secure and stable. This is being done in Quebec, Ontario and some parts of Europe.

BIG SOLAR HIGHLIGHTS QUEENSLAND'S PATH TO ENERGY FUTURE

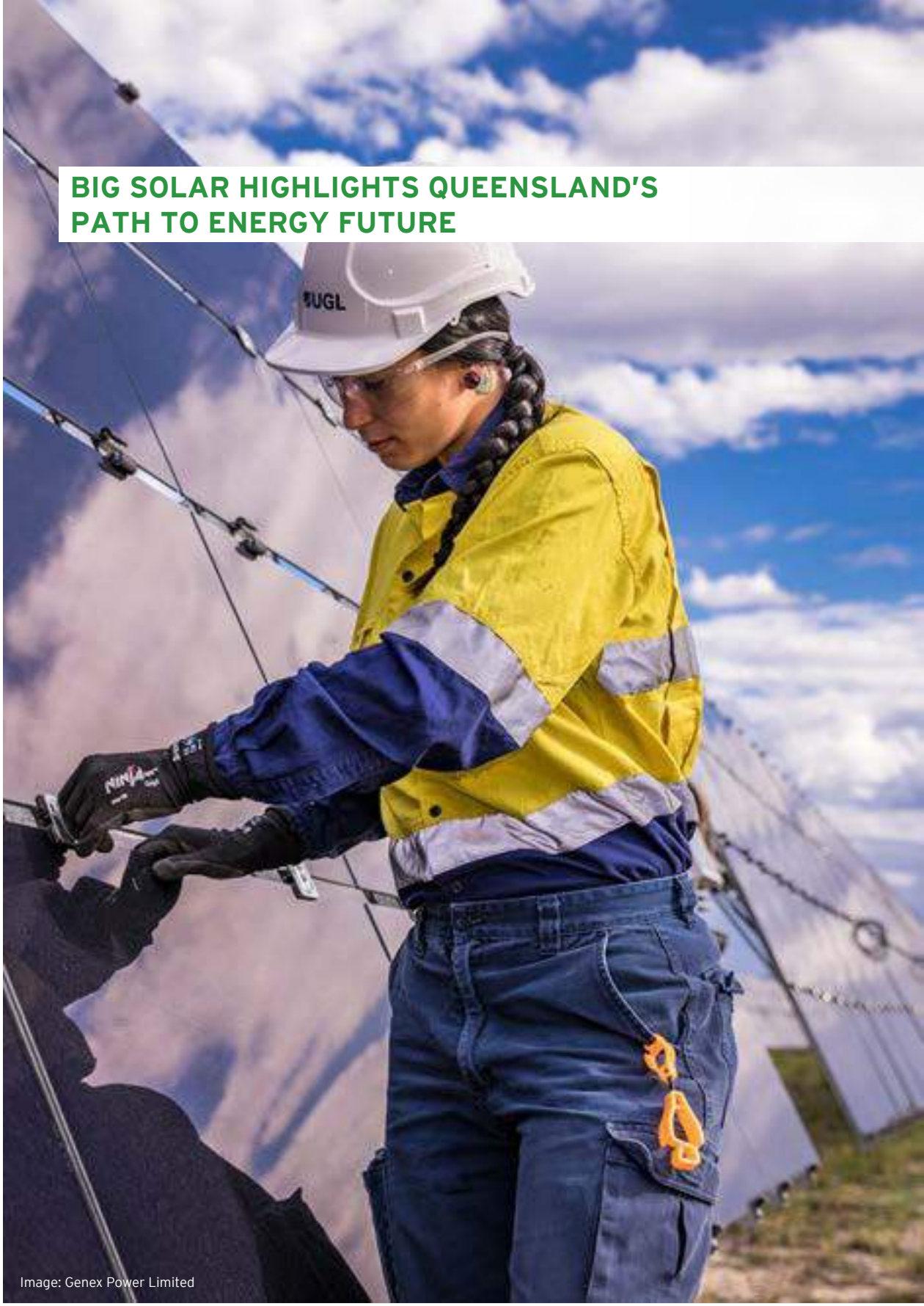


Image: Genex Power Limited

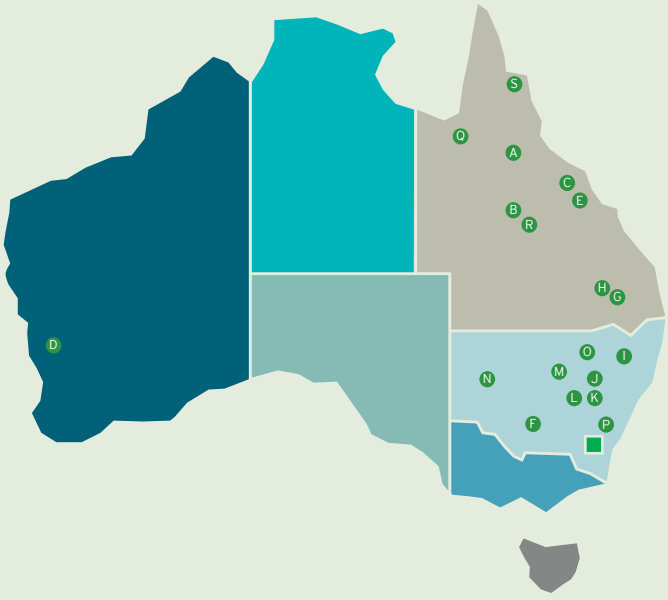
In the six years since it was created, ARENA's grant funding has contributed to the creation of 19 new grid-connected large-scale solar farms across Australia. Twelve of these were funded through the large-scale solar (LSS) competitive funding round in 2016, which helped to slash the cost of big solar projects to the same level as wind energy projects.

The trend has continued, with Australian utility-scale solar projects now being announced without the need for government grant support.

ARENA now has 19 projects involving big solar in its portfolio (see Figure 6). Having helped to bring down the cost and increase the development of large-scale solar projects in Australia, ARENA widened its focus this year to explore the best ways of integrating large amounts of solar energy into the grid while keeping energy costs low and the grid stable.

Three of ARENA's big solar projects in regional and remote Queensland are demonstrating that potential to deliver stability and affordability. Each project is unique in its own right, as well as being very different from most standard solar farms.

FIGURE 6: ARENA'S LARGE-SCALE SOLAR PORTFOLIO



- A Kidston Solar Park, 50 MW
- B Longreach Solar Farm, 15 MW
- C Collinsville Solar Power Station, 42 MW
- D Emu Downs Solar Farm, 20 MW
- E Whitsunday Solar Farm, 57.5 MW
- F Griffith Solar Farm, 25 MW
- G Oakey Solar Farm, 25 MW
- H Darling Downs Solar Farm, 110 MW
- I White Rock Solar Farm, 20 MW
- J Dubbo Solar Hub, 24.2 MW
- K Manildra Solar Farm, 42.5 MW
- L Parkes Solar Farm, 50.6 MW
- M AGL Solar Project, (Nyngan), 102 MW
- N AGL Solar Project (Broken Hill), 53 MW
- O Moree Solar Farm, 56 MW
- P Gullen Solar Farm, 10 MW
- Q Normanton Solar Farm, 5 MW
- R Barcaldine Remote Community Solar Farm, 20 MW
- S Lakeland Solar & Storage Project, 10.8 MW

KENNEDY ENERGY PARK

Lead organisation: Windlab, Eurus Energy
Size: 15 MW solar PV, 43.2 MW wind, 2 MW / 4 MWh battery storage
ARENA funding: $18.0 million
Total project cost: $160.0 million
CEFC debt finance: $93.5 million
Location: Kennedy, QLD

The Kennedy Energy Park is a trailblazing project being developed by Windlab and Eurus Energy that will not only provide reliable and affordable power for its local community but demonstrate how to achieve around-the-clock renewable energy.

As the first grid-connected power plant in Australia to combine large-scale solar and wind with battery storage, it will test the technologies working together to see if the plant can provide dispatchable power over a 24-hour period.

The north Queensland location of the Kennedy Energy Park, about 20 kilometres from Hughenden, features one of the best and largest wind resources in Australia, alongside one of the best solar resources. This allows the two energy sources to complement each other, with solar generating electricity during the day and wind producing mainly at night. By storing the electricity in an onsite battery, the combined power plant is able to smooth out any variability, making it possible to provide more continuous generation of electricity.

If the combination of technologies proves to be viable, the project will lay the foundations for a planned second phase, 'Big Kennedy', which would be 20 times the size of the first facility. The success of the first phase will greatly assist with securing capital, debt finance and approvals for the following phase.

LAKELAND SOLAR AND STORAGE PROJECT

Lead organisation: Lakeland Solar & Storage Pty Limited, a subsidiary of Conergy
Size: 10.8 MW solar PV, 1.4 MW / 5.3 MWh battery storage
ARENA funding: $17.4 million
Total project cost: $42.5 million
Location: Lakeland, QLD

ARENA is supporting the Lakeland Solar and Storage Project to examine how solar farms with energy storage can help to overcome power reliability problems for electricity users living and working on the fringes of grids.

The developers of the project were the first in the world to combine a large-scale smart controller and battery system with a large-scale solar farm to identify how the technologies can best work together at a fringe-of-grid location.

As part of the project's Knowledge Sharing Program, Lakeland will be separated from the grid and powered solely by solar and battery storage for several hours at a time, essentially becoming an 'island' during test periods. This will demonstrate that the combination of big solar and big battery storage with a smart controller system will not only provide communities with protection from network failures, but also make it possible to supply renewable energy overnight and at peak demand periods.

PROJECT DEVELOPMENT ACTIVITIES FOR KIDSTON STAGE TWO HYDRO-SOLAR PROJECT

Lead organisation: Genex Power Limited
ARENA funding: $5.0 million (up to $4.5 million convertible)
Total cost of activities: $12.8 million
Location: Kidston, QLD

With support from ARENA, the world's first integrated solar and pumped hydro project is being developed by Genex Power in Kidston, Queensland. That support has been provided in three stages: $4 million towards a $6.2 million feasibility study for the pumped hydro energy storage (PHES) component, $8.9 million towards the $126 million Kidston Stage One solar farm (as part of ARENA's LSS round), and $5 million to help the combined project reach financial close in 2018.

The hybrid solar and hydro project, known as Kidston Stage Two, is expected to comprise a 250 megawatt pumped hydroelectricity storage facility using two decommissioned mine pits and a 270 megawatt solar farm. It will be capable of generating around 783 gigawatt hours of renewable energy each year, which is enough to meet the average annual power needs of 140,000 Australian homes.

The project will demonstrate the benefits of a solar PV and PHES hybrid generating reliable, dispatchable and affordable renewable energy. The PHES will also be able to provide stability and support to the grid, including FCAS.

In addition to repurposing two decommissioned mine pits for the pumped storage component, the project developer Genex is using infrastructure left from the previous mining operation to save time and money as well as minimise any environmental impact. These include the mine's accommodation camp, airstrip, road access and an electricity substation and transmission line.

WHAT IS DISPATCHABLE ENERGY?

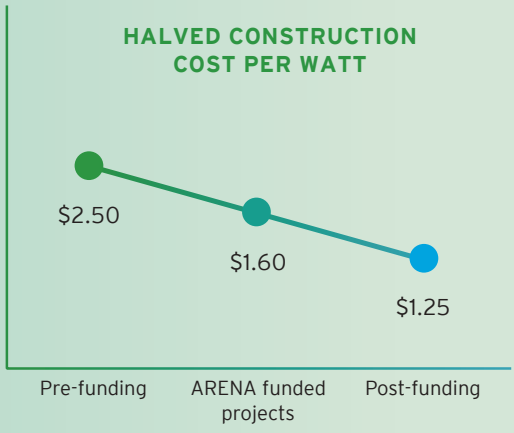
Dispatchable energy is electricity that can be made available - or dispatched - by a power generator or energy system whenever it is needed, or switched off when it is not needed. It can also include batteries (large and small) as well as demand response, where energy customers can be paid to reduce their electricity use during peak times or emergencies.

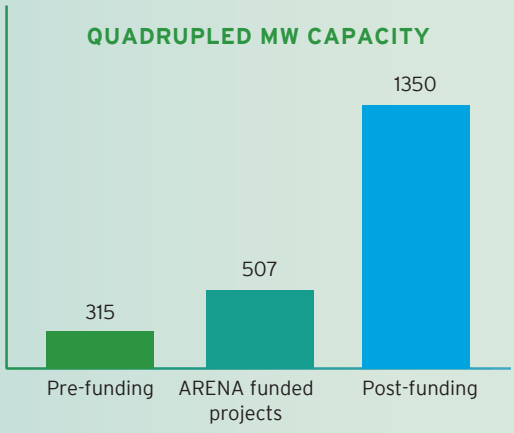
Dispatchable energy systems that can respond very quickly to changes in the grid are also known as flexible capacity.

In addition to meeting spikes in demand for electricity, dispatchable energy can help to smooth out electricity supply when the amount of renewable energy in the grid increases or decreases.

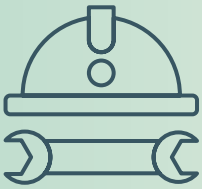
Australia's energy future will involve increasing amounts of variable renewable energy, increasing the importance of flexible capacity in stabilising the grid.

LARGE-SCALE SOLAR FUNDING ROUND

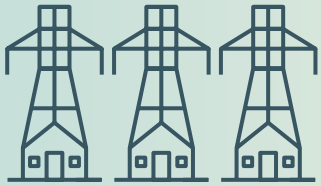




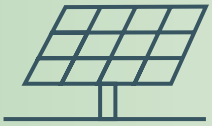
$92M COMMITTED → **12** PROJECTS → **$1.1B** COST



2300
JOBS



POWER FOR
150,000
HOMES



GENERATION CAPACITY
507 MW

21+ SOLAR FARMS BUILT SINCE LSS ROUND WITHOUT ARENA SUPPORT

INVESTMENT LEVERAGE
1:10

ADVANCED COMMERCIALITY BY
5 YEARS

SMART SOLAR FOR NSW CLASSROOMS

Image: Hivve

HIVVE SUSTAINABLE MODULAR CLASSROOMS

Lead organisation: Eastern Portable Buildings
ARENA funding: $368,000
Total project cost: $736,000
Location: Holsworthy and Wollongong, NSW

ARENA is supporting a trial of two self-powering modular classrooms that could drastically cut power costs for Australian schools.

Manufactured by Sydney-based Hivve, the modular classrooms are portable and highly energy efficient. Each building incorporates solar panels with smart technology, including real-time energy metering and CO_2 monitoring. This gives schools the ability to actively manage their energy use as well as indoor temperature and air quality to keep the classroom environments just right for learning.

Hivve classrooms are designed to generate enough electricity to power themselves as well as two other classrooms, an estimated net energy generation of 7600 kilowatts each year.


Image: Hivve

Participants in the trials have reported the advanced design of the classrooms, emphasising sustainable materials, energy efficiency and ergonomics, has inspired students to learn more about renewable energy. The project has also raised awareness within the schools sector that it could follow the lead taken by almost two million Australian households and slash its energy costs by installing solar.

The success of the Hivve project could help inform thinking about how such a model could be rolled out nationwide, reducing pressure on the grid and even providing a significant amount of power back to the National Electricity Market.

PORTABLE MINI-SOLAR FARMS FOR REMOTE LOCATIONS

Image: ECLIPS

What began life as a way to provide renewable power to Australian troops on the ground in remote locations could soon see solar energy powering disaster relief efforts and construction sites.

CONTAINER ROLL-OUT SOLAR SYSTEM

Lead organisation: ECLIPS
ARENA funding: $289,000
Total project cost: $703,000
Location: Canberra, ACT

The Container Roll-Out Solar System (CROSS) is a mobile solar PV unit that provides temporary solar energy in place of diesel generators.

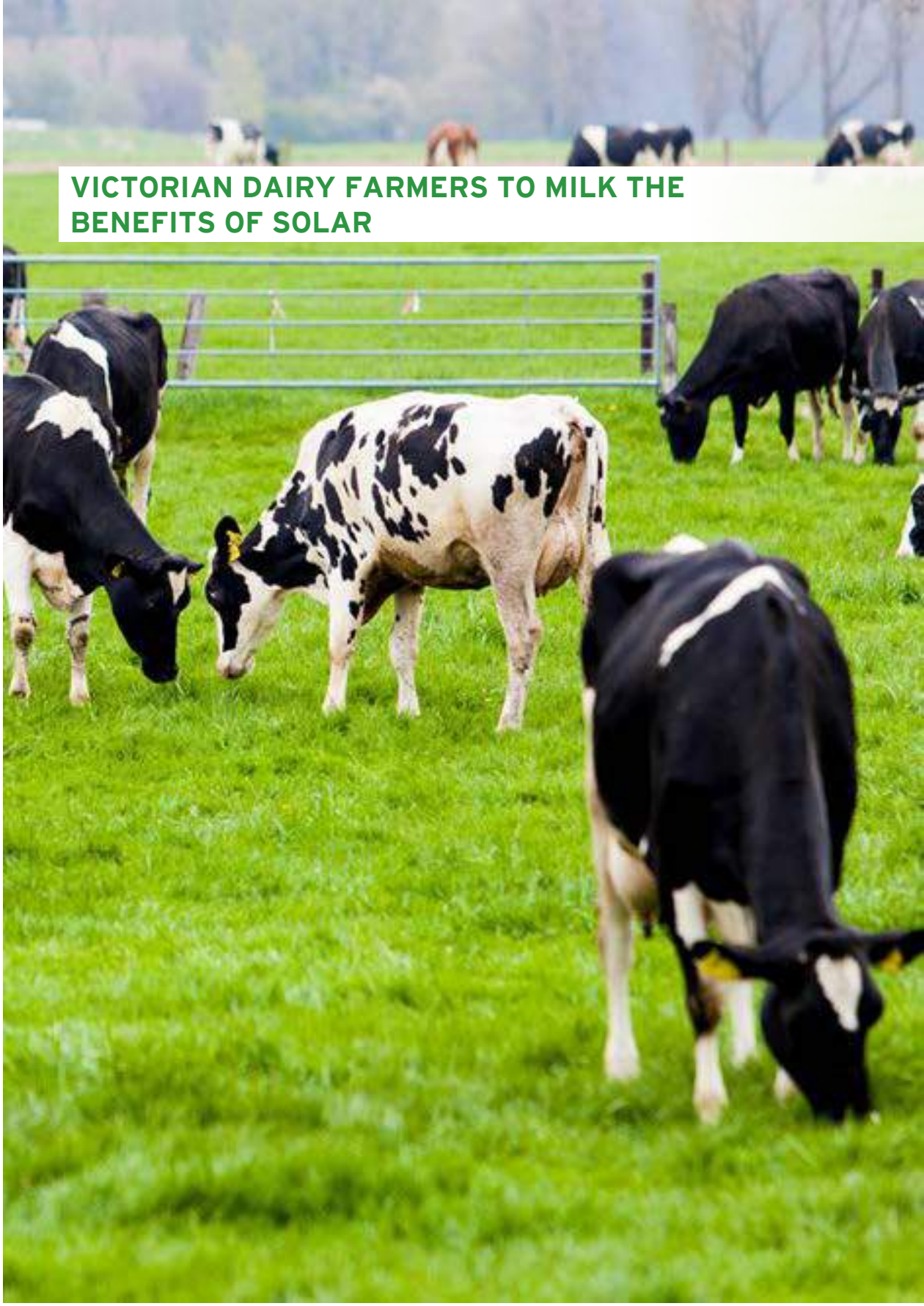
CROSS fills a gap in the Australian market for small (100-500 kilowatt) renewable energy systems that can be easily moved and temporarily deployed for days, months or even a few years. A rapidly-deployable solar PV system would open up previously inaccessible markets for temporary power, such as in the defence and construction industries, or for use in disaster relief or humanitarian efforts.

Developed by Canberra-based company ECLIPS, the CROSS is designed to fit inside transportable standard shipping containers and can be delivered wherever it is needed to bring clean energy to remote locations in a way not previously possible.

ARENA's support made it possible for ECLIPS to design, manufacture and test the CROSS units, which come in two sizes. The CROSS units, which are transported inside a shipping container, can be deployed in minutes to produce power. They are delivered fully assembled, providing up to 2175 watts of power for each 20 foot unit and up to 4350 watts for each 40 foot unit.

The project also demonstrates how standard material handling equipment can be used to transport and set up CROSS units, and confirm there is a market for mini-solar farms of this size.

VICTORIAN DAIRY FARMERS TO MILK THE BENEFITS OF SOLAR



Around 200 dairy farmers in Victoria's Latrobe Valley are poised to participate in an innovative project that marks a new chapter in the region's long history as an energy production hub – a virtual microgrid or online marketplace that would allow them to sell renewable energy and grid support services.

ARENA has provided support to LO3 Energy for the first step in this process, a study to test the feasibility of creating a local energy marketplace in the Gippsland region. The virtual microgrid would incorporate solar PV, battery storage, smart appliances and enabling technologies, combined with LO3's Exergy peer-to-peer energy trading platform.

LATROBE VALLEY MICROGRID FEASIBILITY STUDY

Lead organisation: LO3 Energy
ARENA funding: $370,000
Total project cost: $775,000
Location: Latrobe Valley, VIC

Dairy farms typically need the most energy for milk production in the mornings and afternoons. The project capitalises on the midday lull, creating an opportunity for farmers to sell excess electricity being generated by solar panels back to the grid.

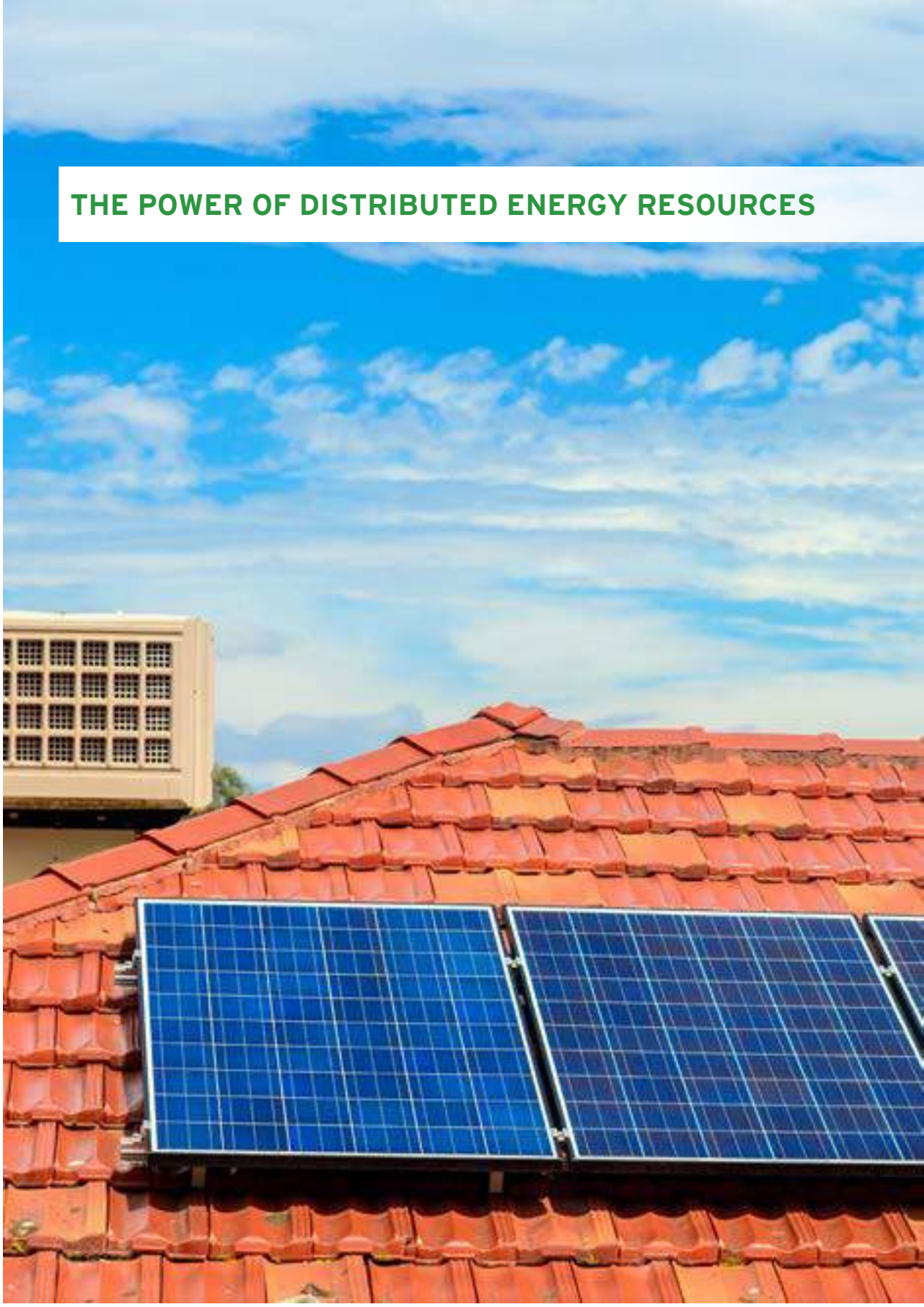

Image: LO3 Energy

The virtual marketplace would also make it possible for farmers to offer demand response or grid stability services. Overall, it would potentially reduce energy costs and create a valuable new revenue stream for participants.

The feasibility study is expected to be completed by the end of 2018, and, if successful, the pilot microgrid could be rolled out in Gippsland in 2019. The pilot would also involve more than 100 households with rooftop solar that will act as either energy users or suppliers, and around 20 commercial and industrial customers to create a range of energy supply and use patterns to test the scheme.

If successful, the scheme could be rolled out in other agricultural areas, allowing farmers and other participants to take control of their energy use while trading renewable energy from distributed energy resources - such as solar combined with batteries - back to the grid.

THE POWER OF DISTRIBUTED ENERGY RESOURCES



Australia is a leader in the decentralisation of its energy system with the highest per capita installation of rooftop solar PV in the world. More than 1.7 million Australian households, or around 20 per cent, already have solar panels on their roof.

The nation's enthusiastic uptake of rooftop solar is expected to be followed by similar growth in the number of households and businesses investing in batteries and energy management systems that include smart thermostats and other demand side technologies. This has been forecast to lead to a future where up to 45 per cent of all electricity could be produced by consumers.

The strong increase in generation of renewable energy presents challenges for the Australian Energy Market Operator (AEMO) in maintaining the grid's stability. Working with AEMO, ARENA has been at the centre of efforts to find solutions that will improve the security and reliability of a more decentralised and renewables-based electricity system in Australia. Part of that work is ARENA's demand response initiative, which is featured in an earlier case study.

To help the providers and users of distributed energy resources (DER) in Australia reach their full potential, ARENA also commenced a program of work this year in collaboration with AEMO, the Australian Energy Market Commission (AEMC) and the DER sector to identify and overcome technical, economic and regulatory challenges.

ARENA launched a $12.5 million funding initiative in early 2018 to support a range of DER pilot projects and integration studies, with the results of the round expected to be announced in the second half of the year.

The selected pilot projects will be expected to demonstrate new ways of understanding and managing the impacts of high amounts of DER in different parts of the grid. This will allow networks to connect more DER while reducing costs and operating within the technical limits of the system. The integration studies will be used to help startups, networks, retailers, government and systems operators develop solutions to address the technical, regulatory and commercial challenges of managing a grid that has high amounts of DER.

HORIZON DISTRIBUTED ENERGY TRIAL

Lead organisation: Horizon Power
ARENA funding: $1.9 million
Total project cost: $7.1 million
Location: Carnarvon, WA

One of ARENA's existing DER projects is being conducted by Horizon Power, which operates 37 distributed energy microgrids across Western Australia. As part of the pilot project, Horizon will install a variety of distributed energy technologies in at least 90 homes and businesses in the remote WA town of Carnarvon.

The technology will include 'internet of things' energy metering, rooftop solar, household battery storage and inverters with remote monitoring and control devices, as well as weather forecast devices.

The three-year trial aims to overcome the technical and commercial barriers faced by energy 'prosumers' who both produce and consume energy, potentially reducing the cost of distributed energy systems by up to 25 per cent.

This will make it possible to design future energy systems that make it easier for householders and businesses to contribute electricity to the broader system and be rewarded for doing so. It will also benefit energy users by identifying innovative solutions that will give them more choice in how to manage their own energy requirements.

SOLAR REDUCING DIESEL RELIANCE OF REMOTE COMMUNITIES

Image: Power and Water Corporation
(Photo taken by George Fragopoulos)

Australia's Northern Territory has many disparate and remote communities spread apart by vast distances. As with all cities and towns they each have their own energy needs. However, many of these communities rely on diesel for electricity generation that is costly and can be difficult to transport.

SOLAR ENERGY TRANSFORMATION PROGRAM (SETUP)

Lead organisation: Power and Water Corporation
ARENA funding: $35.0 million
Total project cost: $62.5 million
Location: NT

The Solar Energy Transformation Project (SETuP) offers two dozen of the NT's most remote communities, which are dependent on diesel generation, a viable solution to these issues by using renewable energy to displace current fuel usage. This lowers the fuel costs of each community, encourages economic activity and creates a greater sense of energy independence.

Funded by ARENA in partnership with the Northern Territory Government's Power and Water Corporation, the project is progressively integrating 10 megawatts of solar PV with existing diesel power stations located in remote areas around the NT, without compromising power quality and reliability.

Once complete, the project will have installed more than 30,000 solar panels and reduced the communities' reliance on diesel by 3.5 million litres each year.

Image: Power and Water Corporation

The majority of installations will see 15 per cent of diesel generation replaced by renewables. However the SETuP project in Daly River (Nauiyu) has achieved a much larger proportion of solar energy, displacing 50 per cent of the community's diesel generation and demonstrating what is possible for other communities.

A strong focus on community engagement throughout the roll-out of SETuP is providing valuable knowledge regarding the benefits that renewable energy can bring to remote communities.

WASTE NOT, WANT NOT

Image: MSM Milling

Less than one per cent of Australia's electricity needs are met by bioenergy, however the CSIRO has found that organic sources could provide as much as 20 per cent of the nation's electricity supply in the short term.

ARENA has been supporting a range of bioenergy and waste-to-energy projects since its inception, which involve a variety of innovative ways to capture energy from waste materials including sewerage, abattoir waste, landfill and organic litter.

Bioenergy projects supported by ARENA during 2017-18 include the following:

MSM MILLING BIOMASS FUEL SWITCH PROJECT

Lead organisation: MSM Milling
ARENA funding: $2.0 million
Total project cost: $5.4 million
Location: Manildra, NSW

Wood waste from the local timber industry will soon power MSM Milling's canola processing facility in Manildra, NSW. The makers of premium canola oil and stock feed aim to annually save 2500 kilolitres of LPG by converting their plant to run on biomass. This will allow them to take control of rising energy costs in addition to reducing their emissions.

The company will use wood waste from the nearby cyprus pine industry - branches, offcuts, forest thinnings and sawdust - to fuel its boilers to create heat that will be used throughout the canola processing facility. In addition, the oilseed crushing and processing plant will be run on woodchips and other raw residues.

The biomass fuel switch project is one of the first demonstrations of a large-scale food manufacturing company using biomass for thermal energy to reduce their costs and environmental impact.

GOULBURN BIOENERGY PROJECT

Lead organisation: ReNu Energy
Size: 1.6 MW
ARENA funding: $2.1 million
Total project cost: $5.8 million
Location: Goulburn, NSW

Thanks to ReNu Energy's innovative bioenergy generation project in Goulburn NSW, Southern Meats will be producing low-waste, low-emissions lamb that could create new market opportunities for Australia's agricultural sector.

The abattoir processes around 4000 sheep every day, using up to 20,000 kilowatt hours of electricity daily.

With support from ARENA, ReNu Energy is building a bioenergy facility that will convert liquid waste from the processing plant into a biogas to fuel a gas-fired electricity generator.

ReNu estimates the generator will be able to produce around 4000 megawatt hours of electricity each year, which is around half the amount used annually by the abattoir.

ARENA WIRE SOCIAL MEDIA REACH

During the past year, ARENA's focus on increasing its online knowledge sharing activities across its digital, web and social media mediums yielded excellent results. Some of the top results include:

Website: arena.gov.au
ARENAWire: arena.gov.au/blog
Facebook: AustRenewableEnergyAgency
Twitter: @ARENA_aus

40% INCREASE
Web engagement increased by 40 per cent

200% INCREASE
Facebook reach increased by 200 per cent with an average of 240,000 people each month reading posts

54.7K DOWNLOADS
ReWired – ARENA's podcast series - was downloaded 54,700 times

#1 ITUNES CHARTS
Series Two of ReWired reached number one on the iTunes charts under the energy sector. Apple also selected the podcasts to feature on their iTunes banner

Videos posted on ARENA Wire continue to be popular on Facebook. The top five blog videos for 2017-18 were:

61,000 VIEWS	Students learning in the new self-powered Hivve classrooms
27,000 VIEWS	Flinders Island's new Hybrid Energy Hub could have global reach
24,000 VIEWS	Cheap, abundant substance that could revolutionise how we store energy
24,000 VIEWS	The great Aussie rubbish tip has come a long way
23,000 VIEWS	Can this Tassie wind farm provide grid stability services?

MANAGEMENT & ACCOUNTABILITY

This section provides information about:

- our Board, its governance practices and activities
- our management and people
- engagement with our Portfolio Minister
- engagement with our stakeholders.

OUR BOARD

Responsibilities

The Board sets ARENA's investment strategies and priorities, oversees the running of the organisation, and approves funding for projects up to $50 million. The Minister responsible for ARENA approves funding more than $50 million, while the ARENA CEO has board-delegated authority to approve funding up to $1 million. The Board may also delegate to the CEO specific powers or functions, subject to any directions specified by the Board and any applicable ARENA policies and legislation.

The Board formally met nine times during 2017-18.

Membership

The Board consists of up to six appointed members as well as the Secretary of the Department responsible for the Agency. Board members (with the exception of the ex-officio member) are appointed by the Minister.

Appointed members of the Board must have experience or knowledge in renewable energy technology, commercialisation, business investment or corporate governance. This ensures expert administration of ARENA's funds.

Board members may be appointed for a term of up to two years, and may be reappointed for a total of up to six continuous years.

At 30 June 2018, members of the ARENA Board were:

- Mr Martijn Wilder AM (Chair)
- Ms Samantha Hogg
- Ms Susan Jeanes
- Ms Meg McDonald
- Mr Dougal McOmish
- Ms Stephanie Unwin
- Mr Finn Pratt AO PSM (ex-officio member as Secretary of the Department of the Environment and Energy)
- Ms Jo Evans (delegate for Mr Finn Pratt AO PSM).

With the exception of Mr Pratt and his delegates, these Board members were appointed by the Portfolio Minister on 17 April 2018 for a two-year term.

ARENA Board members (from left): Mr Dougal McOmish, Ms Jo Evans (delegate for Mr Finn Pratt AO PSM), Ms Susan Jeanes, Mr Martijn Wilder AM (Chair), Ms Meg McDonald, Ms Samantha Hogg. Not present: Ms Stephanie Unwin.

Previous members of the Board, whose terms concluded on 17 April 2018, were:

- Ms Maria Atkinson AM
- Mr Jonathan Jutsen
- Dr Katherine Woodthorpe AO.

There were two Secretaries of the Department during the reporting period, both of whom were an ex-officio member of the Board during their tenure.

Dr Gordon de Brouwer PSM was Secretary of the Department until 8 September 2017, and Mr Finn Pratt AO PSM commenced as Secretary of the Department on 18 September 2017.

BOARD MEMBER PROFILES

Mr Martijn Wilder AM
Chair / Non-executive member

Start date: April 2016, re-appointed April 2018
Board meeting attendance: 9/9 meetings

Martijn Wilder is head of Baker & McKenzie's Global Environmental Markets and Climate Change practice specialising in climate change law, international carbon and broader environmental markets, climate and conservation finance and conservation projects. He is also Chair of the Baker & McKenzie Law for Development Initiative and Professor of Climate Change Law at the Australian National University.

In addition to being Chair of ARENA, Martijn is a Director of WWF (Australia) and the Climate Council. He also holds advisory roles as Chair of the NSW Climate Change Council and Governing Board Member of the Renewable Energy and Energy Efficiency Partnership, and is a member of the Wentworth Group of Concerned Scientists. Martijn is also Deputy Chair of the Private Sector Roundtable of the Asia Pacific Rainforest Recovery Plan.

Martijn chaired the Independent Review Committee of the Victorian Climate Change Act, was formerly Chairman of Low Carbon Australia and for many years chaired TRAFFIC (Oceania).

In 2012, Martijn was awarded a Member of the Order of Australia in recognition of his "service to environmental law, particularly in the area of climate change through contributions to the development of law, global regulation, public policy and the promotion of public debate, and to the community".

Martijn holds a BEcon (Hons) from the University of Sydney, LLB Honours from the Australian National University, LLM from the University of Cambridge and studied at the Hague Academy Centre for Studies and Research in International Law and International Relations. He is also a Graduate Member of the Australian Institute of Company Directors.

Ms Samantha Hogg
Non-executive member

Start date: April 2018
Board meeting attendance: 2/2 meetings

Samantha Hogg brings more than 25 years of experience in executive management across the resources and road infrastructure sectors as well as broad Australian and international experience in finance, marketing and strategic projects.

Her most recent executive role was as Chief Financial Officer of Transurban Limited during the period that the business grew to become a Top 20 ASX company.

Samantha holds positions on a number of boards, serving as Chair of Tasmanian Irrigation, Chair of TasRail, non-executive Director of Hydro Tasmania and non-executive Director of MaxiTRANS.

She resides on a family farm outside of Launceston in Northern Tasmania and is a graduate of the Australian Institute of Company Directors.

Ms Susan Jeanes
Non-executive member

Start date: April 2016, re-appointed April 2018
Board meeting attendance: 9/9 meetings

Susan Jeanes is a consultant at Jeanes Holland and Associates, which assists companies that are developing and promoting the goals of sustainability, particularly in the emerging renewable energy sector.

She has worked closely with the Australian renewable energy and sustainability sectors for more than two decades, most recently in her roles as the Chief Executive Officer of the Australian Geothermal Energy Association, the national body representing the Australian geothermal energy industry, and previously as the Chief Executive Officer of the Renewable Energy Generators Australia.

Susan is the Chair of the South Australian Centre for Geothermal Energy Research and the Centre for Energy Technology. She is also a former Director of The Climate Institute. Prior to 2002, she worked exclusively in the political area as Advisor to the former Federal Environment Minister Robert Hill on climate change, renewable energy and the urban environment, and serving the Federal Parliament as the Member for Kingston. Susan has tertiary qualifications in politics and environmental studies.

Ms Meg McDonald
Non-executive member

Start date: April 2016, re-appointed April 2018
Board meeting attendance: 8/9 meetings

Meg McDonald has career experience at senior levels in business and government across the fields of energy and environment.

From 2013 to 2015 she served as Chief Operating Officer of the Clean Energy Finance Corporation. Previously, from 2010 to 2013, Meg was CEO of Low Carbon Australia Limited (LCAL), leading the organisation's development of innovative financial solutions for energy efficiency and investment partnerships for financing projects deploying low emissions technologies. Over three years, LCAL financed more than $80 million in projects valued at more than $270 million. LCAL merged with the CEFC in 2013.

From 2002 to 2010, Meg held roles with the global resources and manufacturing corporation, Alcoa, including as Director, Global Issues, Alcoa Inc. in New York and as Global President of Alcoa Foundation. The Foundation was one of the largest US corporate foundations, managing a fund with assets of more than US$500 million and which made annual grants up to US$50 million across 24 countries in environment, sustainability and social projects.

While in the Australian Public Service from 1978 to 2002, Meg had roles across a variety of portfolios. She served as a senior Australian diplomat, including in Geneva, as Assistant Secretary, Environment and Antarctic Branch, and in the Australian Embassy in Washington as Australia's Deputy Chief of Mission to the United States.

As Australia's Ambassador for the Environment from 1997 to 1998, Meg was Australia's lead negotiator for the Kyoto Protocol and played a key role in shaping those negotiations and other environment treaties.

Meg holds an Honours Degree in Applied Science from the University of NSW and has served on boards and a variety of advisory bodies in Australia and the United States.

Mr Dougal McOmish
Non-executive member

Start date: April 2018
Board meeting attendance: 2/2 meetings

Dougal McOmish has more than twelve years of experience in senior management across the agriculture and financial advisory sectors, as well as large-scale infrastructure project delivery and stakeholder management.

He is the Chief Operating Officer of Sundrop Farms, a global pioneer in sustainable agriculture. Dougal joined Sundrop Farms in 2015 to lead business and project development efforts as Sundrop expands its operations in Australia and into new product categories.

That work has involved steering the operation's adoption of a revolutionary greenhouse system that harnesses the sun's energy to produce freshwater for irrigation, electricity to power its greenhouse, and energy to heat and cool its crops.

Dougal's investment banking and project management experience stretches across the infrastructure, utilities, resources and oil and gas sectors, both in Australia and overseas.

He now lives in the Adelaide Hills, and is an economics graduate of the University of Adelaide.

Ms Stephanie Unwin
Non-executive member

Start date: April 2018
Board meeting attendance: 1/2 meetings

Stephanie Unwin is General Manager Transformation and Technology of CBH Group, where she is responsible for information technology and overseeing the transformation of CBH to a low-cost, efficient supply chain from paddock to port. Prior to that she was Chief Executive Officer of Phylogica, a biotech and medical devices company in Western Australia.

Stephanie has significant executive and board-level experience across a variety of sectors, is a former General Manager Commercial at energy retailer Synergy and General Counsel at Verge Energy. During her time at Synergy, Stephanie was responsible for strategy and innovation, modelling and analytics, corporate affairs and communication, policy and regulation, corporate development and continuous improvement.

Stephanie has considerable experience with renewable energy, including being a key negotiator at Synergy and then the General Manager with oversight for the construction and commissioning of the Greenough River Solar Farm and Mumbida Wind Farm. She also conceived of and developed a renewables infrastructure fund to initial commercial close, took the Alkimos Beach Community Battery Storage project through funding to commissioning and into delivery, and developed the company's forward strategy for innovation and renewables.

She was also the Chair and operational Board member for the joint venture companies supplying renewable energy from the solar and wind farms.

In addition to being a member of the ARENA Board, Stephanie is a non-executive director of ASX-listed independent power producer Zenith Energy.

Finn Pratt AO PSM
Ex-officio member

Commenced: September 2017
Board meeting attendance: 8/8 meetings
(attended by Mr Pratt or his delegate)

Finn Pratt has a public service career spanning 35 years and during this time he has driven many government priorities. As Secretary of the Department of the Environment and Energy he is responsible for delivering energy market reform, environmental policy priorities such as biodiversity conservation and protecting the Great Barrier Reef.

Finn was appointed Secretary of the Department of the Environment and Energy in September 2017. Before this appointment, he held other senior positions including Secretary of the Department of Social Services (2013-2017), Secretary of the Department of Families, Housing, Community Services and Indigenous Affairs (2011-2013), Secretary of the Department of Human Services (2009-2011) and the Chief Executive Officer of Centrelink (2008-2009).

In these roles, he has been responsible for setting the strategic and corporate directions of each Department and its portfolio and providing senior policy advice to the portfolio Ministers and Assistant Ministers. He is a member of the Jawun Board and was Chair of the Australia and New Zealand School of Government (ANZSOG) from 2014 to 2017.

Finn was awarded a Public Service Medal in 2008 and in 2015 became an Officer of the Order of Australia for distinguished service in public administration, social policy development and service delivery reform, and improving support for people with disability, their families and carers. Finn has a Bachelor of Arts degree from the Australian National University.

Jo Evans
Ex-officio member
(Delegate for Mr Finn Pratt AO PSM)

Jo Evans is a Deputy Secretary at the Department of the Environment and Energy. Jo is responsible for Climate Change and Energy Innovation, which includes the Emissions Reduction Fund, international climate programs, ozone and air quality programs and clean energy innovation. Jo is proud to be the Department's Indigenous Champion.

Jo has worked in a number of portfolios including the Department of Agriculture and Water Resources and in the Department of the Prime Minister and Cabinet. Prior to joining the Australian Public Service in 2000, Jo worked for management consultants McKinsey & Company.

Jo has a Masters of Public Policy from the Woodrow Wilson School of Public and International Affairs, Princeton University; a Masters in Environmental Science from the University of Melbourne; and a combined bachelor degree in Asian studies and economics (honours) from the Australian National University.

Ms Maria Atkinson AM
Non-executive member

Term expired: April 2018
Board meeting attendance: 6/7 meetings

Mr Jonathan Jutsen
Non-executive member

Term expired: April 2018
Board meeting attendance: 7/7 meetings

Dr Katherine Woodthorpe AO
Non-executive member

Term expired: April 2018
Board meeting attendance: 6/7 meetings

Dr Gordon de Brouwer PSM
Ex-officio member

Ended: September 2017
Board meeting attendance: 1/1 meeting
(attended by Dr de Brouwer or his delegate)

BOARD GOVERNANCE PRACTICES

ARENA places strong emphasis on governance. The Board's business and meetings were conducted during the reporting period in accordance with the requirements of applicable legislation and in line with best practice. Its members regularly review the Board's operation as part of their responsibility to continually improve the efficiency and effectiveness of governance processes.

BOARD COMMITTEES

In June 2017, the Board established two new committees to the Board, in addition to the existing Risk and Audit Committee. Details of each Board committee are provided below.

Risk and Audit Committee

The Board's Risk and Audit Committee (RAC) was established as a sub-committee of the Board in compliance with section 45 of the PGPA Act. The RAC formally met four times during 2017–18.

The RAC is responsible and accountable to the ARENA Board for the performance of its functions, which are to provide independent advice and assurance to the Board on the appropriateness of ARENA's financial reporting, performance reporting, system of risk oversight and management and system of internal control. It also provides a forum for communication between the Board and the internal auditor (Callida Consulting) as well as the external auditor (Australian National Audit Office).

The Board has authorised the RAC, within the scope of its responsibilities, to:

- seek any information that it requires from an ARENA official, consultant or external party (subject to any legal obligation to protect information)
- discuss any matters with the external auditor or other external parties (subject to confidentiality considerations)
- obtain legal or other independent professional advice, as considered necessary to meet its responsibilities, at ARENA's expense and in accordance with its Charter.

RAC members are expected to understand and observe the requirements of the PGPA Act and Public Governance, Performance and Accountability Rule 2014. In 2017–18 the RAC was made up of the following Board members and independent members:

- Ms Meg McDonald (Board member)
- Ms Samantha Hogg (Board member, from June 2018)
- Dr Katherine Woodthorpe AO (Board member, until April 2018)
- Ms Jenny Morison (RAC Chair and independent member)
- Ms Judith Smith (independent member).

Review Implementation Oversight Committee

The Review Implementation Oversight Committee (RIOC) was created as a Board committee under section 48 of the ARENA Act to assist the Board by providing oversight of the implementation of operational improvements following a review.

During the reporting period, the RIOC formally met seven times and was made up of the following Board members:

- Mr Martijn Wilder AM (ARENA Chair and RIOC Chair)
- Ms Meg McDonald (Board member)
- Ms Jo Evans (as the delegate of the Secretary of the Department, who is an ex-officio member of the Board).

People and Culture Committee

The People and Culture Committee (PCC) was created as a Board committee under section 48 of the ARENA Act to assist the Board by reviewing, reporting on and, if required, making recommendations to the Board or management on matters relating to human resources, culture and diversity, including the representation of women, compensation policy and continuity and development of senior management for the Agency.

During the reporting period, the PCC formally met three times and was made up of the following Board members and independent members:

- Ms Meg McDonald (Board member and PCC Chair)
- Ms Susan Jeanes (Board member)
- Ms Jo Evans (as the delegate of the Secretary of the Department, who is an ex-officio member of the Board)
- Ms Sonya Clancy (independent member).

RISK MANAGEMENT

Approach to risk

The ARENA Board is ultimately responsible for the operation of ARENA and its management of risk. Effective risk management is an essential part of performance management. While the Board and ARENA executive are ultimately accountable for risk management, it is also the responsibility of all ARENA workers to manage risk.

In 2017, ARENA undertook a comprehensive review of its risk policies, and adopted an enhanced risk management framework that embeds risk management practices and mitigation measures into all processes and operations. ARENA's Risk Report, which includes a Risk Appetite Statement, Risk Dashboard and Risk Register, is provided to the Board and RAC at each meeting and is regularly reviewed both at Board and Committee, as well as management level.

ARENA classifies its risks in three categories:
- safety, compliance and mandate
- people, environment and operations
- innovation, technology and projects.

Overall ARENA has assessed 14 major risks, of which two remain outside the Board's risk appetite and for which additional treatments have been put in place to manage and reduce risk. The key risks under consideration include cybersecurity and loss of corporate memory due to changes in personnel and Board members.

ARENA's RAC provides independent assurance and advice to the Board on ARENA's risk management.

Conflict of interest

In 2017–18, the Board continued to manage any conflicts in accordance with its conflict of interest policy, which was substantially revised in August 2017. The policy sets out:

- the duties in respect to the disclosure of actual or potential conflicts applying to:
  - all ARENA workers, including employees of the Department who are made available to ARENA
  - the Board (including committee and advisory panel members), the Chief Executive Officer and the Chief Financial Officer
  - all ARENA workers, contractors and consultants engaged by ARENA
- how individuals are to discharge their duties under the policy
- how conflict of interest declarations are managed.

All Board, committee and panel members are required to complete a conflict of interest form upon appointment in accordance with the requirements of ARENA's conflict of interest policy. They are also required to provide updated declarations to the Secretariat in the event that new conflicts arise or the circumstances of their original notification changes.

The declaration of conflicts are a standing item at all Board and Committee meetings. The process followed is that, at least two days prior to the meeting date, the Secretariat circulates to members a list of all entities to be discussed in a material manner in the upcoming meeting. If the member notifies the Secretariat that he or she has a conflict with one of the entities, then the declaration is referred to the ARENA Chair, as delegate, to determine materiality and, if so, how such a conflict will be managed. Conflicts are typically managed by excluding the conflicted member from discussions and decisions relating to the paper dealing with entity with which they have notified a conflict. The delegate for

determining the materiality of any conflicts of interests notified by Board members is the ARENA Chair and, in the case of the ARENA chair, the Minister. If a conflict arises during the meeting, the matter will be similarly referred to the Chair in order that it can be managed.

All conflict declarations, including any management action agreed, are recorded in a conflict of interest register maintained by ARENA's Legal and governance team.

Fraud control

The Agency's fraud control arrangements comply with section 10 of the PGPA Rule.

ARENA's Fraud Control Plan is reviewed by the Board on an annual basis to ensure that ARENA has in place appropriate mechanisms for preventing, detecting incidents of, investigating and otherwise dealing with, and recording of fraud. ARENA has taken all reasonable measures to minimise the incidence of fraud. ARENA's ongoing adherence to the plan encompasses fraud risk assessment and periodic review. In addition, reporting on fraud is a standard item at all Board and RAC meetings.

All of ARENA's workers are provided with annual fraud awareness training.

Indemnities and insurance premiums of officers

During 2016-17, ARENA was a member of the Comcover self-managed fund, which includes cover for directors and officers against liability claims. The premium paid for ARENA's insurance policy was $162,885 (excluding GST).

ARENA has entered into a Deed of Indemnity, Access and Insurance with each Board member, with the exception of the Secretary of the Department of Environment and Energy. ARENA has also entered into a Deed of Indemnity, Access and Insurance with the CEO of ARENA.

The purpose of this deed is to provide Board members with access to the ARENA books and to provide additional indemnity and insurance coverage.

OUR PEOPLE

ARENA is a dynamic and outcomes-oriented agency, staffed by highly qualified and experienced people. The Agency also aims to be agile, with the ability to respond quickly to any changes in its operating environment.

Staff

The ARENA Act provides for ARENA to have two employees, the Chief Executive Officer and Chief Financial Officer. All other ARENA staff are employed by the portfolio Department under the *Public Service Act 1999* and made available to ARENA by the Secretary of the Department. ARENA also engages consultants, contractors and service providers as necessary.

At 30 June 2018, the Agency had two ARENA staff (CEO and CFO), 41 departmental staff (38.6 FTE) including staff in non-ongoing positions, and a number of consultants and contractors. ARENA has three offices, which are located in Canberra, Sydney and Melbourne.

Chief Executive Officer

ARENA's Chief Executive Officer (CEO) was Mr Ivor Frischknecht during the reporting period. In August 2018, Mr Frischknecht was succeeded by Mr Darren Miller.

The CEO is appointed by the Portfolio Minister on the recommendation of the Board for a period of up to three years and is eligible for reappointment.

The CEO has responsibility for the day-to-day business of ARENA, including:

- executing directions of the Board
- overseeing administration of existing projects
- supporting the Board to develop and execute its General Funding Strategy, forward work plan and initiatives
- representing ARENA at public events and managing stakeholder engagement
- analysing and sharing knowledge and information about renewable energy technologies
- developing advice to the Minister on renewable energy technology innovation.

Chief Financial Officer

ARENA's CEO is supported by an executive team, including a Chief Financial Officer (CFO). The CFO during 2017–18 was Mr Ian Kay.

DARREN MILLER

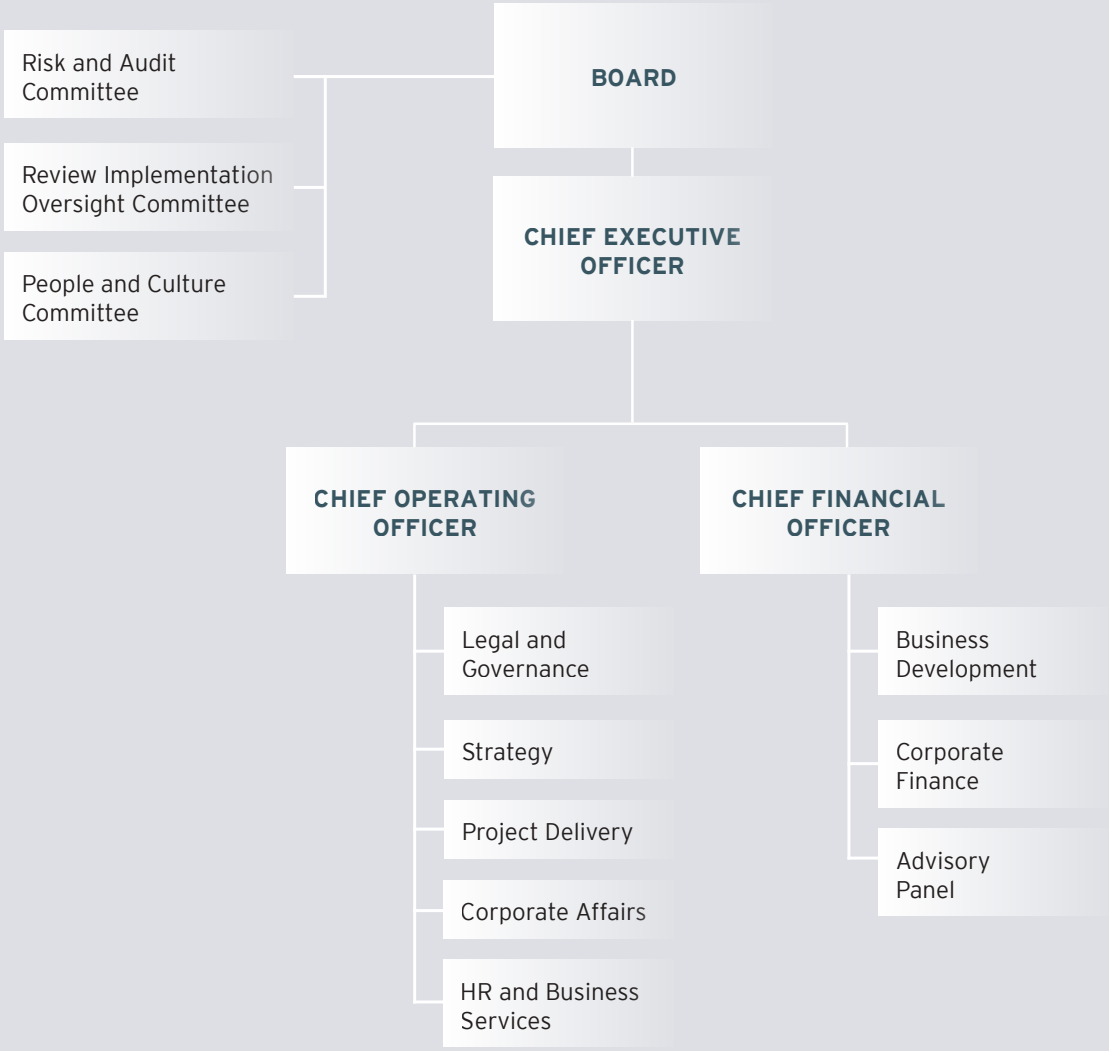
Darren Miller commenced as ARENA's CEO on 27 August 2018. He has more than 25 years' experience across a range of sectors including renewable energy, electricity retail, technology, finance, media and entertainment.

Darren was co-founder and CEO of Mojo Power, an innovative electricity retailer, from 2015 until July 2018. He was previously the Director of Asset Finance at Sungevity Australia in 2014, and co-founder and CEO of Sumwise, a technology and services company from 2007 to 2013.

Darren's previous experience includes a position as investment manager for Publishing and Broadcasting Limited (PBL) and Consolidated Press Holdings (CPH) as well as roles at New Zealand Natural and Ernst & Young.

Darren is a Chartered Accountant with a Bachelor of Commerce (Hons) from the University of New South Wales.

FIGURE 7: ARENA ORGANISATIONAL STRUCTURE



Values

ARENA's updated organisational values were approved by the Board in late 2017.

The Agency has a strong commitment to modelling these values and significant efforts have been made in the reporting period to embed them into ARENA's organisational culture.

Workforce engagement

The 2018 ARENA worker survey received a high response rate with 95 per cent of workers responding to the survey (an increase from 62 per cent the year before). Across the past 12 months, ARENA has increased management focus on its people and launched initiatives focussed on career development, culture and communication resulting in a high engagement score.

Workforce planning

Significant progress has been made in establishing sound workforce planning principles to more effectively manage ARENA's workforce. This not only has an impact on the way recruitment is managed but also in actively planning for changes to the size and shape of the workforce.

Workplace diversity

For the reporting period, the gender ratio for the ARENA Board and senior personnel within ARENA was:

- of the seven Board members, four were female
- of the nine personnel in ARENA's Executive Leadership Team (excluding the CEO), four were female.

Of the departmental staff working at ARENA, four per cent advised they were of a non-English speaking background and two per cent reported as having a disability. No workers identified as Indigenous.

Work health and safety

In accordance with the *Work Health and Safety Act 2011* (WHS Act), ARENA aims to ensure - so far as reasonably practicable - the health and safety of workers (who are engaged by us or whose work is influenced or directed by us) and other persons who may be put at risk by work carried out as part of the conduct of ARENA's business or undertaking.

ARENA considers health and safety throughout the life cycle of the funding process and its officials promote a positive safety culture at ARENA. The Board closely monitors health and safety in both the projects it supports and in ARENA workplaces.

While supported in securing the health and safety of its workers during its day-to-day operations by the portfolio Department, during 2017-18 ARENA developed an internal WHS Safety Management System. This was implemented with the release of a WHS Management System Manual, with supporting guidelines and processes continuing to be implemented in a phased approach.

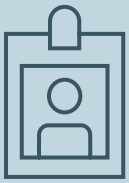
In respect of ARENA workers, no investigations were conducted and no notifiable incidents were reported during 2017–18. Reporting in respect of Departmental staff made available to ARENA is covered in the Department of the Environment and Energy's Annual Report 2017–18.

ARENA'S 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 strive for an approach that is:

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.

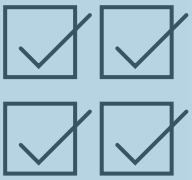


STAKEHOLDER-FOCUSSED

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

COLLABORATIVE

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



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.

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.

ENGAGEMENT WITH OUR PORTFOLIO MINISTER

During 2017-18 the Minister responsible for ARENA was the Hon Josh Frydenberg MP, Minister for the Environment and Energy.

Ministerial approval

The Australian Government included safeguards in the ARENA Act to ensure that ARENA is transparent and accountable in its funding decisions.

Accordingly, the Portfolio Minister must approve ARENA's General Funding Strategy (GFS) and any guidelines for programs that could grant funding more than $15 million for projects. The Minister must also approve individual projects where grants more than $50 million are to be awarded.

Ministerial requests and directions

The Minister made no requests of ARENA under section 11 of the ARENA Act during 2017–18. He issued one direction under section 13 of the Act, which was to work with the CEFC, in consultation with the Infrastructure and Project Financing Agency, to provide the Government with advice on a proposal by SolarReserve Australia to construct a concentrated solar thermal power plant at Port Augusta, South Australia.

The Minister also wrote to the Board to encourage ARENA to continue focusing on waste to energy projects, particularly those involving the avoidance of landfill, and to consider collaborating with the CEFC on such projects.

Under section 22 of the PGPA Act, ARENA must comply with Government Policy Orders (made by the Finance Minister) to the extent that they apply. No Government Policy Orders applied to ARENA during 2017–18.

Reports to the Minister

ARENA kept the Minister informed about its operations during the year by providing updates on the Agency's progress towards meeting the objective of the ARENA Act. It also provided the Minister with reports of each ARENA Board meeting, including key deliberations, meeting outcomes and significant correspondence.

Following each Board meeting, the Chair provided the Minister with a report on the key outcomes of that meeting.

There were no significant issues reported to the Minister under paragraph 19(1)(e) of the PGPA Act that relates to non-compliance with the finance law in relation to ARENA.

ENGAGEMENT WITH OUR STAKEHOLDERS

ARENA service charter

ARENA aims to provide a high standard of service to all its stakeholders, focusing on the achievement of honest and ethical working relationships that are underpinned by genuine consultation and feedback. As the Agency continues to help drive the development and deployment of renewable energy in Australia, it anticipates an increase in the volume of contact with stakeholders. ARENA aims to continue to deliver professional and timely services to an expanded customer base.

Complaints handling

ARENA has an established internal complaints and review process, and a complaints policy, which allows reviews of ARENA decisions and complaints about service quality to be resolved fairly and simply. ARENA's complaint-handling policy was recently reviewed and updated.

Information on the complaints and review process is available at arena.gov.au/contact/.

Freedom of information

Australian Government entities that are subject to the *Freedom of Information Act 1982* (FOI Act) are required to publicly publish information as part of the Information Publication Scheme. ARENA's publications covered by the scheme are accessible from the ARENA website at arena.gov.au.

There were three requests for information under the FOI Act received in 2017-18.

Information on how to make a request under the FOI Act is available on the Department of the Environment and Energy's website.

Contact details are:

FOI Contact Officer
Legal Section
Department of the Environment and Energy
GPO Box 787 CANBERRA ACT 2601
Email: foi@environment.gov.au
Phone: 02 6274 2098

Public interest disclosure

There were no disclosures under the *Public Interest Disclosure Act 2013* in 2017–18.

OTHER EVENTS AND ACTIVITIES

Key governance events and other activities affecting ARENA

There were no key governance events or other activities affecting ARENA during the reporting period.

Judicial decisions and reviews by outside bodies

During 2017–18 ARENA was not subject to any judicial decisions or reviews by administrative tribunals, the Auditor-General, the Australian Government Ombudsman or the Office of the Australian Information Commissioner.

ARENA received an unqualified audit report on its financial statements for 2017–18. The Auditor-General's independent report is presented in the financial statements section of this annual report.

OTHER REPORTING REQUIREMENTS

This section should be read in conjunction with ARENA's audited financial statements for 2017-18, which appear in the financial statements section of this annual report.

Legal expenditure

ARENA outsources all legal work. During 2017–18 ARENA incurred $2,274,995 (excluding GST) in external legal service expenditure. ARENA reported the expenditure to the Office of Legal Services Coordination as required under the Legal Services Directions 2017.

Material matters

ARENA did not have any 'material' matters disclosed in the financial statements as defined in paragraph 7 of the Public Governance, Performance and Accountability (Financial Reporting) Rule 2015.

Related entity transactions

An ARENA Board member is a non-executive Board member of Right Angle Business Services Pty Ltd. During the reporting period ARENA entered into the following transactions:

- grant payments totalling $322,505 were made to Right Angle Business Services Pty Ltd for the purpose of developing a concentrating solar thermal roadmap.

A partner of one of ARENA's key management personnel is a Director of Planet Innovation Pty Ltd. During the reporting period ARENA entered into the following transactions:

- grant payments totalling $647,955 were made to Planet Innovation Pty Ltd for the ZenHQ Virtual Power Plant project.

The partner is also a Director on the Board of Origin Energy LPG Ltd and was a Director on the Board of Zen Ecosystems until May 2018. No financial transactions occurred during the reporting period.

An ARENA Board member is a non-executive Board member of Hydro-Electric Corporation. During the reporting period ARENA entered into the following transactions:

- grant payments totalling $3,013,679 were provided to Hydro-Electric Corporation during the reporting period. The transactions were for several projects including Flinders Island Hybrid Energy Hub and the Tasmanian Hydropower System feasibility study.

These arrangements were entered into prior to this Board member being appointed to ARENA on 17 April 2018.

A non continuing ARENA Board member is the Chair of the Board for the Australian Alliance for Energy Productivity Ltd (A2EP). During the reporting period ARENA entered into the following transactions:

- $6,058 was provided in respect of professional services.

Service level agreement

The Portfolio Department provides corporate support for ARENA's day-to-day operations, with a service level agreement setting out the services to be provided by the Department to ARENA along with the applicable services standard. The service level agreement is subject to six-monthly review. Following the review of the agreement in 2017-18, the updated agreement will be executed early in 2018-19.

Subsidiaries

ARENA did not have any subsidiaries during 2016–17.

Environmental performance

Appendix 2 sets out ARENA's performance against section 516A of the *Environment Protection and Biodiversity Conservation Act 1999*.

Image: APA Group

FINANCIAL STATEMENTS

This section contains ARENA's audited financial statements for the year ended 30 June 2018.

INDEPENDENT AUDITOR'S REPORT

To the Minister for the Environment

To the Minister for Energy

Opinion

In my opinion, the financial statements of the Australian Renewable Energy Agency for the year ended 30 June 2018:

(a) comply with Australian Accounting Standards – Reduced Disclosure Requirements and the *Public Governance, Performance and Accountability (Financial Reporting) Rule 2015*; and

(b) present fairly the financial position of the Australian Renewable Energy Agency as at 30 June 2018 and its financial performance and cash flows for the year then ended.

The financial statements of the Australian Renewable Energy Agency, which I have audited, comprise the following statements as at 30 June 2018 and for the year then ended:

- Statement by the Board, Chief Executive and Chief Financial Officer;
- Statement of Comprehensive Income;
- Statement of Financial Position;
- Statement of Changes in Equity;
- Cash Flow Statement;
- Notes to the financial statements, comprising an Overview and other explanatory information.

Basis for Opinion

I conducted my audit in accordance with the Australian National Audit Office Auditing Standards, which incorporate the Australian Auditing Standards. My responsibilities under those standards are further described in the *Auditor's Responsibilities for the Audit of the Financial Statements* section of my report. I am independent of the Australian Renewable Energy Agency in accordance with the relevant ethical requirements for financial statement audits conducted by the Auditor-General and his delegates. These include the relevant independence requirements of the Accounting Professional and Ethical Standards Board's APES 110 *Code of Ethics for Professional Accountants* (the Code) to the extent that they are not in conflict with the *Auditor-General Act 1997*. I have also fulfilled my other responsibilities in accordance with the Code. I believe that the audit evidence I have obtained is sufficient and appropriate to provide a basis for my opinion.

Accountable Authority's Responsibility for the Financial Statements

As the Accountable Authority of the Australian Renewable Energy Agency, the Board of Directors is responsible under the *Public Governance, Performance and Accountability Act 2013* for the preparation and fair presentation of annual financial statements that comply with Australian Accounting Standards – Reduced Disclosure Requirements and the rules made under that Act. The Board is also responsible for such internal control as the Board determines is necessary to enable the preparation and fair presentation of financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, the Board is responsible for assessing the Australian Renewable Energy Agency's ability to continue as a going concern, taking into account whether the entity's operations will cease as a result of an administrative restructure or for any other reason. The Board is also responsible for disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless the assessment indicates that it is not appropriate.

GPO Box 707 CANBERRA ACT 2601
19 National Circuit BARTON ACT
Phone (02) 6203 7300 Fax (02) 6203 7777

Auditor's Responsibilities for the Audit of the Financial Statements

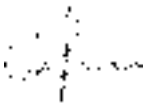
My objective is to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes my opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with the Australian National Audit Office Auditing Standards will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of the financial statements.

As part of an audit in accordance with the Australian National Audit Office Auditing Standards, I exercise professional judgement and maintain professional scepticism throughout the audit. I also:

- identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for my opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control;
- obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control;
- evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by the Accountable Authority;
- conclude on the appropriateness of the Accountable Authority's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the entity's ability to continue as a going concern. If I conclude that a material uncertainty exists, I am required to draw attention in my auditor's report to the related disclosures in the financial statements or, if such disclosures are inadequate, to modify my opinion. My conclusions are based on the audit evidence obtained up to the date of my auditor's report. However, future events or conditions may cause the entity to cease to continue as a going concern; and
- evaluate the overall presentation, structure and content of the financial statements, including the disclosures, and whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation.

I communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that I identify during my audit.

Australian National Audit Office



Peter Kerr

Executive Director

Delegate of the Auditor-General

Canberra

14 September 2018

CONTENTS

Certification

Financial statements

Statement of Comprehensive Income
Statement of Financial Position
Statement of Changes in Equity
Cash Flow Statement

Notes to the financial statements

Overview
Financial Performance
1.1 Expenses
1.2 Own-Source Revenue and Gains
Financial Position
2.1 Financial Assets
2.2 Non-Financial Assets
2.3 Payables
2.4 Other Provisions
People and Relationships
3.1 Employee Provisions
3.2 Key Management Personnel Remuneration
3.3 Related Party Disclosures
Managing Uncertainties
4.1 Financial Instruments
Other Information
5.1 Assets Held in Trust
5.2 Budget Variance Commentary

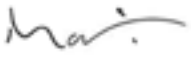
Australian Renewable Energy Agency

STATEMENT BY THE BOARD AND CHIEF FINANCIAL OFFICER

In our opinion, the attached financial statements for the year ended 30 June 2018 comply with subsection 42(2) of the *Public Governance, Performance and Accountability Act 2013* (PGPA Act), and are based on properly maintained financial records as per subsection 41(2) of the PGPA Act.

In our opinion, at the date of this statement, there are reasonable grounds to believe that the Australian Renewable Energy Agency will be able to pay its debts as and when they fall due.

This statement is made in accordance with a resolution of the directors.



Martijn Wilder AM
Chair of the Board

14 September 2018

Ian Kay
Chief Financial Officer

14 September 2018

Statement of Comprehensive Income

for the period ended 30 June 2018

	Notes	2018 $'000	2017 $'000	Original[1] Budget $'000
NET COST OF SERVICES				
Expenses				
Employee benefits	1.1A	**1,068**	977	951
Suppliers	1.1B	**28,965**	26,872	32,725
Grants	1.1C	**176,327**	160,738	267,501
Depreciation and amortisation	2.2	**537**	175	518
Write-down and impairment of assets	1.1D	**293**	-	-
Total expenses		**207,190**	188,762	301,695
Own-source revenue				
Interest	1.2A	**1,476**	1,163	1,000
Other revenue	1.2B	**6,737**	10,173	6,640
Total own-source revenue		**8,213**	11,336	7,640
Net cost of services		**(198,977)**	(177,426)	(294,055)
Revenue from Government	1.2C	**209,073**	192,104	259,998
Surplus on continuing operations		**10,096**	14,678	(34,057)
OTHER COMPREHENSIVE INCOME				
Items not subject to subsequent reclassification to net cost of services				
Increase in asset revaluation reserve	2.2	**(238)**	-	-
Decrease in the value of investment		**584**	4,080	**-**
Total other comprehensive income		**346**	4,080	**-**
Total comprehensive income		**9,750**	10,598	(34,057)

The above statement should be read in conjunction with the accompanying notes.

[1] ARENA's budget as published in the 2017-18 Portfolio Budget Statements.

Statement of Financial Position

as at 30 June 2018

	Notes	2018 $'000	2017 $'000	Original[1] Budget $'000
ASSETS				
Financial assets				
Cash and cash equivalents	2.1A	**56,389**	55,738	13,976
Trade and other receivables	2.1B	**2,546**	2,586	1,676
Investments	2.1C	**30,641**	22,502	37,496
Total financial assets		**89,576**	80,826	53,148
Non-financial assets				
Leasehold improvements	2.2	**1,734**	1,307	-
Plant and equipment	2.2	**128**	220	890
Computer software	2.2	**-**	414	2,457
Prepayments		**405**	317	174
Total non-financial assets		**2,267**	2,258	3,521
Total assets		**91,843**	83,084	56,669
LIABILITIES				
Payables				
Suppliers - trade creditors and accruals		**1,465**	1,479	2,208
Grants	2.3	**763**	1,815	2,979
Other payables - salaries and wages		**6**	12	-
Total payables		**2,234**	3,306	5,187
Provisions				
Employee provisions	3.1	**208**	205	160
Other provisions	2.4	**425**	347	-
Total provisions		**633**	552	160
Total liabilities		**2,867**	3,858	5,347
Net assets		**88,976**	79,226	51,322
EQUITY				
Asset revaluation reserve	2.2	**238**	-	-
Retained surplus		**88,738**	79,226	51,322
Total equity		**88,976**	79,226	51,322

The above statement should be read in conjunction with the accompanying notes.

[1] ARENA's budget as published in the 2017-18 Portfolio Budget Statements.

Statement of Changes in Equity

for the period ended 30 June 2018

	2018 $'000	2017 $'000	Original[1] Budget $'000
TOTAL EQUITY			
Retained surplus			
Balance carried forward from previous period	**79,226**	68,628	85,379
Surplus for the period	**10,096**	14,678	(34,057)
Total retained earnings	**89,322**	83,306	51,322
Comprehensive income			
Other comprehensive income	**(584)**	(4,080)	**-**
Total comprehensive income	**(584)**	(4,080)	**-**
Asset revaluation reserve			
Opening balance	-	-	-
Adjustment for revaluations	**238**	-	-
Total asset revaluation reserve	**238**	-	-
Total comprehensive income	**9,750**	10,598	(34,057)
Closing balance as at 30 June	**88,976**	79,226	51,322

The above statement should be read in conjunction with the accompanying notes.

[1] ARENA's budget as published in the 2017-18 Portfolio Budget Statements.

Cash Flow Statement

for the period ended 30 June 2018

	Notes	2018 $'000	2017 $'000	Original[1] Budget $'000
OPERATING ACTIVITIES				
Cash received				
Receipts from Government		**209,073**	192,104	259,998
Interest		**1,472**	1,127	1,000
Net GST received		**17,815**	16,073	**-**
Return of grant funds from prior years		**-**	13,835	**-**
Other		**38**	-	-
Total cash received		**228,398**	223,139	260,998
Cash used				
Employees		**(1,071)**	(920)	(951)
Suppliers		**(24,294)**	(22,536)	(25,085)
Grants		**(193,224)**	(177,719)	(267,501)
Total cash used		**(218,589)**	(201,175)	(293,537)
Net cash from operating activities		**9,809**	21,964	(32,539)
INVESTING ACTIVITIES				
Cash used				
Purchase of property, plant and equipment		**(435)**	(1,233)	(2,234)
Investments		**(8,723)**	(6,653)	(7,943)
Total cash used		**(9,158)**	(7,886)	(10,177)
Net cash used by investing activities		**(9,158)**	(7,886)	(10,177)
Net increase in cash held		**651**	14,078	(42,716)
Cash and cash equivalents at the beginning of the reporting period		**55,738**	41,660	56,692
Cash and cash equivalents at the end of the reporting period	2.1A	**56,389**	55,738	13,976

The above statement should be read in conjunction with the accompanying notes.

[1] ARENA's budget as published in the 2017-18 Portfolio Budget Statements.

Overview

Objectives of the Australian Renewable Energy Agency

The Australian Renewable Energy Agency (ARENA) is an Australian Government controlled entity under the *Public Governanance, Performance and Accountability Act 2013* (PGPA Act). It is a not-for-profit entity. The objective of ARENA is to improve the competitiveness of renewable energy technologies and increase the supply of renewable energy in Australia.

ARENA is structured to meet the following outcome:

Outcome 1: To support improvements in the competitiveness of renewable energy and related technologies and the supply of renewable energy by administering financial assistance, developing analysis and advice about and sharing information and knowledge with regard to renewable energy and related technologies.

ARENA operates under the following legislation:

- *Australian Renewable Energy Agency Act 2011 (as amended);*
- *Australian Renewable Energy Agency (Consequential Amendments and Transitional Provisions) Act 2011;*
- *Australian Renewable Energy Agency (Consequential Amendments and Transitional Provisions) Act 2012;*
- *Australian Renewable Energy Agency Determination No 1 of 2013; and*
- *Australian Renewable Energy Agency Regulation 2016* .

ARENA is governed by an independent, decision-making Board. The members of the Board draw together skills in renewable energy technology, commercialisation, business investment and corporate governance to provide expert administration of ARENA funds.

Basis of preparation

The financial statements are general purpose financial statements and are required by section 42 of the PGPA Act.

The financial statements have been prepared in accordance with:

a) *Public Governance, Performance and Accountability (Financial Reporting) Rule 2015* (FRR); and

b) Australian Accounting Standards and Interpretations - Reduced Disclosure Requirements issued by the Australian Accounting Standards Board that apply for the reporting period.

The financial statements have been prepared on an accrual basis and in accordance with the historical cost convention, except for certain assets and liabilities at fair value. Except where stated, no allowance is made for the effect of changing prices on the results or the financial position. The financial statements are presented in Australian dollars and values are rounded to the nearest thousand dollars unless otherwise specified.

Events after the reporting period

ARENA is not aware of any subsequent Adjusting Events that have a potential to significantly affect its ongoing structure or financial activities.

Financial Performance

This section analyses the financial performance of the Australian Renewable Energy Agency for the year ended 2018.

1.1 Expenses

	2018 $'000	2017 $'000
1.1A: Employee Benefits		
Board remuneration fees	**232**	229
Salaries and wages	**680**	585
Superannuation - defined contribution plans	**71**	82
Leave and other entitlements	**85**	81
Total employee benefits	**1,068**	977

Accounting Policy
Accounting policies for employee related expenses is contained in the People and Relationships section.

1.1B: Suppliers		
Goods and services supplied or rendered		
Audit fees	**99**	102
Consultants	**16,094**	12,613
Department support costs (resources received free of charge)[1]	**6,699**	7,338
IT services	**996**	872
Legal fees	**2,275**	3,477
Travel	**437**	372
Other	**1,547**	1,431
Total goods and services supplied or rendered	**28,147**	26,205
Other suppliers		
Operating lease rentals in connection with:		
Operating lease rentals - external parties:		
Minimum lease payments	**813**	659
Workers compensation expenses	**5**	8
Total other suppliers	**818**	667
Total suppliers	**28,965**	26,872

[1] Department support costs represent the cost of staff and associated costs made available by the Secretary of the Portfolio Department (also refer to resources received free of charge in note 1.2B).

Leasing commitments
Canberra ACT - Commencing on 1 July 2017 a 5 year lease was initiated in respect of the Canberra office. Lease payments are subject to a fixed annual increase of 3.75% on review date (1 July each year).
Sydney NSW (1 Bligh Street)- Commencing on 31 March 2017 a 1.5 year lease was initiated in respect of the Sydney office. This lease is due to cease on 31 August 2018.
Sydney NSW (25 Bligh Street) - Commencing on 1 July 2018 a new lease for 4 years was initiated in respect of the new Sydney office. Lease payments are subject to a fixed annual increase of 4.00% on review date. (1 July each year).
Melbourne VIC - Commencing on 1 July 2017 a 5 year lease was initiated in respect of the Melbourne office. Lease payments are subject to a fixed annual increase of 4.00% on review date. (1 July each year).

Commitments for minimum lease payments in relation to non-cancellable operating leases are payable as follows:		
Within 1 year	**643**	963
Between 1 to 5 years	**2,059**	2,206
Total operating lease commitments	**2,703**	3,169

Accounting Policy
Operating Leases
Operating lease payments are expensed on a straight-line basis which is representative of the pattern of benefits derived from the leased assets. The lessor effectively retains substantially all such risks and benefits of ownership.

1.1 Expenses (contd.)

	2018 $'000	2017 $'000
1.1C: Grants		
Public sector		
Australian Government entities	**8,261**	4,224
Private sector		
Australian private companies	**141,487**	135,389
Australian not-for-profit companies	**1,818**	1,292
Other entities[1]	**24,761**	19,833
Total grants	**176,327**	160,738

[1] This includes the Australian Government's contribution to the Clean Energy Solutions Centre and the International Renewable Energy Agency.

Accounting Policy

Grants are recognised to the extent that services required to be performed by the grantee have been performed or the grant eligibility criteria has been satisfied. A commitment is recorded when ARENA has a binding agreement to make these grants but services have not been performed or criteria satisfied. Where grant monies are paid in advance of performance or eligibility, a prepayment is recognised. Grants payable are settled within twelve months of recognition.

Certain grants provided by ARENA include the potential for ARENA to recoup all, or part, of its grant expenditure. The amount of any future recoupment may in some instances even exceed that of the initial grant expense depending on the realisation of specified future events and/or other commercial indicators.

Recoverability will in certain instances be predicated on formulas that have been agreed as part of the terms and conditions of the relevant grant funding agreement.

ARENA has no quantifiable contingent assets at reporting date as the amount and likelihood cannot be measured reliably.

Locked Box Arrangements

ARENA's Locked Box funding arrangements relate to grant funding agreements whereby ARENA deposits the total amount of the grant into a prescribed bank account, in the recipient's name, after the execution of a legally binding funding agreement. ARENA retains sole control of the Locked Box until withdrawal conditions precedent (WCPs) have been satisfied.

At the time of payment by ARENA into the prescribed bank account, the transaction is recorded as a Prepayment in the Statement of Financial Position. After all WCPs have been met, ARENA relinquishes sole control over the Locked Box and the recipient is able to withdraw money from the Locked Box in accordance with the funding agreement. At this point, the Prepayment is expensed as a Grant in the Statement of Comprehensive Income.

Withdrawals from Locked Boxes require joint signatures from the recipient and ARENA. ARENA can only refuse the release of funds if there is a breach of conditions in the funding agreement. ARENA continues to be responsible and accountable for ensuring that the funds are only released from the Locked Boxes when conditions specified in the grant funding agreement have been met. Accordingly, the value of Locked Boxes at balance date is deemed to be held by ARENA in trust and is disclosed under Note 5.1: Assets Held in Trust.

1.1D: Write-down and Impairment of Assets		
Impairment on intangible assets	**292**	-
Revaluation decrements	**1**	-
Total write-down and impairment of assets	**293**	-

Accounting Policy

Refer to Note 2.2A: Non-Financial Assets.

1.2 Own-Source Revenue and Gains

	2018 $'000	2017 $'000
Own-Source Revenue		
1.2A: Interest		
Deposits	**1,476**	1,163
Total interest	**1,476**	1,163

Accounting Policy
Interest revenue is recognised using the effective interest method.

1.2B: Other Revenue		
Resources received free of charge - Department of the Environment and Energy	**6,699**	7,338
Return of grants	**-**	2,835
Other	**38**	-
Total other revenue	**6,737**	10,173

Accounting Policy
Resources Received Free of Charge
Resources received free of charge are recognised as revenue when, and only when, a fair value can be reliably determined and the services would have been purchased if they had not been donated. Use of those resources is recognised as an expense (see Note 1.1B: Suppliers). Resources received free of charge are recorded as either revenue or gains depending on their nature.

Return of Grant
Return of grant is reported as other revenue if the grant was fully expensed in the previous financial year(s).

1.2C: Revenue from Government		
Payments from Portfolio Department	**209,073**	192,104
Total revenue from Government	**209,073**	192,104

Accounting Policy
Amounts appropriated through ARENA's enabling legislation totalling $1.937 billion up to 2021-22 are recognised as Revenue from Government when ARENA receives the cash from the Portfolio Department.

Financial Position

This section analyses the Australian Renewable Energy Agency's assets used to conduct its operations and the operating liabilities incurred as a result. Employee related information is disclosed in the People and Relationships section.

2.1 Financial Assets

	2018 $'000	2017 $'000
2.1A: Cash and Cash Equivalents		
Cash at bank	**387**	1,100
Cash on deposit	**56,002**	54,638
Total cash and cash equivalents	**56,389**	55,738

Accounting Policy

Cash is recognised at its nominal amount. Cash and cash equivalents include:

a) cash on hand; and

b) demand deposits in bank accounts with an original maturity of 12 months or less that are readily convertible to known amounts of cash and subject to insignificant risk of changes in value.

2.1B: Trade and Other Receivables		
GST receivable from the Australian Taxation Office	**2,259**	2,374
Interest receivable	**215**	212
Other	**72**	-
Total trade and other receivables	**2,546**	2,586

There is no impairment allowance for receivables as at 30 June 2018 (2017: 0).

2.1 Financial Assets (contd.)

	2018 $'000	2017 $'000
2.1C: Investments		
REVC Fund Commonwealth Participation Trust	**30,641**	22,502
Total investments	**30,641**	22,502

Accounting Policy
Investments are expected to be recovered in more than 12 months.

At 30 June 2018 ARENA held 43,094,784 (2017: 25,501,807) fully paid "A" class units in the Renewable Energy Venture Capital (REVC) Fund Commonwealth Participation Trust (Trust).

The Trust is an investor pursuant to the REVC Co-Investment Arrangement. The principal activity of the REVC Co-Investment Arrangement, which is independently managed, is investing in early stage technology companies consistent with governing documents, including the Co-Investment Deed signed in 2011.

The investments of the REVC Co-Investment Arrangement comprise traded debt, equity and unlisted equity investments; these are valued in accordance with the guidelines published by the Australian and Venture Capital Association Limited (AVCAL).

The valuation is assessed to be materially consistent with AASB 13 Fair Value Measurement as the AVCAL methodology adopts market-based and observable inputs to the maximum extent possible in arriving at the values for the investments shown.

The REVC Co-Investment Arrangement recognises investments on the date it becomes party to the underlying contractual agreement and recognises any changes in value from this date. The value of ARENA's investment at 30 June 2018 is based on annual audited financial statements of the REVC Co-Investment Arrangement at that reporting date.

2.2 Non-Financial Assets

2.2: Reconciliation of the Opening and Closing Balances of Property, Plant and Equipment and Intangibles

	Leasehold Improvements $'000	Plant and Equipment $'000	Computer Software $'000	Total $'000
As at 1 July 2017				
Gross book value	**1,307**	**273**	**854**	**2,434**
Accumulated depreciation, amortisation and impairment	**-**	**(53)**	**(440)**	**(493)**
Total as at 1 July 2017	**1,307**	**220**	**414**	**1,941**
Additions:				
Purchase	**435**	**-**	**-**	**435**
Revaluations recognised in other comprehensive income	**238**	**-**	**-**	**238**
Revaluations recognised in net cost of services	**78**	**-**	**-**	**78**
Impairments recognised in net cost of services	**-**	**(1)**	**(292)**	**(293)**
Depreciation and amortisation	**(324)**	**(91)**	**(122)**	**(537)**
Total as at 30 June 2018	**1,734**	**128**	**-**	**1,862**
Total as at 30 June 2018 represented by				
Gross book value	**1,734**	**128**	**854**	**2,716**
Accumulated depreciation, amortisation and impairment	**-**	**-**	**(854)**	**(854)**
Total as at 30 June 2018 represented by	**1,734**	**128**	**-**	**1,862**

All software assets were assessed for indications of impairment as at 30 June 2018. The Grant Management System was found to be impaired and has been written down accordingly.

2.2 Non-Financial Assets (contd.)

Accounting Policy

Acquisition of Assets

Assets are recorded at cost on acquisition except as stated below. The cost of acquisition includes the fair value of assets transferred in exchange and liabilities undertaken. Financial assets are initially measured at their fair value plus transaction costs where appropriate.

Leasehold Improvements

Leasehold improvements are carried at fair value.

Plant and Equipment

Plant and equipment are valued at cost in accordance with the FRR.

Intangibles

ARENA's intangibles comprise internally developed software for internal use. These assets are carried at cost less accumulated amortisation and accumulated impairment losses. Software is amortised on a straight-line basis over its anticipated useful life. The useful lives of ARENA's software is 3-10 years (2017: 3-10 years).

Impairment

All assets are assessed for impairment at the end of each reporting period. When indications of impairment exist, the asset's recoverable amount is estimated and an impairment adjustment made if the asset's recoverable amount is less than its carrying amount.

Revaluations

Following initial recognition at cost, all asset classes except for Intangibles are carried at fair value less subsequent accumulated depreciation and accumulated impairment losses. Valuations are conducted with sufficient frequency to ensure that the carrying amounts of assets did not differ materially from the assets' fair values as at the reporting date. The regularity of independent valuations depended upon the volatility of movements in market values for the relevant assets.

Revaluation adjustments are made on a class basis. Any revaluation increment is credited to equity under the heading of Asset Revaluation Reserve except to the extent that it reversed a previous revaluation decrement of the same asset class that was previously recognised in the surplus/deficit. Revaluation decrements for a class of assets are recognised directly in the surplus/deficit except to the extent that they reversed a previous revaluation increment for that class.
Any accumulated depreciation as at the revaluation date is eliminated against the gross carrying amount of the asset and the asset restated to the revalued amount.

Depreciation

Depreciable plant and equipment assets are written off to their estimated residual values over the estimated useful lives to ARENA, using, in all cases, the straight-line method of depreciation.

Leasehold improvements are depreciated over the lease term.

Depreciation rates (useful lives), residual values and methods are reviewed at each reporting date and necessary adjustments are recognised in the current, or current and future reporting periods, as appropriate.

2.3 Payables

	2018 $'000	2017 $'000
2.3: Grants		
Private sector		
Australian private companies	**763**	1,632
Other entities	**-**	183
Total grants	**763**	1,815
Grants expected to be settled		
No more than 12 months	**763**	1,815
Total grants	**763**	**1,815**

2.4 Other Provisions

2.4 Other Provisions

	Provision for restoration $'000
Opening Balance as at 1 July 2017	**347**
Additional provisions made	
Amounts recognised	**78**
Total as at 30 June 2018	**425**

ARENA currently has four (2017: two) agreements for the leasing of premises which have provisions requiring ARENA to restore the premises to their original condition at the conclusion of the lease. ARENA has made a provision to reflect the present value of these obligations.

People and Relationships

This section describes a range of employment and post employment benefits provided to our people.

3.1 Employee Provisions

	2018 $'000	2017 $'000
Employee provisions		
Leave	**208**	205
Total employee provisions	**208**	205

Accounting policy

Liabilities for short-term employee benefits and termination benefits expected within twelve months of the end of the reporting period are measured at their nominal amounts. Other long-term employee benefits are measured as net total of the present value of the defined benefit obligation at the end of the reporting period.

Leave

The liability for employee benefits includes provision for annual leave and long service leave.
The leave liabilities are calculated on the basis of employees' remuneration at the estimated salary rates that will be applied at the time the leave is taken, including the entity's employer superannuation contribution rates to the extent that the leave is likely to be taken during service rather than paid out on termination.

The liability for long service leave has been determined by reference to the short hand method' as per the FRR. The estimate of the present value of the liability takes into account attrition rates and pay increases through promotion and inflation.

3.2 Key Management Personnel Remuneration

Key management personnel (KMP) are those persons having authority and responsibility for planning, directing and controlling the activities of an entity, directly or indirectly, including any director (whether executive or otherwise) of that entity. ARENA has determined the KMP to be the Directors, the Chief Executive Officer, Chief Financial Officer and the Chief Operating Officer. KMP remuneration is reported in the table below.

	2018 $	2017 $
Short-term employee benefits	**969,499**	799,959
Post-employment benefits	**59,030**	106,711
Other long-term employee benefits	**39,285**	70,223
Total KMP remuneration expenses	**1,067,814**	976,893

The total number of KMP that are included in the above table are twelve individuals (2017: eight) and includes nine ARENA Directors (2017: six). The two year appointment terms of ARENA's six Directors expired during 2017-18. Three Directors were reappointed, three new Directors were announced by the Minister on 17 April 2018. One Director and the Chief Operating Officer are from the Portfolio Department and are not remunerated by ARENA.

The above KMP remuneration excludes the remuneration and other benefits of the Portfolio Minister. The Portfolio Minister's remuneration and other benefits are set by the Remuneration Tribunal and are not paid by ARENA.

3.3 Related Party Disclosures

Related party relationships:
ARENA is an Australian Government controlled entity. Related parties of ARENA include:

i) Key Management Personnel (See Note 3.2: KMP)
ii) Portfolio Ministers;
iii) Close family members of the persons identified in (i) and (ii) above; and
iv) An entity which is controlled or jointly controlled by a member of the KMP.

Transactions with related parties:

Given the breadth of Government activities, related parties may transact with the Government sector in the same capacity as ordinary citizens. Such transactions include payment of taxes, use of public infrastructure and public services that are available to all citizens. These transactions have not been separately disclosed in this note.

Giving consideration to relationships with related entities, and transactions entered into, it has been determined that ARENA transacted with four (2017: none) related parties during the reporting period. It should be noted that in all transactions the KMP affected by a relationship excluded themselves from all decision processes and/or management of the contract or arrangement. All transactions were on normal business terms and conditions.

An ARENA Board Member is a non-executive Board Member of Right Angle Business Services Pty Ltd. During the reporting period ARENA entered into the following transactions:

Grant payments totalling $322,505 were made to Right Angle Business Services Pty Ltd for the purpose of developing a Concentrating Solar Thermal roadmap.

A partner of a KMP is a Director of Planet Innovation Pty Ltd. During the reporting period ARENA entered into the following transactions:

Grant payments totalling $647,955 were made to Planet Innovation Pty Ltd for the ZenHQ Virtual Power Plant project.

The partner is also a Director on the Board of Origin Energy LPG Ltd and was a Director on the Board of Zen Ecosystems until May 2018. No financial transactions occurred during the reporting period.

An ARENA Board Member is a non-executive Board Member of Hydro-Electric Corporation. During the reporting period ARENA entered into the following transactions:

Grant payments totalling $3,013,679 were provided to Hydro-Electric Corporation during the reporting period. The transactions were for several projects including Flinders Island Hybrid Energy Hub and the Tasmanian Hydropower System feasibility study.

These arrangements were entered into prior to this Board Member being appointed to ARENA on 17 April 2018.

A non continuing ARENA Board Member is the Chair of the Board for the Australian Alliance for Energy Productivity Ltd. (A2EP). During the reporting period ARENA entered into the following transactions:

$6,058 was provided in respect of professional services.

Managing Uncertainties

This section analyses how the Australian Renewable Energy Agency manages financial risks within its operating environment.

4.1 Financial Instruments

	2018 $'000	2017 $'000
4.1A: Categories of Financial Instruments		
Financial assets		
Loans and receivables		
Cash and cash equivalents	**56,389**	55,738
Trade and other receivables	**287**	212
Total loans and receivables	**56,676**	55,950
Available-for-sale financial assets		
Investments	**30,641**	22,502
Total available-for-sale financial assets	**30,641**	22,502
Total financial assets	**87,317**	78,452
Financial liabilities		
Trade creditors	**1,465**	1,479
Grant payables	**763**	1,815
Total financial liabilities	**2,228**	3,294

Accounting Policy

Financial Assets

ARENA classifies its financial assets in the following categories:

a) available-for-sale financial assets; and

b) loans and receivables

The classification depends on the nature and purpose of the financial assets and is determined at the time of initial recognition. Financial assets are recognised and derecognised upon trade date.

Available-for-Sale Financial Assets

Available-for-sale financial assets are non-derivatives that are either designated in this category or not classified in any of the other categories.

Available-for-sale financial assets are recorded at fair value. Gains and losses arising from changes in fair value are recognised as a "below the line item" in the Statement of Comprehensive Income with the exception of impairment losses. Interest is calculated using the effective interest method. Where the asset is disposed of or is determined to be impaired, part (or all) of the cumulative gain or loss previously recognised in the Asset Revaluation Reserve is included in surplus or deficit for the period.

Loans and Receivables

Trade receivables, loans and other receivables that have fixed or determinable payments that are not quoted in an active market are classified as loans and receivables. Loans and receivables are measured at amortised cost using the effective interest method less impairment. Interest is recognised by applying the effective interest rate.

Effective Interest Method

The effective interest method is a method of calculating the amortised cost of a financial asset and of allocating interest income over the relevant period. The effective interest rate is the rate that exactly discounts estimated future cash receipts through the expected life of the financial asset, or, where appropriate, a shorter period.

Impairment of Financial Assets

Financial assets are assessed for impairment at the end of each reporting period.

Financial liabilities

Trade creditors and other payables are recognised at amortised cost. Liabilities are recognised to the extent that the goods or services have been received (and irrespective of having been invoiced). Trade creditors and other payables are derecognised

4.1 Financial Instruments (contd.)

	2018 $'000	2017 $'000
4.1B Net Gains or Losses on Financial Assets		
Loans and receivables		
Interest revenue	**1,476**	1,163
Net gains on loans and receivables	**1,476**	1,163
Available-for-sale financial assets		
Fair value changes	**(584)**	(4,080)
Net loss on available-for-sale financial assets	**(584)**	(4,080)
Net gain / (loss) on financial assets	**892**	(2,917)

Credit Risk

ARENA was exposed to minimal credit risk as loans and receivables were cash and trade receivables. The maximum exposure to credit risk was the risk that arises from potential default of a debtor. This amount was equal to the total amount of other receivables of $287,000 (2016-17 $212,000). ARENA held no collateral to mitigate against credit risk. The risk of interest rate movements is deemed to be immaterial due to the way ARENA manages its cash requirements.

Liquidity Risk

ARENA's financial liabilities are payables. The exposure to liquidity risk was based on the notion that ARENA will encounter difficulty in meeting its obligations associated with financial liabilities. This was highly unlikely due to government funding mechanisms available to ARENA and internal policies and procedures in place to ensure there were appropriate resources to meet its financial obligations.

Market Risk

ARENA is indirectly exposed to currency risk through its investment in the Renewable Energy Venture Capital Fund Commonwealth Participation Trust (the Trust). The movements associated with ARENA's investment in the Trust are accounted for through the Statement of Other Comphrensive Income.

Other Information

5.1 Assets Held in Trust

	2018 $'000	2017 $'000
Cash held in Locked Boxes		
Balance as at 1 July	**42,273**	32,155
Receipts[1]	**43,223**	99,869
Payments[2]	**(64,977)**	(89,751)
Balance as at 30 June	**20,519**	42,273
Total monetary assets held in trust	**20,519**	42,273

This note should be read in conjunction with Note 1.1C : Grants. The transaction values mentioned above are not linked to any other Statement or Note within these documents.

This note has been added to the Financial Statements for information purposes only. It provides the reader with an indication of Locked Box funding levels where ARENA continues to be responsible and accountable for ensuring that the funds are only released when conditions specified in the grant funding agreement have been met.

[1] Receipts were the amounts paid into Locked Boxes by ARENA. These amounts include interest received from the balances of the Locked Boxes.

[2] Payments are those amounts which have been withdrawn by the projects in accordance with agreed milestones.

Note 5.2: Budget Variance Commentary

ARENA's financial performance is measured against its original budget as published in the 2017-18 Portfolio Budget Statements.

Variances are considered to be 'major' if they are core to ARENA's activities and based on the following criteria:

- the variance between budget and actual is greater than +/- 10% of the original budget for a line item; and
- the variance between budget and actual is greater than $1,000,000; or
- an item is below this threshold but is considered important for the reader's understanding or is relevant to an assessment of the discharge of accountability and to an analysis of the ARENA's performance.

The budget is not audited.

Budget Variance Commentary	Affected statements and line items
Due to the complex nature of ARENA's projects, which deal with emerging and developing technologies, there are regular project variations. These variations are difficult to predict and therefore material variances to original budget are possible. In 2015-16 the Agency received $40.899m refunds of grants that were not budgeted for. These funds were not immediately required and, in accordance with s59 of the PGPA Act, were placed in demand deposits in Australian bank accounts. It was expected that these funds would be required in 2017-18 to fund a variation of the original project. Due to slippages within the project these funds were not required and remain in demand deposits. Additional variances to budgets include the termination of $10.7m worth of funding agreements, $25.5m of non-permanent delays (variations), and $25.0m was budgeted for Concentrated Solar Thermal projects. The supplier variance is impacted by lower grant expenditure as the costs associated with administering grants decreases. Revenue from Government is accounted for on a cash basis and is drawn down as required. A reduction in expenditure and cash paid results in a corresponding reduction in receipts from Government.	**Statement of Comprehensive Income:** - Suppliers - Grants - Revenue from Government **Statement of Financial Position:** - Cash and cash equivalents - Grant payable **Cash Flow Statement:** - Receipts from Government - Grants cash used
Investment calls made by the Fund Manager of the Renewable Energy Venture Capital Co-Investment arrangement were less than expected. The principal activity of the Fund is to invest in the commercialisation of renewable energy companies. All investment decisions are to be made by the Fund Manager within an agreed timeframe ending in 2024. Actual investments made from year to year may vary from budget. As a result of the restatement of investments, there was a decrease of $0.584m in the value of the investment. This is reported under Other Comprehensive Income.	**Statement of Comprehensive Income:** - Decrease in the value of investment **Statement of Financial Position:** - Other investments
ARENA's Canberra office was previously supplied as a resource received free of charge by the respective Portfolio Department. The provision of the Canberra premises ceased upon the expiry of the lease in 2016-17. ARENA subsequently entered into a separate lease agreement and acquired the necessary leasehold improvement, plant, and equipment assets. These assets were independently revalued at 30 June 2018. ARENA entered into a lease agreement for its Sydney office in March 2017 which includes a fitout and a provision to makegood at the end of the lease in August 2018. ARENA entered into a lease agreement for its Melbourne office and acquired the necessary leasehold improvement asset. The investment in computer software was found to be impaired at 30 June 2018 and was written down as a result.	**Statement of Financial Position:** - Leasehold improvements - Computer software **Cash Flow Statement:** - Purchase of property, plant and equipment
The original budget cash flow statement was prepared with GST refunds netted against Suppliers and Grants and are shown as gross amounts in the cash flow statement.	**Cash Flow Statement**: - Net GST received - Grants

APPENDICES & GLOSSARY

This section provides details of the projects to which ARENA committed or provided financial assistance during 2017-18. There is also an index showing how this report complies with our legal reporting requirements, and a glossary that explains technical terms, acronyms and abbreviations.

APPENDIX 1: FINANCIAL ASSISTANCE AGREEMENTS AND PROGRESS

ARENA is required under the ARENA Act to publish details of financial assistance agreements and an assessment of the extent to which these agreements have progressed, or are expected to progress, the principal objectives and priorities as stated in the general funding strategy in force for the year.

The *Australian Renewable Energy Agency (Consequential Amendments and Transitional Provisions) Act 2011* also requires ARENA to report details of people to whom financial assistance is provided under a transferred Australian Government funding agreement or Australian Solar Institute agreement.

During the reporting period, 211 projects were actively managed by ARENA. Seven of those projects were terminated during the course of the year, two of which received no funding prior to the closure of the projects.

ARENA contractually committed funds to 83 new projects in 2017-18 (Table 8). The Board and CEO also approved funds for 39 projects that were subject to commercial negotiations on 30 June 2018, and are likely to lead to contractual commitments in 2018-19. As with previous years, some of the projects contractually committed during 2017-18 were approved by the Board in the previous financial year, while other projects approved by the Board during 2017-18 will be contractually committed in 2018-19. This is reflective of ARENA's approval processes.

Details of the 128 ongoing projects during 2017-18 are provided in Table 9.

TABLE 8: ARENA FUNDS CONTRACTUALLY COMMITTED TO NEW PROJECTS IN 2017-18

Proponent name	Project status*	Project description	Financial assistance committed 2017-18 (ex. GST)	Location	Investment priority	Primary technology	Innovation
AGL Energy Services Pty Limited	Active	AGL Energy demand response NSW	$2,624,019	NSW	Delivering secure and reliable electricity	Enabling	Demonstration
Allen Taylor and Co	Active	Hardwood residue bio-refinery feasibility study	$500,000	NSW	Improving energy productivity	Bioenergy	Study
Aquahydrex Pty Limited	Terminated	Connecting the power and gas grids – High-efficiency, low-cost hydrogen production as a means of decarbonising natural gas pipelines and enabling greater deployment of renewables	$5,000,000	SA	Exporting renewable energy	Hydrogen	Demonstration
ATCO Gas Australia Pty Ltd	Active	ATCO H2 Microgrid Project	$1,530,000	WA	Delivering secure and reliable electricity	Hydrogen	Demonstration
Australian Association for Hydrogen Energy	Active	Promoting hydrogen implementation and utilisation in Australia through international collaboration	$494,000	QLD	Exporting renewable energy	Hydrogen	Study
Australian National University	Active	Next generation industrial bifacial silicon solar cells	$1,977,845	ACT	Accelerating solar PV innovation	Solar PV	R&D

Proponent name	Project status*	Project description	Financial assistance committed 2017-18 (ex. GST)	Location	Investment priority	Primary technology	Innovation
Australian National University	Active	Driving increased efficiency and reliability in silicon photovoltaics - from ingots to modules	$2,399,392	ACT	Accelerating solar PV innovation	Solar PV	R&D
Australian National University	Active	Monolithic perovskite – silicon tandem cells: towards commercial reality	$672,841	ACT	Accelerating solar PV innovation	Solar PV	R&D
Australian National University	Active	Advanced silicon solar cells by DESIJN (Deposited silicon junctions)	$1,116,142	ACT	Accelerating solar PV innovation	Solar PV	R&D
Australian National University	Active	Development of stable electrodes for perovskite solar cells	$936,732	ACT	Accelerating solar PV innovation	Solar PV	R&D
Australian National University	Active	Tandem PV micro concentrator	$788,515	ACT	Accelerating solar PV innovation	Solar PV	R&D
Australian PV Institute	Active	IEA PV Power Systems Technical Collaborative Program: Increasing the uptake of solar PV through the delivery of quality research, data and information	$668,000	NSW	Accelerating solar PV innovation	Solar PV	Study
Australian PV Institute	Active	IEA Solar Heating and Cooling Technology Collaboration Program: Promoting the use of all aspects of solar thermal energy	$383,500	NSW	Improving energy productivity	Solar thermal	Study

Proponent name	Project status*	Project description	Financial assistance committed 2017-18 (ex. GST)	Location	Investment priority	Primary technology	Innovation
Bioenergy Australia	Active	Driving growth of reliable bioenergy and biofuels in Australia	$885,733	NSW	Exporting renewable energy	Bioenergy	Study
CSIRO	Active	Manufacturing of printed perovskite PV modules	$3,310,248	VIC	Accelerating solar PV innovation	Solar PV	R&D
CSIRO	Active	Participation in IEA Solar Power and Chemical Energy Systems (SolarPACES) Technology Collaboration Program	$434,000	NSW	Delivering secure and reliable electricity	Solar thermal	Study
CSIRO	Active	Smart Grids Innovation Challenge: Participation in international events and knowledge sharing	$113,750	NSW	Delivering secure and reliable electricity	Enabling	Study
CSIRO	Active	Challenge Affordable Heating and Cooling of Buildings, participation in international conferences and knowledge sharing	$37,000	NSW	Improving energy productivity	Enabling	Study
CSIRO	Active	IEA Ocean Energy Systems, Technology Collaboration Program	$283,500	TAS	Other	Marine	Study

Proponent name	Project status*	Project description	Financial assistance committed 2017-18 (ex. GST)	Location	Investment priority	Primary technology	Innovation
CSIRO	Active	Feasibility study into dispatchable, cost effective power from forest and mill waste using the direct injection carbon engine (bioDICE)	$432,000	NSW	Delivering secure and reliable electricity	Bioenergy	Study
DCP Company Pty Ltd	Active	Rooftop solar electricity retailer	$1,000,000	VIC	Accelerating solar PV innovation	Enabling	Study
DNV GL Australia Pty Ltd	Active	Gap analysis and development of a performance standard for battery storage employed in a domestic/ commercial solar-battery application	$1,400,000	VIC	Delivering secure and reliable electricity	Enabling	Study
ElectraNet Pty Limited	Active	ElectraNet Energy Storage for Commercial Renewable Integration (ESCRI) Phase 2	$12,000,000	SA	Delivering secure and reliable electricity	Storage	Deployment
EnergyAustralia Development Pty Ltd	Active	EnergyAustralia demand response NSW	$1,435,500	NSW	Delivering secure and reliable electricity	Enabling	Demonstration
EnergyAustralia Development Pty Ltd	Active	EnergyAustralia demand response VIC and SA	$6,929,000	VIC	Delivering secure and reliable electricity	Enabling	Demonstration

Proponent name	Project status*	Project description	Financial assistance committed 2017-18 (ex. GST)	Location	Investment priority	Primary technology	Innovation
EnergyAustralia Development Pty Ltd	Active	Cultana Pumped Hydro Energy Storage Project - Phase 2	$500,000	SA	Delivering secure and reliable electricity	Enabling	Study
EnerNOC Pty Ltd	Active	EnerNOC demand response NSW	$1,800,000	NSW	Delivering secure and reliable electricity	Enabling	Demonstration
EnerNOC Pty Ltd	Active	EnerNOC demand response VIC	$5,400,000	VIC	Delivering secure and reliable electricity	Enabling	Demonstration
EPC Technologies	Active	Demonstration of medium-scale solar on industrial rooftops can be effectively integrated into the distribution network	$225,000	QLD	Delivering secure and reliable electricity	Enabling	Study
ERM Power	Active	NSW Schools Energy Productivity Program (SEPP)	$500,000	NSW	Improving energy productivity	Solar PV	Demonstration
Evenergi Pty Ltd	Active	South Australian strategic regional electric vehicle adoption program	$172,215	SA	Accelerating solar PV innovation	Electric vehicles	Demonstration
Flow Power	Active	Flow Power demand response NSW	$1,318,250	NSW	Delivering secure and reliable electricity	Enabling	Demonstration

Proponent name	Project status*	Project description	Financial assistance committed 2017-18 (ex. GST)	Location	Investment priority	Primary technology	Innovation
Genex Power	Active	Project development activities for the Kidston Stage Two Hydro-Solar Project	$5,000,000	QLD	Delivering secure and reliable electricity	Enabling	Study
GESS Devco Pty Ltd	Active	Gannawarra Energy Storage System (GESS)	$22,735,000	VIC	Delivering secure and reliable electricity	Storage	Demonstration
Greatcell Solar Limited	Active	Perovskite solar cell technology - large area module development	$6,000,000	NSW	Accelerating solar PV innovation	Solar PV	Demonstration
Hivve	Active	Hivve modular sustainable classrooms	$368,115	NSW	Improving energy productivity	Enabling	Demonstration
HWF 2 PTY LTD	Active	Hornsdale Wind Farm Stage 2 (HWF2) FCAS Trial	$299,550	SA	Delivering secure and reliable electricity	Wind	Demonstration
Hydro Tasmania	Closed	Concept study of pumped-hydro opportunities in Tasmania, including conversion of existing hydro generators and new installations	$300,000	TAS	Delivering secure and reliable electricity	Storage	Study
Hydro Tasmania	Closed	Establishing an expanded role for Tasmania in the future NEM as the 'Battery of the Nation'	$500,000	TAS	Delivering secure and reliable electricity	Enabling	Study
Hydro Tasmania	Active	Fish Migration Roadmap	$280,000	TAS	Delivering secure and reliable electricity	Enabling	Study

Proponent name	Project status*	Project description	Financial assistance committed 2017-18 (ex. GST)	Location	Investment priority	Primary technology	Innovation
Hydro Tasmania	Active	Repurposing the Tarraleah hydropower scheme for the future electricity market - Feasibility study	$2,500,000	TAS	Delivering secure and reliable electricity	Storage	Study
Institute for Sustainable Futures, University of Technology Sydney	Active	Renewable Energy and Load Management (REALM) Stage 1 - Study	$293,578	NSW	Improving energy productivity	Enabling	Study
Intercast & Forge Pty Ltd	Active	Intercast & Forge demand response SA	$323,654	SA	Delivering secure and reliable electricity	Enabling	Demonstration
IT Power (Australia) Pty Limited	Active	Open-source grid integration model for the National Electricity Market	$476,844	ACT	Delivering secure and reliable electricity	Enabling	Study
Jeanes Holland and Associates	Active	Roadmap for concentrated solar thermal (CST) power generation in Australia	$407,592	TAS	Delivering secure and reliable electricity	Solar thermal	Study
LO3 Energy Pty Ltd	Active	Latrobe Valley Microgrid - Feasibility assessment	$370,000	VIC	Delivering secure and reliable electricity	Enabling	Study
Microbiogen Pty Ltd	Active	Microbiogen biocatalyst optimisation and deployment project for efficient production of biofuels	$4,029,467	NSW	Improving energy productivity	Bioenergy	Demonstration

Proponent name	Project status*	Project description	Financial assistance committed 2017-18 (ex. GST)	Location	Investment priority	Primary technology	Innovation
Monash University	Active	Developing a new type of high-efficiency building-integrated PV cell	$744,661	VIC	Accelerating solar PV innovation	Solar PV	R&D
Monash University	Active	Bringing all-polymer solar cells closer to commercialisation	$840,000	VIC	Accelerating solar PV innovation	Solar PV	R&D
Monash University	Active	Leveraging Monash Smart City platform to create a centre of knowledge excellence for DSM	$500,500	VIC	Delivering secure and reliable electricity	Enabling	Study
MSM Milling	Active	MSM Milling Biomass Fuel Switch Project	$2,000,000	NSW	Improving energy productivity	Bioenergy	Deployment
Musselroe Wind Farm	Active	Enablement of FCAS at Musselroe Wind Farm	$499,120	TAS	Delivering secure and reliable electricity	Wind	Study
NOJA Power Switchgear Pty Ltd	Active	NOJA Power Intelligent Switchgear Project	$5,000,000	QLD	Delivering secure and reliable electricity	Enabling	Demonstration
Planet Innovation Pty Ltd	Active	ZenHQ Virtual Power Plant	$1,963,500	VIC	Delivering secure and reliable electricity	Enabling	Demonstration
Plumbing Industry Climate Action Centre (PICAC)	Active	Net Zero Energy Facility	$500,000	VIC	Improving energy productivity	Geothermal	Deployment
Pooled Energy Pty Ltd	Active	Pooled Energy demand management and modulation	$2,500,000	NSW	Improving energy productivity	Enabling	Demonstration

Proponent name	Project status*	Project description	Financial assistance committed 2017-18 (ex. GST)	Location	Investment priority	Primary technology	Innovation
Powershop Australia	Active	Powershop demand response Vic	$995,237	VIC	Delivering secure and reliable electricity	Enabling	Demonstration
Regional Power Corporation	Active	Horizon Power Business Model Pilot Project - Phase 1 (Highgarden)	$1,920,000	WA	Delivering secure and reliable electricity	Enabling	Deployment
Restech Pty Limited	Active	The Enerverter (Project Aztec)	$700,000	NSW	Delivering secure and reliable electricity	Enabling	Deployment
Sea Box International Pty Ltd	Active	Design, manufacture and test of a factory assembled and relocatable Container Roll Out Warehousing System - Photovoltaic (CROWS-PV)	$289,725	ACT	Improving energy productivity	Enabling	Demonstration
Simply Energy Solutions	Active	Simply Energy VPPX	$7,700,000	SA	Accelerating solar PV innovation	Enabling	Deployment
Snowy Hydro Limited	Active	Feasibility study: New pumped hydroelectric energy storage (PHES) in the Snowy Hydro scheme	$8,000,000	NSW	Delivering secure and reliable electricity	Storage	Study
SPARK Infrastructure SA (No 1) Pty Limited	Terminated	SAPN Fort Largs Community Microgrid	$2,623,500	SA	Delivering secure and reliable electricity	Enabling	Demonstration

Proponent name	Project status*	Project description	Financial assistance committed 2017-18 (ex. GST)	Location	Investment priority	Primary technology	Innovation
Spotless Sustainability Services	Active	Ballarat Terminal Station Battery Energy Storage System (BESS)	$2,265,000	VIC	Delivering secure and reliable electricity	Storage	Demonstration
United Energy Distribution Pty Ltd	Active	Peak demand reduction using solar and storage	$450,000	VIC	Delivering secure and reliable electricity	Enabling	Demonstration
United Energy Distribution Pty Ltd	Active	United Energy dynamic voltage management demand response (Product 2)	$5,762,000	VIC	Delivering secure and reliable electricity	Enabling	Demonstration
University of Adelaide	Active	Converting Sunlight Innovation Challenge: Building Australia's international partnerships in solar fuels research and innovation	$494,000	SA	Exporting renewable energy	Enabling	Study
University of New South Wales	Active	Accelerating industrial solar cells efficiency by development of PECVD-based metal oxides / Increasing efficiency of silicon solar cells by novel passivated contact structures	$503,389	NSW	Accelerating solar PV innovation	Solar PV	R&D
University of New South Wales	Active	Investigate metallised encapsulant for silicon PV modules: A path to reduced LCOE for PV	$1,160,000	NSW	Accelerating solar PV innovation	Solar PV	R&D

Proponent name	Project status*	Project description	Financial assistance committed 2017-18 (ex. GST)	Location	Investment priority	Primary technology	Innovation
University of New South Wales	Active	Hydrogenated bifacial PERL silicon PV cells with laser doping and plated contacts	$1,100,000	NSW	Accelerating solar PV innovation	Solar PV	R&D
University of New South Wales	Active	Improving world-record commercial high-efficiency n-type solar cells through recombination analysis	$1,785,000	NSW	Accelerating solar PV innovation	Solar PV	R&D
University of New South Wales	Active	Hydrogenated and hybrid heterojunction p-type silicon PV cells	$1,735,000	NSW	Accelerating solar PV innovation	Solar PV	R&D
University of New South Wales	Active	Development of beyond 20% efficiency kesterite (CZTSSe) solar cells: Win the PV race with sustainable low-cost, low-toxic and stable materials	$1,331,098	NSW	Accelerating solar PV innovation	Solar PV	R&D
University of New South Wales	Active	Advanced high-efficiency silicon solar cells employing innovative atomic scale engineered surface and contact passivation layers	$2,019,456	NSW	Accelerating solar PV innovation	Solar PV	R&D
University of New South Wales	Active	Next Generation III-V/Si multi-junction solar cells using GaP buffers and novel silicon sub-cells	$1,144,628	NSW	Accelerating solar PV innovation	Solar PV	R&D

Proponent name	Project status*	Project description	Financial assistance committed 2017-18 (ex. GST)	Location	Investment priority	Primary technology	Innovation
University of New South Wales	Active	Integrating industrial black silicon with high efficiency multicrystalline solar cells	$500,000	NSW	Accelerating solar PV innovation	Solar PV	R&D
University of New South Wales	Active	Development of novel hydrogen trapping techniques for breakthrough Si casting and wafering technologies	$1,968,000	NSW	Accelerating solar PV innovation	Solar PV	R&D
University of New South Wales	Active	Efficient adamantine thin-film on silicon tandem cells: The next step in commercial cell evolution	$3,184,166	NSW	Accelerating solar PV innovation	Solar PV	R&D
University of New South Wales	Active	Developing systems that enable off-grid households and communities to access affordable and reliable renewable electricity	$228,000	NSW	Delivering secure and reliable electricity	Enabling	Study
University of Queensland	Active	PV penetration project	$1,190,000	QLD	Delivering secure and reliable electricity	Enabling	Study
University of Technology, Sydney	Active	Social Access Solar Gardens	$239,930	NSW	Delivering secure and reliable electricity	Enabling	Study

Proponent name	Project status*	Project description	Financial assistance committed 2017-18 (ex. GST)	Location	Investment priority	Primary technology	Innovation
University of the Sunshine Coast	Active	Control and manage the moisture content of woody biomass to create certainty in the quality and supply for bioenergy	$300,000	QLD	Improving energy productivity	Bioenergy	Study
Zero Mass Water (Australia) Pty Ltd	Active	SOURCE drinking water solar panel demonstration project	$420,000	SA	Improving energy productivity	Solar PV	Demonstration
Total		83	$165,706,892				

TABLE 9: OTHER PROJECTS ACTIVELY MANAGED BY ARENA IN 2017-18

Proponent name	Project status*	Project description	Funding committed (ex. GST)	Location	Investment priority	Primary technology	Innovation
AGL Energy Limited	Closed	P2P-DLT: A virtual trial of peer-to-peer energy trading including an assessment of the applicability of distributed ledger technology	$120,000	VIC	Delivering secure and reliable electricity	Enabling	Study
AGL Energy Services Pty Limited	Active	5 MW Virtual Power Plant	$5,000,000	SA	Delivering secure and reliable electricity	Enabling	Deployment
AGL Pty Ltd	Active	AGL Solar PV project	$166,700,000	NSW	Delivering secure and reliable electricity	Solar PV	Deployment
APT Pipelines Limited	Active	Emu Downs Solar Farm Project	$5,500,000	WA	Delivering secure and reliable electricity	Solar PV	Deployment
APT Pipelines Limited	Active	Darling Downs Solar Farm	$20,000,000	QLD	Accelerating solar PV innovation	Solar PV	Deployment
Australian National University	Active	Katherine Booker: Metal-assisted chemical etching of Sliver solar cells	$356,749	ACT	Accelerating solar PV innovation	Solar PV	Fellowship
Australian National University	Active	Advanced surface and contact technologies for industrial silicon photovoltaics	$3,962,616	ACT	Accelerating solar PV innovation	Solar PV	R&D

Proponent name	Project status*	Project description	Funding committed (ex. GST)	Location	Investment priority	Primary technology	Innovation
Australian National University	Active	High-temperature solar thermal energy storage via manganese-oxide based redox cycling	$1,193,534	ACT	Delivering secure and reliable electricity	Solar thermal	R&D
Australian National University	Active	PV Modules for the Australian environment (PV-MATE)	$502,977	ACT	Accelerating solar PV innovation	Solar PV	R&D
Australian National University	Active	Eliminating material quality barriers to low cost, very high efficiency silicon solar cells and modules	$2,023,407	ACT	Accelerating solar PV innovation	Solar PV	R&D
Australian National University	Active	Bladed receivers with active airflow control	$1,361,327	ACT	Other	Solar thermal	R&D
Australian National University	Active	An atlas of pumped hydro energy storage	$609,000	ACT	Delivering secure and reliable electricity	Enabling	Demonstration
Australian National University	Active	A robotic vision system for automatic inspection and evaluation of solar plant infrastructure	$876,183	ACT	Other	Solar thermal	R&D
Australian National University	Active	Real-time operational distributed PV simulations for distribution network service providers	$1,198,359	ACT	Delivering secure and reliable electricity	Solar PV	R&D

Proponent name	Project status*	Project description	Funding committed (ex. GST)	Location	Investment priority	Primary technology	Innovation
Australian National University	Active	CONSORT: Consumer energy systems providing cost-effective grid support	$2,895,951	TAS	Delivering secure and reliable electricity	Enabling	R&D
Australian National University	Closed	Jose Zapata: Model predictive control of thermal components in point focus solar thermal systems	$359,654	ACT	Other	Solar thermal	Fellowship
Australian National University	Closed	Thomas Allen: Negatively-charged dielectric films for surface passivation of silicon solar cells	$124,324	ACT	Accelerating solar PV innovation	Solar PV	Scholarship
Australian National University	Terminated	Qunyu Bi: Nanostructures design for light trapping in silicon wafer and chalcogenide thin-film solar cells	$242,728	ACT	Accelerating solar PV innovation	Solar PV	Fellowship
Australian PV Institute	Active	Australian involvement in the IEA PV power systems, and solar heating and cooling implementing agreements	$440,500	NSW	Improving energy productivity	Solar PV	Demonstration
Barcaldine Remote Community Solar Farm Pty Ltd	Active	Barcaldine 25 MW Remote Community Solar Project	$22,800,000	QLD	Delivering secure and reliable electricity	Solar PV	Demonstration
Bioenergy Australia	Active	Enhanced Australian participation in IEA Bioenergy tasks and activities	$707,667	NSW	Improving energy productivity	Bioenergy	Demonstration

Proponent name	Project status*	Project description	Funding committed (ex. GST)	Location	Investment priority	Primary technology	Innovation
BioPower Systems Pty Ltd	Active	bioWAVE ocean pilot at Port Fairy	$11,960,000	VIC	Other	Marine	Demonstration
Bundaberg Regional Irrigators Group Ltd	Active	Adapting renewable energy concepts to irrigated sugarcane production at Bundaberg	$446,011	QLD	Improving energy productivity	Enabling	Demonstration
Canadian Solar (Australia) Pty Limited	Active	Longreach Solar Farm	$1,300,000	QLD	Delivering secure and reliable electricity	Solar PV	Deployment
Canadian Solar (Australia) Pty Limited	Active	Oakey Solar Farm	$2,162,000	QLD	Delivering secure and reliable electricity	Solar PV	Deployment
Carnegie Wave Energy Limited	Active	Perth Wave Energy Project	$13,095,381	WA	Other	Marine	Demonstration
Carnegie Wave Energy Limited	Active	CETO 6 Project	$13,000,000	WA	Other	Marine	Demonstration
Carnegie Wave Energy Limited	Active	Garden Island Microgrid Project: Development and demonstration of the integration of CETO 6 wave energy technology with solar PV, energy storage system and a desalination plant	$2,500,000	WA	Delivering secure and reliable electricity	Enabling	Demonstration
CSIRO	Closed	The Australian Wave Energy Atlas	$1,329,900	TAS	Other	Marine	Study

Proponent name	Project status*	Project description	Funding committed (ex. GST)	Location	Investment priority	Primary technology	Innovation
CSIRO	Active	AIRAH PUSCH Australia - Promoting the use of solar cooling and heating in Australia	$399,436	NSW	Improving energy productivity	Solar thermal	Demonstration
CSIRO	Active	Novel concepts for low-cost small heliostats in remote installations	$1,000,000	NSW	Other	Solar thermal	R&D
CSIRO	Active	Specifying guidelines for assessing perovskite solar cells	$892,000	NSW	Accelerating solar PV innovation	Solar PV	Demonstration
CSIRO	Active	Australian Solar Thermal Research Initiative (ASTRI)	$35,208,747	NSW	Delivering secure and reliable electricity	Solar thermal	R&D
CSIRO	Closed	Solar-driven supercritical CO2 Brayton Cycle	$2,496,835	NSW	Other	Solar thermal	R&D
CSIRO	Closed	Optimisation of central receivers for advanced power cycles	$1,150,879	NSW	Other	Solar thermal	R&D
CSIRO	Closed	Kallista Sears: ITO free, efficient organic solar cells based on textured graphene electrodes	$320,811	VIC	Accelerating solar PV innovation	Solar PV	Fellowship
CSIRO	Closed	Virtual Power Station 2	$850,000	NSW	Delivering secure and reliable electricity	Enabling	R&D
CSIRO	Terminated	High efficiency solar Allam cycle	$428,928	NSW	Other	Solar thermal	R&D

Proponent name	Project status*	Project description	Funding committed (ex. GST)	Location	Investment priority	Primary technology	Innovation
Curtin University	Active	Increasing the uptake of solar PV using energy storage, monitoring and grid-connected micro-grids within strata	$900,375	WA	Delivering secure and reliable electricity	Enabling	R&D
DeGrussa Solar Project Pty Ltd	Active	DeGrussa 10.56 MW off-grid solar PV/ storage project	$20,900,000	WA	Improving energy productivity	Solar PV	Demonstration
Echuca Regional Health	Closed	Case study and implementation of solar field chilling and heating opportunities in a hospital environment	$147,500	VIC	Improving energy productivity	Enabling	Deployment
EDL Group Operations Pty Ltd	Active	Coober Pedy Renewable Diesel Hybrid	$18,410,879	SA	Delivering secure and reliable electricity	Hybrid	Demonstration
Electricity Generation and Retail Corporation	Active	Alkimos Beach Energy Storage Project	$3,310,000	WA	Delivering secure and reliable electricity	Enabling	Demonstration
Energy Storage Council, Australia Solar Council	Closed	Australian Energy Storage Council research and report	$45,000	ACT	Delivering secure and reliable electricity	Storage	Study
EnergyAustralia Development Pty Ltd	Closed	EnergyAustralia South Australian Pumped Hydro Energy Storage (PHES) Feasibility Study	$453,000	SA	Delivering secure and reliable electricity	Enabling	Study
Ergon Energy Corporation Limited	Terminated	Doomadgee Solar Farm	$145,084	QLD	Delivering secure and reliable electricity	Hybrid	Demonstration

Proponent name	Project status*	Project description	Funding committed (ex. GST)	Location	Investment priority	Primary technology	Innovation
Ergon Energy Queensland Pty Ltd	Active	Pilot a commercial and operational model for integrating solar and storage to provide energy services to residential customers	$400,000	QLD	Delivering secure and reliable electricity	Enabling	Demonstration
Frontier Carbon Pty Ltd	Active	Toolkit for renewable energy financing	$467,717	VIC	Delivering secure and reliable electricity	Enabling	Demonstration
Genex Power	Active	Feasibility study to validate the construction of a large-scale pumped storage hydroelectric energy storage facility at a remote disused mine site in Northern Queensland	$4,000,000	QLD	Delivering secure and reliable electricity	Enabling	Demonstration
Genex Power	Active	Kidston Solar Project	$8,850,000	QLD	Delivering secure and reliable electricity	Solar PV	Deployment
Goldwind Australia Pty Ltd	Active	White Rock Solar Farm, co-located with White Rock Wind Farm	$5,400,000	NSW	Delivering secure and reliable electricity	Solar PV	Deployment
GreenSync	Closed	Distributed Energy ExchanOge (deX) - design and pilot a prototype digital exchange for trading DER to support integrating renewables and grids	$450,000	VIC	Delivering secure and reliable electricity	Enabling	Demonstration

Proponent name	Project status*	Project description	Funding committed (ex. GST)	Location	Investment priority	Primary technology	Innovation
Gullen Solar Pty Ltd	Active	Gullen Range Solar Farm, co-located with Gullen Range Wind Farm	$9,900,000	NSW	Delivering secure and reliable electricity	Solar PV	Deployment
Hydro Tasmania	Active	Flinders Island Renewable Energy Project	$5,500,000	TAS	Delivering secure and reliable electricity	Hybrid	Demonstration
Hydro Tasmania	Active	Rottnest Island: Addressing the energy and water nexus	$3,758,010	WA	Delivering secure and reliable electricity	Hybrid	Demonstration
Hydro Tasmania	Closed	Augmenting the Tasmanian hydropower system – feasibility studies	$500,000	TAS	Delivering secure and reliable electricity	Enabling	Study
Indigenous Essential Services Pty Ltd	Active	Northern Territory Solar Energy Transformation Program (SETuP)	$35,000,000	NT	Delivering secure and reliable electricity	Hybrid	Demonstration
IT Power (Australia) Pty Limited	Active	Testing the performance of lithium-ion batteries	$870,000	ACT	Delivering secure and reliable electricity	Enabling	R&D
Karratha Solar Power No 1 Pty Ltd	Active	Karratha Airport Solar Project	$2,300,000	WA	Delivering secure and reliable electricity	Solar PV	Demonstration
Kennedy Energy Park Pty Ltd	Active	Kennedy Energy Park	$18,000,000	QLD	Delivering secure and reliable electricity	Hybrid	Demonstration

Proponent name	Project status*	Project description	Funding committed (ex. GST)	Location	Investment priority	Primary technology	Innovation
Laing O'Rourke Australia Pty Ltd	Active	SunSHIFT pre-commercial deployment	$2,100,396	QLD	Exporting renewable energy	Solar PV	Deployment
Lakeland Solar & Storage Pty Limited	Active	Lakeland Solar & Storage Project	$17,419,000	QLD	Delivering secure and reliable electricity	Solar PV	Demonstration
LMS Energy Pty Ltd	Active	Joule Energy - Pilot Landfill Solar Project, Phase 1	$100,000	VIC	Delivering secure and reliable electricity	Solar PV	Demonstration
Lord Howe Island Board	Active	Lord Howe Island Hybrid Renewable Project	$4,500,000	NSW	Delivering secure and reliable electricity	Hybrid	Demonstration
Manildra Solar Farm Pty Ltd	Active	Manildra Solar Farm	$9,810,000	NSW	Delivering secure and reliable electricity	Solar PV	Deployment
MASG Renewables P1 Operations Pty Ltd	Active	Feasibility study for integrated community waste-to-energy project for Mt Alexander Shire	$146,468	VIC	Improving energy productivity	Bioenergy	Demonstration
Monash University	Active	Accelerating community and business support for a low carbon future	$390,000	VIC	Delivering secure and reliable electricity	Enabling	Demonstration
Moree Solar Farm Pty Ltd	Active	Moree Solar Farm	$101,700,000	NSW	Delivering secure and reliable electricity	Solar PV	Deployment

Proponent name	Project status*	Project description	Funding committed (ex. GST)	Location	Investment priority	Primary technology	Innovation
Moreland Energy Foundation Limited (MEFL)	Closed	Feasibility and product design for inner city brown fields off-grid solar (Here Comes The Sun)	$112,400	VIC	Delivering secure and reliable electricity	Solar PV	Study
National ICT Australia Limited	Active	Australian Renewable Energy Mapping Infrastructure (AREMI)	$2,197,150	NSW	Delivering secure and reliable electricity	Enabling	Demonstration
NEOEN Australia Pty Ltd	Active	Griffith Solar Farm	$4,500,000	NSW	Delivering secure and reliable electricity	Solar PV	Deployment
NEOEN Australia Pty Ltd	Active	Dubbo Solar Hub	$4,950,000	NSW	Delivering secure and reliable electricity	Solar PV	Deployment
NEOEN Australia Pty Ltd	Active	Parkes Solar Farm	$6,750,000	NSW	Delivering secure and reliable electricity	Solar PV	Deployment
NEV Power Pty Ltd	Active	Narara Ecovillage smart grid	$1,158,660	NSW	Delivering secure and reliable electricity	Hybrid	Deployment
Northern SEQ Distributor - Retailer Authority	Active	Feasibility study to undertake an assessment of the commercial viability of a waste-to-energy project at Unity Water's sewerage treatment plant	$695,143	QLD	Improving energy productivity	Bioenergy	Demonstration

Proponent name	Project status*	Project description	Funding committed (ex. GST)	Location	Investment priority	Primary technology	Innovation
Queensland University of Technology	Active	Integration of biogas from sugarcane residues in sugarcane transport and milling to reduce fossil fuel usage	$2,239,100	QLD	Improving energy productivity	Bioenergy	R&D
RATCH - Australia Corporation Limited	Active	Collinsville Solar PV Power Station Stage 1	$9,500,000	QLD	Delivering secure and reliable electricity	Solar PV	Deployment
RayGen Resources	Active	RayGen PV Ultra Series B equity investment opportunity	$4,800,000	VIC	Exporting renewable energy	Solar PV	Deployment
Re.Group Pty Ltd	Active	Feasibility Study into Mt Piper hybrid EfW project	$400,000	NSW	Improving energy productivity	Bioenergy	Demonstration
Regional Development Australia ACT Incorporated	Closed	Establish the SERREE (South East Region of Renewable Energy Excellence) Industry Cluster - build and demonstrate a renewable energy region of collaborative industry/research excellence	$488,870	ACT	Delivering secure and reliable electricity	Enabling	Study
Renergi Pty Ltd	Active	Advanced biomass gasification technology	$4,160,542	WA	Delivering secure and reliable electricity	Bioenergy	Demonstration
Renergi Pty Ltd	Active	A low emission biofuel technology	$5,473,000	WA	Improving energy productivity	Bioenergy	Demonstration

Proponent name	Project status*	Project description	Funding committed (ex. GST)	Location	Investment priority	Primary technology	Innovation
Renewable Developments Australia Pty Ltd	Active	Feasibility study for Stage 1 of the Pentland Bioenergy Project	$3,000,000	QLD	Improving energy productivity	Bioenergy	Demonstration
Royal Melbourne Institute of Technology	Active	MUSIC: Micro-urban solar integrated concentrators	$4,921,191	VIC	Improving energy productivity	Solar thermal	R&D
Rural Industries Research & Development Corporation (RIRDC)	Active	Australian biomass for bioenergy assessment	$3,160,669	ACT	Delivering secure and reliable electricity	Bioenergy	Demonstration
Scouller Energy Pty Ltd	Active	Normanton Solar Farm	$8,380,000	QLD	Delivering secure and reliable electricity	Solar PV	Demonstration
SM Project Company Pty Ltd	Active	Goulburn Bioenergy Project	$2,100,000	NSW	Improving energy productivity	Bioenergy	Deployment
Smart Storage (Ecoult)	Active	Commercialisation of partial state of charge management and control systems for UltraBattery	$4,100,000	NSW	Delivering secure and reliable electricity	Enabling	R&D
Solar Analytics Pty Ltd	Active	Solar monitoring for better energy outcomes for residential solar PV	$2,144,000	NSW	Accelerating solar PV innovation	Enabling	Deployment
Southern Oil Refining Pty Ltd	Active	Australian Biofuels from Australian Resources	$3,188,630	QLD	Improving energy productivity	Bioenergy	Demonstration

Proponent name	Project status*	Project description	Funding committed (ex. GST)	Location	Investment priority	Primary technology	Innovation
Sustainable Melbourne Fund	Active	Expansion of the Environmental Upgrade Agreement market in Victoria	$821,369	VIC	Delivering secure and reliable electricity	Solar PV	Demonstration
Swinburne University of Technology	Active	Towards an Australian capability in arrays of ocean wave-power machines	$770,728	VIC	Other	Marine	Demonstration
The Trustee for Biosystems Engineering Trust	Terminated	Final development of a full-scale woody crop harvester prototype and commercial biomass supply chain demonstration	$463,417	NSW	Improving energy productivity	Bioenergy	Demonstration
The Trustee for the NSW Electricity Networks Operations Trust	Closed	New England Renewable Hub (Feasibility Study)	$450,000	NSW	Delivering secure and reliable electricity	Enabling	Study
University of Adelaide	Active	Establishing the Australian Energy Storage Knowledge Bank	$1,441,811	SA	Delivering secure and reliable electricity	Enabling	Demonstration
University of Adelaide	Active	AusPERM - Structural permeability mapping in Australia	$450,000	SA	Other	Geothermal	Demonstration
University of Adelaide	Active	Integrating concentrating solar thermal energy into the Bayer Alumina Process	$4,490,752	SA	Improving energy productivity	Solar thermal	R&D
University of New South Wales	Active	Development and commercialisation of high-efficiency silicon solar cell technology	$6,472,980	NSW	Accelerating solar PV innovation	Solar PV	R&D

Proponent name	Project status*	Project description	Funding committed (ex. GST)	Location	Investment priority	Primary technology	Innovation
University of New South Wales	Active	Multi-junction c-Si solar cells based on virtual Ge substrates	$1,455,000	NSW	Accelerating solar PV innovation	Solar PV	R&D
University of New South Wales	Active	40% efficient photovoltaic "Power Cube" power tower receiver	$1,400,000	NSW	Accelerating solar PV innovation	Solar PV	R&D
University of New South Wales	Active	Adrian Shi: Stability of perovskite solar cells and modules	$46,041	NSW	Accelerating solar PV innovation	Solar PV	Scholarship
University of New South Wales	Active	Australia-US Institute for Advanced Photovoltaics (AUSIAPV)	$45,999,005	NSW	Accelerating solar PV innovation	Solar PV	R&D
University of New South Wales	Active	Low-cost, high-efficiency copper-zinc-tin-sulphide (CZTS) on silicon multi-junction solar cells	$2,612,358	NSW	Accelerating solar PV innovation	Solar PV	R&D
University of New South Wales	Active	Towards ultimate performance commercial silicon solar cells	$2,970,702	NSW	Accelerating solar PV innovation	Solar PV	R&D
University of New South Wales	Active	High-efficiency silicon/perovskite tandem cells and modules: Demonstration and commercial evaluation	$3,599,459	NSW	Accelerating solar PV innovation	Solar PV	R&D
University of New South Wales	Active	Addressing barriers to efficient renewable integration	$982,000	NSW	Delivering secure and reliable electricity	Enabling	Demonstration

Proponent name	Project status*	Project description	Funding committed (ex. GST)	Location	Investment priority	Primary technology	Innovation
University of New South Wales	Closed	Cost-effective GaAsP top solar cell grown on a high-performance, low-cost silicon solar cell	$2,616,463	NSW	Accelerating solar PV innovation	Solar PV	R&D
University of New South Wales	Closed	Clare Disney: Plasmonic light trapping for solar cells	$109,944	NSW	Accelerating solar PV innovation	Solar PV	Scholarship
University of New South Wales	Closed	Andrew Danos: The role of spin in triplet-triplet annihilation upconversion	$70,000	NSW	Accelerating solar PV innovation	Solar PV	Scholarship
University of New South Wales	Closed	Tools for design and scale-up of solar thermochemical reactors	$1,083,320	NSW	Other	Solar thermal	R&D
University of New South Wales	Closed	Bernard Mitchell: Advanced and industry-ready photoluminescence characterisation of silicon bricks	$330,195	NSW	Accelerating solar PV innovation	Solar PV	Fellowship
University of New South Wales	Closed	Alexander To: Surface passivation of high voltage solar cell structures with ALD deposited aluminium oxide	$51,015	NSW	Accelerating solar PV innovation	Solar PV	Scholarship
University of New South Wales	Closed	Advanced recombination-based loss analysis methods for silicon wafer and silicon solar cells	$381,328	NSW	Accelerating solar PV innovation	Solar PV	R&D
University of New South Wales	Terminated	Vincent Allen: Fabrication of a new cost-effective high-efficiency solar cell structure	$111,840	NSW	Accelerating solar PV innovation	Solar PV	Scholarship

Proponent name	Project status*	Project description	Funding committed (ex. GST)	Location	Investment priority	Primary technology	Innovation
University of South Australia	Active	Maximising solar PV with phase change thermal energy storage	$995,290	SA	Accelerating solar PV innovation	Enabling	R&D
University of South Australia	Closed	Shane Sheoran: A direct contact heat exchanger for high-temperature thermal storage in solar power plants	$120,000	SA	Other	Solar thermal	Scholarship
University of Tasmania	Active	Tidal Energy in Australia – Assessing resource and feasibility to Australia's future energy mix	$2,494,860	TAS	Delivering secure and reliable electricity	Marine	Demonstration
University of Technology, Sydney	Active	Develop lithium-sulfur batteries for large-scale electrical energy storage	$830,000	NSW	Delivering secure and reliable electricity	Enabling	R&D
University of Technology, Sydney	Active	Networks Renewed: Using innovative inverter and battery storage technologies to improve network power quality, reduce costs and support solar PV	$1,871,000	NSW	Delivering secure and reliable electricity	Enabling	Demonstration
University of Technology, Sydney	Closed	Mapping Potential Network Opportunities for Renewable Energy DM	$538,240	NSW	Delivering secure and reliable electricity	Enabling	Study
University of Western Australia	Active	From single to multiple wave energy converters: Cost reduction through location and configuration optimisation	$994,198	WA	Other	Marine	R&D

Proponent name	Project status*	Project description	Funding committed (ex. GST)	Location	Investment priority	Primary technology	Innovation
University of Wollongong	Active	Smart sodium storage system for renewable energy storage	$2,707,000	NSW	Delivering secure and reliable electricity	Enabling	R&D
University of Wollongong	Closed	Joseph Giorgio: Light-weight and flexible solid-state dye-sensitised solar cells	$49,227	NSW	Accelerating solar PV innovation	Solar PV	Scholarship
Vast Solar Pty Ltd	Active	Vast Solar 6 MWth grid-connected CSP research, development and demonstration facility with thermal energy storage	$9,896,960	NSW	Delivering secure and reliable electricity	Solar thermal	Demonstration
Voyages Indigenous Tourism	Active	Yulara 1.8 MW Dispersed PV	$447,525	NT	Delivering secure and reliable electricity	Solar PV	Demonstration
Weipa Solar Farm Pty Ltd	Active	Weipa Solar PV Project	$11,300,000	QLD	Improving energy productivity	Solar PV	Demonstration
Whitsunday Solar Farm Pty Ltd	Active	Whitsunday Solar Farm	$9,500,000	QLD	Delivering secure and reliable electricity	Solar PV	Deployment
WorleyParsons Services Pty Ltd	Active	Tidal turbine reef feasibility study	$280,000	WA	Other	Marine	Demonstration
Total		128	$801,012,714				

*Projects listed as active include projects that are substantially complete but are still fulfilling knowledge sharing commitments.

APPENDIX 2: INDEX OF COMPLIANCE WITH ANNUAL REPORT REQUIREMENTS

The following table lists the information ARENA is required by law to include in this report, and where in the report the information is located.

TABLE 10: INDEX OF COMPLIANCE WITH ANNUAL REPORT REQUIREMENTS

Australian Renewable Energy Agency Act 2011 (section 70)	P133-162	**Funding provided under ARENA Act** Provide particulars of each person to whom financial assistance was provided or committed during the year: › name of the person › nature and amount of the financial assistance › renewable energy technology or technologies to which the assistance relates › an assessment of the extent to which agreements for the provision of financial assistance entered into during the year have progressed, or are expected to progress, the principal objectives and priorities as stated in the general funding strategy in force for the year
Australian Renewable Energy Agency (Consequential Amendments and Transitional Provisions) Act 2011 (Schedule 2, Part 2, section 28)	P133-162	**Funding provided under a transferred agreement** Provide particulars of each person to whom financial assistance has been provided during the year under a transferred Australian Government funding agreement, or a transferred ASI Limited funding agreement: › name of the person › nature and amount of the financial assistance › renewable energy technology or technologies to which the assistance relates
Australian Renewable Energy Agency Act 2011 (section 11)	P102	**Ministerial requests** Provide details of each request made by the Minister under s11 asking ARENA to consider providing financial assistance for a specified project
Australian Renewable Energy Agency Act 2011 (section 13)	P102	**Ministerial directions** Provide details of each direction made by the Minister under s13 requiring ARENA to provide advice
Public Governance, Performance and Accountability Act 2013 (section 46), Public Governance, Performance and Accountability Rule 2014 (section 17BB)	P5	**Approval of annual report by accountable authority (ARENA Board)** Be approved by the ARENA Board Be signed by the Board, or a member of the Board Include details of how and when approval of the annual report was given State that the Board is responsible for preparing and giving the annual report to ARENA's responsible minister in accordance with s46 of the Act

Public Governance, Performance and Accountability Act 2013 (section 46), Public Governance, Performance and Accountability Rule 2014 (section 17BC)	Yes	**Parliamentary standards of presentation** Comply with the guidelines for presenting documents to the Parliament
Public Governance, Performance and Accountability Act 2013 (section 46), Public Governance, Performance and Accountability Rule 2014 (section 17BD)	Yes	**Plain English and clear design** Provide information that is relevant, reliable, concise, understandable and balanced Follow standards of presentation, language and design Define acronyms and technical terms
Public Governance, Performance and Accountability Act 2013 (section 46), Public Governance, Performance and Accountability Rule 2014 (section 17BE)		**Contents of annual report**
	P22	Details of the legislation that established ARENA
	P22	Summary of ARENA's objectives and functions as set out in the legislation:
	P22-23, 28	ARENA's purpose as set out in the corporate plan for the period
	P102	Any ministerial directions given under the act or instrument
	P102	Any government policy orders under s22 of the Act
	n/a	Particulars of any non-compliance
	P28-53	Annual performance statement for ARENA for the period in accordance with paragraph 39(1)(b) of the Act and s16F of the Rule
	P102	Statement of any significant issue reported to the responsible Minister under paragraph 19(1)(e) of the Act that relates to non-compliance with finance law in relation to ARENA
	n/a	An outline of the action taken to remedy that non-compliance
	P88-93	Information on each member of the ARENA Board: › name, qualification and experience › number of meetings attended › whether executive or non-executive
	P99	Organisational structure
	P98	Location/s of operations

Public Governance, Performance and Accountability Act 2013 (section 46), Public Governance, Performance and Accountability Rule 2014 (section 17BE)		**Contents of annual report (continued)**
	P86-105	Main corporate governance practices used by ARENA during the period: › board committees and their main responsibilities › education and performance review processes for members of the Board › ethics and risk management policies
	P105	Related entity transactions
	P104	Any significant activities and changes that affected ARENA's operations or structure during the period
	P104	Particulars of judicial decisions or decisions of administrative tribunals made during the period that have, or may have, a significant effect on the operations of ARENA
	P104	Particulars of any report on ARENA given during the period by: › the Auditor-General › a committee of either House, or both Houses, of the Parliament › the Australian Government Ombudsman › the Office of the Australian Information Commissioner
	P97	Details of any indemnity that applied during the period to the Board, any member of the Board or officer of ARENA against a liability (including premiums paid, or agreed to be paid, for insurance against the Board, Board member or officer's liability for legal costs)
	P163	An index identifying where the requirements of this section and s17BF (if applicable) are to be found

Public Governance, Performance and Accountability Act 2013 (section 42), Public Governance, Performance and Accountability (Financial Reporting) Rule 2015	P107	**Financial statements** Financial statements are prepared as soon as practicable after the end of the reporting period, and then provided to the Auditor-General as soon as practicable Statements comply with the accounting standards and any other requirements prescribed by the rules, and fairly present ARENA's financial position, financial performance and cash flows Written confirmation from the Board that statements meet these requirements
Public Governance, Performance and Accountability Act 2013 (section 46)	Yes	**Annual report presented to Minister** ARENA Board must prepare and provide the annual report to the Minister by 15 October each year
Environment Protection and Biodiversity Conservation Act 1999 (section 516A)	P167	**Environmental performance** Information on: › accord between ARENA's activities and ecologically sustainable development (ESD) principles › ARENA's contribution of outcomes to ESD › effects of these activities on the environment › measures to review and minimise effects on the environment
Freedom of Information Act 1982 (Part II)	P103	**Information Publication Scheme** Actions taken to comply

TABLE 11: ARENA'S ENVIRONMENTAL PERFORMANCE

Reporting criteria	Performance
Accordance with and contribution to ecologically sustainable development (ESD), including the development and implementation of policies, plans, programs and legislation	ARENA is specifically tasked with facilitating research, development, demonstration and deployment of renewable energy technologies with a view to driving the commercialisation and reducing the cost of renewable energy. ARENA's policies, plans and programs all accord with and contribute to the ESD principles by: › helping to foster the long-term sustainability of Australia's energy sector while promoting the reduction of energy-related greenhouse gas emissions › taking into account economic, environmental and social considerations when developing renewable energy measures.
Environmental performance, including the impact of the agency's activities on the natural environment, how any impacts are mitigated and how they will be managed	ARENA's accommodation and facilities arrangements are supported by the portfolio Department. The Department operates under the Energy Efficiency in Government Operations policy, which aims to reduce the energy consumption of government operations, with particular emphasis on the energy efficiency of buildings. The Department's Property and Security section works closely with the ARENA corporate team to provide supporting information on ARENA's intended and/or ongoing property and security arrangements. This has ensured ARENA meets its property and security obligations within government (ie. whole-of-government property changes from the Department of Finance) or through regulatory processes (eg. changes to the Building Code 2016). For the duration of 2016–17, ARENA's Canberra offices were located in the NewActon Nishi Building. The offices in the Nishi Building have a 6-star Green Star Design rating and NewActon Nishi is considered to be Canberra's most sustainable mixed use building complex.

APPENDIX 3: LIST OF FIGURES AND TABLES

The following table lists the figures/diagrams and tables provided in this report, as well as their location.

Figures

Figure 1	ARENA's investment across Australia 2017-18	P16-17
Figure 2	ARENA's investment across the innovation chain 2017-18	P18-19
Figure 3	Summary of ARENA Corporate Plan 2017-18	P23
Figure 4	ARENA's investment priorities	P25
Figure 5	ARENA's complementary role	P26
Figure 6	ARENA's large-scale solar portfolio	P67
Figure 7	ARENA organisational structure	P99

Tables

Table 1	2017-18 ARENA funding commitments by investment priority	P32
Table 2	2017-18 ARENA funding commitments by technology	P32
Table 3	2017-18 Board and CEO approvals not yet contractually committed, by investment priority	P33
Table 4	ARENA new funding commitments in 2017-18 across the innovation chain	P35
Table 5	Leverage ratio by project innovation type	P44
Table 6	Number of projects submitted to, and considered by, ARENA in 2017-18	P45
Table 7	Summary of solar research and development reported project outputs	P53
Table 8	ARENA funds contractually committed to new projects in 2017-18	P133
Table 9	Other projects actively managed by ARENA in 2017-18	P146
Table 10	Index of compliance with annual report requirements	P163
Table 11	ARENA's environmental performance	P167

APPENDIX 4: GLOSSARY

This is an alphabetical index that explains the acronyms, abbreviations and technical terms used in the report.

ACAP	Australian Centre for Advanced Photovoltaics
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AM	Member of the Order of Australia
AO	Officer of the Order of Australia
ANAO	Australian National Audit Office
APS	Australian Performance Statement; Australian Public Service
AREMI	Australian Renewable Energy Mapping Infrastructure
ARENA	Australian Renewable Energy Agency
ASI	Australian Solar Institute
ASTRI	Australian Solar Thermal Research Initiative
CEFC	Clean Energy Finance Corporation
CEO	Chief Executive Officer
CFO	Chief Financial Officer
CO_2	carbon dioxide
COAG	Council of Australian Governments
CSP/CST	concentrated solar power / concentrated solar thermal
demand response	See page 57 for a simple explanation of how demand response works
DER	distributed energy resources
dispatchable energy	Dispatchable energy is energy that can be made available - or dispatched - by a power generator or energy system whenever it is needed, or switched off when it is not needed. See page 69 for more information
EE	energy efficiency

energy efficiency	energy efficiency includes energy conservation and demand management technologies
energy productivity	output or value created per unit of energy used
EOI	expression of interest
ESD	ecologically sustainable development
FCAS	Frequency Control Ancillary Services, see page 65 for a simple explanation of FCAS
flexible capacity	includes energy storage, demand response, and generation that can be quickly ramped up and down to help balance energy supply and demand
FOI	freedom of information
fringe-of-grid	areas at the edges of an electricity grid
FTE	full-time equivalent
GFS	General Funding Strategy
GST	goods and services tax
GW	gigawatt
H_2	Hydrogen
Innovation Fund	Clean Energy Innovation Fund
IP	Investment Plan
LCOE	levelised cost of energy
LSS	large-scale solar
MW	megawatt
NEM	National Energy Market
off-grid	not connected to the electricity grid, such as in remote areas
PGPA	Public Governance, Performance and Accountability
PHES	Pumped hydro energy storage

PPA	power purchase agreement; an offtake agreement where a purchaser agrees to purchase and a supplier agrees to supply future generated electricity, usually at a specified price for a defined period
PSM	Public Service Medal
PV	photovoltaic; a type of technology that converts energy from the sun into electricity
RAC	Risk and Audit Committee
R&D	research and development
REVC	Renewable Energy Venture Capital
RIRDC	Rural Industries Research and Development Corporation
STORES	Short Term Off-River pumped hydro Energy Storage
VPP	virtual power plant
WHS	work health and safety

Image: APA Group

INDEX

This section provides an alphabetical index of the information provided in the report to help readers find details quickly.

INDEX

A

abbreviations, 169–171
ACAP *see* Australian Centre for Advanced Photovoltaics
accountable authority statement, 28
achievements *see* performance
address and contact details, 4; FOI, 103
administrative tribunals, 104
Advancing Renewables Program (ARP), 51
Advisory Panel, 13, 45, 99
A-Lab, 30, 34, 49, 51
annual performance statement *see* performance
applications for funding *see* funding by ARENA
ARENA
- external scrutiny, 104
- financial assistance, 10, 14, 22, 29, 30-31, 33, 43-44, 46, 132-161
- financial statements, 104, 105, 107-129
- funding of, 24, *see also* financial statements
- organisational structure, 99
- purpose, 3, 22–23, 28
- role, objectives and functions, 12, 22–23
- staff *see* staff
- values, 100, 101
- *see also* funding by ARENA; performance

ARENA Advisory Panel, 13, 45, 99
ARENA Board
- committees, 94–95
- governance practices, 94
- insurance and indemnities, 97
- meetings, 86
- membership, 11, 86–93
- remuneration, 124
- responsibilities, 86, 96
- *see also* Chair

ARENAWire, 43, 49, 84
ASTRI *see* Australian Solar Thermal Research Initiative
Atkinson AM, Maria, 11, 87, 93
audits
- ANAO report on financial statements, 104, 109–110
- internal, 94

Australian Centre for Advanced Photovoltaics (ACAP), 36
Australian Energy Market Commission (AEMC), 10, 12, 33, 79
Australian Energy Market Operator (AEMO), 10, 12–13, 34, 56–57, 61–62, 65, 79
Australian Energy Regulator (AER), Demand Management Incentive Scheme, 13
Australian Information Commissioner, 104
Australian National Audit Office (ANAO), 94
- independent audit report on financial statements, 104, 109–110

Australian Renewable Energy Agency *see* ARENA
Australian Renewable Energy Agency Act 2011, 5, 22, 28, 94, 95, 98, 102, 132
Australian Renewable Energy Agency (Consequential Amendments and Transitional Provisions) Act 2011, 132
Australian Solar Institute Limited, 52, 132
Australian Solar Thermal Research Institute (ASTRI), 36

B

batteries, 10, 69
- fitted to solar or wind farms, 64, 68
- large-scale, 62–63
- lithium-ion, 42, 62–63
- projects, 40
- with rooftop solar systems, 64, 79
- sodium-ion, 42
- *see also* storage

bioenergy
- biofuels, 13, 15, 83
- project funding, 133–135, 139–140, 144, 148, 154–158
- projects, 32, 83

Board *see* ARENA Board

C

case studies, 33, 34, 37, 39, 41, 47, 50
  see also showcase (feature stories)
CEFC *see* Clean Energy Finance Corporation
Chair
  accountable authority statement, 28
  letter of transmittal, 5
  report from, 10–11
  reporting to Minister, 102
Chief Executive Officer, 11, 98, 124
  insurance and indemnities, 97
  powers and responsibilities, 86, 98
  profile, 98
  report from, 12–13
Chief Financial Officer, 98, 99, 124
Chief Operating Officer, 99, 124
Clancy, Sonya, 95
Clean Energy Finance Corporation (CEFC), 13, 26, 42, 102
Clean Energy Innovation Fund (Innovation Fund), 13, 26, 42
collaboration *see* partnerships
Comcover, 97
commercialisation, 13, 22, 23, 26, 29, 30 *see also* deployment projects; research and development
committees of ARENA Board, 94–95
Commonwealth Ombudsman, 104
complaints handling, 103
concentrating solar thermal (CST) projects, 32, 52, 53, 102, 105 *see also* solar thermal projects
conflict of interest policy, 96–97
consultants, 94, 98
contact details, 4; FOI, 103
contract management, 46, 48
corporate governance, 94, 104
Corporate Plan, 23
  performance against Criterion 1, 29–42
  performance against Criterion 2, 43–53
corporate services, 105
Council of Australian Governments (COAG) Energy Council, 33

D

de Brouwer PSM, Gordon, 87, 93
demand management in electricity supply, 12, 14, 40, 56–57, 69
demand response, 56–57, 69, 79
demonstration projects
  ARENA's complementary role, 26
  funding, 18, 35, 40–41, 44, 133, 136–142, 145, 147–159, 161–162
  number supported, 35
  see also deployment projects; research and development
Department of the Environment and Energy
  employees made available to ARENA, 96, 98, 100
  FOI requests, 103
  Secretary, 86, 87, 92
  service level agreement for ARENA, 105
deployment projects
  ARENA's complementary role, 26
  funding, 19, 35, 40–41, 44, 136, 140–141, 146, 149, 151–157, 162
  number supported, 35
  see also demonstration projects
development (R&D) *see* research and development
diesel generation reduction/replacement, 14, 81
dispatchable energy, 69
distributed energy resources, 10, 12, 15, 33, 40, 42, 64, 78–79
due diligence in funding applications, 45

E

ecologically sustainable development, 167
electric vehicles, 32, 42, 137
electricity generation, 12, 33 *see also* hydro-electric schemes; large-scale solar projects; rooftop solar systems
electricity grid
  dispatchable energy (flexible capacity), 69
  fringe-of-grid areas, 51, 68
  power sourced from homes and businesses, 12, 15
  projects integrating renewables and grid, 13, 15, 29, 40, 47, 60–65, 68, 77–79
  see also electricity supply; off-grid areas

electricity supply
demand management, 12, 14, 40, 56–57, 69
reserves, 13, 14
system security and reliability, 13, 15, 29, 60–65
see also electricity grid
Emissions Reduction Fund, 26
enabling legislation, 22
enabling technologies, 32, 53
project funding, 133, 135–162
energy efficiency disclosure and standards, 26
Energy Efficiency in Government Operations policy, 167
energy storage *see* storage
entity purpose, 22–23, 28
environmental performance, 105, 167
evaluations
ARENA program outcomes, 51-53
also see reviews
Evans, Jo, 87, 92, 95
exports, 11, 13, 29, 33
external scrutiny, 104

F

FCAS *see* Frequency Control Ancillary Services
fellowships and scholarships, 146, 148, 150, 159–162
finance law compliance, 102
financial performance, 117–119
financial position, 120–123
financial statements, 104, 105, 107-129
Finkel, Alan, 33
Finkel Review, 61
flexible capacity, 69 *see also* dispatchable energy
fraud control, 97
freedom of information, 103
Frequency Control Ancillary Services (FCAS), 61–62, 65
fringe-of-grid areas, 51, 68 *see also* off-grid areas
Frischknecht, Ivor, 11, 98
Frydenberg, Hon Josh, 11, 102
funding by ARENA, 14, 46
across the innovation chain, 18–19, 24, 35
approach, 24
delegations of authority, 86
funding agreements, 48
funding applications, 45
General Funding Strategy, 30, 98, 102
investment footprint, 16–17
leverage, 43–44
priorities, 11, 23, 25, 28
projects (details), 30–42, 133–162
proposals, 45
R&D, 13, 30–42
since inception, 10
see also investment (third-party)
funding of ARENA *see* financial statements

G

General Funding Strategy (GFS), 30, 98, 102
geothermal projects, 32, 140, 158
governance, 94, 104
Government Policy Orders, 102
grid *see* electricity grid; fringe-of-grid areas

H

highlights 2017-18, 14–15
Hogg, Samantha, 11, 87, 89, 95
hybrid energy systems, 68–69
for off-grid mines, 50
project funding, 151, 153, 154, 155
hydro-electric schemes, 11, 15, 105
pumped hydro energy storage (PHES), 10, 11, 15, 39, 69
hydrogen projects, 13, 14, 32, 33, 36, 133
hydropanels, 41

I

indemnities, 97
industrial waste *see* waste streams, energy from
information dissemination *see* knowledge sharing
Information Publication Scheme, 103
Infrastructure and Project Financing Agency, 102
innovation chain
ARENA's role, 18–19, 24, 35–40
details of projects, 133–161
Innovation Fund *see* Clean Energy Innovation Fund
insurance cover, 97
internal audit, 94

Internet home page (ARENA), 4
investment (third-party), 10, 43–44
  across the innovation chain, 18–19
  footprint, 16–17
  by Innovation Fund, 42
  priorities, 11, 28
  venture capital, 42
  see also funding by ARENA; projects
Investment Plan, 11, 24–25, 30
isolated communities *see* remote communities

J

Jeanes, Susan, 87, 89, 95
job creation, 46, 71
judicial decisions, 104
Jutsen, Jonathan, 11, 87, 93

K

Kay, Ian, 98
Knowledge Bank, 49
knowledge sharing, 43, 46–47, 49, 68 *see also* research and development

L

large-scale solar projects, 12, 46–47, 66–71 *see also* solar PV projects
legal expenditure, 105
legislative framework, 22
letter of transmittal, 5
lithium-ion batteries, 42, 63

M

management and accountability, 86–105
marine projects, 32, 135, 149, 158, 161, 162
material matters, 105
McDonald, Meg, 87, 90, 95
McOmish, Dougal, 11, 87, 91
meat processing plants, 15, 83
Miller, Darren, 11, 98
  CEO's report, 12–13
mining sites
  hybrid power, 50
  re-use for storage, 15, 69
Minister responsible, 11, 86, 102
Ministerial approval of funding program, 102
Ministerial requests and directions, 102
Mission Innovation, 36, 38
Morison, Jenny, 95

N

new materials and technologies, 37, 42
notifiable incidents, 100

O

objectives of ARENA, 22 *see also* role and functions of ARENA
ocean as reservoir, 11, 15
ocean technologies *see* marine projects
off-grid areas, 13, 50, 51 *see also* fringe-of-grid areas
office locations (ARENA), 98, 167
Office of the Australian Information Commissioner, 104
Ombudsman, 104
operational performance *see* performance
organisational structure, 99
outcome (ARENA), 116

P

partnerships, 10, 26, 44, 49
passivated emitter rear cell (PERC), 37, 52
People and Culture Committee, 95
PERC *see* passivated emitter rear cell (PERC)
performance
  accountable authority statement, 28
  environmental (ARENA entity), 167
  financial (ARENA entity), 117–119 *see also* financial statements
  framework, 28
  highlights, 14–15
performance against Performance Criteria (Corporate Plan):
  1. Strategic investment, 29–42
  2. Strong project assessment, negotiation, delivery and knowledge sharing, 43–53
photovoltaics *see* solar PV projects
plastic water bottle displacement, 41
policy mechanisms, 26
portable buildings, self-powered, 15, 40, 73, 84

Portfolio Budget Statements, 28
ARENA performance against outcome criteria, 30–53
Outcome 1, 116
Pratt, Finn AO PSM, 87, 92
Project Portfolio Management Committee, 46
projects
completed, 46
funded, 13, 146–162 *see also* funding by ARENA
funding approved, 45
governance of, 48
integrating renewables and grid, 13, 15, 29, 40, 47, 60–65, 68, 77–79
interactive map, 55
knowledge sharing requirement, 49
managed by ARENA, 46, 146–162
new projects, 132–145
proposals, 45
range of technologies, 11, 12, 29
showcase *see* showcase (case studies)
terminated, 46
property obligations, 167
'prosumers', 79
Public Governance, Performance and Accountability Act 2013, 5, 22, 28, 95, 102
Public Governance, Performance and Accountability (Financial Reporting) Rules, 27, 95, 97, 105
public interest disclosure, 103
Public Service Act 1999, 98
publications
ARENA, 49, 50
project outputs, 53
pumped hydro energy storage (PHES), 10, 11, 15, 39, 69
purpose of ARENA, 22–23, 28

R

redeployable systems, 74–75
Regional Australia's Renewables initiative, 51
regulatory challenges, 13
related entity transactions, 105
remote communities, 14, 74–75, 81
remuneration, 124
renewable energy
integrated into grid, 13, 15, 29, 40, 47, 60–65, 68, 77–79
investment *see* funding by ARENA; investment (third-party)
see also specific technologies
Renewable Energy Target (RET), 26
Renewable Energy Venture Capital Fund Program, 42
reporting responsibilities, 102
research and development
ARENA's complementary role, 26
funding, 13, 18, 35–39, 44, 133–135, 140, 142–144, 150, 153, 157–162
project outputs, 53
reviews of, 37, 51–52
scholarships and fellowships, 146, 148, 150, 159–162
see also A-Lab; commercialisation; demonstration projects; deployment projects; knowledge sharing; study (project) funding
reviews
Finkel Review, 61
of R&D, 37, 51–52
see also external scrutiny
Risk and Audit Committee, 94–95, 96, 97
risk management, 96–97
role and functions of ARENA, 12, 22–23
rooftop solar systems, 10, 12, 52, 64, 77, 79

S

scholarships and fellowships, 146, 148, 150, 159–162
service charter, 103
service level agreement for ARENA, 105
showcase (feature stories), 56-84
see also case studies
small-scale solar systems *see* rooftop solar systems
smart devices, 13, 42, 59, 68, 79
Smith, Judith, 95
social licence, 47, 50
social media, 84
sodium-ion batteries, 42
Softbank China Venture Capital, 42

solar farms
battery storage, 64, 68
large-scale, 12, 46–47, 66–71
mobile and re-usable, 74–75
number supported, 14, 70–71
and pumped hydro, 69
see also solar PV projects
solar irradiance and cloud monitoring, 52
solar power costs, 10, 12, 37
solar PV projects, 29, 32, 33, 36, 37, 46, 75, 81
outputs, 53
project funding, 133–135, 137–138, 140, 142–156, 158–160, 162
solar R&D
investment in, 13, 14
project outputs, 53
reviews of, 37, 51–52
solar thermal projects
concentrating solar thermal (CST), 32, 52, 53, 102, 105
project funding, 134–135, 139, 147–148, 150, 157, 158, 160, 161, 162
solar-grade silicon wafers, 37
Southern Cross Renewable Energy Fund, 42
staff, 98, 100, 124
states and territories investment footprint, 16–17
storage
case studies, 62–64
project funding, 32, 136, 138, 139, 141, 142, 151
see also batteries
study (project) funding, 133–142, 144, 146, 149, 151, 153, 155–156, 158, 161 *see also* research and development
subsidiaries of ARENA, 105
supply *see* electricity grid; electricity supply
sustainable modular classrooms, 15, 40, 72–73, 84
swimming pool energy consumption, 59

T

terminology (definitions), 169–171
tribunals, 104

U

Unwin, Stephanie, 11, 91

V

values of ARENA, 100, 101
venture capital, 42
virtual power plants, 64
voluntary load shedding *see* demand management in electricity supply

W

waste streams, energy from, 13, 15, 82–83, 102
website (ARENA), 4
Wilder AM, Martijn, 87, 88, 95 *see also* Chair
wind farms
battery storage, 68
grid stability, 13, 15, 61–62, 68
wind projects, 32, 61–62, 68, 138, 140
wood waste, 83
Woodthorpe AO, Katherine, 11, 87, 93, 95
work health and safety, 100
workforce, 98, 100, 124
workplace diversity, 100

Offices

Canberra
NewActon Nishi
2 Phillip Law Street
Canberra City ACT 2601

Sydney
25 Bligh Street
Sydney NSW 2000

Melbourne
222 Exhibition Street
Melbourne VIC 3000

ABN 35 931 927 899