

INVESTMENT PLAN

JULY 2015



Australian Government
Australian Renewable
Energy Agency



Contents

		PAGE
01	Introduction	1
02	About ARENA	1
03	ARENA's investment approach	3
04	ARENA's investment focus areas	4
05	ARENA's new programme structure	12
06	Knowledge sharing activities	12
07	Activity eligibility	15
08	Funding mechanisms	16

01 Introduction

This Investment Plan (IP) provides information on the focus areas for financial support provided by the Australian Renewable Energy Agency (ARENA), and also identifies ARENA's current investment priorities. The investment focus areas and investment priorities are detailed in Section 4.

The IP is intended to inform investment decisions made by ARENA under its current legislation, act as a guide for funding applicants, and inform knowledge sharing activities.

ARENA uses the principles set out in the General Funding Strategy (GFS) to identify investment focus areas and

assesses all proposals for best fit with the investment focus areas to determine which will be financially supported.

The GFS is reviewed each year, updated if necessary, and provided to the Minister for Industry and Science for approval. The IP is reviewed from time to time and updated if necessary.

ARENA may only provide financial assistance in accordance with the GFS. While ARENA considers the documents to be consistent, if any conflict arises between the GFS and this IP, the GFS takes precedence.

02 About ARENA

ARENA is a statutory agency established by the Australian Government on 1 July 2012 under the *Australian Renewable Energy Agency Act 2011*. ARENA's overarching objectives, which are set out in the legislation, are to:

- improve the competitiveness of renewable energy technologies
- increase the supply of renewable energy in Australia.

To achieve these objectives, ARENA's mission is to help catalyse the development and deployment of renewable energy. ARENA's vision is an Australian economy and society increasingly powered by competitive renewable energy.

ARENA takes a long-term view of these objectives with the aim of having maximum impact from 2020 to 2040.

ARENA funds activities
that are expected to
advance renewable energy
technologies towards
commercial readiness,
improve business models or
reduce overall industry costs

03

ARENA's investment approach

The GFS states ARENA's investment objectives are to:

- demonstrate renewable energy's role in addressing Australia's current energy issues
- provide renewable energy technology options for the long term.

To achieve these objectives, ARENA funds activities that are expected to advance renewable energy technologies towards commercial readiness, improve business models or reduce overall industry costs.

ARENA takes a portfolio approach to investments, supporting activities across the innovation chain from research in the laboratory to large-scale pre-commercial deployment activities.

The portfolio includes both innovative technology solutions for earlier-stage activities and commercial models for later-stage solutions.

The timeframe over which ARENA expects activities to have an impact varies by innovation stage and investment focus area. Research and development into emerging technologies, for example, may have a path to commercialisation measured in decades whereas demonstration activities may have a path to commercialisation in five to ten years.

04

ARENA's investment focus areas

ARENA has identified investment focus areas that would best help the organisation achieve its objectives.

The investment focus areas guide ARENA's investment decisions, either as merit criteria for the Advancing Renewables Programme or as eligibility criteria for the competitive Research and Development Programme.

The investment focus areas represent ARENA's best thinking at the time of publication. The renewable energy field is constantly changing therefore ARENA will review its investment focus areas from time to time and update them if required.

A more detailed rationale including reference to studies and other sources can be found at arena.gov.au.

Priorities for new investment

Within ARENA's investment focus areas, five priorities have been assessed as areas where ARENA can currently make the most impact.

ARENA's priorities for new investment are:

- integrating renewables and grids
- renewables for industrial processes
- off-grid areas
- fringe-of-grid and network-constrained areas
- large-scale solar photovoltaics.

The following pages detail ARENA's current investment focus areas, grouped into three investment themes.

Priorities for new investment

Integrating renewables
and grids

Renewables for
industrial processes

Off-grid areas

Fringe-of-grid and
network-constrained areas

Large-scale solar
photovoltaics

Theme: Addressing barriers to the long-term uptake of renewables

PRIORITY: Integrating renewables and grids

ARENA's investment focus is on supporting activities that facilitate higher penetration and utilisation of renewable energy generation and distributed energy resources in Australia, with a focus on:

- behind-the-meter or customer-focused solutions, including approaches to achieve and monetise benefits across the electricity supply chain from new business models to technologies such as storage, inverter controls or load control
- facilitating higher renewable energy penetration in low-voltage networks to allow increased consumer take-up at lower cost, with a particular focus on grid configurations where integration issues are more likely to emerge at relatively low renewable penetration levels
- addressing knowledge gaps for integrating renewables and grids where knowledge is missing or not sufficiently shared, particularly where relevant to deliberations on energy policy, market rules, regulation or network practices and procedures.

Theme: Helping renewable energy technologies meet energy users' needs

PRIORITY: Renewables for industrial processes

ARENA's investment focus is on supporting activities that demonstrate the application of renewable energy within industrial processes to:

- displace fossil fuels in industrial processes, particularly the use of gas to produce thermal energy
- establish the economic benefits possible from renewable energy use by reducing exposure to future volatility in energy prices
- reduce the technical and commercial risks associated with renewable energy deployment.

PRIORITY: Off-grid areas

ARENA's investment focus is on supporting activities that involve the integration of renewable energy with existing supply in remote off-grid areas for:

- industrial end use applications, especially critical mine loads
- remote communities that rely on agreements with an Independent Power Producer (IPP).

PRIORITY: Fringe-of-grid and network-constrained areas

ARENA's investment focus is on supporting knowledge sharing and demonstration activities that are focused on:

- demonstrating the viability of distributed renewable energy systems (potentially in conjunction with an enabling technology such as storage) to alleviate the need for network augmentation in areas that are typically fringe-of-grid or where there is a network constraint
- demonstrating the ability of distributed renewable energy systems to provide other benefits at the fringes of grids, such as to reduce losses or increase reliability.

PRIORITY: Large-scale solar photovoltaics

ARENA intends to run a competitive process for up to 200 MW of large-scale solar photovoltaics (PV). Proposals will be expected to be between 10 MW and 50 MW (DC) and have an LCOE of \$130/MWh or less. The goal of this funding support will be to substantially reduce the current gap in commercial competitiveness between large-scale solar PV and wind generation.

Renewables in residential and commercial buildings

ARENA's investment focus is on supporting:

- studies and knowledge sharing activities with a particular focus on generating and disseminating evidence to inform regulatory, commercial and/or financial barriers to renewable energy in residential or commercial buildings
- demonstration activities with a particular focus on:
 - » innovative approaches to reducing costs, increasing efficiency or proving the reliability of innovative renewable generation technologies in residential or commercial buildings
 - » innovative business models.

ARENA does not fund proposals involving the demonstration or deployment of existing commercial renewable energy technologies in existing conditions.

Community energy

ARENA's investment focus is on continued support for the emerging community energy sector:

- reducing project development costs (including through knowledge sharing)
- building capacity within the community energy sector to the point that community-owned renewable energy becomes self-reliant and does not require government funding
- developing innovative business and financing models that reduce the cost of capital for projects.

ARENA will also consider supporting specific community energy activities where the activity also fits well with ARENA's investment focus area.

Theme: Advancing the commercial development of renewable energy and enabling technologies



Bioenergy

ARENA's investment focus is on supporting bioenergy electricity and heat demonstration activities that demonstrate:

- pathways that meet local demand (particularly off-grid/fringe-of-grid and potential opportunities to displace industrial gas use)
- efficient aggregation, processing and development of renewable feedstock for bioenergy
- purification of biogas.

ARENA will require Life Cycle Assessments for applications, and will not exclude proposals that are economically dependent on co-products.



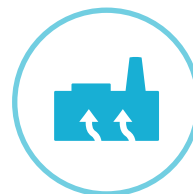
Biofuels

ARENA's investment focus is on supporting biofuels activities that demonstrate:

- pathways that meet demand (particularly aviation/marine fuel, niche or remote applications)
- efficient aggregation, processing and development of renewable feedstock for biofuels
- processing of bio-crude or other intermediate fuels into refined, drop-in fuels¹ suitable for end users.

ARENA is primarily interested in advanced biofuels² and will require Life Cycle Assessments for applications. Proposals that are economically dependent on co-products³ will not be excluded.

1. Renewable or drop-in biofuels are chemically equivalent substitutes for existing fossil based liquid fuels that do not require engine modifications for use.
2. Advanced biofuels are bio-based and other synthetic fuels derived from renewable sources that do not use feedstocks which could be used for food production (eg sugar cane, wheat, corn).
3. Funding support will only be given to aspects of projects which contribute to innovation in producing renewable energy.



Geothermal

Note: *Research and Development Programme only*

ARENA's investment focus is on supporting geothermal research and development activities that develop or improve:

- techniques for finding prospective geothermal resources without drilling
- technologies to increase the flow rate from geothermal wells.



Hydro

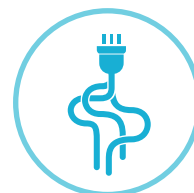
In light of its maturity and widespread deployment, ARENA does not propose to provide funding for hydroelectric activities except where there is an outstanding opportunity to increase deployment in this area.



Marine

ARENA's investment focus is on supporting marine technology activities that involve:

- knowledge sharing activities that capture learning from existing activities, or build industry capacity, as part of global efforts to improve the competitiveness of marine energy
- niche applications that help to commercialise technologies that have high potential to drive down the cost of marine energy deployment.



Renewable-fossil hybrid generation

In the short term, ARENA has no specific investment focus on proposals that are aimed at integrating renewables into existing large-scale generators.

However ARENA remains interested in, and will continue to support, high merit hybrid activities that can demonstrate benefits beyond those identified through ARENA's current portfolio of hybrid projects.

Theme: Advancing the commercial development of renewable energy and enabling technologies (cont)



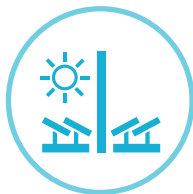
Solar photovoltaic

ARENA's investment focus is on supporting high merit solar photovoltaic (PV) activities that demonstrate benefits beyond those identified through ARENA's current portfolio of solar PV projects. This includes:

- high merit demonstration and pilot-scale activities in innovative applications of solar PV, for example in concentrating or multi-junction applications with the potential to significantly reduce the cost of renewable energy deployment in Australia
- studies, innovative pilots or demonstration activities to reduce balance-of-plant costs
- studies, innovative pilots or demonstration activities that integrate solar PV into buildings.

Later in 2015 ARENA intends to run a competitive process for up to 200 MW of large scale solar PV. Activities will be expected to be between 10 MW and 50 MW (DC) and have an LCOE of \$130/MWh or less. The goal of this funding support will be to substantially reduce the current gap in commercial competitiveness between large-scale solar PV and wind generation.

Support for other activities that use solar PV is also available and is addressed in the sections on integrating renewables and grids, off-grid, fringe-of-grid, and renewable energy in residential and commercial buildings.



Solar thermal

ARENA's investment focus is on supporting solar thermal activities:

- from research and development through to demonstration of small-scale to mid-scale facilities, including balance of plant such as storage and turbines, particularly with high potential to drive down the cost of solar thermal deployment
- involving pilot or demonstration activities for industrial process applications.



Storage

ARENA's investment focus is on supporting activities that involve storage applications behind-the-meter and in a range of off-grid and fringe-of-grid applications, as well as in limited on-grid utility-scale applications, to address barriers to entry and allow for the higher penetration of renewables in Australia. This may include:

- pilots and demonstration activities incorporating storage in end-user applications (ie behind the meter), which may involve control systems and innovative business models designed to maximise the value and benefit sharing of distributed renewable generation
- studies and knowledge sharing activities for utility-scale storage applications, and potentially larger scale pilots and demonstration activities where there is a clear demonstration effect, such as addressing renewable curtailment or unlocking additional value through time shifting or ancillary services
- pilots and demonstration activities that apply storage in off-grid and fringe-of-grid applications to address barriers to higher penetration of renewables or grid stability constraints
- **Note:** *Research and Development Programme only* Research and development activities such as testing and pilots for storage technologies, especially where the activities relate specifically to quality and applicability testing of a technology in Australian conditions.



Wind

In light of its widespread deployment and relative maturity, ARENA does not have a significant investment focus on wind energy. However ARENA may consider providing selective support for new technologies or approaches that could reduce the cost of wind energy, including by:

- reducing balance of plant costs
- overcoming grid integration challenges relating to the intermittency of wind and concentration of wind generation in certain regions
- overcoming 'social licence' challenges.

05

ARENA's new programme structure

ARENA has restructured its suite of initiatives and programmes into two programmes.

This has been done to streamline the application and assessment process and maintain flexibility for ARENA to respond to the market.

ARENA has two funding programmes:

- Research and Development Programme
- Advancing Renewables Programme.

The Southern Cross Renewable Energy Fund also remains open. Applicants should directly contact Southern Cross Venture Partners to discuss venture capital opportunities.

Projects that have already been funded under the ARENA's previous initiatives and programmes will not see a change to their processes as a result of ARENA's new programme structure.

06

Knowledge sharing activities

All ARENA-funded activities are expected to include a knowledge sharing component.

ARENA also funds standalone knowledge sharing activities through the Advancing Renewables Programme that are focused entirely on creating, collecting, analysing, storing, using or sharing knowledge.

Knowledge sharing activities may include a wide range of activities aimed at advancing renewables, such as those described in the high-value knowledge list provided on the ARENA website at www.arena.gov.au/about-arena/knowledge-sharing/high-value-knowledge-list.



Advancing renewables along the path to commercialisation

COMMERCIALISATION PATHWAY



RESEARCH & DEVELOPMENT

Support world-leading Australian research or research relevant to Australian conditions

Early stage research

Development



DEMONSTRATION

Demonstrate the feasibility of new technologies and disseminate learning to facilitate scale-up

Pilot scale

Large scale



DEPLOYMENT

Improve commercial readiness through demonstrating business models and improving commercial viability

Pre commercial

Commercial

ARENA PROGRAMMES

Research and Development Programme

Advancing Renewables Programme

Standalone knowledge sharing activities are funded under the Advancing Renewables Programme. All ARENA-funded activities are required to include a knowledge sharing component.

ARENA'S RELATIONSHIP WITH OTHER RELEVANT ACTIVITIES

ARENA

ARENA-CEFC
Co-Investment projects

CEFC

RET

Before applying for ARENA funding, applicants are encouraged to compare their proposal to the investment focus areas listed in this IP

07

Activity eligibility

The Advancing Renewables Programme provides grant funding (including recoupable grants) for activities spanning from late-stage research through to pre-commercial deployment and knowledge sharing.

Most investment focus areas under the Advancing Renewables Programme are continuously open for funding applications, and ARENA may work with applicants to develop a suitable proposal. From time to time ARENA may also announce competitive funding opportunities under the Advancing Renewables Programme.

The Research and Development Programme is competitive, with an annual application round.

Best fit with investment focus areas

Before applying for ARENA funding, applicants are encouraged to compare their proposal to the investment focus areas listed in this IP. ARENA's Advancing Renewables Programme welcomes applications that fit with the investment focus areas, other

than where an investment focus area is listed as being part of the Research and Development Programme or a competitive funding opportunity. ARENA is particularly interested in receiving applications for the five priorities that are also identified (see page 4).

The extent to which a proposal fits with one or more of ARENA's investment focus areas is part of ARENA's merit assessment under the Advancing Renewables Programme. Proposals that fall outside the investment focus areas may also be considered but would need to be of exceptional merit to be successful.

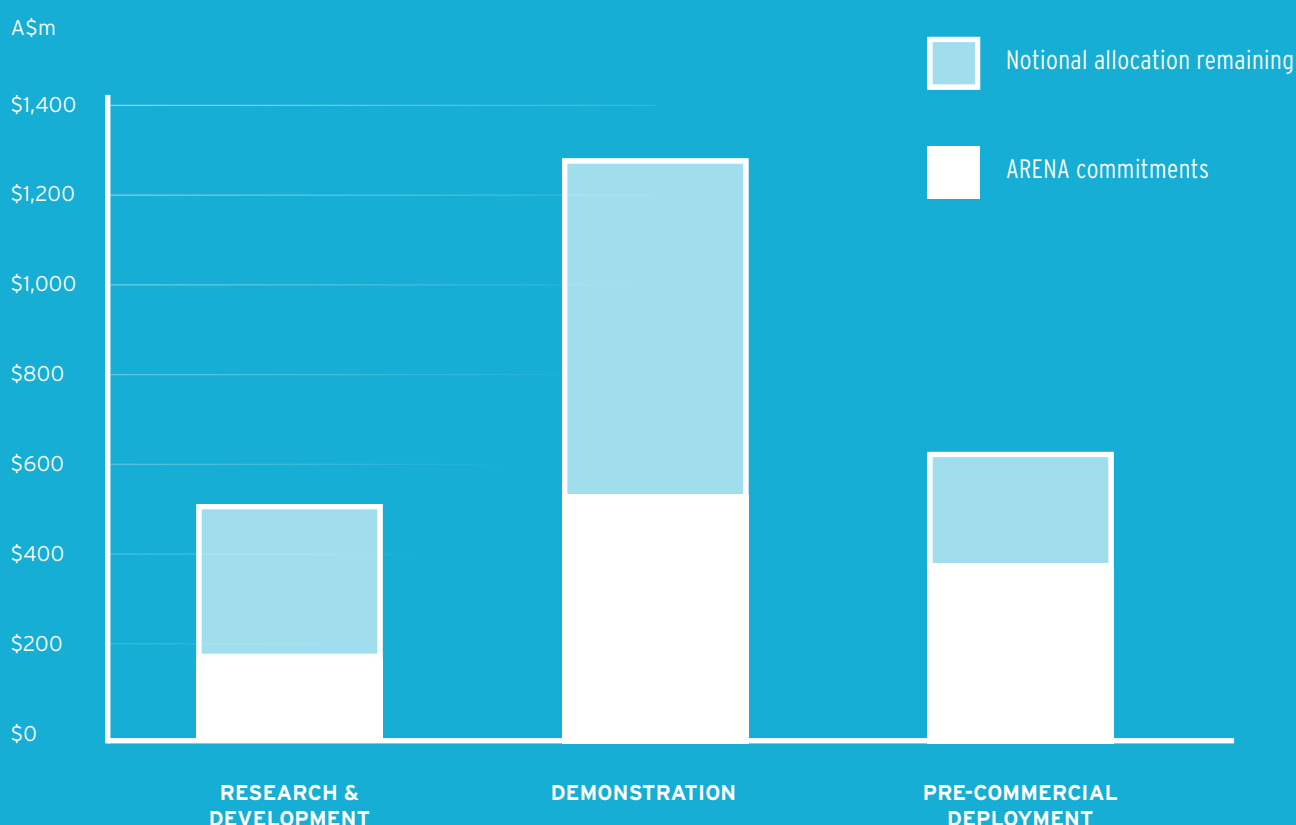
ARENA also plans to run competitive rounds for research and development activities, with the eligibility criteria set and published for each round. Eligible research and development proposals for these rounds are also identified in the investment focus areas.

ARENA does not consider applications for technologies that are not based on sound scientific principles (for example that violate the laws of thermodynamics).

08 Funding mechanisms

ARENA uses a range of funding mechanisms to provide the appropriate type and level of support. It provides funding through a range of grant-based financial support mechanisms (which may include recoupable grants), including open programmes and targeted competitive rounds, as well as procuring technical analysis as required.

Box 1: ARENA's investment across the innovation chain



Current portfolio and notional funding allocation across the innovation chain

Of the \$2.5 billion funding available under the ARENA Act, ARENA invest in activities from research and development through to pre-commercial deployment.

The investment focus areas identified in this IP should be considered alongside ARENA's existing investment portfolio. Given that ARENA is aiming for a diverse portfolio, technologies and applications that are already strongly represented in the existing portfolio will not necessarily be identified as a focus area in this IP.

For example, ARENA added a number of solar PV research and development activities to its portfolio through a dedicated research and development round in 2014.

Similarly, a research and development round has been conducted for activities focusing on integrating renewables and grids, balance of systems, renewables for industrial processes, and building-integrated renewables. ARENA will review the IP for research and development activities in these areas once successful applications are known.

ARENA expects the next update of the IP to include a strong focus on research and development in preparation for the next research and funding round.



Further information is available at
arena.gov.au

Australian Renewable Energy Agency

Enquiries about the Investment Plan

Phone: +61 2 6243 7054

Email: proposals@arena.gov.au

Postal Address

GPO Box 643

Canberra ACT 2601

Location

2 Phillip Law Street

New Action ACT 2601

ARENA



Australian Government

**Australian Renewable
Energy Agency**