

Bioenergy and Energy from Waste in Australia

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Australian Renewable Energy Agency (ARENA)

ARENA's Purpose

ARENA is the Australian Renewable Energy Agency.

The Agency was established by the Australian Government in July 2012.

Our purpose is to improve the competitiveness of renewable energy technologies and increase the supply of renewable energy through innovation that benefits Australian consumers and businesses.

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ARENA's expanded mandate

- The Australian Government has implemented changes to the ARENA's legislation that will expand ARENA's functions, enabling it to support the next generation of clean energy technologies, including energy efficiency and low emissions technologies, in addition to renewable energy.
- The broadened remit will allow ARENA to support technologies contained in the Low Emissions Technology Statement (LETS) such as hydrogen, energy storage to back up renewable energy, low emissions aluminium and steel production, carbon capture and soil carbon.

INVESTED

\$1.70B

PROJECTS

586

VALUE

\$6.92B

INVESTMENT LEVERAGE

\$1:\$3.06

PROJECTS BY TECHNOLOGY



RECENT ACTIVITY

\$71.9M Future Fuels Fund launched to help businesses and regional communities take advantage of opportunities offered by hydrogen, electric, and bio-fueled vehicles

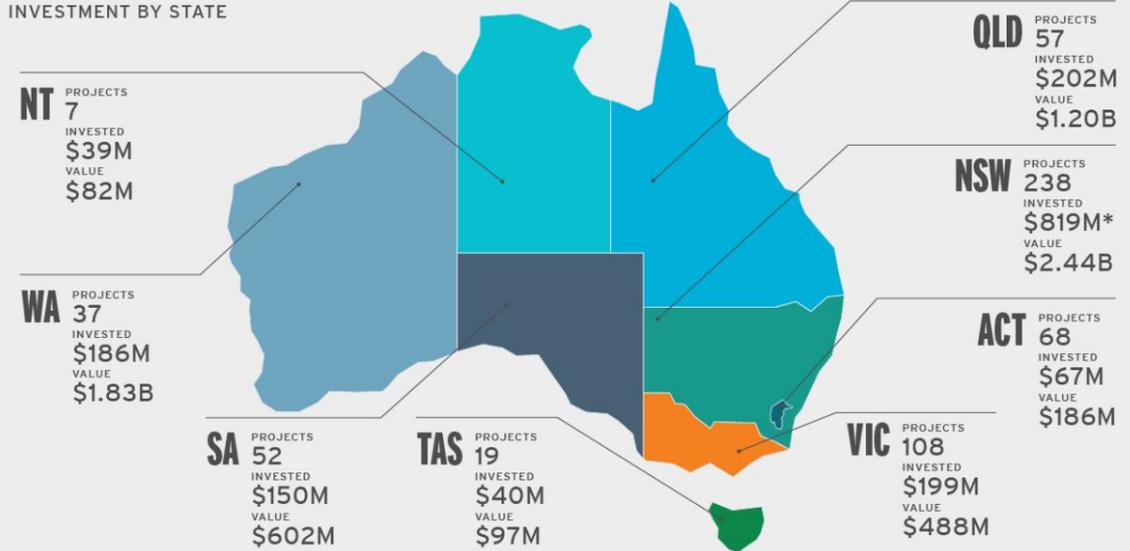
\$1.98M to demonstrate aggregated hot water heater load control

\$1.6M for a residential electric vehicle charging orchestration trial

\$1.49M to commercialise repurposed EV battery and inverter systems

RELEASED State of DER Technology Integration Report, which identifies what is required to integrate DER into Australian electricity markets

INVESTMENT BY STATE



INVESTMENT LEVERAGE ALONG THE INNOVATION CHAIN

STUDY \$1:\$1.68	R&D \$1:\$1.63
DEMONSTRATION \$1:\$1.83	DEPLOYMENT \$1:\$5.73

ENGAGEMENT

INDUSTRIAL ENERGY PROGRAM
Consulted more than 80 people on the Industrial Energy Transformation Studies Program, which aims to help large energy users identify ways to lower energy costs and reduce emissions.

DEIP CEO FORUM
Distributed Energy Integration Program (DEIP) CEOs and senior representatives met to discuss DEIP's progress and next priorities.

* Includes \$567 million contributed to projects inherited by ARENA in 2012.

Investment Priorities

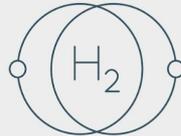
INTEGRATING RENEWABLES INTO THE ELECTRICITY SYSTEM

Delivering technology and business model solutions to enable higher shares of renewables in the electricity sector



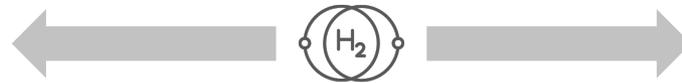
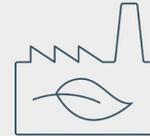
ACCELERATING HYDROGEN

Supporting the growth of Australia's hydrogen industry for domestic applications and export



SUPPORTING INDUSTRY TO REDUCE EMISSIONS

Progressing technologies to reduce costs and reduce emissions



Bioenergy Roadmap

Aims to identify the role that the bioenergy sector can play in Australia's energy transition and help further reduce emissions.

Key focus areas:

- opportunities where the bioenergy sector in Australia may have a competitive advantage, which may include:
 - the role of biofuels to help decarbonise the industrial and transport sectors and contribute to Australia's liquid fuel security
 - opportunities to decarbonise the gas network
 - bioenergy opportunities for heat, steam and power
- current economic and regulatory impediments to the development of the bioenergy sector in Australia
- understanding of markets, technologies, resources, social & environmental factors underpinning the current and potential bioenergy sector
- insights into the economic opportunities for Australia, including a focus on regional Australia



Consultation Process Overview and Themes

9

Consultation
Workshops

17

Direct
Interviews

147

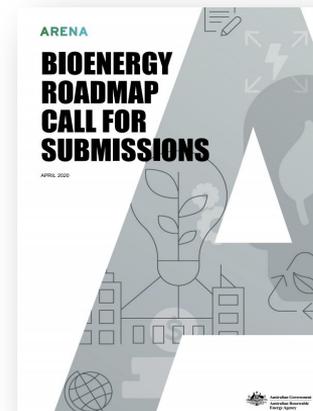
Online
Submissions

137

Participants in
Public
Sessions

Process

- Dedicated landing page launched on ARENA website
 - Accompanied by press releases from the Minister and ARENA
- Landing page included:
 - Expression of interest form for Consultation Workshops
 - Call for Submissions document with accompanying form and upload instructions
- As expected, registrations for workshops exceeded the target number of participants (target was 15-20 per session)
 - As planned, overflow re-directed towards their second choice or Public Session
- The number of submissions has exceeded expectations
 - Over 70% are public submissions



Current opportunities



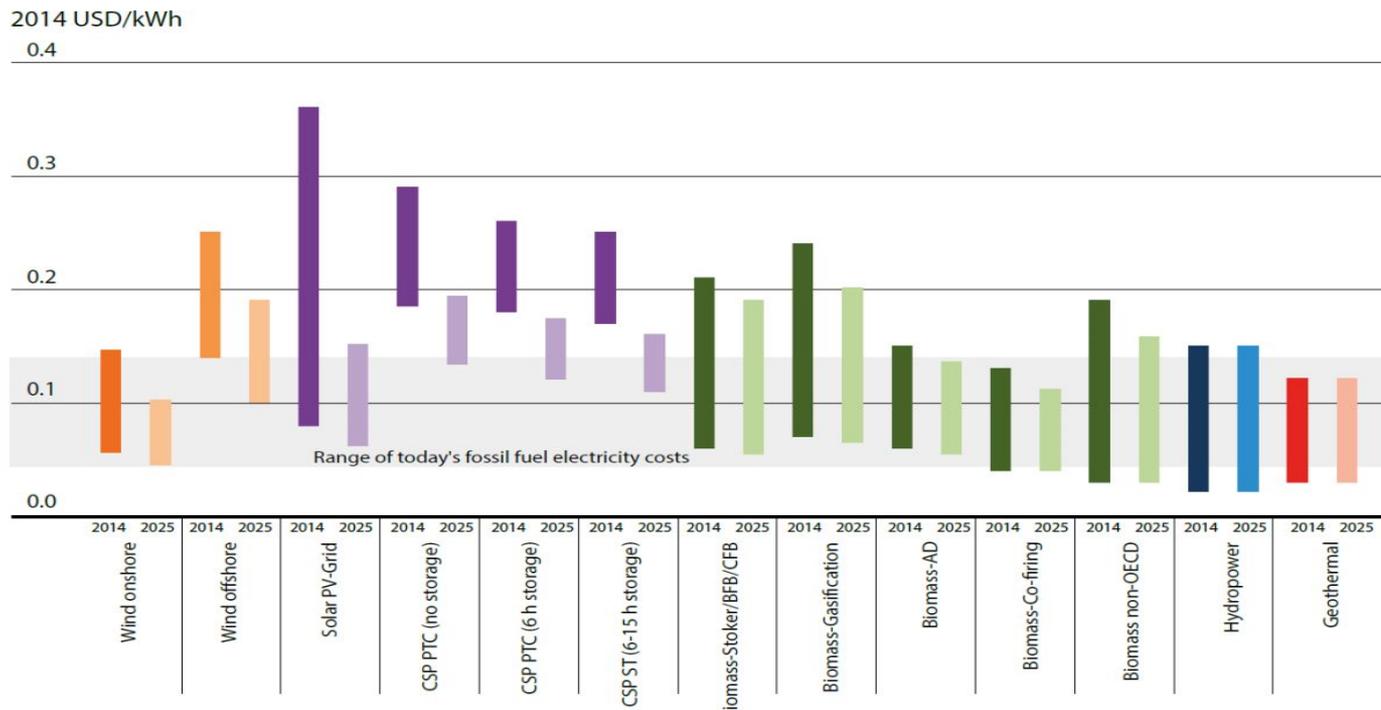
Emissions reduction: Emissions in the waste sector are projected to be 10 Mt CO₂-e in 2020, a decrease of 11 per cent below 2017 levels.¹



Potential Growth and Investment

- In other countries, ~2% of waste is not recycled or used as energy (landfilled), in Australia ~40% goes to landfill.
- Modern bioenergy leads renewables growth to 2023 according to latest IEA market forecast.²
- Bioenergy (excluding traditional use of biomass) was responsible for half of all renewable energy consumed in 2017 – and provided four times the contribution of solar PV and wind combined.

Bioenergy can be competitive on LCOE



Levelised cost of electricity (LCOE, US\$/kWh) ranges by renewable power generation technology, 2014 and 2025 [IRENA, 2015]

ARENA Portfolio



Australian Government
Australian Renewable
Energy Agency

ARENA

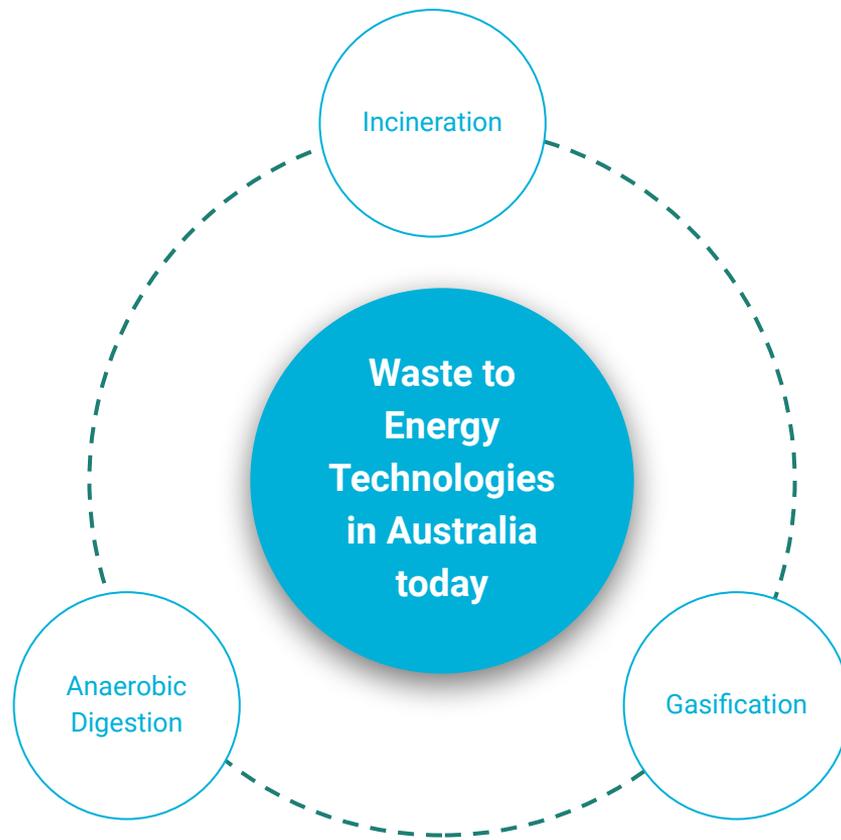


East Rockingham and Kwinana Waste Incineration of MSW to electricity



East Rockingham Resource Recovery Facility: Municipal, industrial, commercial

Goulbourn Bioenergy Project: Anaerobic digestion to capture biogas



Logan City Council - Gasification

Benefits



Reduced carbon footprint



Address disposal problem



Provide secure and reliable dispatchable electricity



Support rural economies

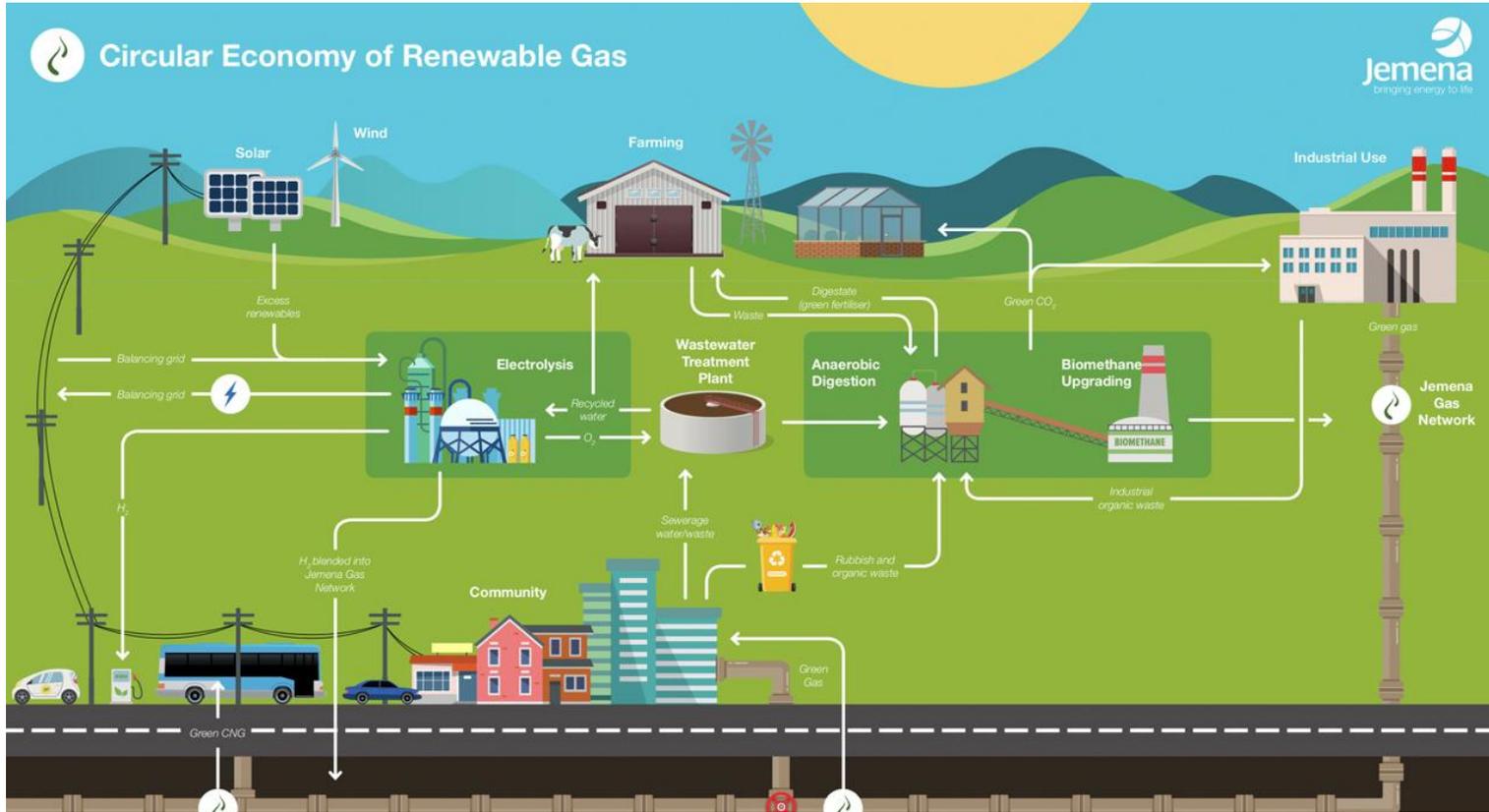


Improved air quality

Renergi - Energy from Waste Through Pyrolysis



Jemena / Sydney Water: Malabar Biomethane Injection Project



ARENA

- ARENA has provided \$131 million in funding towards bioenergy projects across Australia.
- For more on our bioenergy portfolio, visit <https://arena.gov.au/renewable-energy/bioenergy/>
- For funding enquiries please email: proposals@arena.gov.au

Outlook

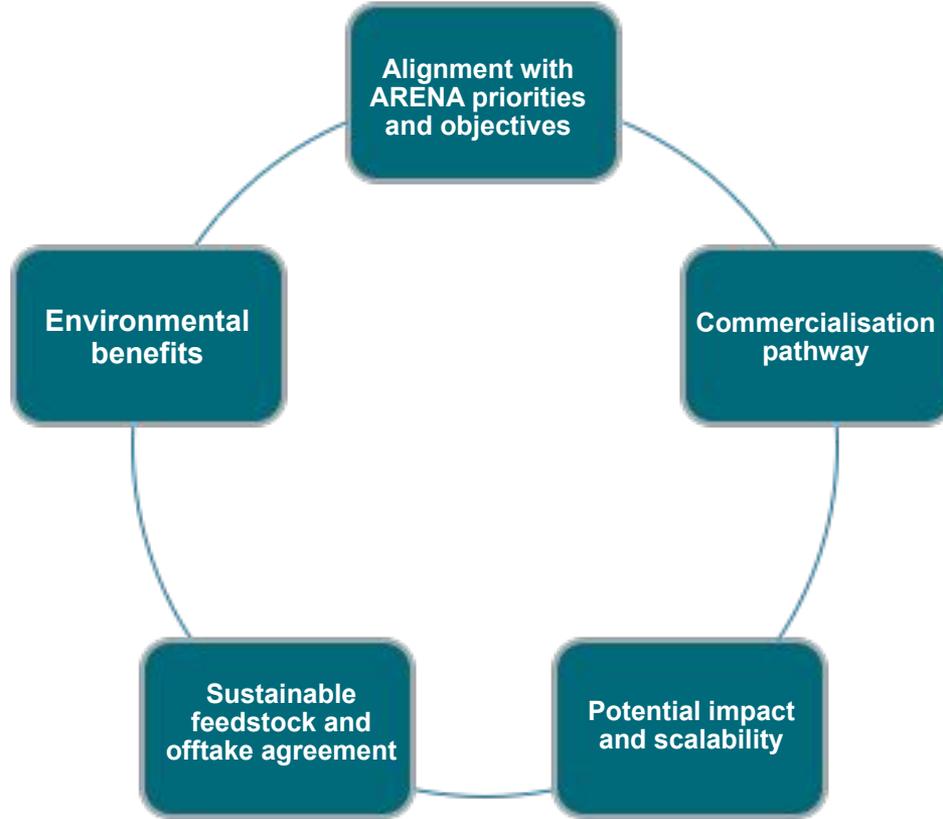


Role for ARENA moving forward

- **Build on existing ARENA portfolio** that has primarily focused on technology innovation and advancement
- Greater focus on **supporting commercial innovation** to align readiness of key technologies with international experience levels
- Identification and utilisation of **new waste streams**

Alignment with
ARENA Priorities
and Objectives

Key investment criteria



Environmental
benefits

Commercialisation
pathway

Alignment with
ARENA Priorities
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