
RACE for
2030
BUSINESS
B5: Anaerobic digestion for electricity, transport and gas opportunity assessment
Barriers & Policy Workshop, 17th March, 2022

AUSTRALIAN ALLIANCE FOR ENERGY PRODUCTIVITY

Jarrod Leak
Chief Executive Officer
jarrod.leak@a2ep.org.au

We would like to acknowledge the Traditional Custodians of country throughout Australia and their connections to land, sea and community. We pay our respect to their Elders past, present and emerging.

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Housekeeping

- The slides will be distributed shortly after this meeting
- This meeting is being recorded. If you do not wish to be recorded, you are welcome to leave your camera turned off.
- Your participation is entirely voluntary, and we will seek your consent to participate at the start this meeting. You are free to withdraw from participating at any time prior to report publication without providing a reason. With your consent, we will list participant organisations in reports, without attributing specific statements to members. Please see the link in the **Chat** for the Consent Form in Google Forms.

RACE for 2030

Agenda

Item	Time	Lead
Open & Welcome	2:30 – 2:40pm	Jarrod Leak – A2EP
Study overview	2:40 – 2:50pm	Prasad Kaparaju– Griffith Uni
Barriers workshop	2:50 – 3:20pm	Andrea Trianni – UTS
Regulatory workshop	3:20 – 3:50pm	Rowena Cantley-Smith – UTS
Closing	3:50 – 4:00pm	Jarrod Leak – A2EP

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Griffith UNIVERSITY

Institute for Sustainable Futures

UTS UNIVERSITY OF TECHNOLOGY SYDNEY

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Associate Professor Prasad Kaparaju, Griffith University (Project Leader)
A leading international researcher in anaerobic digestion, environmental biotechnology and bioprocess engineering. A/Prof. Kaparaju is an active member of Bioenergy Australia and Member of Taskforce on Waste Management, Circular Economy and Biogas in Australia.

Dr Rowena Cantley-Smith, University of Technology, Sydney (Project Manager)
A Senior Lecturer in the Faculty of Law and practicing lawyer with more than 20 years' experience in the Australian and European energy sectors and expertise encompassing energy policy, law, and regulation, climate change law, legal rights and consumer protections.

Professor Long Nghiem, University of Technology, Sydney
Prof. Nghiem is an international leader in energy and resource recovery from waste and wastewater. His research to recover energy and nutrients from wastewater and organic waste has been impactful to bioenergy management and industry practice in Australia and overseas.

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Associate Professor Andrea Trianni, University of Technology, Sydney
A mechanical and industrial engineer internationally recognised as leader in industrial energy efficiency, A/Prof. Andrea Trianni has more than 100 publications with particular emphasis on the barriers to and drivers for the adoption of more sustainable solutions by industry.

Jarrod Leak, CEO, Australian Alliance for Energy Productivity (A2EP)
Before A2EP, Jarrod was Managing Director and Cluster President for Swedish engineering company, Alfa Laval's Oceania and south east Asian operations. He has extensive experience with municipal wastewater treatment, agriculture and food processing, and cogeneration systems.

Dr Rebecca Cunningham, UTS-ISF, Sydney
Dr Rebecca Cunningham is a social scientist with research interest and expertise in climate change adaptation, data analytics and visualisation, natural resource governance, the science/policy/community nexus, science communication including the use social network analysis

A/Prof Brent Jacobs, UTS-ISF, Sydney
A/Prof Brent Jacobs is a Research Director in the UTS-Institute for Sustainable Futures working in climate change adaptation, landscapes and ecosystems, and food systems. He has a background in agricultural science and a decade of experience in the natural resource sector in NSW Govt.

Stakeholders

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Water Utility

Sydney Water

Barwon Water

User / Producer

BlueScope

agl

LMS Energy

VISY

JBS

Jemena
bringing energy to life

Industry Association

AMPC

Dairy Australia

Australian Pork

CANEGROWERS

eit Climate-KIC

QFF Queensland Farmers Federation

Bioenergy Australia
FUEL | GAS | HEAT | POWER

Water Services Association of Australia

FIAL
The Food and Agribusiness Growth Centre

Australian Gas Infrastructure Group

Technology

FINNBIOGAS

ENERGY 360

biogass
Energy from Waste

Gaia EnviroTech

Local Government

City of Gold Coast

LatrobeCity
a new energy

Upper Hunter Shire Council

Investment

cefc

Australian Sustainable Finance Institute

ANZ

State Government

Agriculture Victoria

Victoria State Government
Environment, Land, Water and Planning

EPA Victoria

NSW Government
Planning, Industry & Environment

NSW SEPO

NSW Government
Department of Primary Industries

Queensland Government
State Development, Infrastructure, Local Government and Planning

Queensland Government
Department of Environment and Science

Consultant

ndevr environmental

CORPORATE CARBON
...NEW MARKET SOLUTIONS

enea CONSULTING

Federal Government

Australian Government
Department of Industry, Science, Energy and Resources

Australian Government
Australian Renewable Energy Agency

ARENA

Australian Government
Clean Energy Regulator

CLEAN ENERGY REGULATOR

Developer

CLEAN Cowra

HELMONT energy

VEOLIA

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Study overview by Assoc. Prof. Prasad Kaparaju

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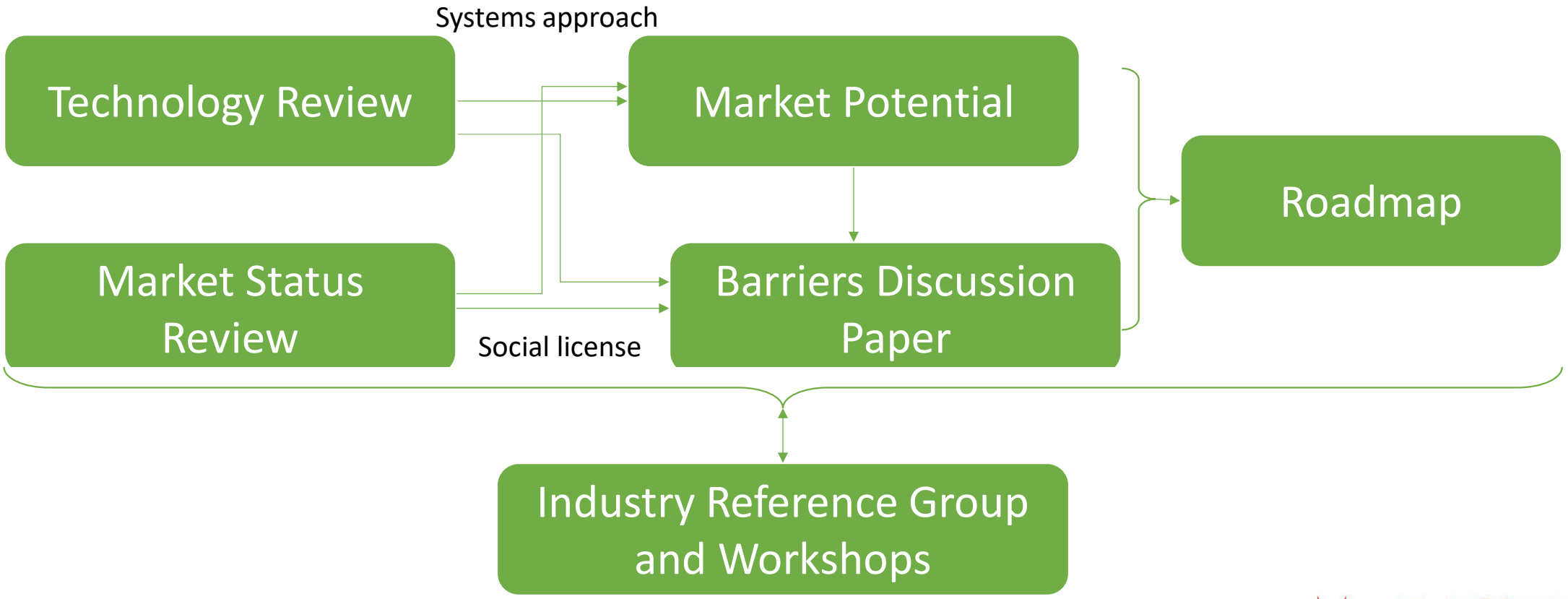
Overview



Assoc. Prof. Prasad Kaparaju

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Poll and Discussion

- Barriers and Opportunities by Andrea

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Overview of Barriers

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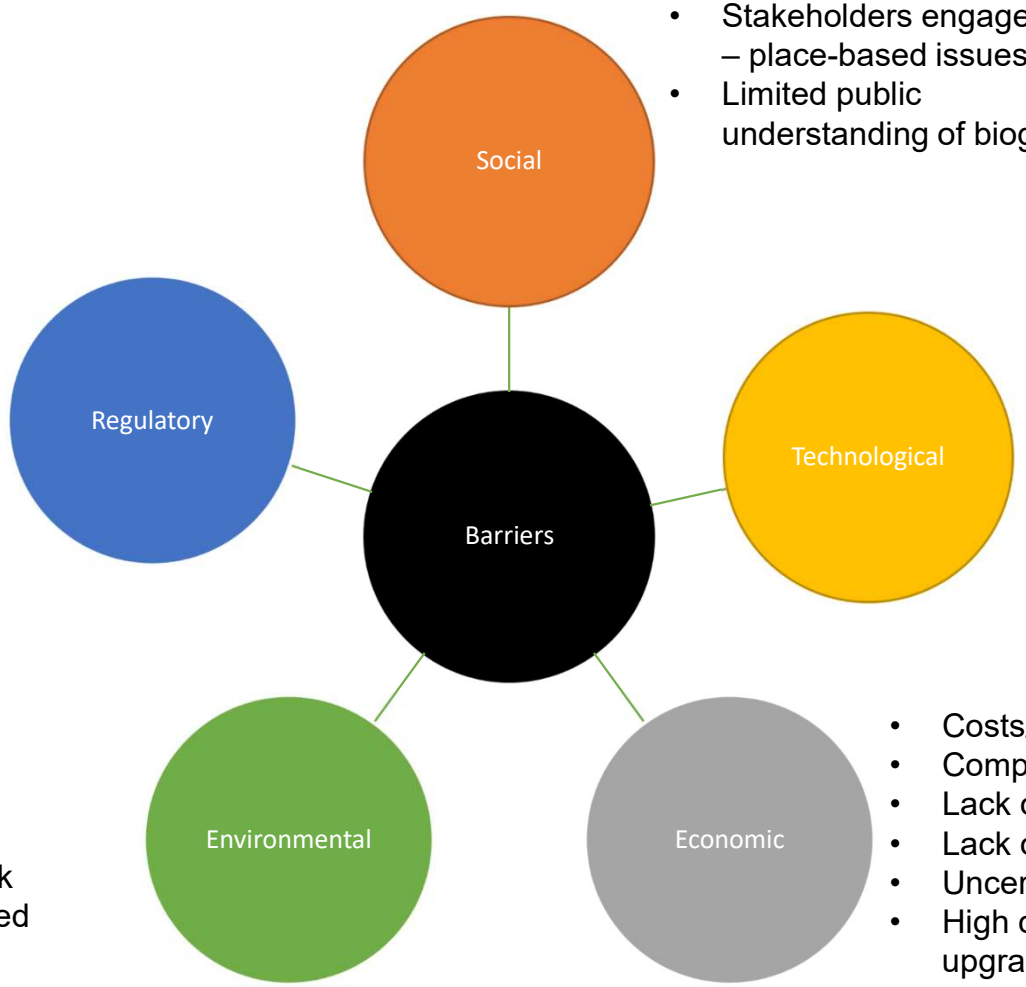
- Complex ecosystem
- Trust - partnerships
- Stakeholders engagement – place-based issues
- Limited public understanding of biogas



- No uniform national regulatory scheme
- Inconsistent or lacking policy, governance and regulatory mechanisms
- Constraints on grid injection
- Environmental and planning restrictions

- Infrastructural
- Feedstock supply and transport
- Being reluctant in signing long-term agreements
- Long distances between biogas unit and targeted feedstocks
- Lack of industrial experience on biogas
- Lack of reliable information and guidelines
- Lack of industry partners to co-develop biogas projects

- Characteristics of biogas
- Characteristics of feedstock
- Quality of feedstock supplied (need for additional processes/treatment)

- Costs/capital requirements
- Competition with other fuels
- Lack of R&D funding
- Lack of subsidies and support
- Uncertainty with creating value from AD
- High costs of production, cleaning and upgrading

What are the most relevant **economic** barriers to AD deployment?

Please rate the following 1/10 (*1=not* relevant, 10 = most relevant):

- Costs/capital requirements
- Competition with other fuels
- Lack of R&D funding
- High costs of production, cleaning and upgrading
- Lack of subsidies and support
- Uncertainty with creating value from AD

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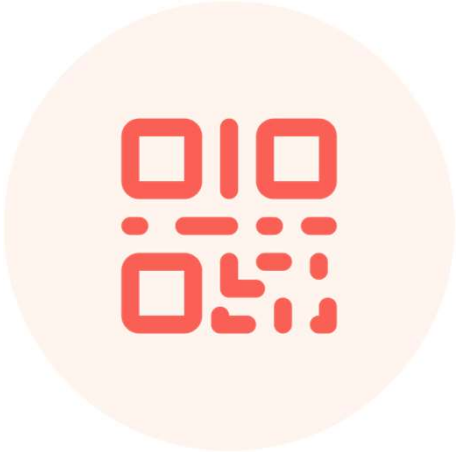

Join at slido.com
#770362

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What are the most relevant economic barriers to AD deployment? Pick the three most relevant

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Are there any other major economic barriers not listed yet?
Please drop a quick note.

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What are the most relevant **technological** barriers to AD deployment?

Please rate the following 1/10 (*1=not* relevant, 10 = most relevant):

- Infrastructural
- Feedstock supply and transport
- Being reluctant in signing long-term agreements
- Long distances between biogas unit and targeted feedstocks
- Lack of industrial experience on biogas
- Lack of reliable information and guidelines
- Lack of industry partners to co-develop biogas projects

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What are the most relevant technological barriers to AD deployment? Pick the three most relevant

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Are there any other major technological barriers not listed yet?
Please drop a quick note

ⓘ Start presenting to display the poll results on this slide.

What are the most relevant **social** barriers to AD deployment?

Please rate the following 1/10 (*1=not* relevant, 10 = most relevant):

- Complex ‘ecosystem’ of partners
- Trust – need for collaborative partnerships
- Lack of stakeholder engagement – place-based issues
- Limited public understanding of biogas production

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What are the most relevant social barriers to AD deployment? Pick the two most relevant.

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Are there any other major social barriers not listed yet?
Please drop a quick note

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What are the most relevant **environment** barriers to AD deployment?

Please rate the following 1/10 (*1=not* relevant, 10 = most relevant):

- Characteristics of biogas
- Characteristics of feedstock
- Quality of feedstock supplied (need for additional processes/treatment)

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What are the most relevant environment barriers to AD deployment? Pick the one that is most relevant.

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Are there any other major environment barriers not listed yet?
Please drop a quick note

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Discussion

- Regulation and policy with Rowena

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CRC-RACE 2030 B5 Opportunity Assessment
17 March 2022

REWENABLE NATURAL GAS: REGULATORY BARRIERS & OPPORTUNITIES

Dr Rowena Cantley-Smith

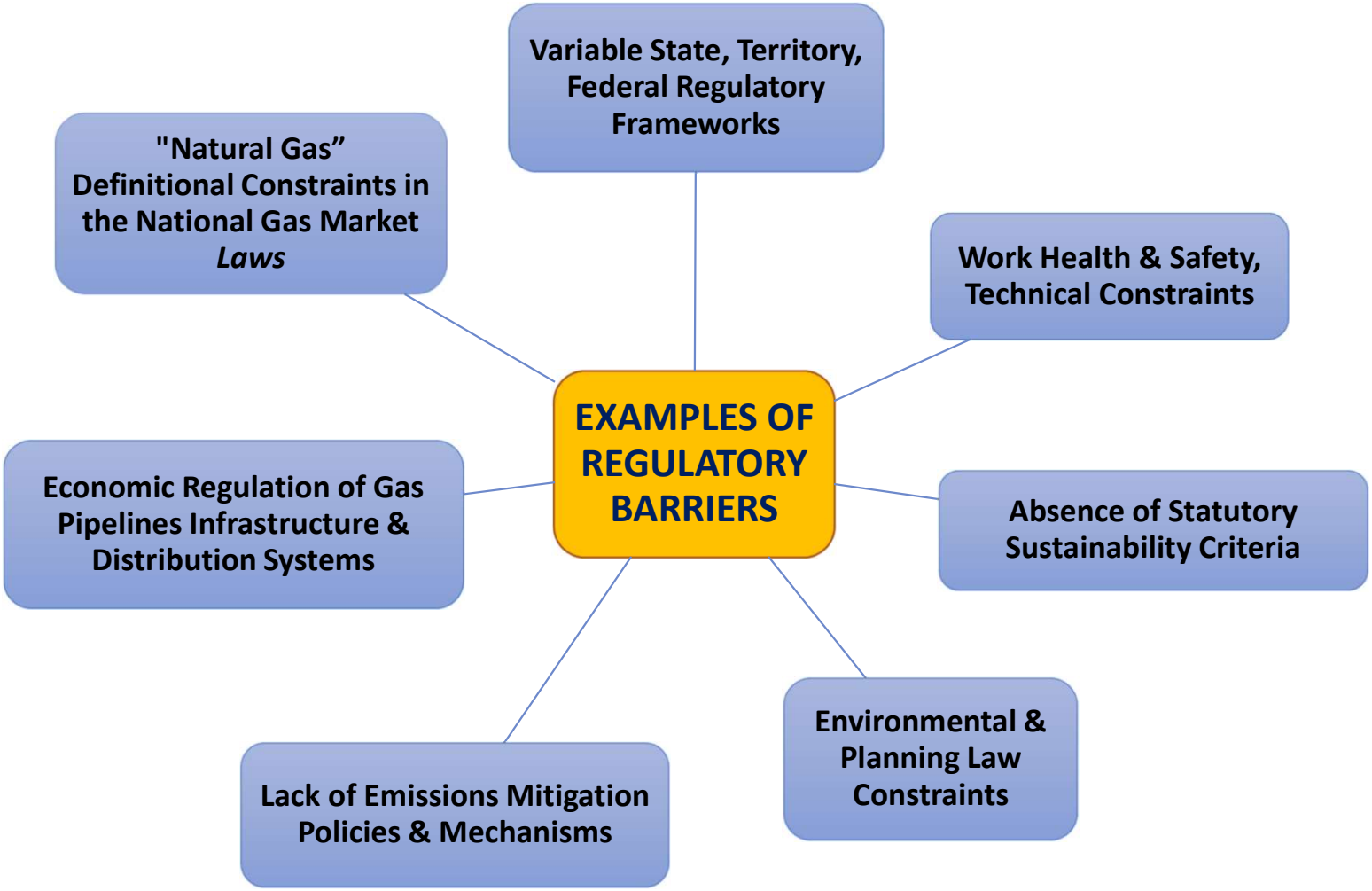
UTS Law Faculty

https://www.bwmonline.com/2019/11/19/keeping-place-with-regulatory-compliance-in-utilities/

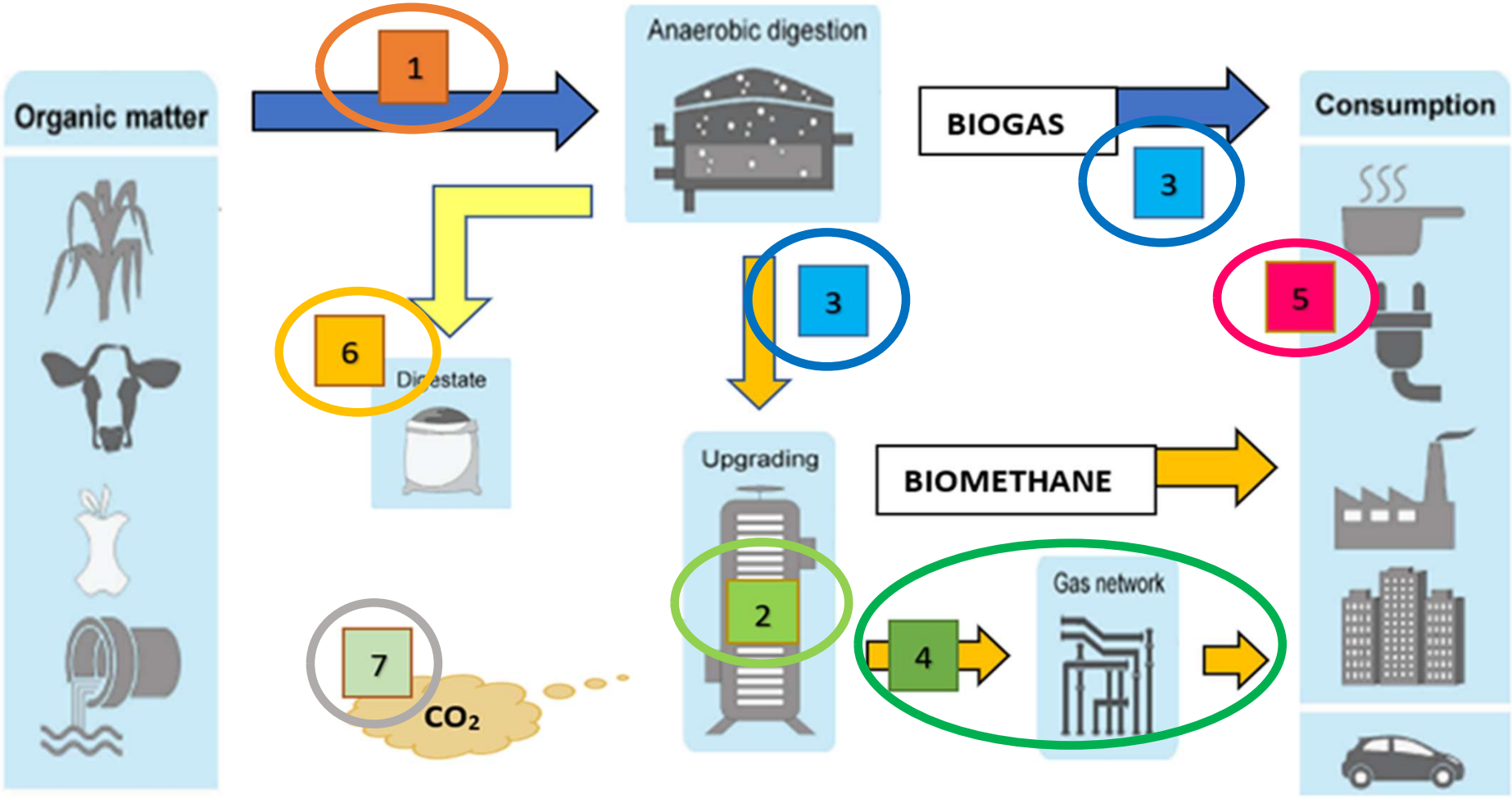
Overview

1. International Perspectives
2. Barriers
3. Recent Developments
4. Opportunities
5. Where to from here?

BARRIERS


EXAMPLES OF REGULATORY BARRIERS
Variable State, Territory, Federal Regulatory Frameworks
"Natural Gas" Definitional Constraints in the National Gas Market *Laws*
Work Health & Safety, Technical Constraints
Economic Regulation of Gas Pipelines Infrastructure & Distribution Systems
Absence of Statutory Sustainability Criteria
Environmental & Planning Law Constraints
Lack of Emissions Mitigation Policies & Mechanisms

BARRIERS


Organic matter
1
Anaerobic digestion
BIOGAS
3
Consumption
5
6
Digestate
3
Upgrading
BIOMETHANE
2
4
Gas network
7
CO_2

RECENT DEVELOPMENTS

International

- Geopolitical concerns
- Energy security risks

Mitigation incentives

- ERF & ACCUs
- 2022 Biomethane Package
- Australian Carbon Market Pilot

Renewable Gas

- NSW National Renewable Gas Certification Scheme
- Review of National Gas Market Laws
- Competitor fuels

Increased electrification

- Ending household use of natural gas
- Promotion of EVs
- Battery storage

RECENT DEVELOPMENTS

UN High Level Dialogue on Energy 2021+

European Union Green Deal

RED II+

Bioenergy

Renewables

Glasgow Climate Pact

International Experiences

OPPORTUNITIES

Comp
Natio

Na
Renewa
Gas

Legally
Susta
Cr

nic
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lational
Reform

Source central graphic https://www.sdpb.org/blogs/arts-and-culture/where-do-we-go-from-here-1/

We would appreciate your feedback on the following questions (answers can be put in the next SLIDO)

DISCUSSION QUESTIONS

- What do you see is the key role of a regulatory framework for biogas and biomethane?
- How can carbon mitigation benefits be better recognised and rewarded?
- What policy drivers could be introduced to support AD/Biogas and Biomethane?
- What renewable gases should be recognised in the existing National Gas Market laws?
- Should the existing market institutions (AEMC, AER, AEMO) have primary responsibility in respect of biomethane?
- A question for further discussion: What "laws" could be introduced to support AD/biogas and Biomethane?

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What do you see is the key role of a regulatory framework for biogas and biomethane?

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Next steps / key dates

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Next steps

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- Future opportunities/brainstorming over the future research roadmap by Andrea
- Market potential paper by Prasad

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Closing

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Supporting slides

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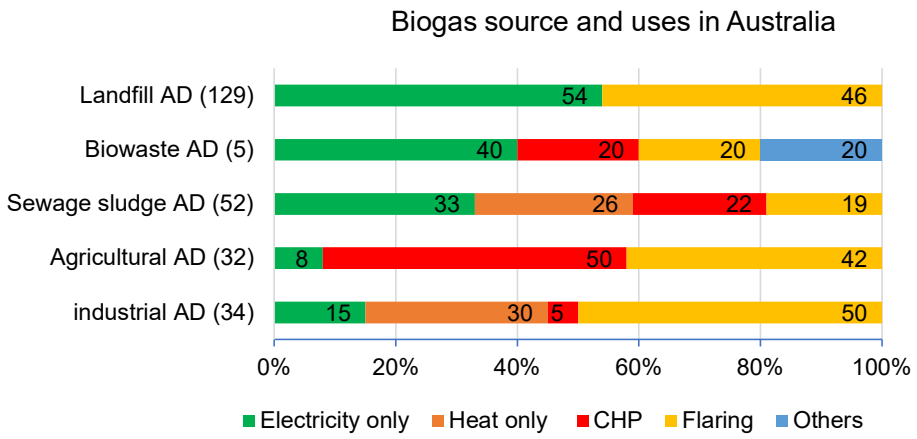
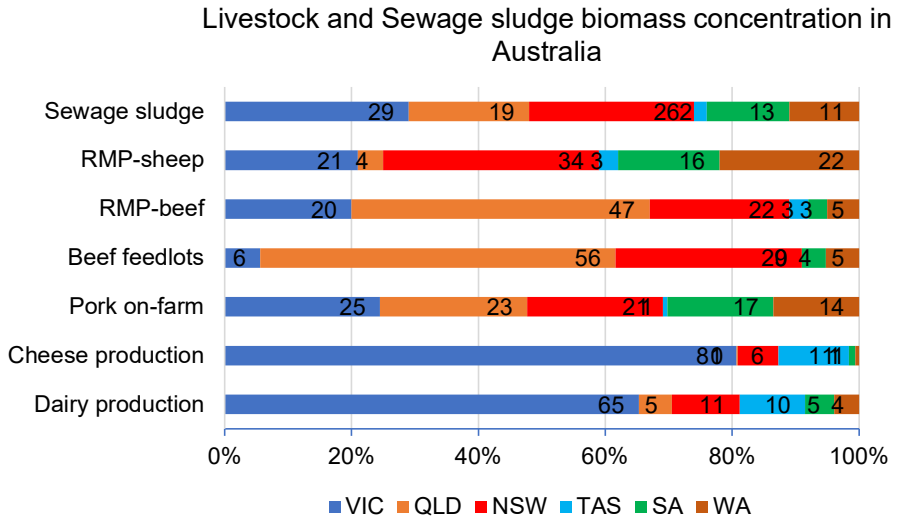
Current status

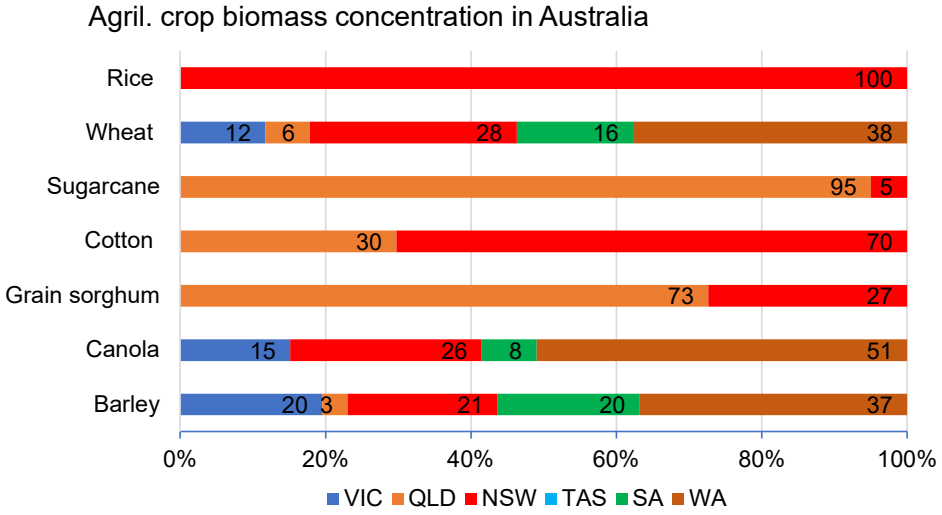
- Total energy consumption 6,013 PJ in 2019-20
  - 16.7 PJ biogas
- 242 AD facilities
- Biogas uses - heat and electricity generation in CHP
  - More than 50% landfills - flare the
- No commercial biogas upgrading plants
- With the future energy policies
  - Share of biomethane could grow to up to 33% by 2050



Sustainable feedstock availability

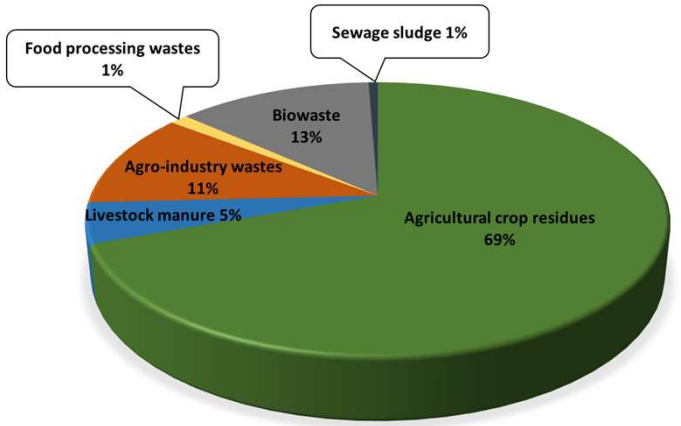
- Agril biomass is the major feedstock.
- Pork production - across QLD, VIC, SA, NSW and WA
- Dairy and beef - VIC and QLD, respectively
- Sheep production - southern states of NSW, SA and VIC and in the southern parts of WA
- Forcing for mono-digestion
- Opportunity for codigestion





Potential biogas production

- Data from the Australian Biomass for Bioenergy Assessment (ABBA) database (ARENA, 2020), available via the AREMI National Map platform
- Total biomass availability: 62 million tonnes TS
- Agril Crop Residues – Major (69.5%)
- Biomass collection rates – Low, Medium and High



Feedstock	Methane prod. (M Nm^3/tFM/yr)	Gross energy potential (GWh/yr)	Biogas use in CHP		Biogas upgrading	
			Electricity Production (GWh_e/yr)	Heat production (GWh_t/yr)	$BioCH_4$ (GJ/yr)	$BioCO_2$ (Million t/yr)
Agricultural crop residues	2,503.72	24,912	10,563	10,613	8,742,286	4,745
Livestock manure	98.92	984	417	419	345,391	151
Agro-industry wastes	375.86	3,740	1,586	1,593	1,312,381	726
Food processing wastes	44.69	445	189	189	156,053	58
Biowaste	154.47	1,537	652	655	539,380	214
Sewage sludge	3.43	34	14	15	11,975	6
Total	3,181.09	31,652	13,420	13,484	11,107,467	5,899

Existing AD Technologies

- AD technologies:
  - Wet process (<10% TS) and Dry (>25%)
  - Batch vs continuous
- Reactor Technology
- CSTR
  - Farm-scale and centralised biogas plants in Europe
  - Manures, energy crops, food waste

- Covered anaerobic lagoon (CAL)
  - High strength abattoir and agricultural wastewater
  - Low initial cost, negligible operating costs and simplicity of operation

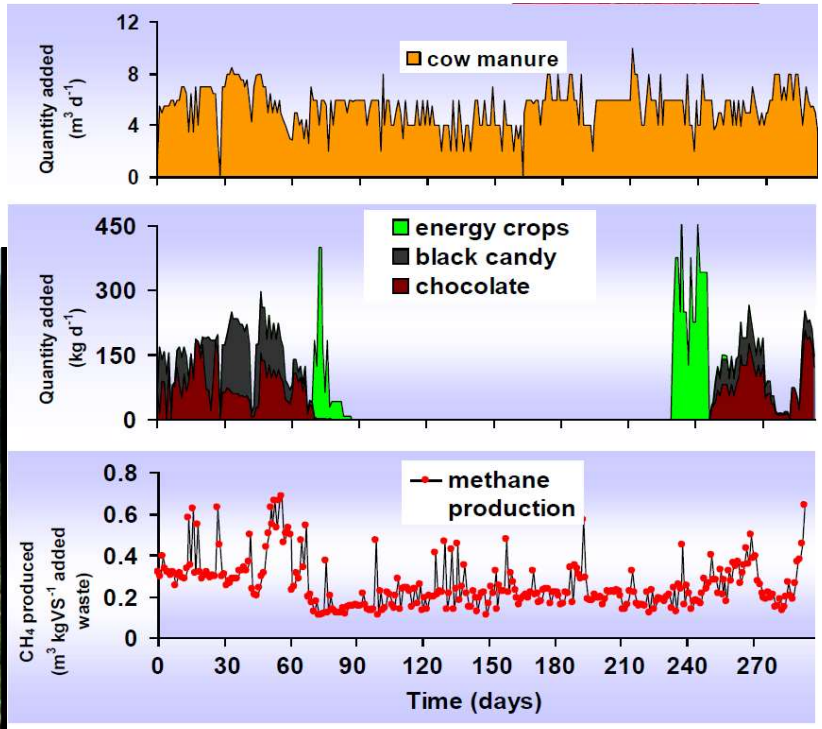
ReWaste Biogas plant Yarra Valley

Southern Meats CAL, Goulburn, NSW

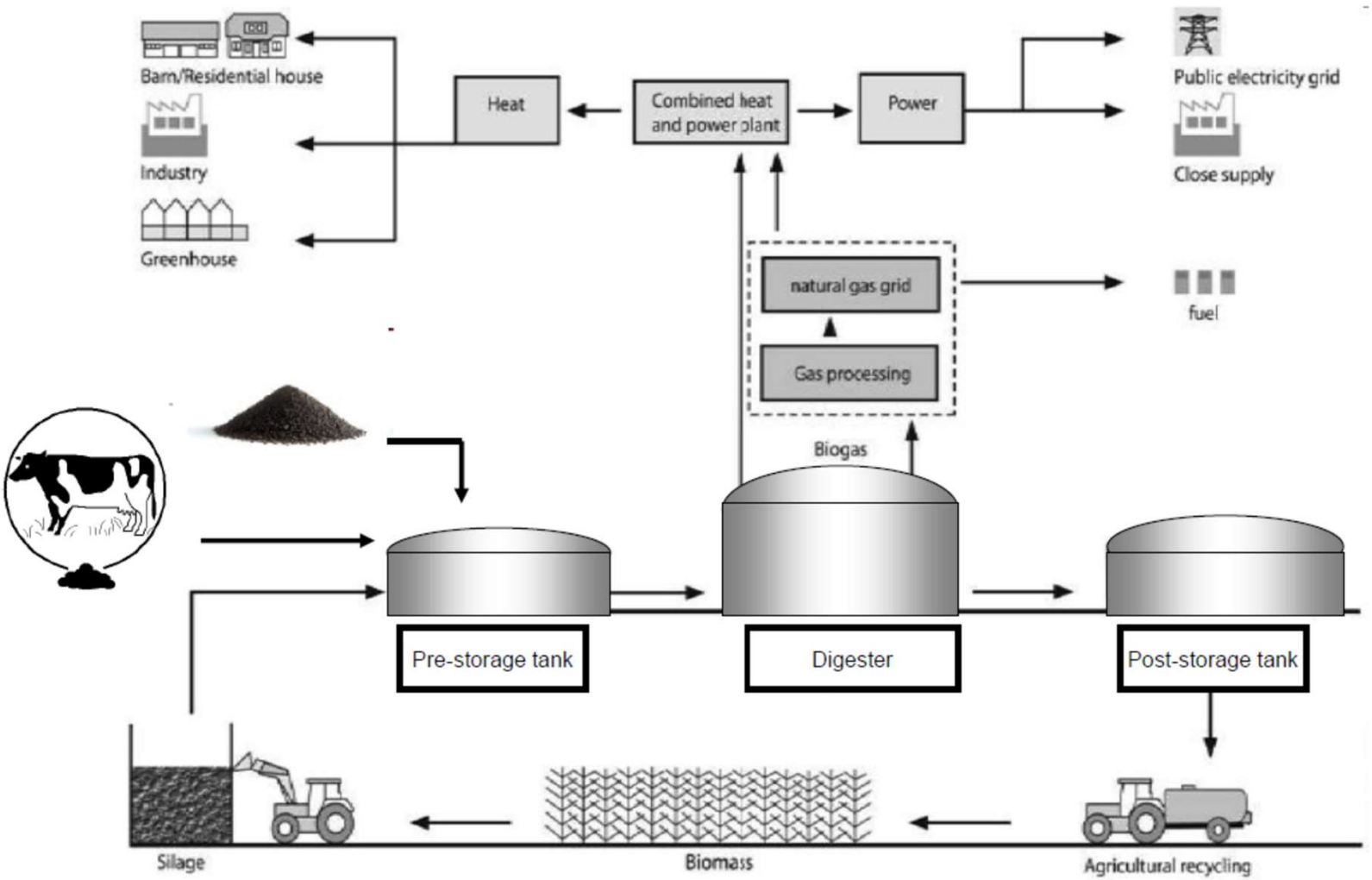
Case studies

Project name	Funding	Feedstock	Fate of digestate	Government incentives eligibility	Power purchase agreement (PPA)	Reference
Jankadot Bioenergy plant	• $A 8 - 10 million capital cost out of which: • $A 2.2 million loan from CEFC • $A 1.6 million grant from Clean Technology Investment program and Western Australia State Government	Commercial and industrial biowaste from various sources	Blended with existing products to improve agricultural values; sold as bio-fertiliser	NIL	NIL	ENEA (2019)
Rewaste plant at Yarra Valley Water	$A 27 million capital cost with no financial support	Commercial and industrial biowaste from various sources	Can be sold for agricultural use	Emission Reduction Fund	NIL	ENEA (2019)
Goulburn Bioenergy Project	$A 6.39 million capital cost out of which: • $A 2.1 million funded by ARENA	On-site feedstock supply, industrial wastewater from proximal abattoir	NIL	Australian Carbon Credit Units (ACCUs)	20 years PPA with Southern Meats abattoir	ARENA (2020)

Biogas plant concepts



Kalmari Farm, Finland


Barn/Residential house
Industry
Greenhouse
Heat
Combined heat and power plant
Power
Public electricity grid
Close supply
natural gas grid
Gas processing
fuel
Biogas
Pre-storage tank
Digester
Post-storage tank
Silage
Biomass
Agricultural recycling

Denmark centralised biogas plant