

The logo features a stylized circular icon on the left, composed of three overlapping curved segments in light blue, light green, and white. To the right of this icon, the word "OPTIMAL" is written in a bold, white, sans-serif typeface.

OPTIMAL



Biogas solutions

OPTIMAL

BIOGAS SOLUTIONS FOR LARGE SCALE FARMING - A short History



Biogas –Hurdles & opportunities (small scale)

The challenges to the viability of biogas installations:

- No thermal load
- Insufficient waste
- Preference to allocate available capital to core business

Ideal locations:

- Piggeries with an abattoir on-site
- Chicken farms with a hatchery on-site
- TMR dairies

Biogas offers an excellent opportunity for diversification

- Any business that requires thermal load
- New hatchery
- Bakery
- Cheese manufacture

On-farm creativity

- Indian Biogas programme
- Small scale compressors
- Lighting
- Fertiliser



About Optimal

Engineering capability

- Optimal is a unique team of dedicated energy professionals who deliver advanced turnkey power generation, combined heat & power and hybrid solutions to industry.
- As the South Pacific regional distributor for Capstone Turbine Corporation, we deliver on-site energy solutions that are cleaner, cheaper and more reliable to a diverse range of industries across Australia, New Zealand and the South Pacific.
- Head Quartered in Mulgrave VIC, we are a privately owned company with an annual



About Optimal

Capability

🔄 Process, chemical, mechanical and electrical engineering team members allow Optimal to integrate combined technologies including;

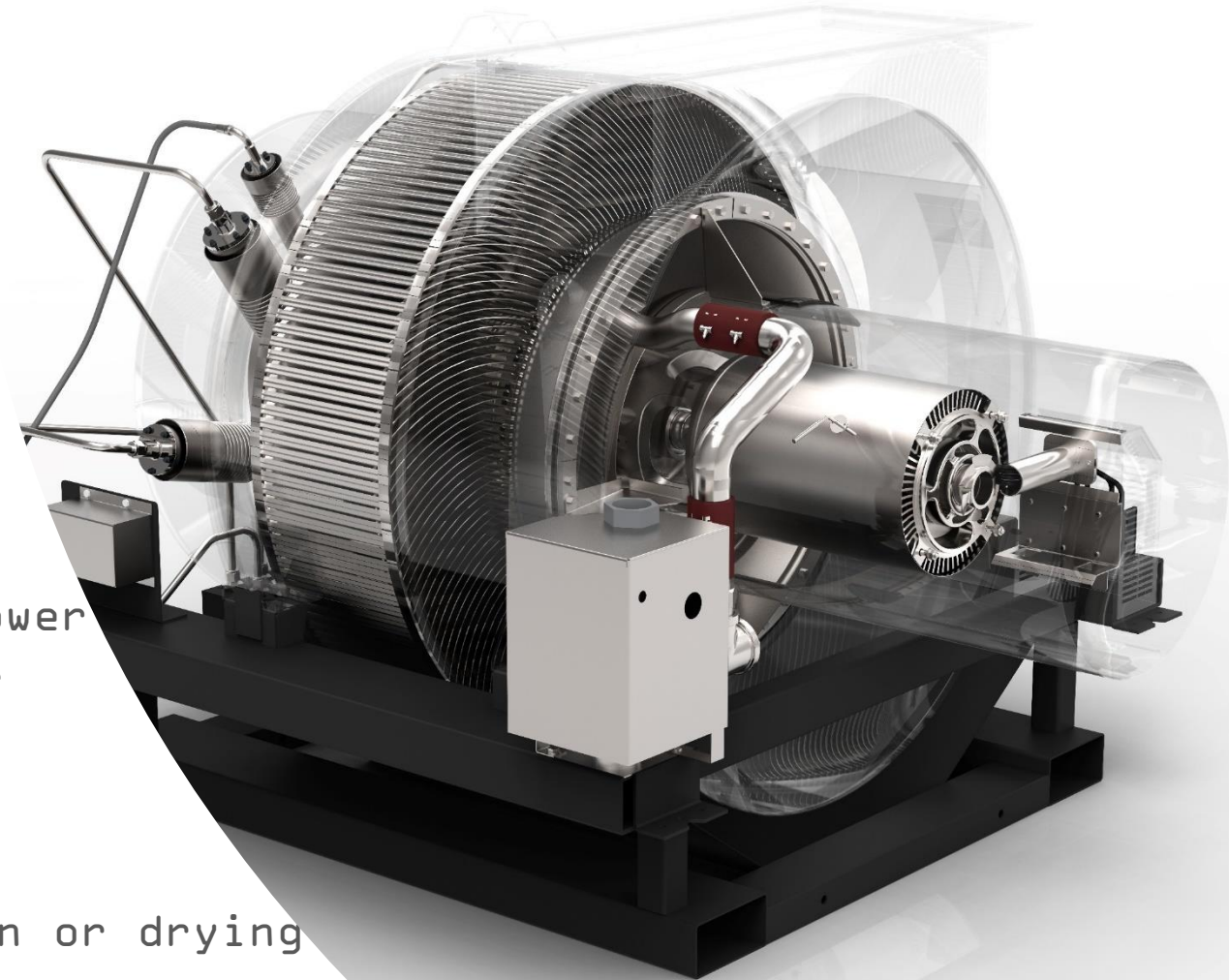
- 🔄 Biogas Anerobic Digesters (Covered Lagoon, Stirred and Fixed Film)
- 🔄 Biogas to Biomethane Upgrading Equipment (CO₂ and contaminant removal)
- 🔄 Biomethane Compression Equipment
- 🔄 Microturbine Power Generation Systems
- 🔄 Heat Recovery Systems (steam, hot water, drying)
- 🔄 Absorption Chilling
- 🔄 Renewables (Solar PV, Wind, Hydrogen)
- 🔄 Energy Storage (battery & capacitor systems)



Technology Overview

Solution based on the Capstone Turbine C200S Technology Platform, 200 kW power generation

- Only one moving part
- No oils, coolants or lubricants
- Clean, quiet and ultra low emission power
- Highly efficient combined heat & power
- Modular & scalable
- High quality inverter based power
- Low maintenance and high uptimes
- Clean exhaust (18% O₂) ideal combustion or drying air
- Fixed cost, fully comprehensive service plans up to 20 years



Revision 4

The C200S: 200 kW of power plus: Combined Heating, Cooling & Power

Direct Exhaust



390 kWt @ 280°C Direct drying
Burner combust air
Steam

Hot Water



280 kWt @ 85°C Domestic Hot Water
Building Heating
Process Heat

Chilled & Hot Water



240 kWr @ 6°C Domestic Hot Water
280 kWt @ 85°C Building Heating
Process Heat

Reliable on-site heat and power from Biogas

Capstone MicroTurbine

- Compared to a small jet engine
- Adapt to varying changes in biogas
- Minimal gas cleaning required
- Long service intervals
- Fixed cost maintenance
- 15-year service agreements
- High step load capability
- Excellent part load efficiency
- Building blocks of 65 kW or 200kW
- Harvest heat for hot or cold water
- No oil to dispose of



Technology Innovation – Hydrogen

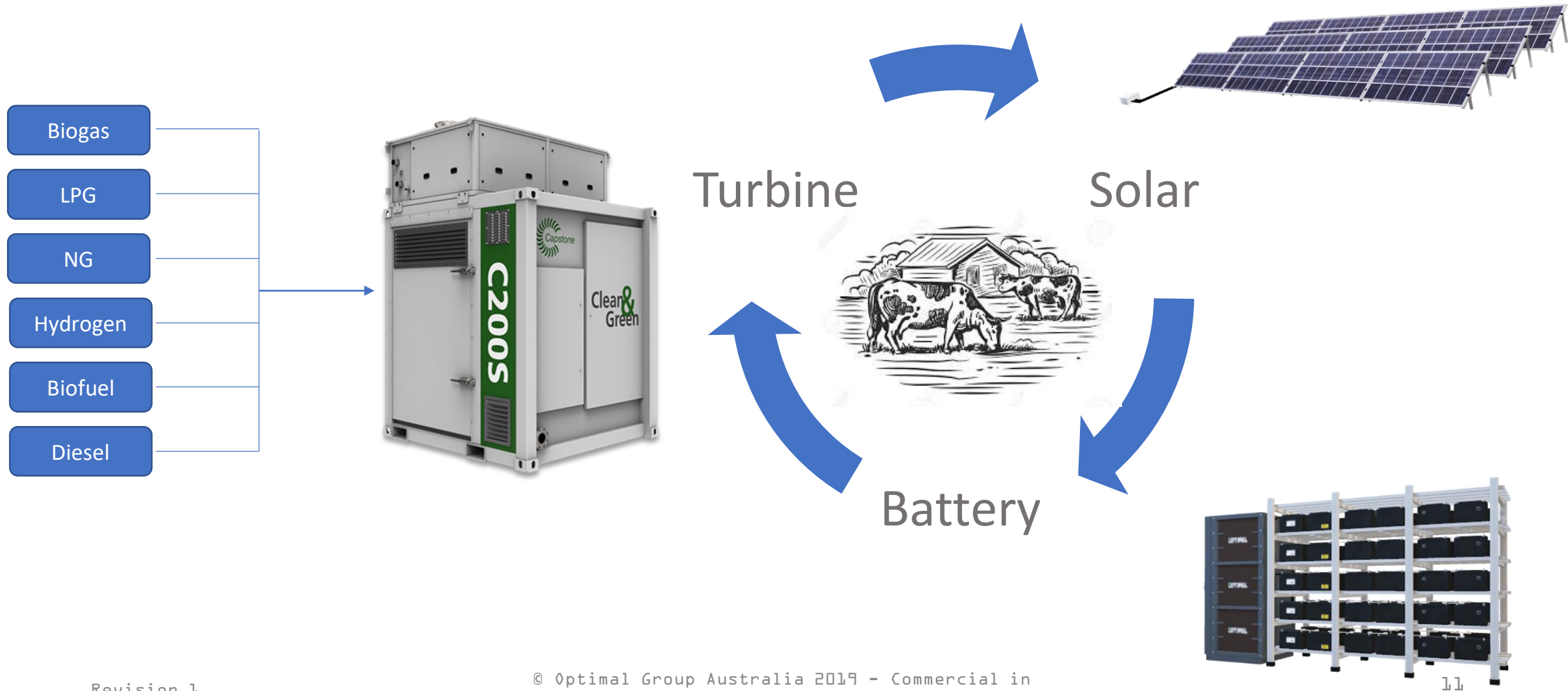
Capstone MicroTurbine

Working with emerging partnerships with ITM and other established gas industry proponents, Optimal are developing Hydrogen opportunities for distributed generation using clean zero Carbon fuels including Hydrogen.

Recently, Optimal were proud to launch the first Hydrogen fuelled Capstone C65 turbine in the world at the Renewable Hydrogen Conference in Perth.



Engineering innovative on-site heat and power solutions



Optimal Biomethane Initiative

Advancing Net Zero
A World Green Building Council global project

WorldGBC definition:
A net zero carbon building is highly energy efficient with all remaining energy from on-site and/or off-site renewable sources

World Green Building Council

2050
100% of buildings must operate at net zero carbon

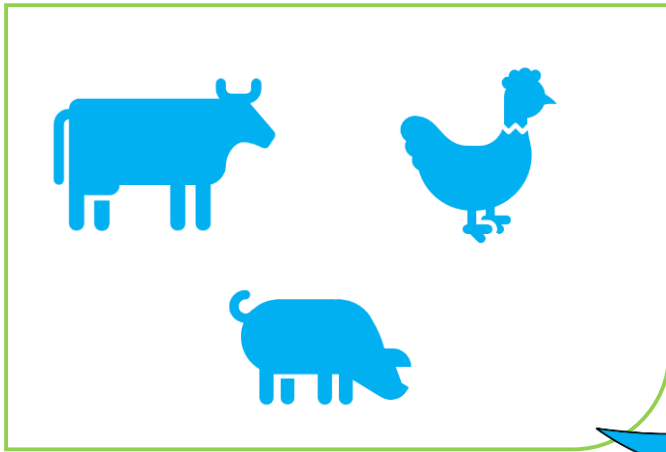
2030
All new buildings must operate at net zero carbon

Key Principles

- 1. Measure and disclose carbon**
Carbon is the ultimate metric to track, and buildings must achieve an annual operational net zero carbon emissions balance based on metered data
- 2. Reduce energy demand**
Prioritise energy efficiency to ensure that buildings are performing as efficiently as possible, and not wasting energy
- 3. Generate balance from renewables**
Supply remaining demand from renewable energy sources, preferably on-site followed by off-site, or from offsets
- 4. Improve verification and rigour**
Over time, progress to include embodied carbon and other impact areas such as zero water and zero waste

Version 1 | March 2018

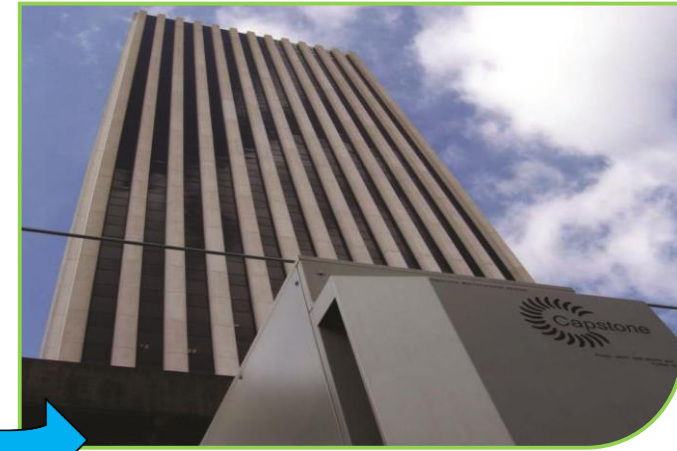
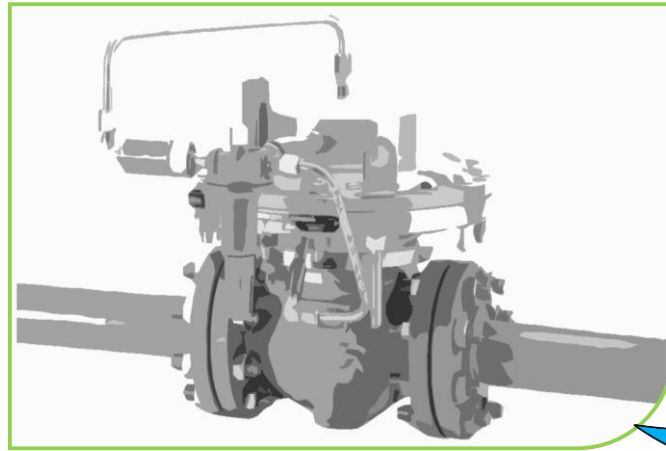
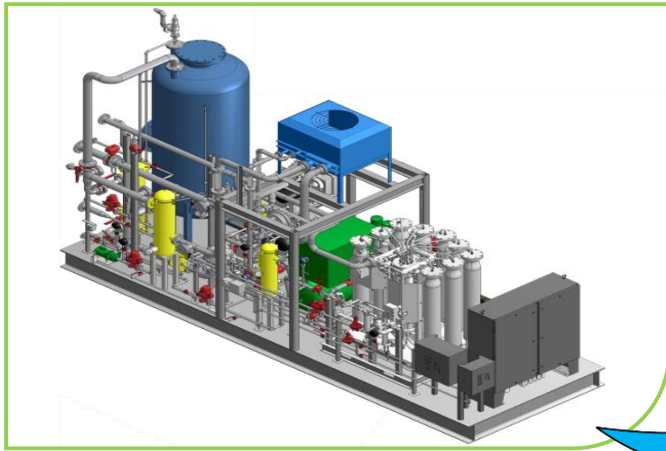
GOVERNMENT ENGAGEMENT
TRAINING & EDUCATION
CORPORATE ENGAGEMENT
CERTIFICATION



Agricultural waste streams
Available waste streams are combined and transported to an anaerobic digester

Food waste diverted from Landfill
Food waste is processed at point of origin and added to the anaerobic digester

Digestion for biogas Generation
Waste is digested in a controlled environment producing a methane rich biogas



Biogas to Bio-Methane Upgrade

Biogas is cleaned, dried and purified into Biomethane & CO₂ - both have commercial applications.

Gas Distribution

Biomethane (Green Gas) is metered and injected into the gas pipeline.
Option for hydrogen to be injected.

Decarbonizing the gas pipeline

Green Gas is Carbon neutral
The fuel switch to Green Gas will facilitate compliance with Net Zero objectives.

 **OPTIMAL**
optimised energy solutions

