

ISC Case Study



Malabar Biomethane Injection Plant: A new approach for circular resource management and energy generation in Australia

Overview

Situated within the Malabar Headland National Park—a location marked by rich biodiversity and historical significance—the Malabar Biomethane Injection Plant (MBIP) represents a ground-breaking step in Australia’s energy landscape. This collaborative demonstration project, led by Jemena and Zinfra together with Sydney Water, and co-funded by ARENA, addresses the dual challenges of waste management and sustainable energy production.

The Plant transforms biogas produced at the Malabar Water Resource Recovery Facility into biomethane suitable for household and commercial use — a first in Australia to inject biomethane into the gas distribution network. By leveraging existing biogas production processes and incorporating sophisticated purification technology, the Plant produces and injects biomethane into the gas distribution network in New South Wales, exemplifying a cutting-edge approach to circularity in resource management. The functionality of the MBIP showcases technological innovation, and the piloting of the IS Essentials Rating Tool during the design and construction of the Plant reflects a commitment to community engagement and sustainable development.

Fast facts

- **Project Leads:** Jemena and Zinfra
- **Rating Achieved:** IS Essentials Pilot Bronze Rating
- **NSW Pioneer:** First project to achieve an IS Essentials rating in NSW
- **Energy Pioneer:** First energy project to receive an IS Essentials rating



Biomethane – from waste to valuable resource

Biomethane is produced from gases emitted from organic matter, like wastewater or agricultural waste. It is considered renewable as organic waste is continually created. The biogas is purified or ‘upgraded’ to biomethane by removing carbon and impurities to meet the Australian Standard for general purpose natural gas, making it a sustainable alternative to fossil fuels. Unlike natural gas, biomethane relies on resources that are constantly replenished and part of the natural carbon cycle. Entirely substitutable for natural gas, it can be used with existing customer appliances and industrial equipment, which can help to reduce greenhouse gas emissions and support circular economy practices.

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The project pioneered the recycling of off-spec biogas, converting it into usable biomethane instead of releasing it into the atmosphere, thereby enhancing the Plant's overall sustainability, throughout its construction and operational phases.

"The Malabar Biomethane Injection Plant not only showcased our commitment to sustainable energy generation but also highlighted the pivotal role of the IS Essentials tool. IS Essentials was crucial in identifying and implementing enhanced practices that allowed our teams to ensure sustainability in the construction of the plant."

Rahul Dorairaj

Project Lead
Jemena

Measuring what matters

Using the Materiality Assessment process within the IS Rating scheme, the project team was able to identify the key areas where the project could have material sustainability outcomes arising from the construction of the plant. The requirements within credits in the IS Essentials rating tool helped the project team to focus on the development and implementation of sustainable measures to mitigate the high material impacts.

Better outcomes with IS Essentials

The IS Essentials tool is a Sustainability rating tool designed for infrastructure projects with a capital value below AU\$100 million. Aligning project goals with the UN Sustainable Development Goals, it provides a robust framework for enhancing and measuring the sustainability impact of infrastructure developments. By identifying opportunities for improvement and fostering innovative practices, IS Essentials helps projects like the Malabar Biomethane Injection Plant to achieve superior economic, environmental, cultural, and social outcomes through improved design and construction of the asset.



Key achievements

1. Energy and Carbon:

- **Carbon Management:** The project achieved a 45 percent reduction in capital and operational carbon emissions, against a verified business-as-usual carbon footprint (Base Case) as per the **Ene-1 credit** within IS Essentials. Key initiatives prioritised innovative energy recovery systems that maximised the efficiency of biomethane production, reducing emissions. Where further reductions were not feasible, the project procured carbon offsets in the form of large-scale generation certificates (LGCs) to complement these efforts.

2. Resource Efficiency

- **Material Use Reduction:** Adhering to the requirements of the **Rso-6 credit** within the IS Essentials rating tool, the project employed advanced material management strategies and decreased its material footprint, reducing greenhouse gas emissions by 20%. This was achieved through several initiatives, including replacing Portland cement with supplementary cementitious materials, utilising off-the-shelf bollards instead of specially fabricated ones, and adopting an alternative spray seal product that eliminated the need for a prime coat.
- **Sustainable Construction Practices:** The project team implemented construction techniques that minimised waste and maximised resource efficiency, specifically through the reuse of construction debris, thereby reducing the need for new materials.

3. Leadership and Management

- **Knowledge Sharing:** The plant is a centre for learning within the industry, hosting seminars and workshops that disseminate findings and best practices related to renewable gas production. Utilising the IS Essentials tool enabled the team to identify innovative sustainability opportunities and build organisational sustainability capacity, which they shared with stakeholders to promote

broader benefits across the energy and waste management sectors.

- **Industry Influence:** By documenting and sharing their experiences, the project team influenced policy discussions and contributed to the development of standards for similar projects nationwide. The IS Essentials tool provided access to metrics that allowed the team to comprehensively report on sustainability performance for ESG reporting, underpinned by third-party verification.

4. Innovation and Market Impact

- **Demonstrating Commercial Viability:** Serving as Australia's first biomethane gas network injection initiative before the meter, the plant showcases the practical and commercial viability of renewable gas technologies. By successfully upgrading biogas to biomethane for injection into the existing gas distribution network, it displaces natural gas and supports decarbonisation efforts.
- **Influencing Policy and Standards Development:** The Malabar Biomethane Injection Project illustrates the practical aspects of deploying renewable gas technologies and demonstrates measurable sustainability performance through IS Essentials, thereby providing valuable insights for future policy, regulation, and standards development, for not only transitioning from fossil to renewable energy but also on constructing such plants with sustainability in mind.

"The success of the Malabar Biomethane Injection Plant underscores Jemena's ambitions in the transition to a sustainable energy future. By integrating the IS Essentials framework, it embodies our unwavering commitment to inventive solutions and sustainability stewardship, setting a new benchmark for the industry."

David Gillespie
Managing Director
Jemena

Broader Impact

The development of the MBIP demonstrated the role that biomethane could play in Australia's decarbonisation journey.

- **Catalyst for New Projects:** The plant provides an example demonstrating biogas technologies in an Australian context, with lessons informing the development of an Australian biomethane sector. Jemena has signed several MOU's with other businesses to assess the feasibility of injecting biomethane produced by each business into the New South Wales gas distribution network.
- **Educational and Community Engagement:** Through community initiatives, aligned with the IS Essentials framework, the project has increased public awareness of the benefits of biomethane as a sustainable energy technology. Since its inception, the plant has been covered by major news publications, such as The Australian, Channel Nine News and the Daily Telegraph.

Towards a Sustainable Energy Future

The Malabar Biomethane Injection Plant exemplifies how the energy sector can innovate by adopting circular economy principles, transforming what is traditionally considered waste into sustainable energy. This project is about producing sustainable energy and embedding sustainability in every facet of design and construction. By utilising the IS Essentials tool, the project has pioneered practices that enhance the overall sustainability of energy assets, from creation to operation. As a pioneering initiative in Australia, it serves as a blueprint for future energy projects.

Legacy: Organisational Improvements and Lessons Learned by applying IS Essentials

- The process of undertaking the IS Essentials rating emphasized the importance of embedding sustainability considerations from the planning and concept design stage through early and ongoing stakeholder consultation.
- IS Essentials underscored the importance of taking a quadruple bottom-line approach—encompassing economic, environmental, social, and cultural outcomes throughout construction.
- Increased awareness of and capability in regard to sustainability across various teams.



The Malabar Biomethane Injection Plant showcased Jemena's holistic approach to sustainable energy generation. Building on a robust Health, Safety, and Environment (HSE) framework, applying IS Essentials has helped realise that embedding sustainability considerations from the planning and concept design stage through early and ongoing stakeholder consultation is imperative. It has not only emphasised the significance of identifying and implementing enhanced practices to ensure sustainability in the design and construction of the project, but also in driving lasting improvements in management, governance systems, and procurement processes across both Jemena and Zinfra that will deliver better outcomes in future projects.

The Bronze rating is a commendable outcome for any first time rating and was achieved by prioritising and pursuing feasible and impactful solutions rather than merely focusing on scores. These key learnings and practices will continue to guide Jemena and Zinfra.

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