Driving emissions reduction in integrated gas facilities – where are the opportunities?

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Global action to combat climate change has led to an increasing number of countries to set ambitious net zero targets or carbon reduction goals.

Shaping a path to net zero will require a blend of solutions, but one of the biggest opportunities will come in optimising existing assets already in operation. Reducing the carbon intensity of these assets will be particularly important for sectors like upstream oil and gas, refining, petrochemicals and mining, where rising demand means these assets need to keep producing and cannot be easily replaced.

At Wood, our experience of working on integrated gas facilities has shown that with the right interventions, it's possible to achieve a 20% reduction in Scope 1 and 2 emissions in two years. As well as driving carbon reduction, these initiatives can also help to increase production and lower overall operating costs.

This is a compelling opportunity – above and beyond the environmental benefits, it gives companies a chance to drive long-term economic value and mitigate the risk of assets becoming future liabilities on their balance sheet.

The optimisation opportunities are real, and the clock is ticking - the time to act is now.

Peter Carydias
Global Digital Solutions Manager

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Identifying opportunities to reduce emissions on operating assets

So where are the opportunities to reduce carbon emissions on operational gas facilities? And once these opportunities have been identified, what are the actions required to help deliver these savings?

At Wood, we work with clients who own and operate some of the largest gas facilities in the world – in our experience, we find most CO_2 reduction opportunities can be met through discrete improvement programmes in four key areas (see Fig 1 below).

1. Plant process optimisation

The use of digital tools like throughput optimisation and advanced compressor advisory systems can help to enhance production efficiency, increase output, and deliver emissions reduction by reducing the need for routine flaring.

On gas assets, we find this step can typically deliver a 3-5% reduction in CO_2 emissions - crucially, this is substantially Net Present Value (NPV) positive as it also delivers an increase in overall production levels.

2. Energy optimisation

On operational assets, we find that deploying a range of solutions can help to maximise power output, improve system utilisation, and balance supply needs. Collectively, these steps can help to reduce emissions intensity and support fuel gas recovery.

In our experience, this step can deliver a 5% reduction in CO_2 emissions on gas production assets and is also significantly NPV positive as the recovered fuel gas can then be monetised.

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3. Compression and generation reliability optimisation

By analysing data to assess equipment health, it's possible to identify early warning signs before a failure occurs. This allows a client to intervene and take actions that avoid production loss, unplanned shutdowns, and trip-related flaring.

On a real-life gas production asset, optimising the maintenance strategy has delivered a 5% reduction in CO_2 emissions. As before, this step is also significantly NPV positive as it can help to unlock increased production levels which drives new income streams.

4. Field-wide methane leak mitigation

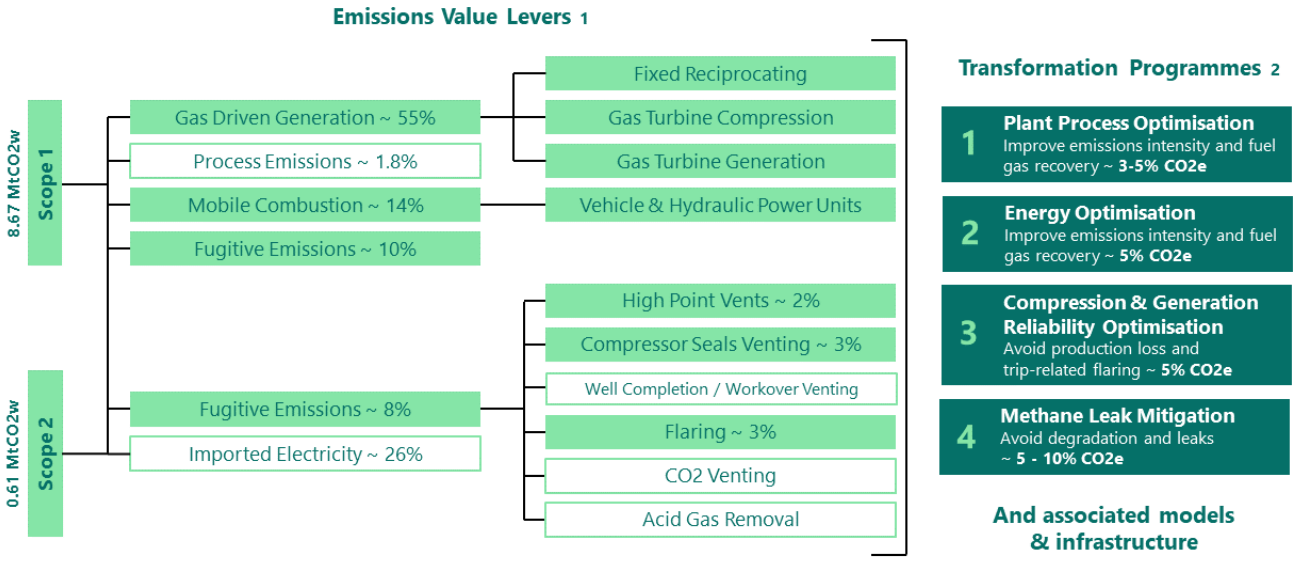
Using physics-based modelling, satellite data and pressure integrity models, we can identify the primary drivers of venting emissions on upstream oil and gas compression and gathering systems. Importantly, we can also track system integrity degradation and methane leaks and take steps to mitigate this risk and reduce fugitive emissions.

Each of the four areas outlined above can deliver incremental improvements. However, when combined, they provide a clear and implementable roadmap to achieving a 15-20% reduction in overall emissions intensity.

To put that in perspective, this is roughly the equivalent of planting 7 million trees, installing 1 million solar panels or over 100 megawatts of onshore wind capacity (assuming 200,000 tonnes per annum of abatement potential on an average asset base).

'When combined, these solutions provide a clear and implementable roadmap to achieving a 15-20% reduction in overall emissions intensity.'

Fig 1 – Typical opportunities to reduce CO_2 emissions intensity on integrated gas facilities.



Securing a return on investment

A concerted focus on reducing carbon intensity is not just an environmental imperative and the right thing to do, it's also a commercial opportunity.

With clients, we recognise there is a balance to strike between the cost of carbon and the cost of mitigating emissions. In some markets, there are emissions trading schemes that set a price on carbon, while in other markets, companies typically derive an internal benchmark price based on external and internal factors.

In economic analysis, a marginal abatement cost curve (MACC) is used to compare the costs and benefits of different projects or investments. Projects that fall on the left-hand side of the curve (lower cost) but that also result in a large reduction in emissions are the most valuable.

Initiatives that focus on reducing emissions by optimising existing operations are often value accretive as they not only reduce carbon but also increase production and availability, reduce energy consumption and lower overall operating costs.

Optimisation initiatives are therefore more immediately attractive than measures like electrification or carbon capture and storage (CCS), which tend to require higher CAPEX and take longer to implement. In our experience, initiatives such as reducing unplanned flaring, increasing production, and lowering energy consumption create value beyond emissions savings. These projects will typically have a negative marginal abatement cost curve (MACC), meaning that the benefits of the project exceed the costs (see Fig. 2 below).

As a result, these projects should be prioritised to deliver quick wins and free up cashflow to invest in longer-term sustainable developments.

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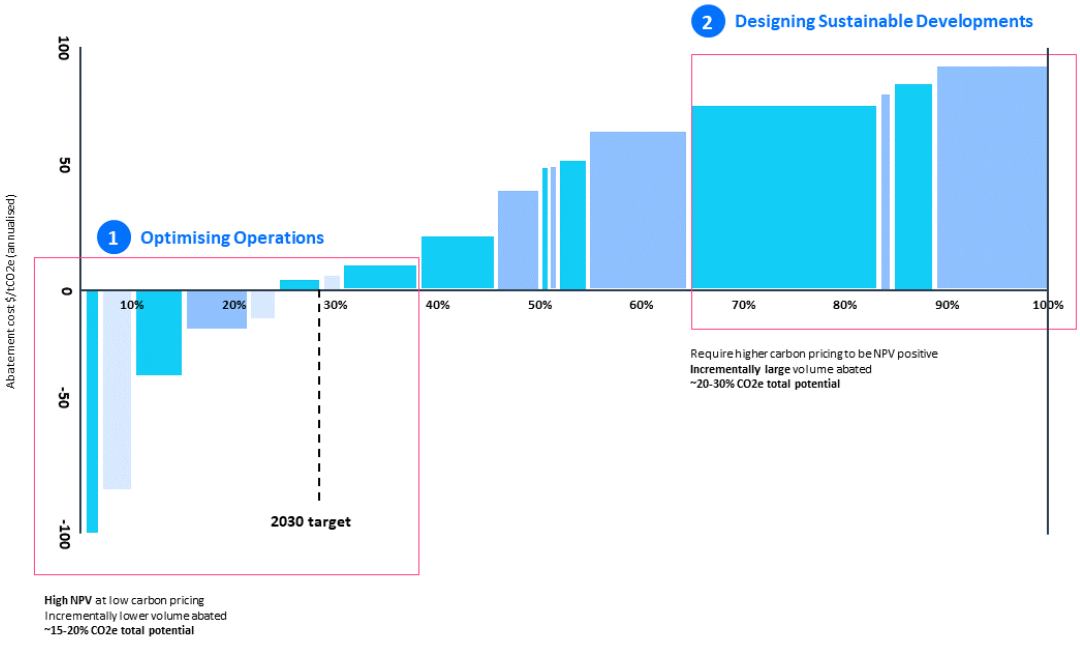
Fig 2 – Typical opportunities to reduce CO_2 emissions intensity on integrated gas facilities.



Helping clients reduce emissions

At Wood, we use proprietary tools to help asset operators identify and prioritise emissions reduction opportunities that can also increase production and drive efficiency improvements across their portfolio.

Below are three examples of work we have delivered with clients in the upstream sector:

1. Saving 225,000 tons of CO_2 and unlocking $30m of value

As an early step towards achieving net zero emissions by 2050, our client, a leading independent energy company, set a corporate target to reduce operated greenhouse gas emissions intensity by ~50% by 2025 (this equated to 17kg of CO_2 per barrel of oil equivalent and was against a 2017 baseline).

Wood was tasked with developing a 5-year roadmap to identify how and where emissions could be reduced from one of their gas assets in Southeast Asia. We brought together subject matter experts from Wood and the client to discuss this challenge.

Collectively, we identified and screened over 40 emissions reduction initiatives, with a focus on energy efficiency opportunities and the largest emission sources, e.g. fuel gas combustion. Together, we agreed on ten priority initiatives, that included a portfolio of traditional engineering modifications and digital solutions.

Each initiative was then road-mapped from study-to-implementation with clear timelines agreed with senior decision-makers as part of a fully costed programme.

The project showed it was possible to drive a 13% reduction in Scope 1 emissions for an already lean asset, and six of the ten initiatives were cash generative due to the financial benefits gained from production improvements and OPEX savings. Abating over 225,000 tons of CO_2 over the remaining field life, the roadmap is forecast to generate over US$30m net present value (NPV) benefit for the client, with a pay back within just three years.

2. Defining a roadmap to reduce Scope 1 and 2 emissions by 30%

A leading oil and gas producer in Australia and New Zealand set a goal to reduce emissions intensity across their portfolio by 35% by 2030. They needed a roadmap that detailed how they could achieve this objective, by focusing on the most economic abatement opportunities.

We deployed our proprietary Accelerate consulting framework designed to accelerate value realisation from operations transformation across high value target areas, to bring together a range of client stakeholders and Wood subject matter experts to discuss this challenge. Collectively, we surfaced and ranked 140 abatement opportunities across four assets and then began the process of prioritising the most compelling opportunities.

The final output was a robust roadmap that set out an achievable path to abate around 30% of net Scope 1 and Scope 2 emissions at a marginal cost below the AUD$50 internal cost of emissions. The first benefits of this programme will be achieved in just 18 months, and this will provide momentum to then scale the approach across different parts of their wider portfolio.

3. Saving 130,000 tons of CO_2 a year via digital solutions

One of the largest national energy companies in the Middle East set a strategic goal of becoming the producer with the lowest emissions intensity in the region.

As their engineering partner, Wood carried out a front-end analysis of one of their developments to assess potential opportunities to reduce emissions intensity. We considered all the Scope 2 emissions drivers on the development, identified the major sources of emissions, defined opportunities to mitigate them, and then developed a roadmap based on the top opportunities.

The result was a clear programme of initiatives that offered a timeline on where and when emissions savings could be achieved and the associated costs to achieve them. The most significant improvement opportunity identified was the potential to reduce Scope 2 carbon emissions by around 130,000 tonnes a year through the introduction of an emissions monitoring and optimisation solution.

Maximum energy, minimal emissions

As we work towards building a new energy economy, our focus should be on securing maximum energy with minimal emissions across all operational facilities, if we are to build momentum and achieve net zero.

A licence to operate is not a given anymore. The whole supply chain will need to work together and take sustained action on reducing carbon intensity across the asset lifecycle, from brownfield assets in operation to the design of future greenfield projects.

There's no denying the complexity of this challenge but we have an opportunity to reinvent, to secure competitive advantage and, importantly, design the low-carbon future the world needs.

'To safeguard a long-term licence to operate, the onus is on energy producers and asset operators to take sustained action on reducing carbon intensity both from their operational assets and in how they design and plan future greenfield projects.'

Contact us

If you would like to discuss any of the points raised in this paper in more detail or receive additional information on Wood's wider decarbonisation or digitalisation expertise, then please get in touch.

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