



Woodside  
Energy

# METHANE EMISSIONS MANAGEMENT AEP MASTERCLASS

Woodside Energy

Ian Joynes | May 20, 2024



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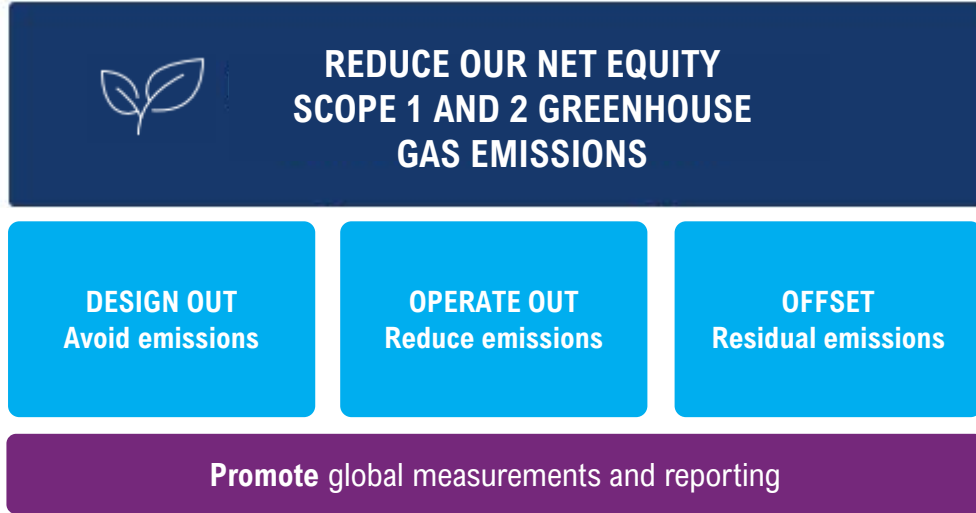
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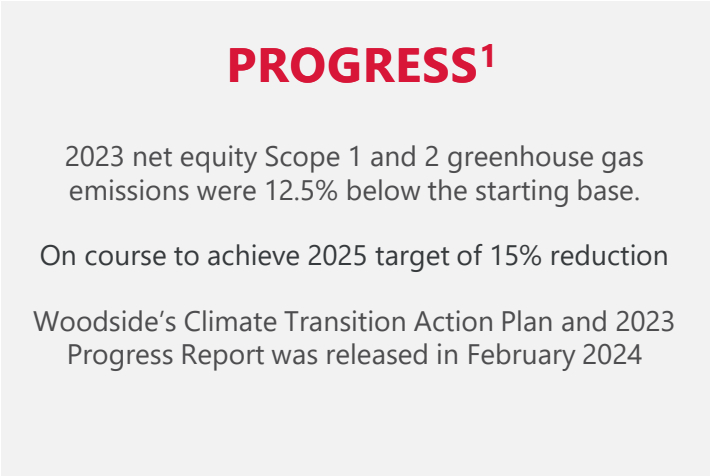
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# WOODSIDE'S CLIMATE STRATEGY



See pages 6-7 of the Climate Transition Action Plan for more



3 | 1. Targets and aspiration are for net equity Scope 1 and 2 greenhouse gas emissions relative to a starting base of 6.32 Mt CO<sub>2</sub>-e which is representative of the gross annual average equity Scope 1 and 2 greenhouse gas emissions over 2016-2020 and which may be adjusted (up or down) for potential equity changes in producing or sanctioned assets with a final investment decision prior to 2021. Net equity emissions include the utilisation of carbon credits as offsets.

# WOODSIDE'S METHANE STRATEGY



## REDUCE OUR NET EQUITY SCOPE 1 AND 2 GREENHOUSE GAS EMISSIONS

**DESIGN OUT**  
Avoid emissions

**OPERATE OUT**  
Reduce emissions

**OFFSET**  
Residual emissions

Promote global measurement and reporting



## MINIMISE OPERATED METHANE EMISSIONS

**MEASURE**  
and create high integrity emissions data

**REPORT**  
our emissions data to stakeholders

**REDUCE**  
and strive for 'Near Zero' methane emissions

**LEAD**  
advocate and collaborate with our stakeholders

### TARGETS<sup>1</sup>

**15%**  
by 2025

**30%**  
by 2030

**Net zero**  
aspiration by 2050  
or sooner

### PROGRESS<sup>1</sup>

2023 net equity Scope 1 and 2 greenhouse gas emissions were 12.5% below the starting base.


On course to achieve 2025 target of 15% reduction

Released Climate Transition Action Plan in 2023

See pages 6-7 of the Climate Transition Action Plan for more

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**LEAD**

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## TARGETS<sup>1</sup>

### 'Near Zero'

Methane emissions aspiration from our operated oil and gas assets by 2030<sup>2</sup>

## PROGRESS<sup>1</sup>

2023 emissions well below 0.2% (OGCI target)

Progressing reporting to OGMP2.0


2023 delivery of 2kT methane mitigation<sup>3</sup> through asset decarbonization (methane action plans)

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2. Signatories to the OGCI 'near zero' initiative agree to strive to reach 'near zero' methane emissions by 2030.

3. The methane emissions reductions are estimated using engineering judgment by appropriately skilled and experienced Woodside engineers. All examples are for gross emission reductions, not equity share.

# WOODSIDE'S METHANE STRATEGY



## REDUCE OUR NET EQUITY SCOPE 1 AND 2 GREENHOUSE GAS EMISSIONS

### DESIGN OUT

Avoid emissions

### OPERATE OUT

Reduce emissions

### OFFSET

Residual emissions

Promote global measurements and reporting

## TARGETS<sup>1</sup>

### 15%

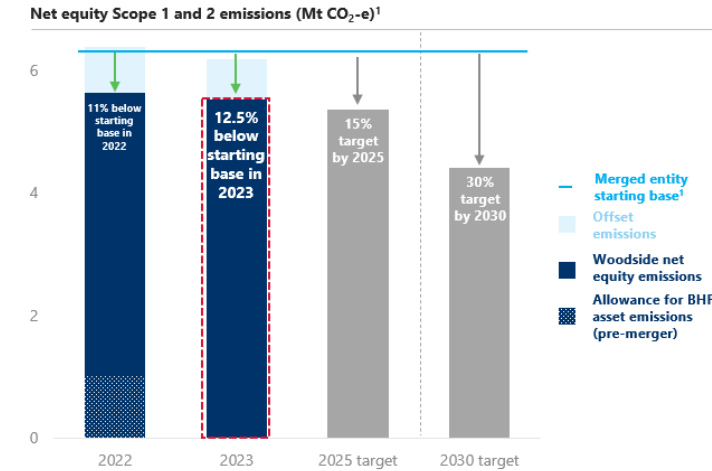
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### 30%


by 2030

## Net zero

aspiration by 2050 or sooner



See pages 6-7 of the Climate Transition Action Plan for more



## MINIMISE OPERATED METHANE EMISSIONS

### MEASURE

and create high integrity emissions data

### REPORT

our emissions data to stakeholders

### REDUCE

and strive for 'Near Zero' methane emissions

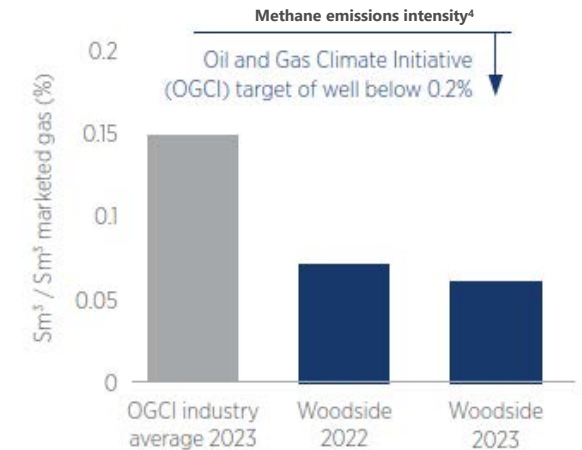
### LEAD

advocate and collaborate with our stakeholders

## TARGETS<sup>1</sup>

## 'Near Zero'

Methane emissions aspiration from our operated oil and gas assets by 2030<sup>2</sup>



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3. The methane emissions reductions are estimated using engineering judgment by appropriately skilled and experienced Woodside engineers. All examples are for gross emission reductions, not equity share.

4. Woodside analysis, based on Woodside methane emissions data for 2022 and 2023, relative to OGCI average and targets. <https://www.ogci.com/action-and-engagement/reducing-methane-emissions/#methane-target..>

# METHANE INVENTORIES

## LIDAR

NPL survey



## Satellite

GHGSat, other NGOs



## Aerial Surveys

Drone or plane mounted survey



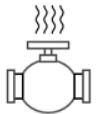
Top down measurement techniques

Top down facility quantification

Bottom up inventory

Validation

Bottom up inventory (measured and estimated sources)



## Equipment leaks

Weeps and seeps at sealed locations



## Vented methane

Continuous vents, routine venting and intermittent releases

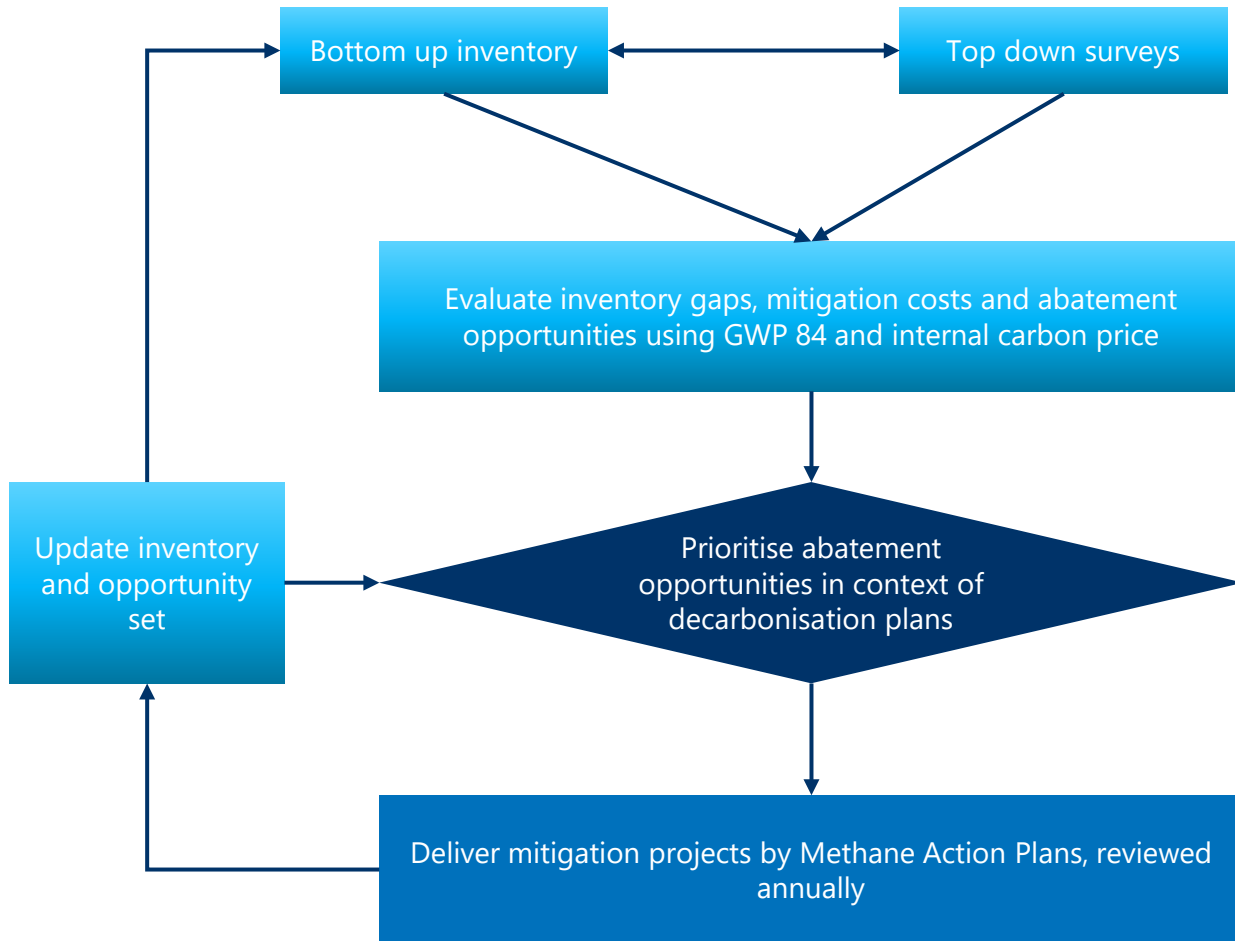


## Methane slip

Incomplete combustion sources fuel gas and flaring



# METHANE MITIGATION AND VALUATION



**Inventories**

**Mitigation feasibility and valuation**

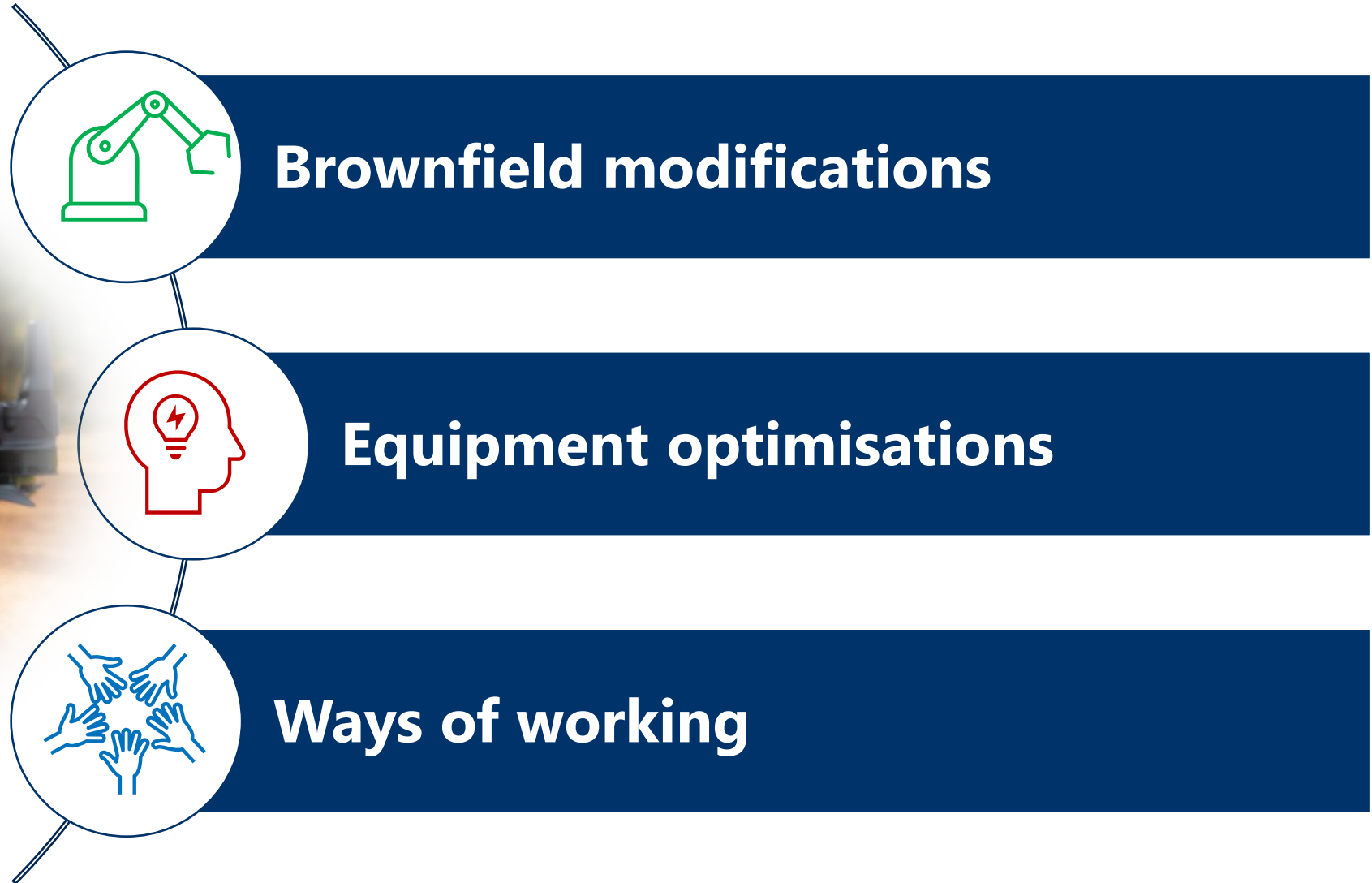
**Prioritisation by marginal abatement cost**

**Accountability via methane action plan**





# DELIVERING MITIGATION



# BUILDING A CULTURE

## Top-down leadership

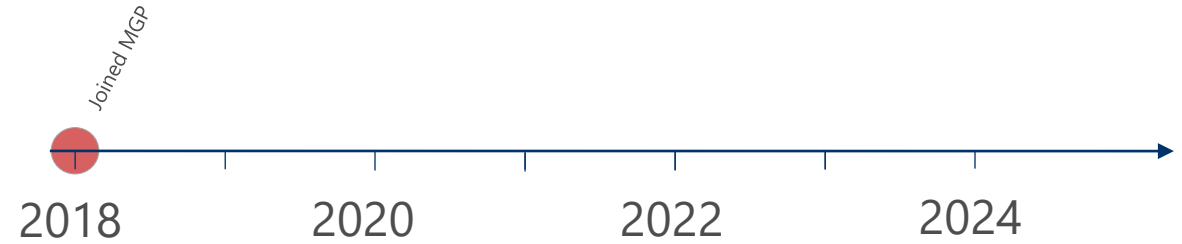
- CEO and Executive endorsed methane emissions strategy and corresponding methane emissions reduction plan, galvanizing core companies to our objectives.
- Demonstration of our commitment by Woodside becoming the first Australasian company to join the OGCI's Aiming for Zero Methane Emissions Initiative and OGMP2.0.
- Leader led emissions reduction priorities cascaded throughout the business. This also encompassed inclusion of performance metrics for key personnel to build an understanding of the methane emissions footprint of their role and how to influence outcomes.
- Methane emissions measurement and reduction key performance indicators tracked and reported to Executives.

## Bottom-up leadership

- Reward and recognition linked to methane emissions reduction activities.
- Engagement via the employee-led community network, Woodside Energy Climate Awareness Network (WECAN), which encourages employees to share knowledge and contribute to Woodside's objective to thrive in the energy transition as a low cost, lower carbon energy provider.
- Development of a people engagement plan across the newly merged organization including employee focused activities, education and training and leader enablement.



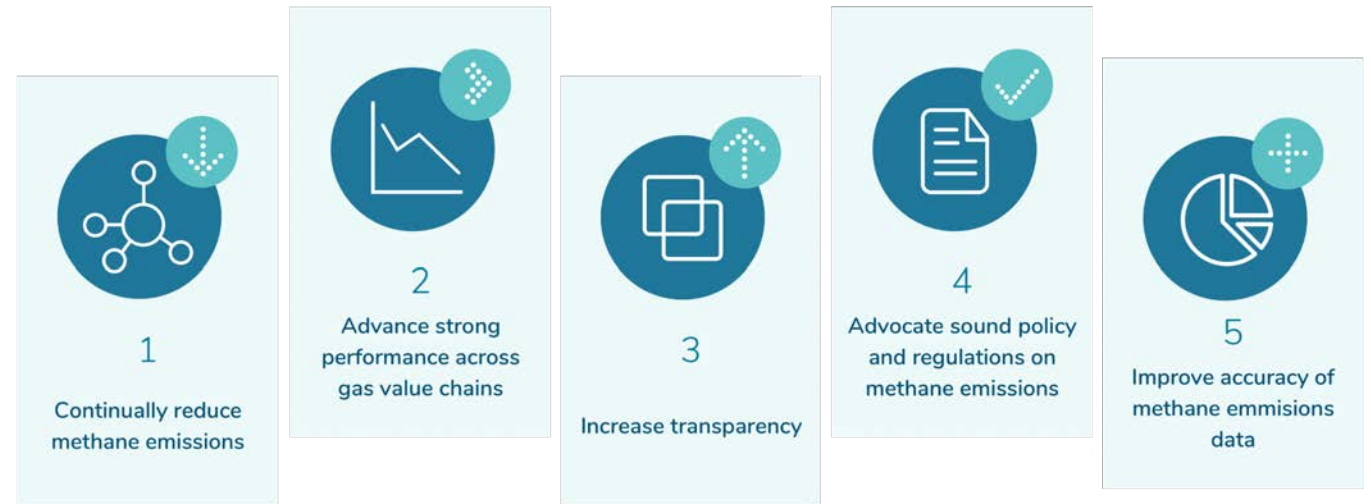
# OUR JOURNEY



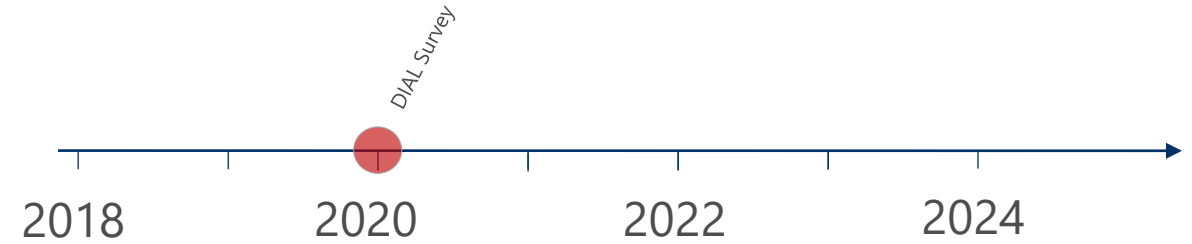
## Joined Methane Guiding Principles

Develop an awareness of methane emissions and advocate internally and externally, aligned with 5 key principles.

- Held first methane masterclass for senior leaders and decision makers.
- Membership supported top-down cultural alignment and facilitated proactivity.
- Woodside remains an active member involved with several workstreams and is leading the 'Midstream Initiative'.



# OUR JOURNEY



## Differential Adsorption LIDAR (DIAL) Survey

World's first global methane study<sup>1</sup> with provision of financial and technical backing from:

- Oil and Gas Climate Initiative (OGCI).
- United Nations Environment.
- Environmental Defence Fund (EDF) .

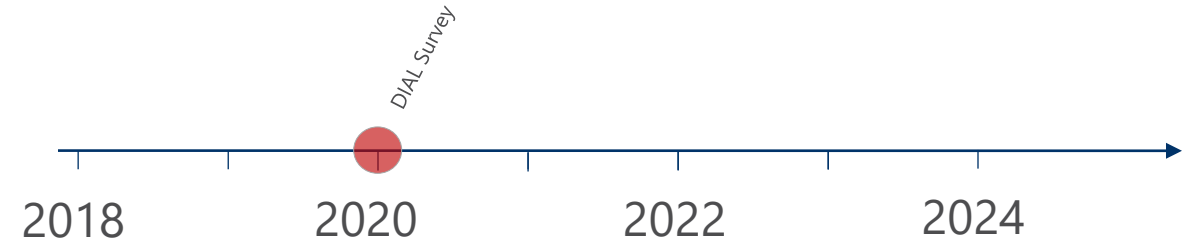
Objective of the study was to quantify the methane emissions in liquification stage of the supply chain.

- National Physical Laboratory Bus imported from UK.
- Six months to manage quarantine requirements.

DIAL is a mobile remote sensing technology to detect, quantify and map the methane emissions from gas processing and LNG handling operations.



# OUR JOURNEY



## Differential Adsorption LIDAR (DIAL) Survey

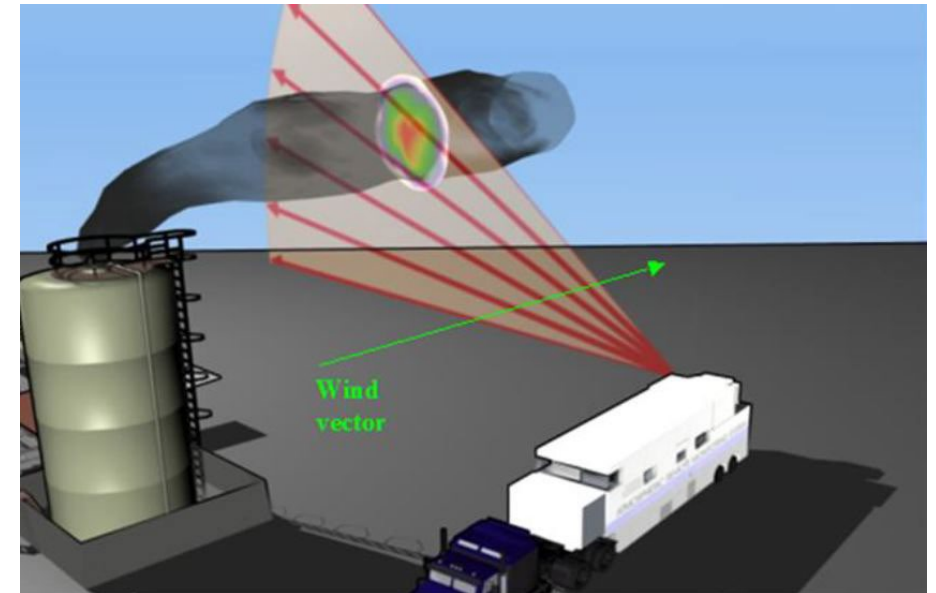
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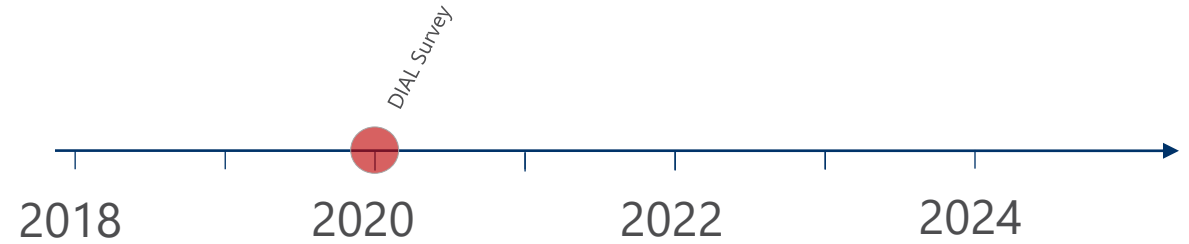
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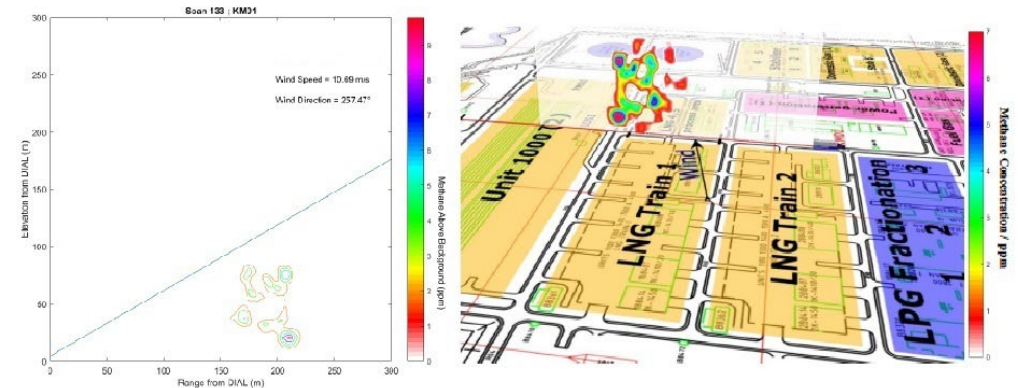
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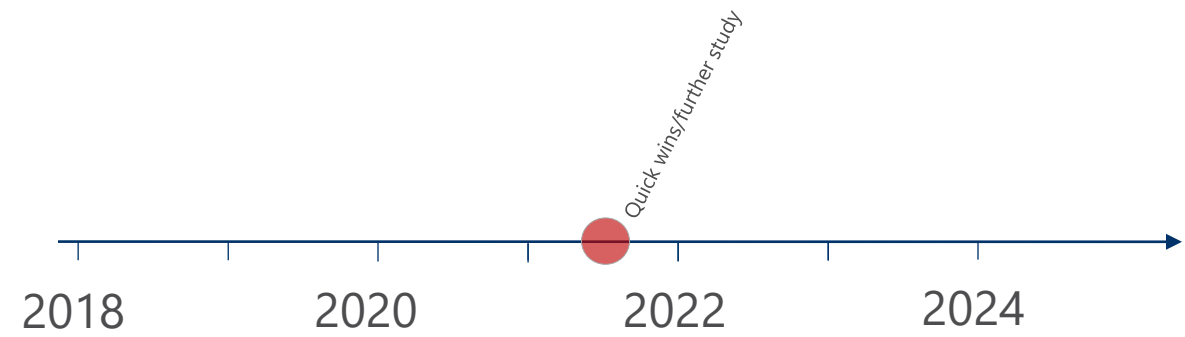
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# OUR JOURNEY



## Interpretation of DIAL study and decision on next steps.

- Ongoing deep-dive of DIAL study to get insights.
- Link insight to mitigation via quick wins.

## Embark on further methane studies.

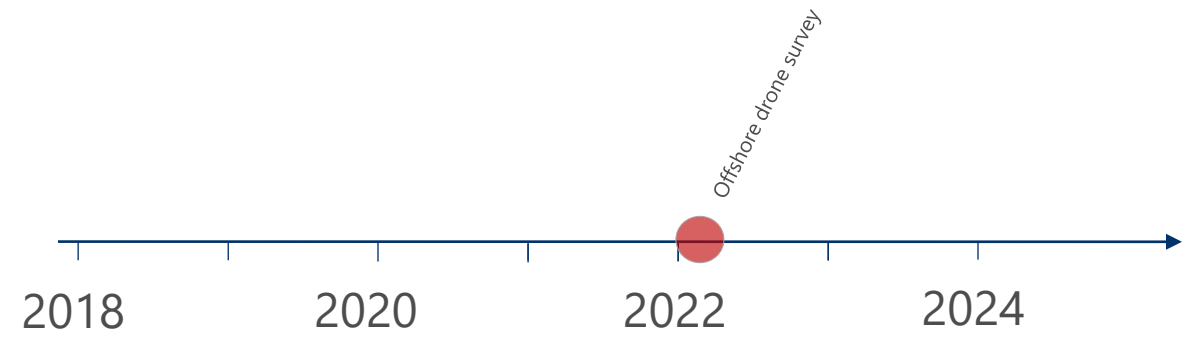
- Commence satellite monitoring with GHGSat.
- Kick-off measurement campaigns:
  - Study of all onshore combustion sources via direct measurement.
  - Drone study of all material offshore facilities.



# OUR JOURNEY

## Offshore drone campaign (2022)

- Undertook drone campaign on all material assets, including operated merged BHP assets.
- Two separate mobilisations; NW Australia via support vessel and US assets via helipad launch.
- Intent of the study was to understand materiality of all assets in the portfolio and to sharpen focus on mitigation opportunities.
- Around 10 platforms/FPSOs were measured over a period of a few months.

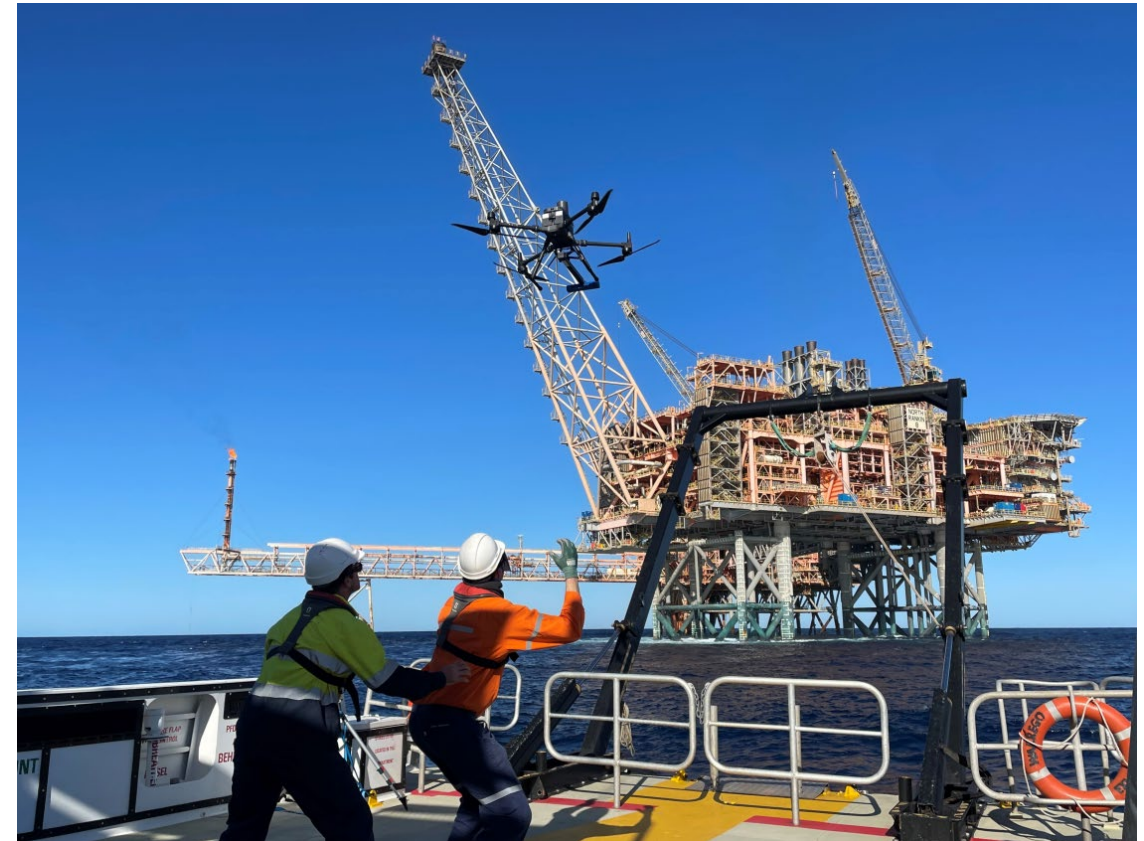
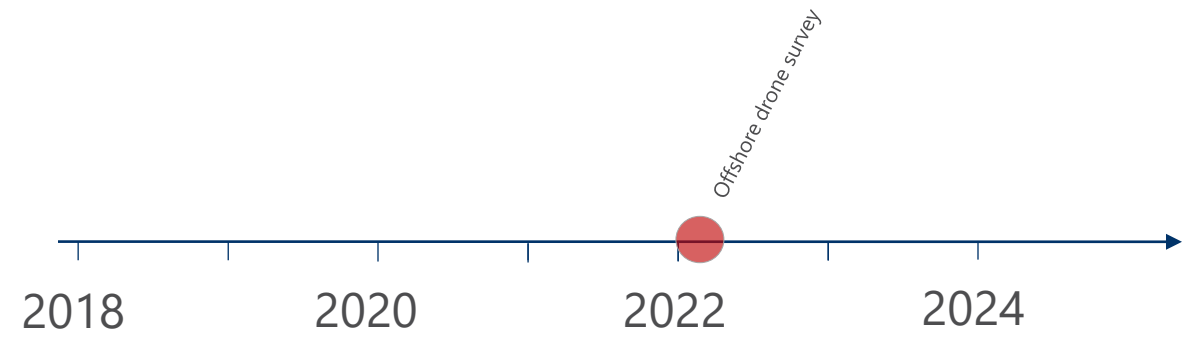




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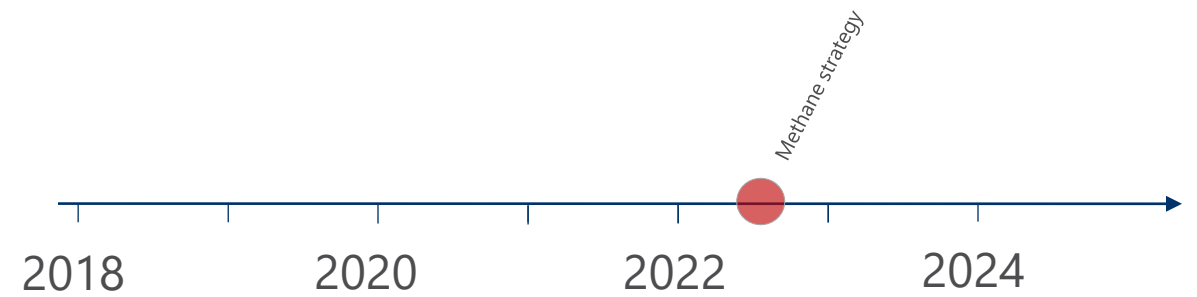
# OUR JOURNEY

## Embedding of a methane strategy

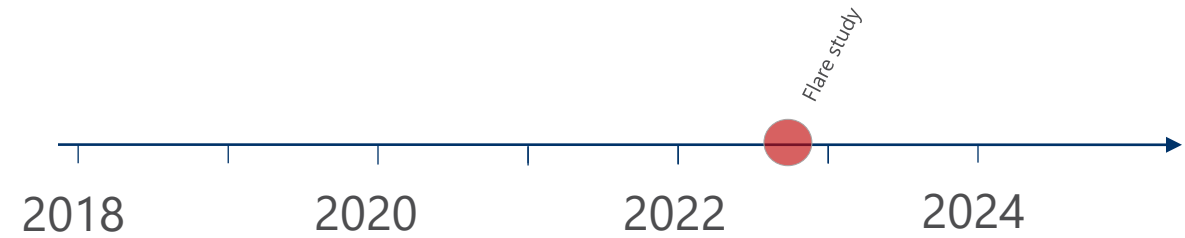
- Embedded Woodside methane strategy (four pillars).
- Established basis for valuation of opportunities.
- Commenced development of methane inventories for all operated assets.
- Delivered mitigation projects through methane actions plans, linked to asset decarbonization plans.
- Enhanced employee engagement with a focus on methane through Woodside Climate Action Network.

## Ramping up of Scope 3 leadership and collaboration

- Joined OGCI's Aiming for Near Zero methane emissions initiative.
- Commenced collaboration with researchers conducting science studies as part of UNEP's International Methane Emissions Observatory's efforts to fill knowledge gaps in methane emissions.
- Shared our approach via a journal publication and presentation at the AEP conference.



# OUR JOURNEY

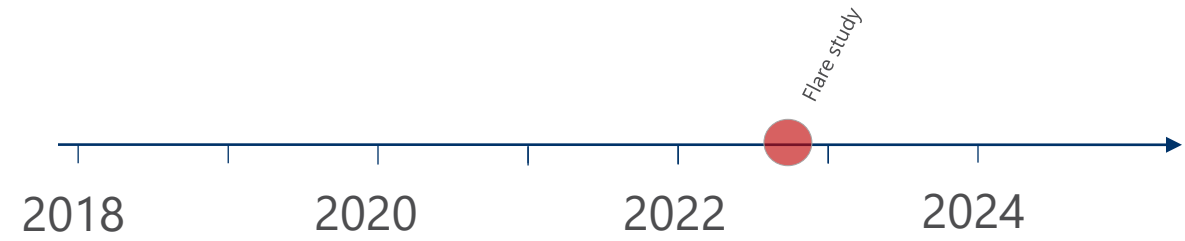


## Flare study

- DIAL study attributed a higher-than-expected methane enhancement on a specific flare at one facility.
- The study sought to validate the measurements and understand if there was a mitigation opportunity.
- Additionally, we sought to validate the performance of VISR as a technique for flare destruction efficiency measurement.
- The study involved running the flares through a variety of operating modes and measuring destruction efficiency by drone in conjunction with measurement via two models of VISR camera.

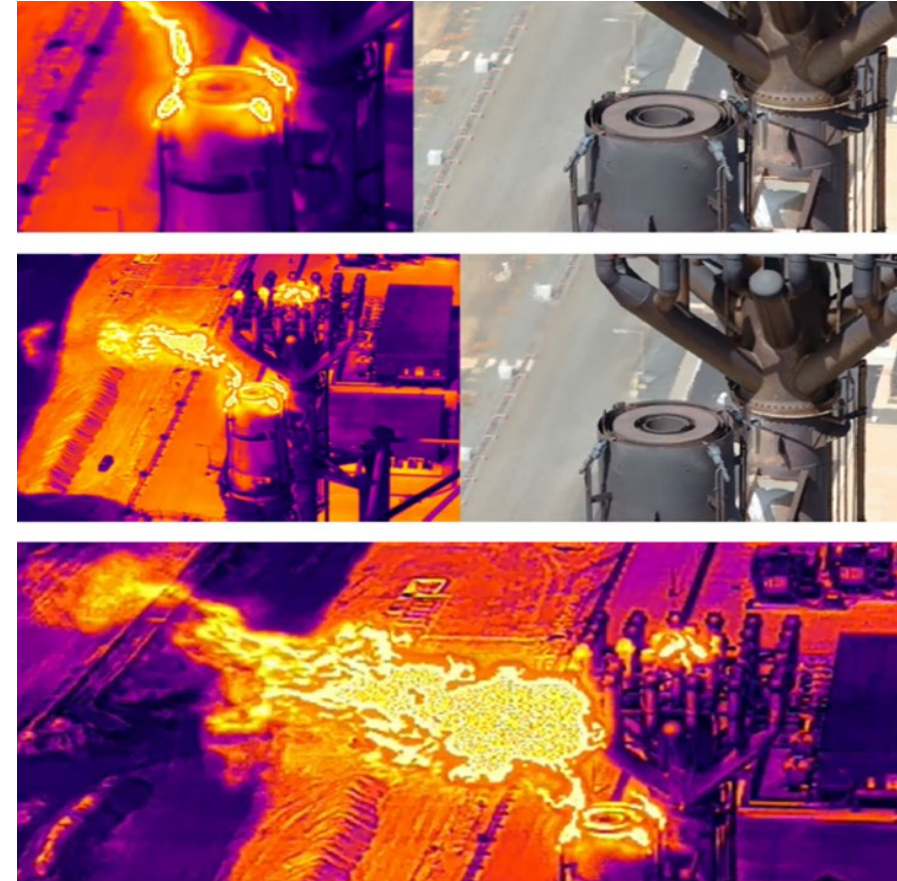


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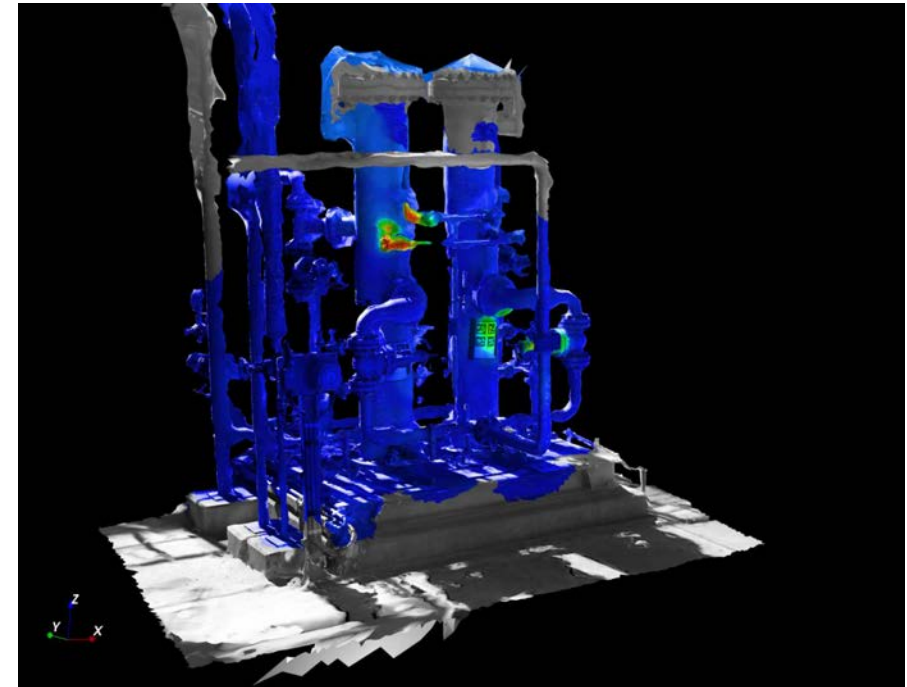
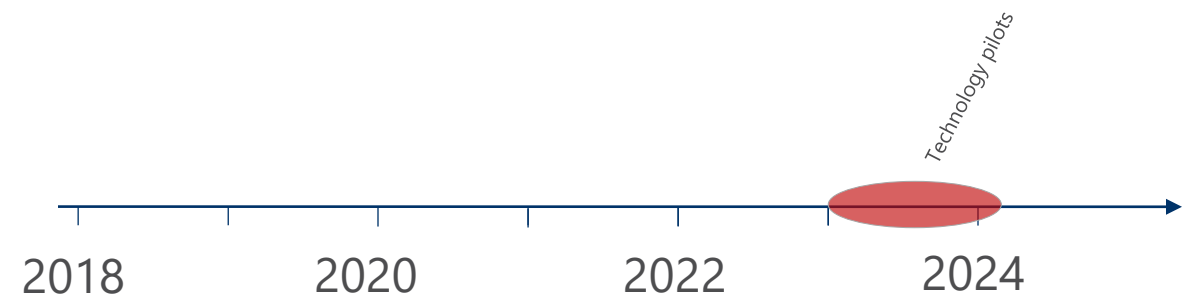
## Deployment of pilots to understand technology gaps

- Aerial AVIRIS measurement of onshore assets.
- Trial of several fugitive detection technologies to understand detection, localization and quantification capabilities.
- Deployment of component level drone measurements by two different vendors.
- Routine monitoring by two different satellites to progress and understand capabilities.
- Continued collaboration with researchers conducting science studies as part of UNEP's International Methane Emissions Observatory's efforts to fill knowledge gaps in methane emissions.
- Progressed a controlled testing facility concept for validation and verification of technologies to facilitate a pathway into methane regulations.

## Further our commitment to Scope 3 leadership and collaboration

- As part of COP28 Woodside signed the Oil and Gas Decarbonisation Charter.
- Launched and led the Midstream initiative workstream with Methane Guiding Principles (Now called the Scope 3 Methane Action Group).
- Joined the ASEAN MLP and re-invigorated the AEP Methane Taskforce, sponsored inaugural conference.

***In early 2024, Woodside became a signatory of the OGMP2.0.***



# COMPRESSOR WET SEALS – VAPOR RECOVERY

## The Issue

- LNG train liquification compressors can emit methane continuously by design.

## The Approach

- A variety of options were assessed, and vapor recovery packages were procured and installed in 2022.
- The packages capture the methane previously being sent to vent and recover it to the compressor suction.
- This outcome improves the efficiency and reduces the methane emissions.

## Outcome

Mitigation of 280tpa of methane.



# AGRU SKIMMING PROCEDURE OPTIMISATION

## The Issue

- Acid gas removal units (AGRU) are used in the LNG industry to strip sour gas (H<sub>2</sub>S, CO<sub>2</sub>) prior to the cryogenic liquefaction process. A small % of hydrocarbon (methane) is entrained in this process and typically vented to atmosphere
- A manual skimming procedure is conducted periodically to remove impurities from the solvent interface, during which methane can be vented.

## The Approach

- Control logic was implemented to precisely automate the skimming procedure reducing operations resourcing input, improving efficiency and reducing methane emissions.

## Outcome

Mitigation of 180tpa of methane.



# GAS COMPRESSION SPARING

---

## The Issue

- An FPSO was suffering from suction strainer blockages required 10 hours of flaring while the strainers were cleaned.

## The Approach

- By installing a parallel strainer we are now able to clean blockages online and eliminate the associated flaring.

## Outcome

Mitigation of 440tpa of methane.





# COMPRESSOR WET SEAL – PRESSURE OPTIMISATION

## The Issue

- A boil off gas compressor is used to recover boil off gas from LNG storage.
- The compressor was commissioned with wet seals which vent continuously.
- Measurements indicated that the methane emissions from the seals were higher than expected using a first principles engineering calculation.

## The Approach

- An investigation was conducted into the operation of the wet seals.
- It was determined that the operational pressure of the seal gas was not optimised.
- An optimisation of the seal gas pressures was conducted, and procedures developed to ensure ongoing optimisation of the operation of the seal pressures.
- This has led to an improvement in the amount of product recovered as well as reducing the methane emissions.

## Outcome

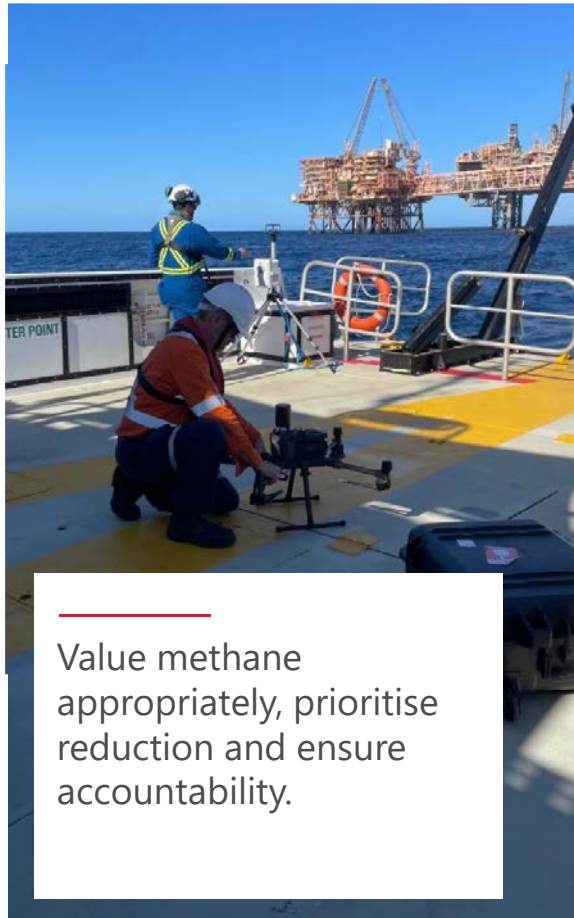
Mitigation of 1,400tpa of methane.



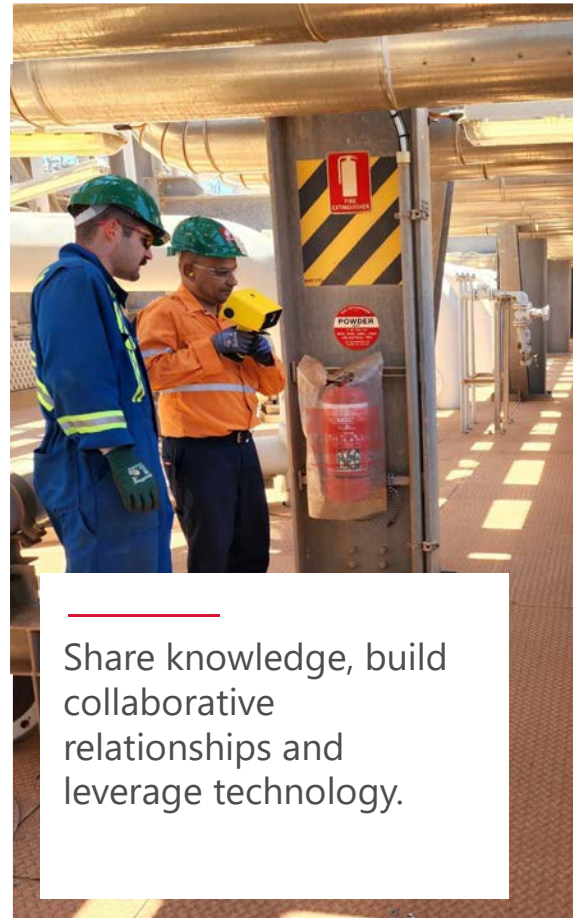
# CONCLUDING REMARKS



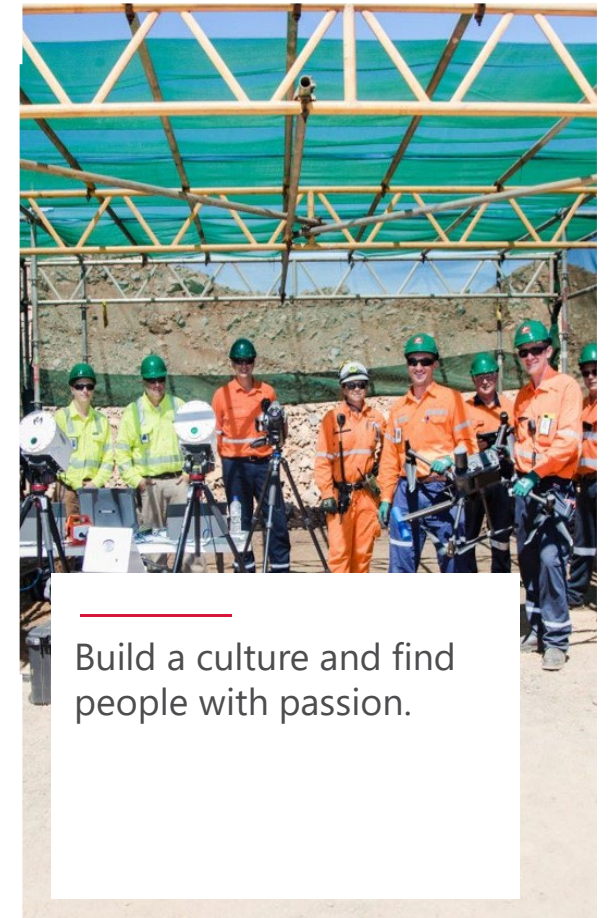
Leader led vision to understand methane emissions by understanding your inventories.



Value methane appropriately, prioritise reduction and ensure accountability.



Share knowledge, build collaborative relationships and leverage technology.



Build a culture and find people with passion.