

The background of the slide features a night-time photograph of an industrial facility, likely a refinery or chemical plant, with several tall distillation columns and various structures illuminated by warm lights. Overlaid on this image is a complex digital network of white lines connecting numerous glowing nodes, some of which are larger and more prominent, suggesting a data-driven or smart industrial environment.

HONEYWELL EMISSIONS MANAGEMENT

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PRODUCT DIRECTOR, SUSTAINABILITY+ EMISSIONS MANAGEMENT

09-MAY-2024

Honeywell

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UNDERSTANDING GHG AND CHALLENGES

HONEYWELL EMISSIONS MANAGEMENT

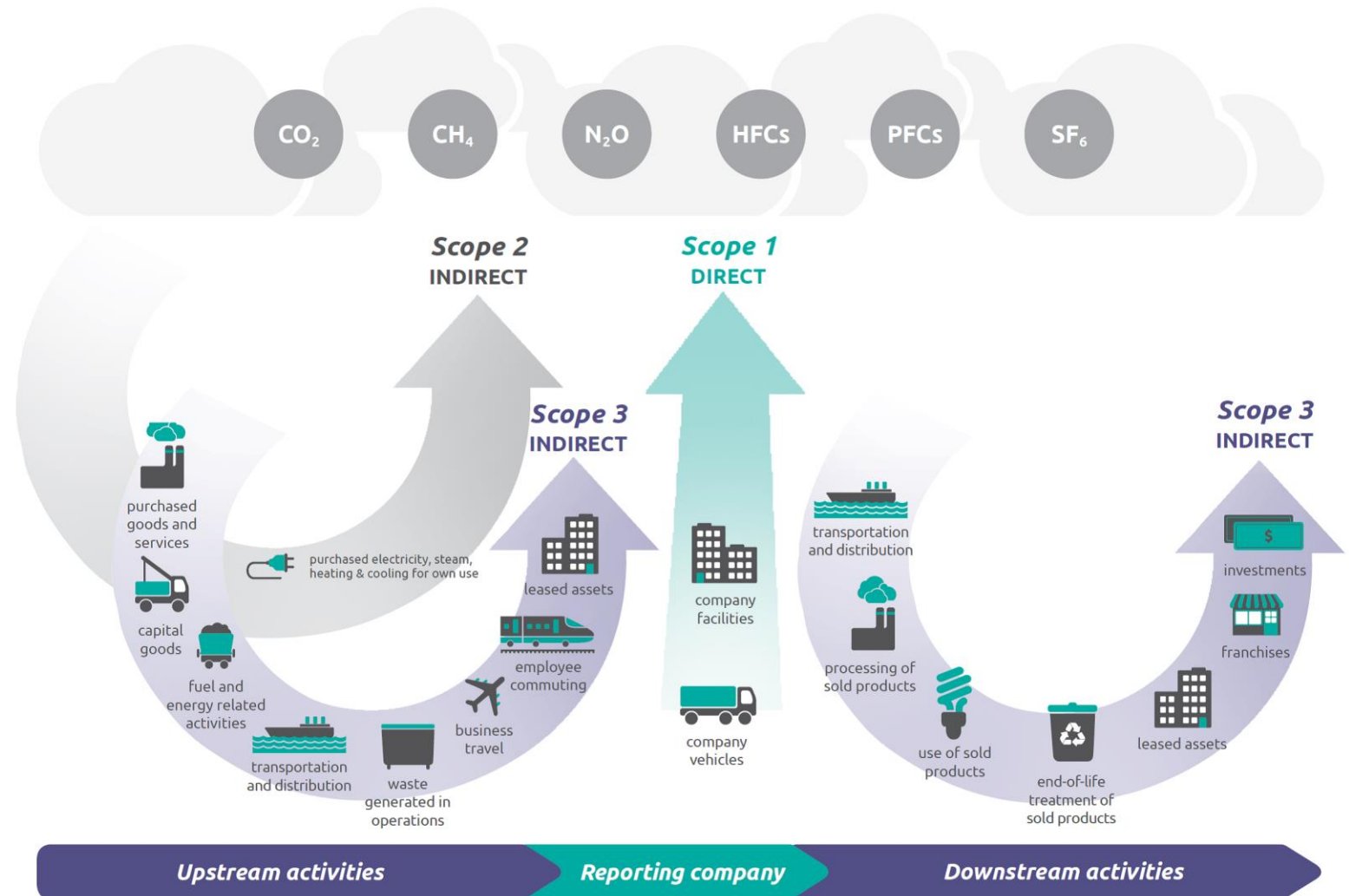
DIRECT MEASUREMENT TECHNOLOGIES

SUSTAINABILITY+ DIGITAL PLATFORM

FLARE INTELLIGENCE - AI USE CASE

TYPES OF GHG EMISSIONS

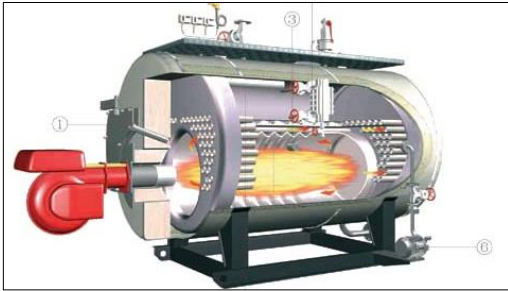
- **Scope 1:** Direct emissions from a company's owned or controlled sources. Common examples include fuel combustion at company facilities or in company-owned cars.
- **Scope 2:** Indirect emissions from the generation of purchased energy. Purchased energy includes purchased electricity, steam and heating/cooling.
- **Scope 3:** Indirect emissions (not included in scope 2) that occur in the value chain of the reporting company.



<https://www.epa.gov/climateleadership/scope-1-and-scope-2-inventory-guidance>

SOURCES OF GHG EMISSIONS

SCOPE 1



COMBUSTION

Emissions result from combustion of fuels in stationary and mobile sources, e.g., Boilers, Furnaces, Turbines, Trucks, ships, Airplanes.



FLARING

Process of burning excess natural gas at the production well and safely regulating pressure in chemical plants.



VENTING & PROCESS

Emissions result from venting of natural gas into the atmosphere and manufacturing or processing of chemicals and materials.



FUGITIVE

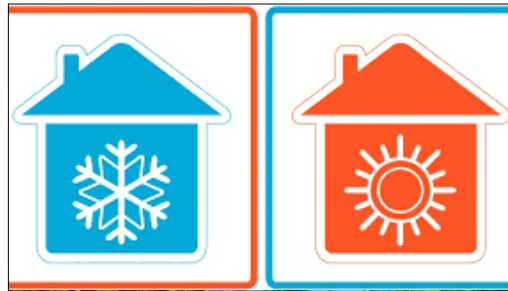
Emissions result from intentional or unintentional releases, e.g., equipment leaks from joints, seals, packing, and gaskets.

SCOPE 2



ELECTRICITY

Emissions from the generation of Purchased Electricity that is consumed in its owned or controlled equipment or operations



HEATING & COOLING

Emissions from the generation of Purchased heating and cooling that is consumed in its owned or controlled equipment or operations




SCOPE 3



UPSTREAM & DOWNSTREAM

Upstream emissions come from the production of your business's products or services while downstream emissions come from their use and disposal.

CHALLENGES IN ENERGY AND EMISSIONS MANAGEMENT

USER	CHALLENGES	OUTCOME EXPECTED
 <p>Process / HSE Engineer</p>	<ul style="list-style-type: none"> • Manual data collection from multiple sources. • Calculate energy & emissions footprint in spreadsheet. • Reconcile data between engineering calculations and actual monitoring. 	<ul style="list-style-type: none"> • Automated data collection and energy & emissions calculation. • Simplified data wrangling & reconciliation.
 <p>Plant / Sustainability Manager</p>	<ul style="list-style-type: none"> • Lack of Proactive Insights to minimize energy losses and emissions. • Do not know where to start net zero journey & how to prioritize projects. • No easy way to monitor emissions status against environmental permit regulations. 	<ul style="list-style-type: none"> • Near real-time energy & emissions insights & enable closed loop optimization. • Ability to provide blueprint. Deliver what-if scenarios & expert guidance workflow. • Tool to understand the economic and environmental impact of carbon emissions.
 <p>Chief Sustainability Officer / CEO / CFO</p>	<ul style="list-style-type: none"> • Limited visibility of enterprise-wide GHG emissions. • Lack of traceability for managing & analyzing nonconformance compliance. • Difficult to perform manual reporting & audit compliance. 	<ul style="list-style-type: none"> • Provide standardized, Interoperable, system agnostic, enterprise-wide energy & emissions monitoring. • Build Single System of Energy & Emissions Record. • Streamline reporting and audit compliance process.

OVERCOMING EMISSIONS CHALLENGES

THE PATH TO NET ZERO

MEASURE

Automated Near Real-Time Emissions Coverage

Honeywell Rebellion Gas Cloud Imaging



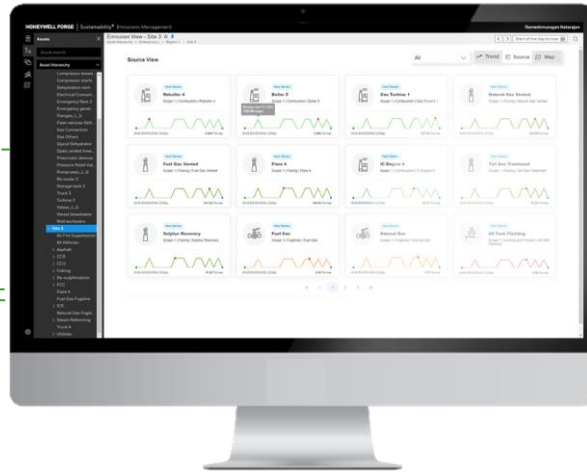
Third-Party Data (i.e. satellite, drone/aircraft, LDAR)

Honeywell Versatilis™ Signal Scout™



MONITOR & REPORT

Source, Site, Region and Enterprise-Level Trending and Visualization



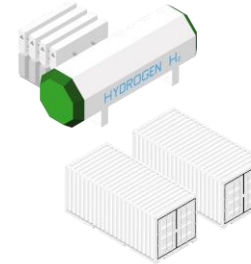
Honeywell Forge Sustainability+ for Industrials | Emissions Management

REDUCE

Enable Automated and Manual Emissions Actions



Energy Efficiency & Optimization (i.e., Asset Performance; Digital Twin; Combustion Control, Flare Analytics, Emissions and Reporting Solutions)



- Hydrogen (H₂) transition
- Carbon Capture (CCUS)
- Energy Storage
- Renewable Fuels
- Zero Routine Flaring



Emissions 360 Outcome and KPI Based Service Program

REDUCTION PROGRAMS, INCLUDING E360 ACTS AS FEEDBACK LOOP

End-To-End Emissions Management & Decarbonization Solutions

AI-POWERED HONEYWELL EMISSIONS MANAGEMENT SOLUTIONS

1

Source & site emission sensing with "top-down" measurements

Detect leaks in real-time



Rebellion Gas Cloud Imaging Camera

2

Source emission sensing with "bottom-up" measurements

Detect leaks in real-time



Versatilis™ Signal Scout™ IOT Sensor

3

Enterprise Sustainability data lake Harmonize disparate data sources

Holistic, near real-time view of emissions



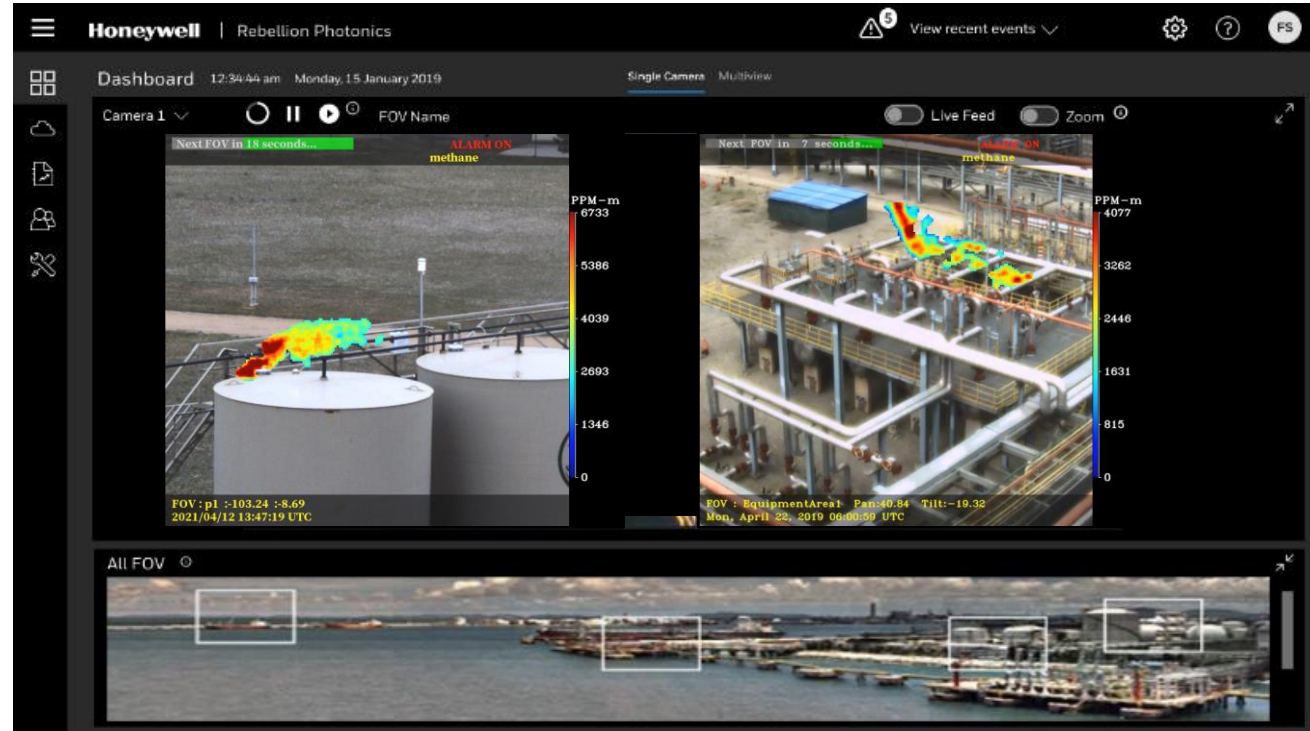
Honeywell Forge Sustainability+ Emissions Management - Emissions Analytics

State-of-the-art Artificial Intelligence Technologies in Emissions Management

REBELLION GAS CLOUD IMAGING CONTINUOUS VISUAL EMISSIONS MONITORING

CH₄ EMISSION EVENT AT TANK BATTERY

- Rebellion capturing a storage tank methane emission
- The leak source, size and direction is detected for the operator to diagnose remotely via the live dashboard



H₂S+CH₄ EMISSION DURING ROUTINE MAINTENANCE

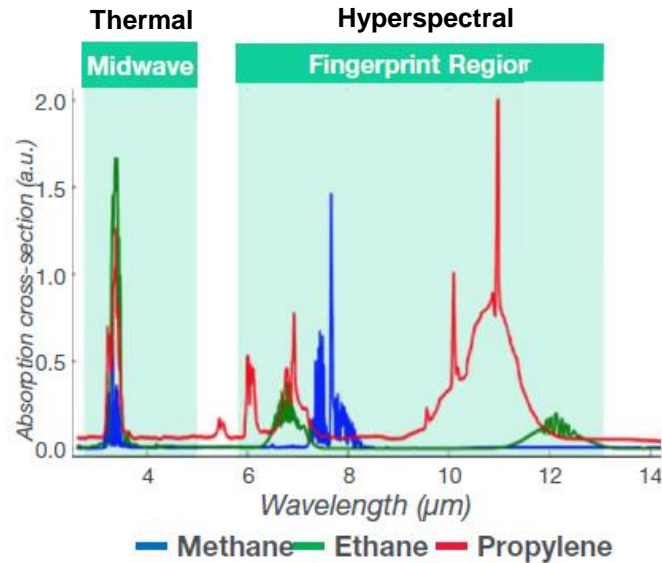
- Rebellion capturing an emission during routine maintenance
- The fence-line point sensors did not detect the large gas plume rising over workers on site due to their inherent limitations with rising gas plumes

Identify problems Operators don't even know exist!

REBELLION GAS CLOUD IMAGING CAMERA

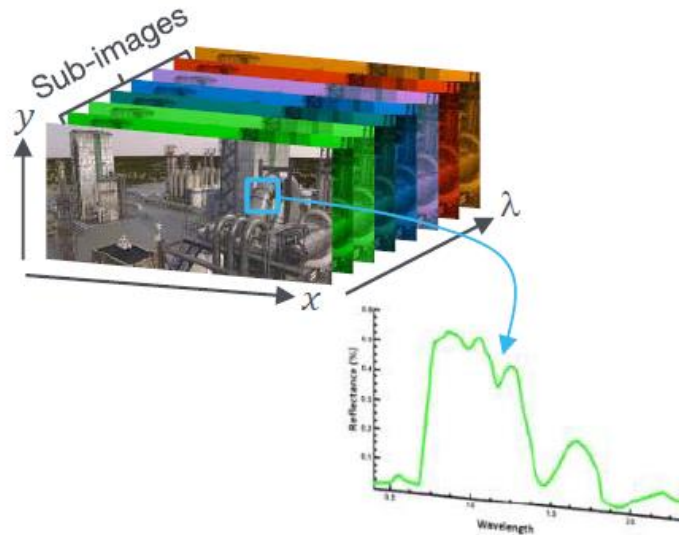
PHYSICS OF THE GCI SYSTEM

GAS FINGERPRINT IDENTIFICATION



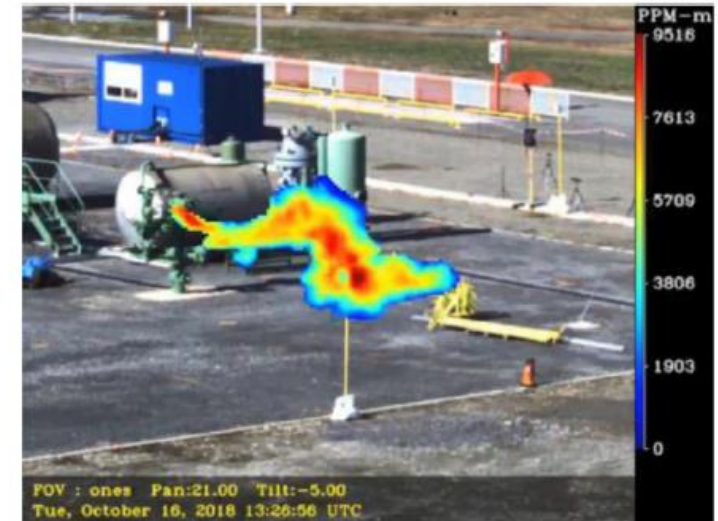
Rebellion utilizes the **fingerprint region** to identify gases and **minimize false alarms** unlike conventional thermal imaging cameras which cannot identify gas signatures

HYPERSPPECTRAL ACCURACY



Full snapshot **hyperspectral data** **continuously collected** for each pixel in field of view for **greater accuracy**

PROPRIETARY ALGORITHMS



Proprietary algorithms convert hyperspectral data to a visual gas cloud display and then overlay on a **live video feed** for **remote diagnosis**

Proprietary Hyperspectral Technology Enables Continuous Monitoring

VERSATILIS™ SIGNAL SCOUT™

2



Sensing parameters

Methane (50-1M ppm), Temperature, Humidity, Pressure

Certified for Hazardous Area Operation

Hazloc certs: IECEx, ATEX Exi-a, C1D1 and Marine

Solar Powered with Battery backup

No cables required for installation, low maintenance

IIoT Communications

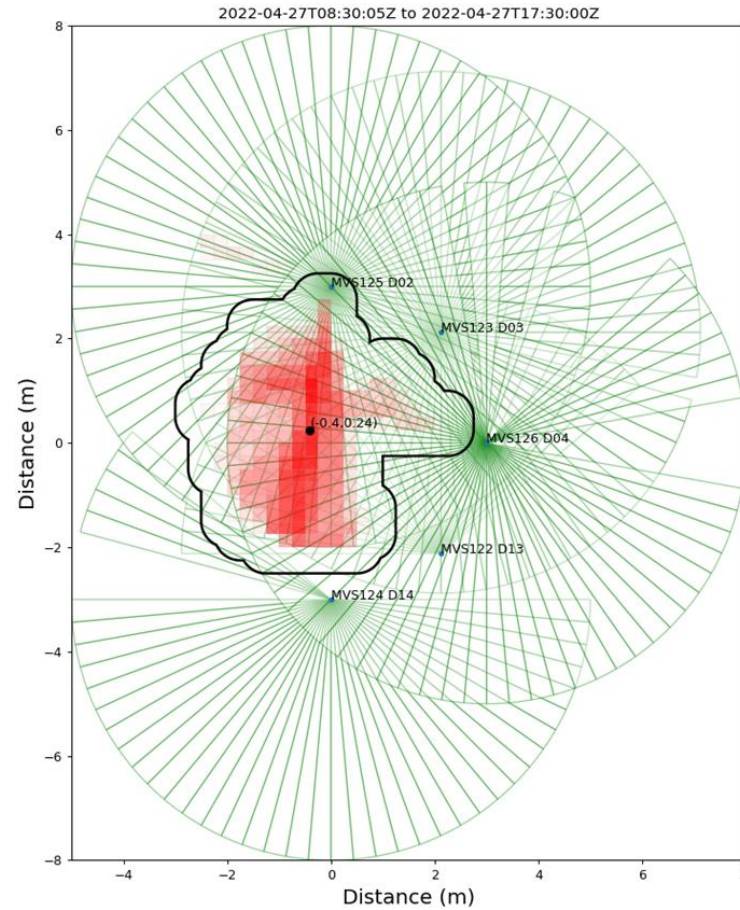
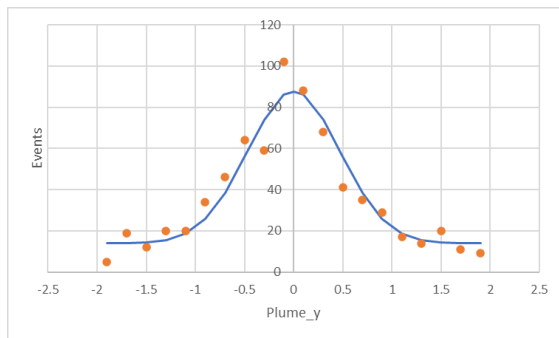
Utilizes LoRA for rapid and low-cost communications

VERSATILIS™ SIGNAL SCOUT™

PROACTIVE LEAK DETECTION WITH SENSORS

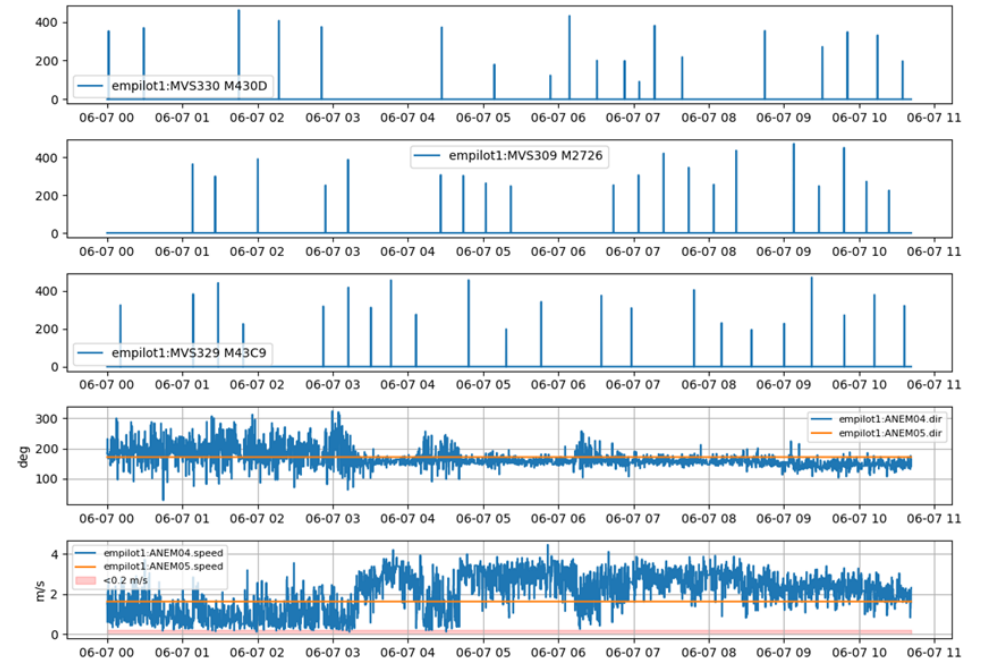


Versatilis™ Signal Scout™

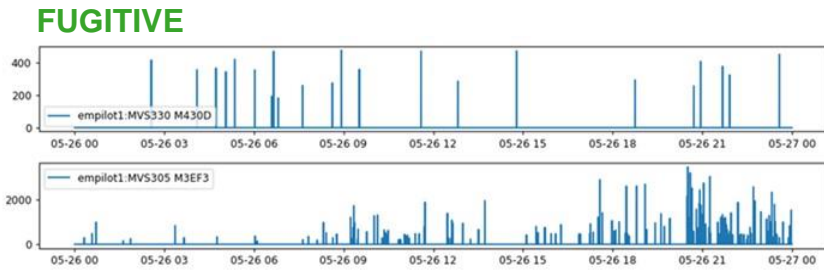
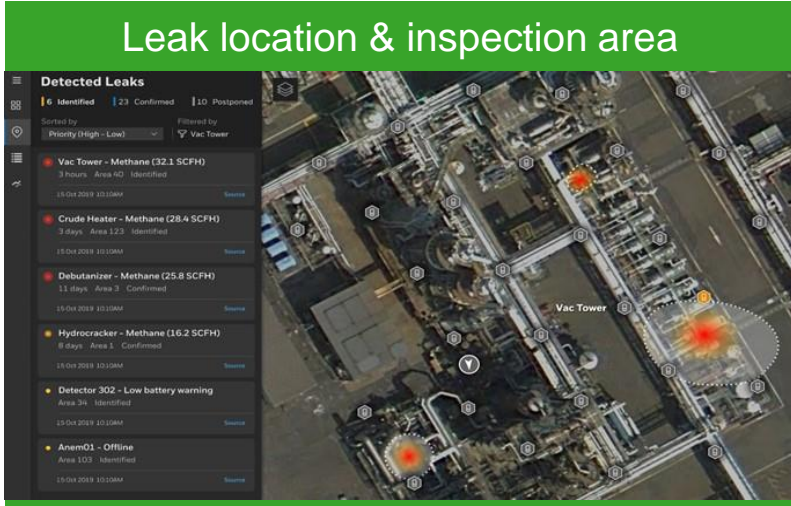


Detect a leak of 100 l/h at 10 m distance

A swarm of low-power, fast, very sensitive gas sensors, positioned adjacent to potential emission sources, feeding data to Sustainability+ Emissions Management software through a wireless LoRa interface, where Analytics correlate time-series methane events wind speed and -direction data to triangulate the leak location and quantify the Emissions.



SITE EXAMPLE AND FINDINGS



Industry first breakthrough with hazardous area certified devices

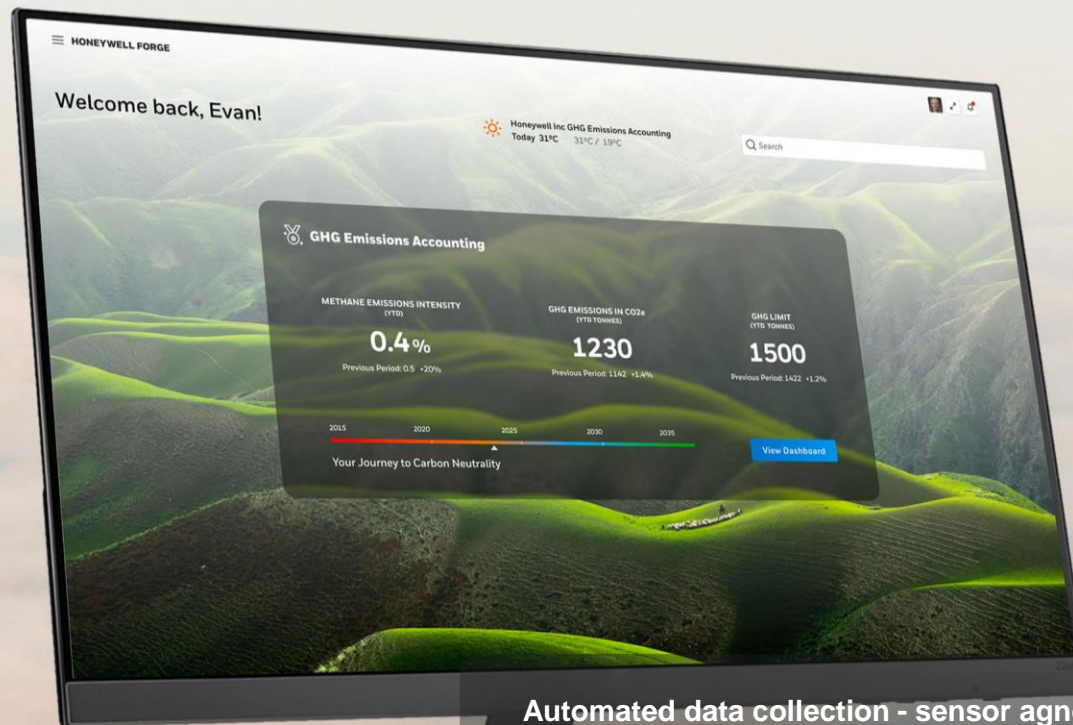


SUSTAINABILITY+ EMISSIONS MANAGEMENT

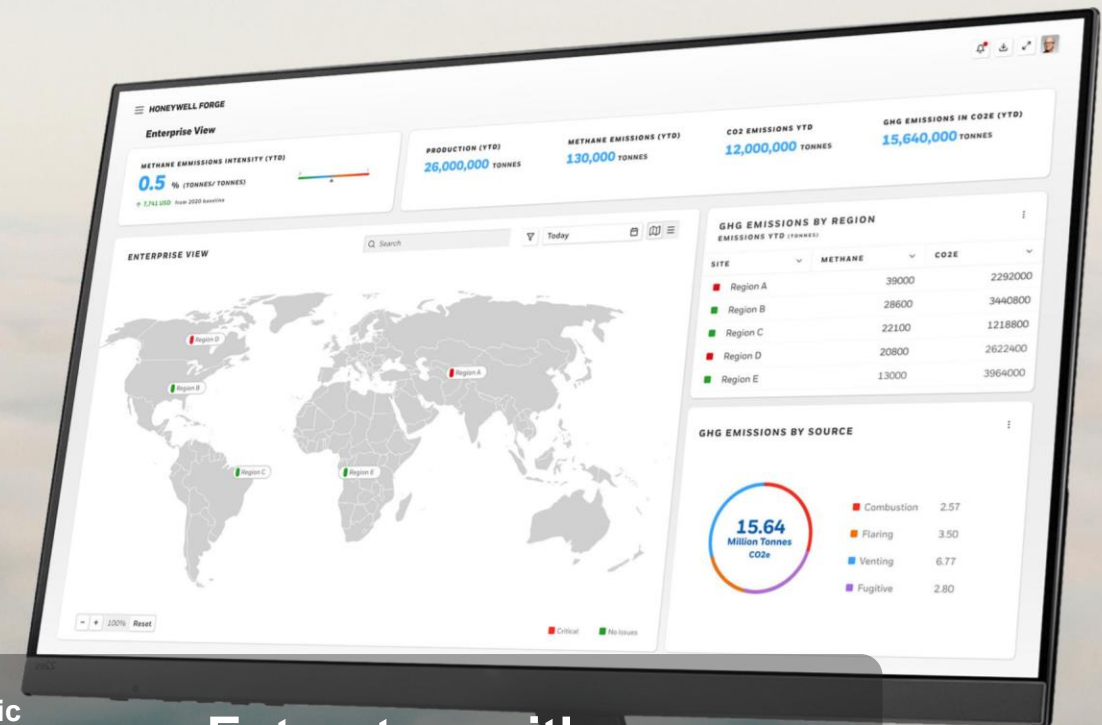
3

Measure, Monitor, Reduce & Report.

Honeywell presents the next generation of Enterprise Emissions application for accurate scope 1 & 2 GHG accounting, near real-time enterprise-wide visualization & simplified reporting to drive your decarbonization goals.



Automated data collection - sensor agnostic
 Calculate emissions in near real-time
 Enterprise-wide visualization
 Emissions reduction insights
 Simplified reporting and integration

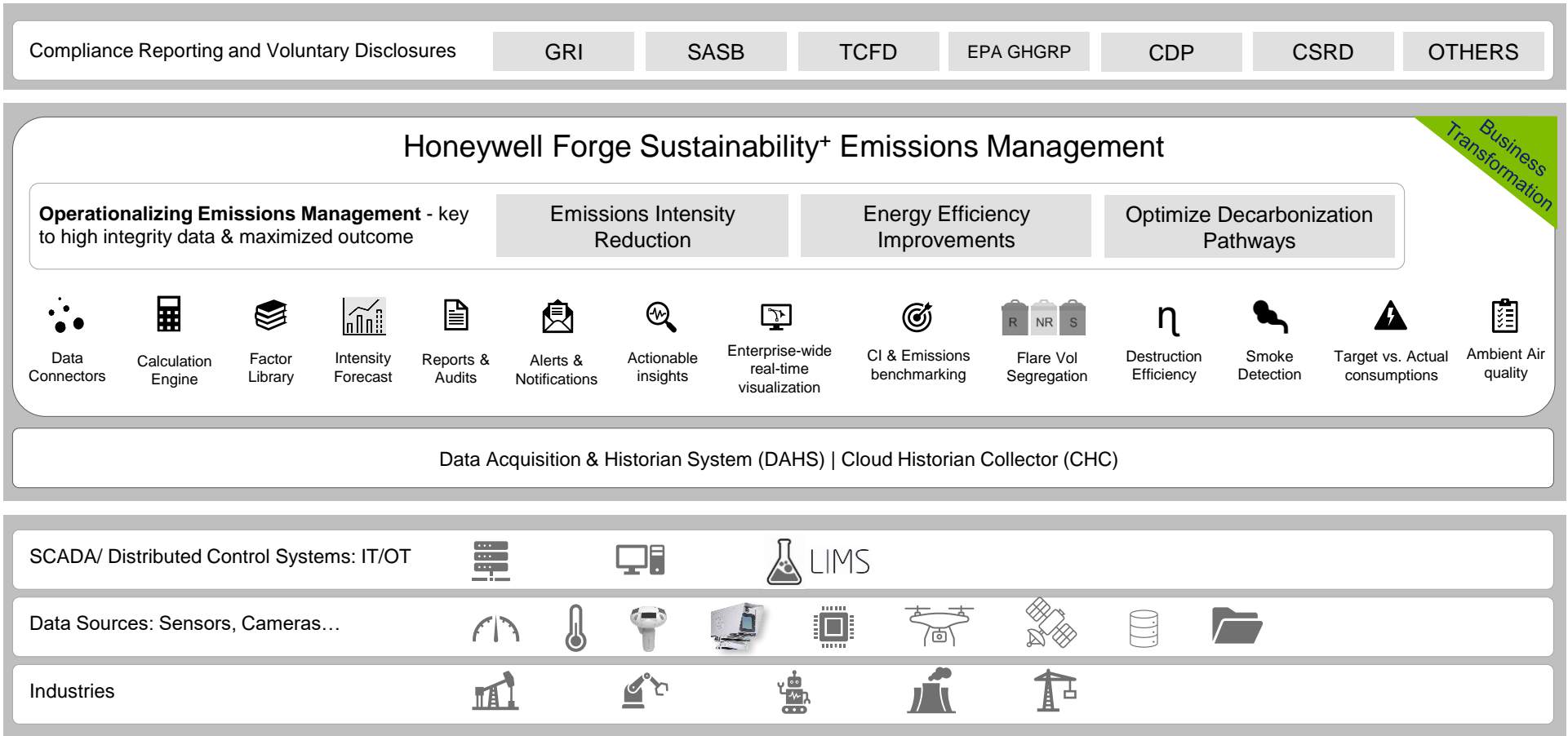


Entrust us with
 achieving your
 decarbonization goals

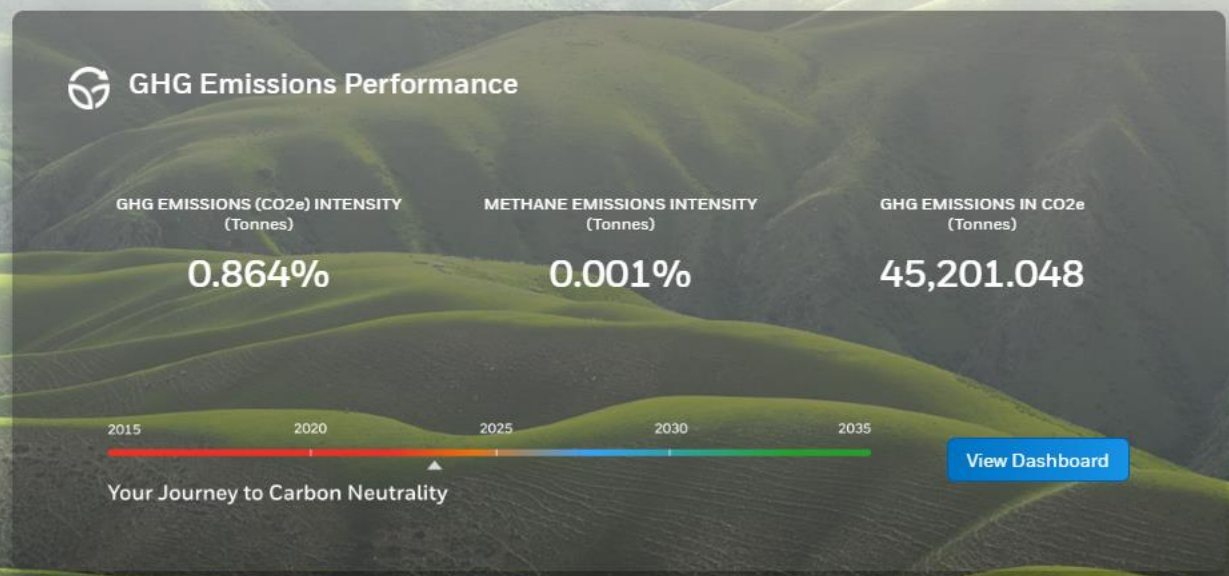
HONEYWELL FORGE SUSTAINABILITY+ EMISSIONS MANAGEMENT

SOLUTION ARCHITECTURE

Enabling high-integrity IT/OT emissions data and insights to reduce emissions intensity, improve energy efficiency and optimize decarbonization pathways for the business transformation of key processes.



- Assets
- Quick search
- Asset Hierarchy
 - Malibu Enterprise
 - APAC
 - Perth Aluminium plant
 - Terengganu Offshore plant
 - EMEA
 - Arabia oil field
 - Arezzo Gas Plant
 - North America [US]
 - Mississippi Refinery



C-Suite Visuals: Enable users to quickly monitor the performance the GHG emissions at the enterprise level. Configurable Key Performance Indicators (KPIs).

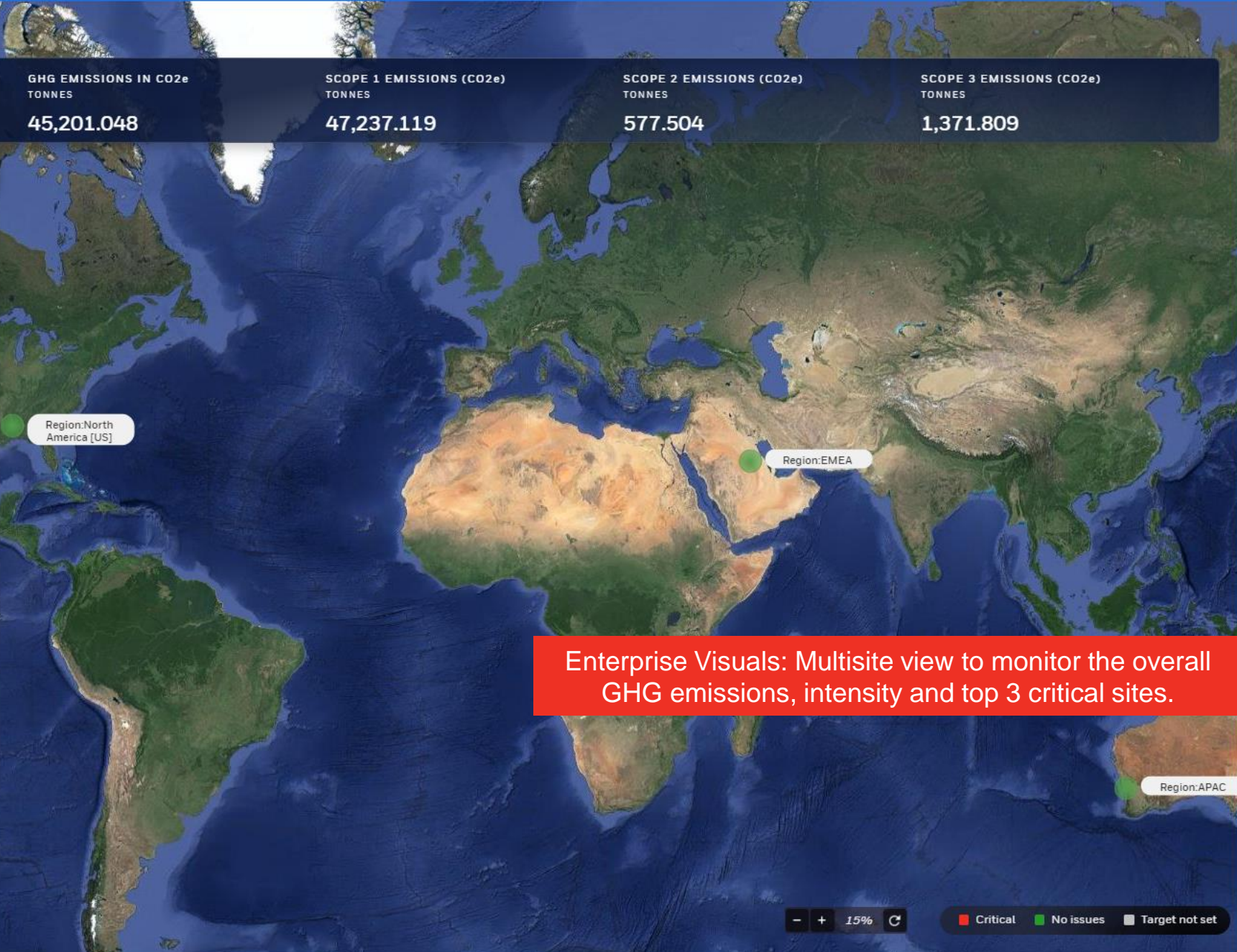


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Malibu Enterprise				
PRODUCTION TONNES	GHG EMISSIONS IN CO2e TONNES	SCOPE 1 EMISSIONS (CO2e) TONNES	SCOPE 2 EMISSIONS (CO2e) TONNES	SCOPE 3 EMISSIONS (CO2e) TONNES
5,230,419.888	45,201.048	47,237.119	577.504	1,371.809



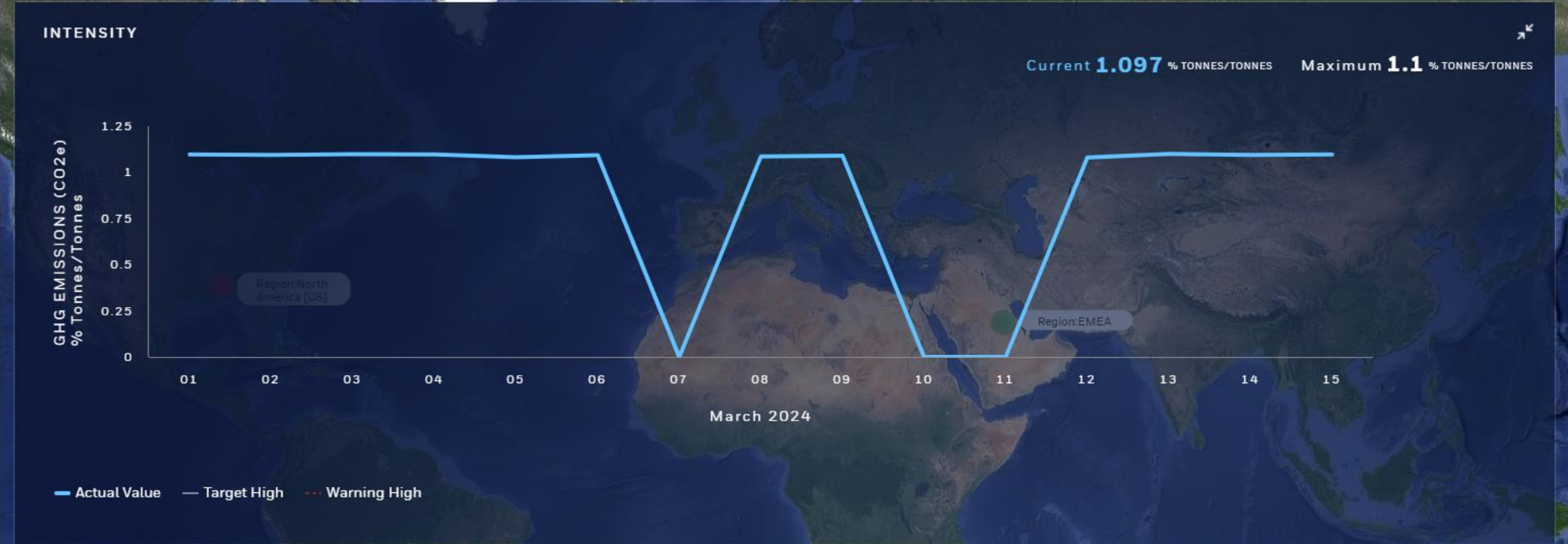
- TOP 3 CRITICAL SITES
- PERTH ALUMINIUM PLANT, APAC** ↗
 1,771.126 TONNES
 1,588.874
 - ARABIA OIL FIELD, EMEA** ↗
 108.033 TONNES
 179.967
 - MISSISSIPPI REFINERY, NORTH AMERICA [US]** ↗
 92.243 TONNES
 51.757



Enterprise Visuals: Multisite view to monitor the overall GHG emissions, intensity and top 3 critical sites.

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PRODUCTION TONNES	GHG EMISSIONS IN CO2e TONNES	SCOPE 1 EMISSIONS (CO2e) TONNES	SCOPE 2 EMISSIONS (CO2e) TONNES	SCOPE 3 EMISSIONS (CO2e) TONNES
5,379,683.691	46,860.356	48,836.697	594.231	1,414.813



Enterprise Visuals: Drill down to monitor Emission Intensity Trend

Assets

Quick search

Asset Hierarchy

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PRODUCTION TONNES	GHG EMISSIONS IN CO2e TONNES	SCOPE 1 EMISSIONS (CO2e) TONNES	SCOPE 2 EMISSIONS (CO2e) TONNES	SCOPE 3 EMISSIONS (CO2e) TONNES
902,871.317	7,675.969	4,446.603	34.212	3,195.154

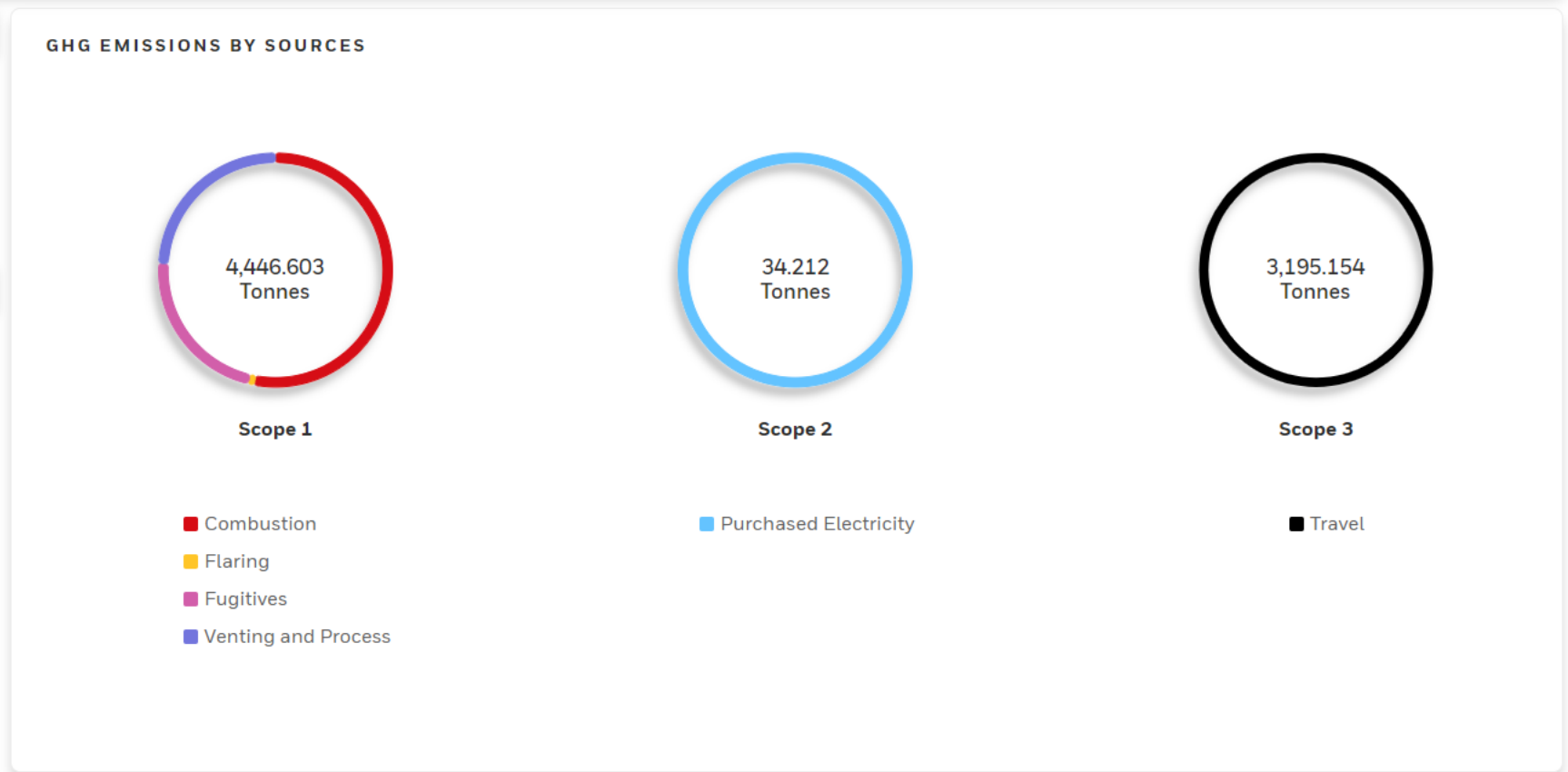
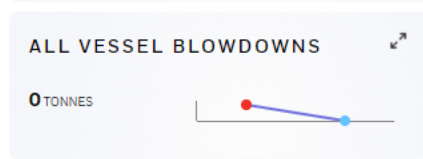
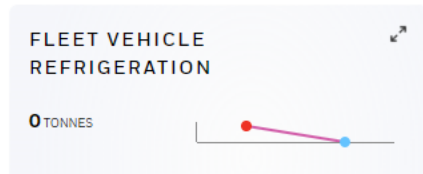
GHG EMISSIONS (CO2e)

INTENSITY

Current 0 % TONNES/TONNES

Maximum 0.85 % TONNES/TONNES

TOP 3 EMITTING SOURCE TAGS



[View Details](#)

Site Visuals: Monitor the overall GHG emissions by categories, intensity and top 3 critical emission sources.



Assets

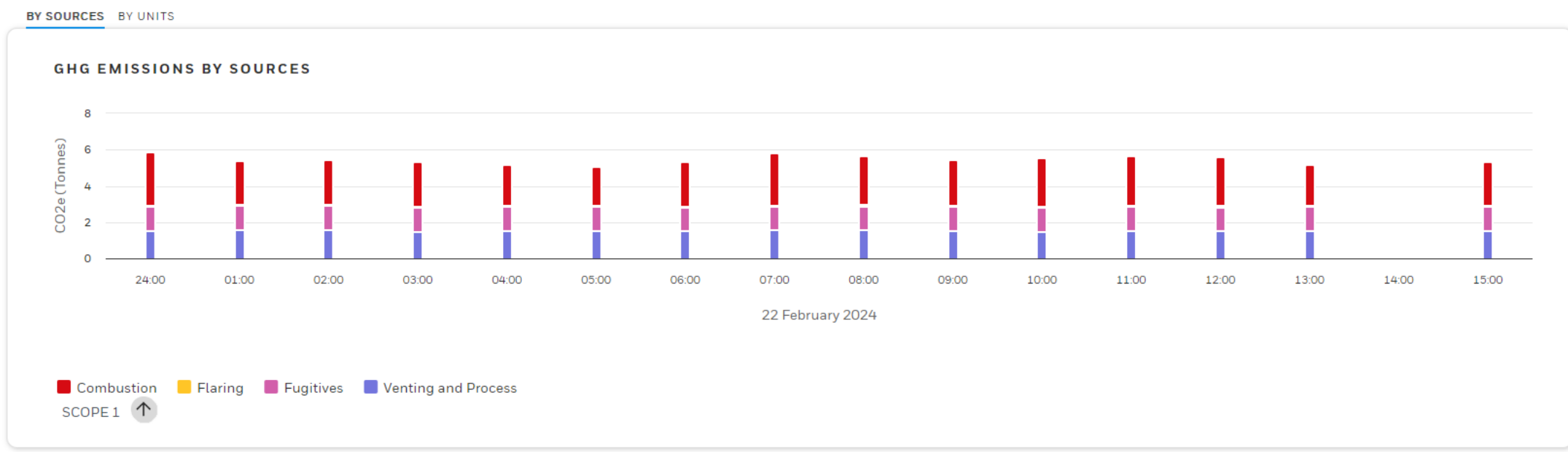
Quick search

Asset Hierarchy

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 - EMEA
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Trend View : Arabia oil field

Trends Source Map



EMISSIONS SOURCES	GHG EMISSIONS (CO2e) (TONNES)	METHANE (CH4) (TONNES)	CARBON DIOXIDE (CO2) (TONNES)	NITROUS OXIDE (N2O) (TONNES)	FLUORO CARBONS (HFC) (TONNES)
Scope 1	82.287	0.998	37.702	0	0.015
Flaring	0.835	0	0.758	0	0
Venting and Process	23.526	0.646	7.386	0	0
Fugitives	19.905	0.016	0	0	0.015
Combustion	38.021	0.337	29.558	0	0

Site Visuals: Trend and Table view of emissions by sources and gases at granular level.



Assets

Quick search

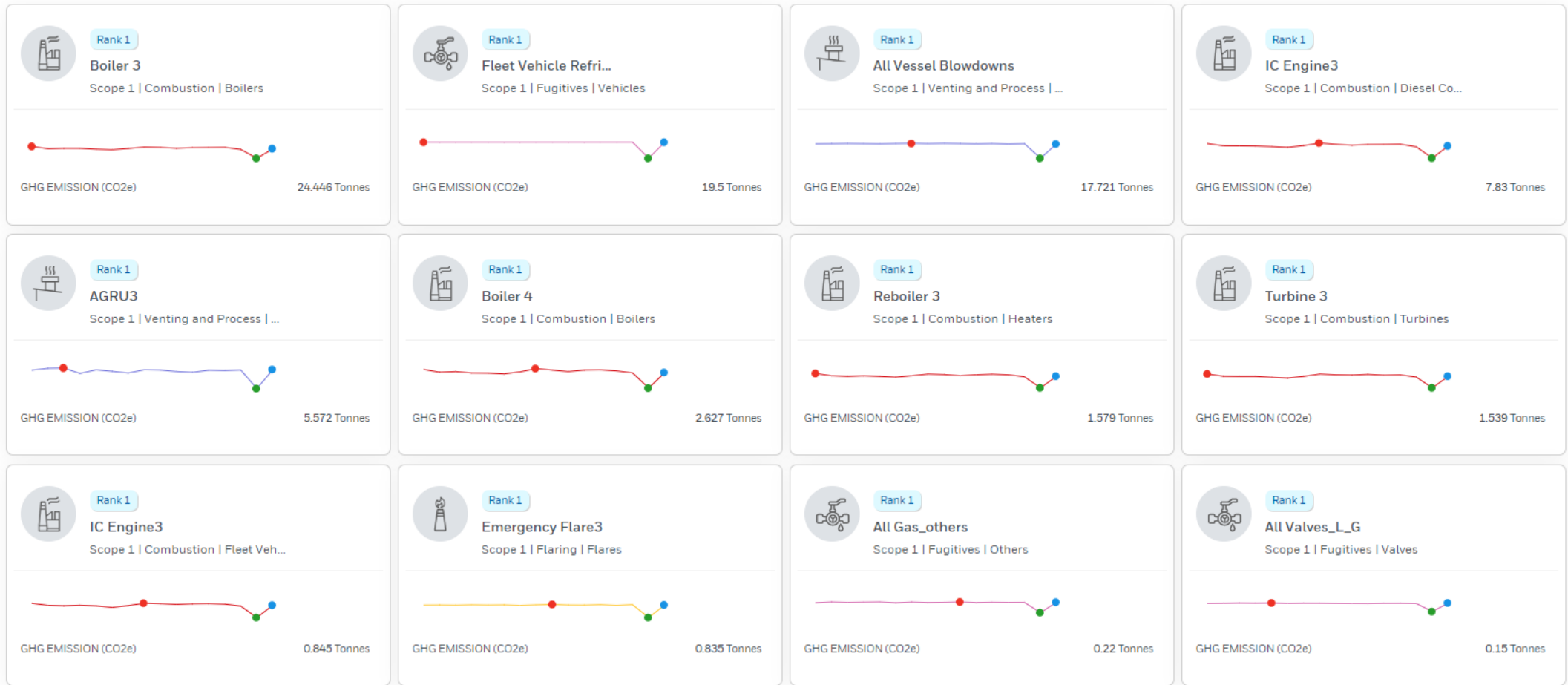
Asset Hierarchy

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Source View : Arabia oil field

EMISSIONS BY SOURCES

1 - 12 of 26 | No filters applied



Emissions Source Visuals: Each tile represents emissions source and its trend.

Assets

Quick search

Plant Hierarchy


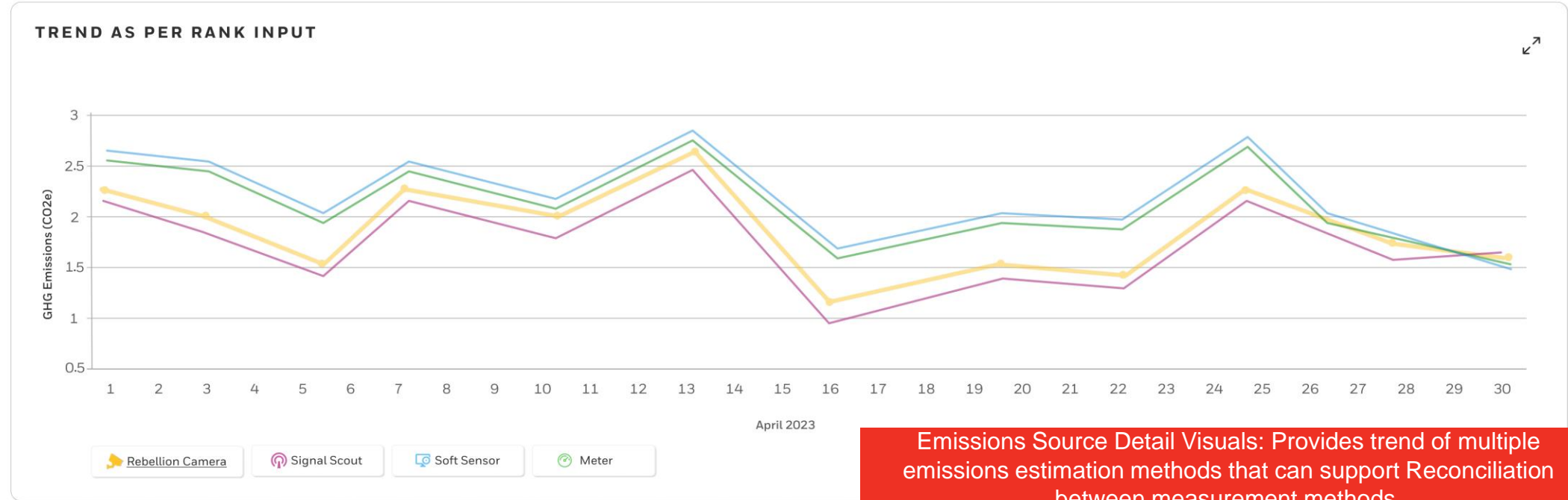
- Malibu Enterprise
 - Enterprise View
 - Region View: North America
 - Beaumont**
 - Texas
 - Baton Rouge

< **Beaumont: Storage Tank Area 101**

Rebellion Camera

STORAGE TANK AREA 101
Scope 1 | Fugitive | Area

1.45 Tonnes
ACTUAL GHG EMISSIONS

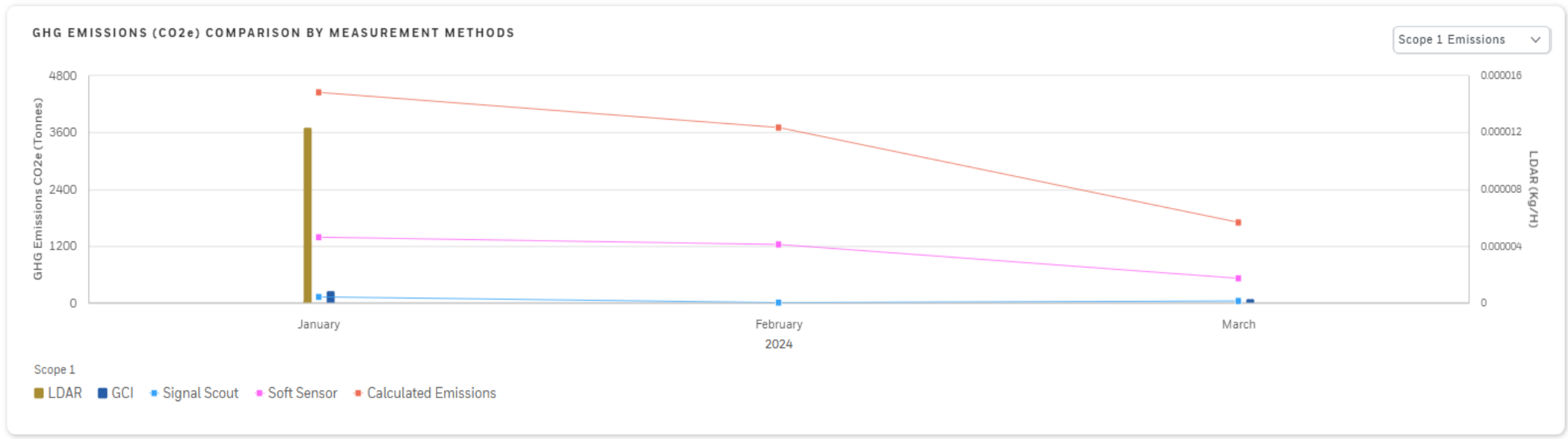



Emissions Source Detail Visuals: Provides trend of multiple emissions estimation methods that can support Reconciliation between measurement methods.

EMISSIONS SOURCES	GHG EMISSIONS (CO2e) (TONNES)	CARBON DIOXIDE (CO2) (TONNES)	METHANE (CH4) (TONNES)	NITROUS OXIDE (N2O) (TONNES)	FLUOROCARBONS (FCs) (TONNES)
Storage Tank Area 201	1.45	-	0.05	-	-

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 - AGRU3
 - AIL_CIPs
 - AIL_Compressor_blowdowns
 - AIL_Compressor_starts
 - AIL_Flanges_L_G
 - AIL_Gas_Connectors
 - AIL_Gas_Others
 - AIL_Open_ended_lines_L_G
 - AIL_Pneumatic_Devices
 - AIL_PRVs
 - AIL_Pump_seals_L_G
 - AIL_Valves_L_G
 - AIL_Vessel_blowdowns
 - AIL_Well_workovers
 - Boiler_3
 - Boiler_4
 - Centrifuge_1
 - Centrifuge_2
 - Compressor_1
 - Compressor_2
 - Compressor_3
 - Direct Emissions Measurements
 - LDAR
 - Electrical_Consumed_Meter_A
 - Electrical_Consumed_Meter_B
 - Emergency_flare_3
 - Emergency_generator_IC_engine_3
 - Fleet_vehicles_Refrigeration
 - FOV_1A
 - FOV_1B
 - FOV_2A
 - FOV_2B
 - Gas_Turbine
 - Generator_1
 - Generator_2
 - Generator_3
 - Glycol_Dehydrator

Emissions Reconciliation



Search Emission Source

EMISSIONS SOURCES	CALCULATED EMISSIONS (CO2e) (Tonnes)	ELEVATE (CO2e) (Tonnes)	GCI (CO2e) (Tonnes)	LDAR (Kg/H)	SOFT SENSOR (CO2e) (Tonnes)
Scope 1	9,844.147	155.82	360.77	-	3,126.758
> Combustion	4,685.861	-	-	-	3,126.758
> Direct Emissions Measurements	-	155.82	360.77	0	-
> Flaring	95.073	-	-	-	-
> Fugitives	2,360.331	-	-	-	-
> Venting and Process	2,702.882	-	-	-	-

Reconciliation View: Comparison of Emissions from multiple estimation methods.

Assets ×

Quick search

Asset Hierarchy ▾

- Malibu Enterprise
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Emission View - Arabia oil field ☆ 📍

Asset Hierarchy > Malibu Enterprise > EMEA > Arabia oil field

Map View : Arabia oil field

Trends 📄 Source 🗺️ **Map** 🔍



Assets

Quick search

Asset Hierarchy

- > Arabia oil field1
- > Assetranjan10
- > Efls_Asset_Enterprise
- > Enterprise 1
- > Malibu
- ▼ Malibu Enterprise
 - > APAC
 - ▼ EMEA
 - ▼ Arabia oil field
 - AGRU3
 - AILCIPs
 - ▼ Direct Emissions Measurements
 - > GCI Cameras
 - LDAR
 - > **Signal Scout**
 - Electrical_Consumed_Meter A
 - Electrical_Consumed_Meter B
 - Emergency_flare_3
 - Emergency_generator_JC_engi...
 - FLARE M1
 - FLARE M2
 - All_VesseCblowdowns
 - All_Well_workovers
 - Boiler_3
 - Boiler_4
 - CDU Tank Bottom

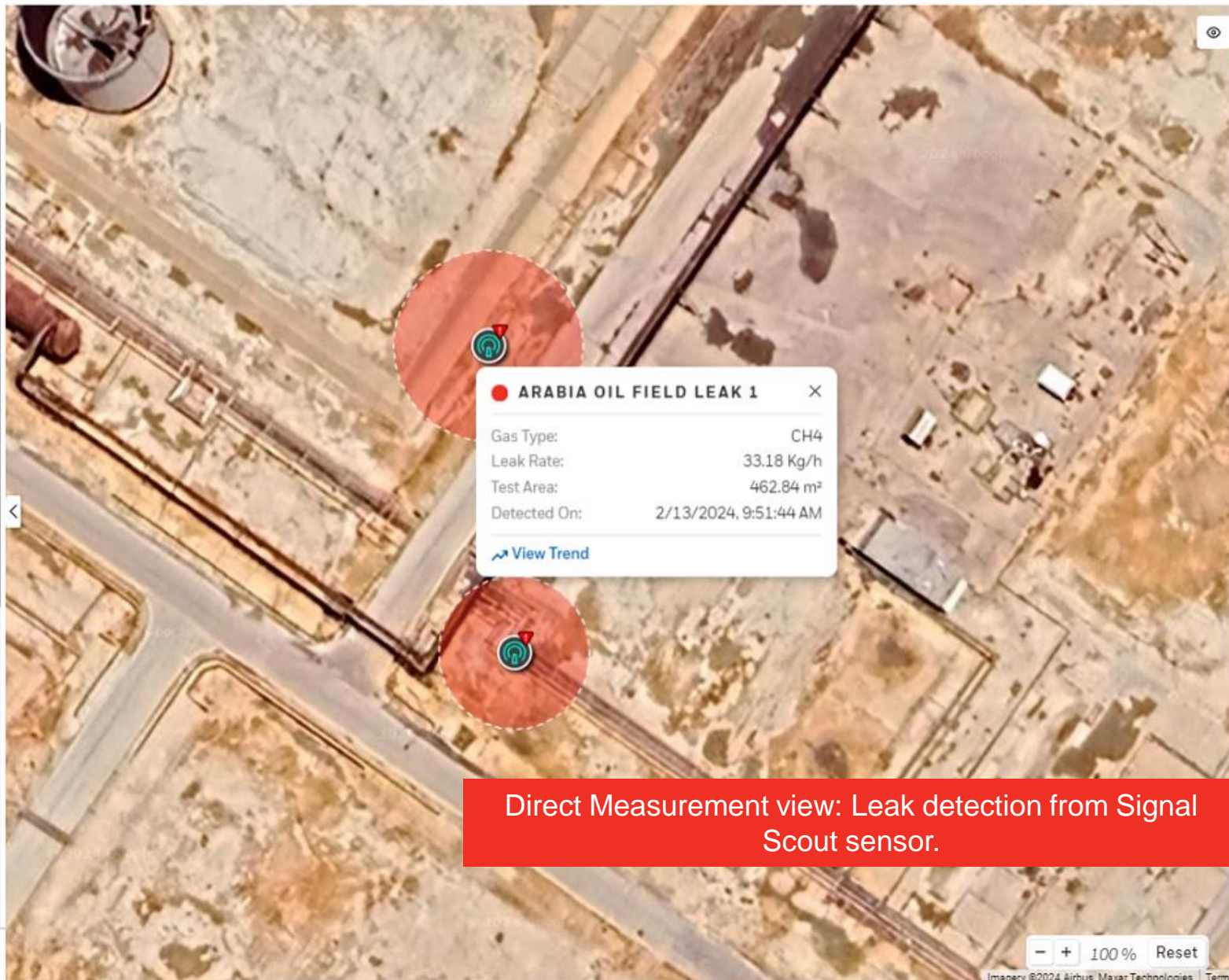
← 🏠 **Signal Scout View: Arabia oil field**

DETECTED LEAKS (16) 🗨️ ☰

🔍 Search by Leak Name #

1-10 of 16 | No filters applied

- **ARABIA OIL FIELD LEAK 0**
0 Kg/h
3/11/2024, 9:41:44 AM
- **ARABIA OIL FIELD LEAK 15**
32.232 Kg/h
2/25/2024, 3:00:45 PM
- **ARABIA OIL FIELD LEAK 14**
16.343 Kg/h
2/22/2024, 3:00:45 PM
- **ARABIA OIL FIELD LEAK 13**
25.435 Kg/h
2/22/2024, 3:00:45 PM
- **ARABIA OIL FIELD LEAK 12**
35.546 Kg/h
2/22/2024, 3:00:45 PM
- **ARABIA OIL FIELD LEAK 11**
20.547 Kg/h
2/21/2024, 3:00:45 PM



Direct Measurement view: Leak detection from Signal Scout sensor.

Assets

Quick search

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Energy Management

<p>ENERGY CONSUMPTION</p> <p>TARGET (MMBTU) 6.12K</p> <p>ACTUAL (MMBTU) 4.375K</p>	<p>GHG EMISSIONS (CO2e)</p> <p>4.002K Tonnes</p>	<p>ENERGY SAVINGS/LOSS</p> <p>1.745K MMBTU</p>	<p>EMISSIONS AVOIDED/EXCEEDED</p> <p>-94.717 Tonnes</p>
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SOURCE WISE ANALYSIS

🔍 Search Asset ⓘ

1 - 4 of 4

EMISSION SOURCES	TARGET ENERGY CONSUMPTION (MMBTU)	ACTUAL ENERGY CONSUMPTION (MMBTU)	GHG EMISSIONS (CO2e) (Tonnes)	ENERGY SAVINGS/LOSS (MMBTU)	EMISSIONS AVOIDED/EXCEEDED (Tonnes)
> VDU	835.200	1294.200	936.270	● -459	● 99.989
> Seperators	1080.000	519.400	515.800	● 560.6	● -102.671
▼ CPP	759.600	779.100	760.300	● -19.5	● 11.051
> Generators	756.000	781.400	762.100	● -25.4	● 11.129
▼ CDU	3240.000	1790.400	1797.600	● 1,449.6	● -103.469
▼ Boilers	1728.000	519.600	519.300		
Boiler 4	44.000	260.800	261.800	● -116.8	● 36.481
Boiler 3	1440.000	261.700	260.100	● 1,178.3	● -113.08
> Turbines	36.000	510.900	509.900	● -474.9	● 94.828
> Cooling Towers	1440.000	507.800	517.900	● 932.2	● -173.869

Energy Management: Scope 2 drilldown of each emissions source highlighting the deviations.

View Details



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 - AGRU3
 - All_CIPs
 - All_Compressor_blowdowns
 - All_Compressor_starts
 - All_Flanges_L_G
 - All_Gas_Connectors
 - All_Gas_Others
 - All_Open_ended_lines_L_G
 - All_Pneumatic_Devices
 - All_PRVs
 - All_Pump_seals_L_G
 - All_Valves_L_G
 - All_Vessel_blowdowns
 - All_Well_workovers
 - Boiler_3
 - Boiler_4
 - Centrifuge 1
 - Centrifuge 2
 - Compressor 1
 - Compressor 2
 - Compressor 3
 - Direct Emissions Measurements
 - LDAR
 - Electrical_Consumed_Meter A
 - Electrical_Consumed_Meter B
 - Emergency_flare_3
 - Emergency_generator_IC_engine_3
 - Fleet_vehicles_Refrigeration
 - FOV 1A
 - FOV 1B
 - FOV 2A
 - FOV 2B
 - Gas Turbine
 - Generator 1
 - Generator 2
 - Generator 3
 - Glycol_Dehydrator

Arabia oil field: Emissions Prediction

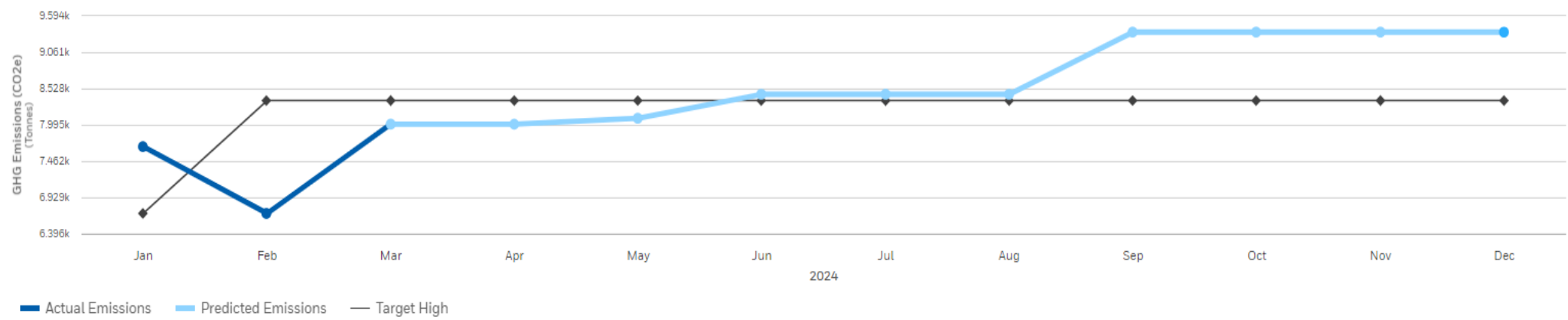
Last Updated: 3/15/2024, 15:09 Recalculate Generate Report

EMISSIONS PREDICTION

Gas Type: GHG EMISSIONS (CO2e) Prediction Type: Total Emissions

CURRENT (YTD) **14,371.521** Tonnes TARGET (ANNUAL) **98,568** Tonnes PREDICTED (ANNUAL) **101,238.062** Tonnes ↗ 2.709% from Target

Production Data



MONTH	GHG EMISSIONS (CO2e) (Tonnes)	INTENSITY (% Tonnes/Tonnes)	PRODUCTION (Tonnes)
	Actual	Actual	Actual
Jan 2024	7,675.969	0.85	902,871.317
Feb 2024	6,695.551	0.726	921,934.072
	Predicted	Predicted	Planned
Mar 2024	8,006.03	0.866	925,000
Apr 2024	8,006.03	0.866	
May 2024	8,092.816	0.87	930,000
Jun 2024	8,444.637	0.889	950,000

Year-end Predictions: Absolute Emissions Prediction based on the historical data and production plan.

- Assets
- Quick search
- Asset Hierarchy
 - Malibu Enterprise
 - Perth Aluminium plant
 - Terengganu Offshore plant
 - EMEA
 - Arabia oil field**
 - Arezzo Gas Plant
 - North America [US]
 - Mississippi Refinery

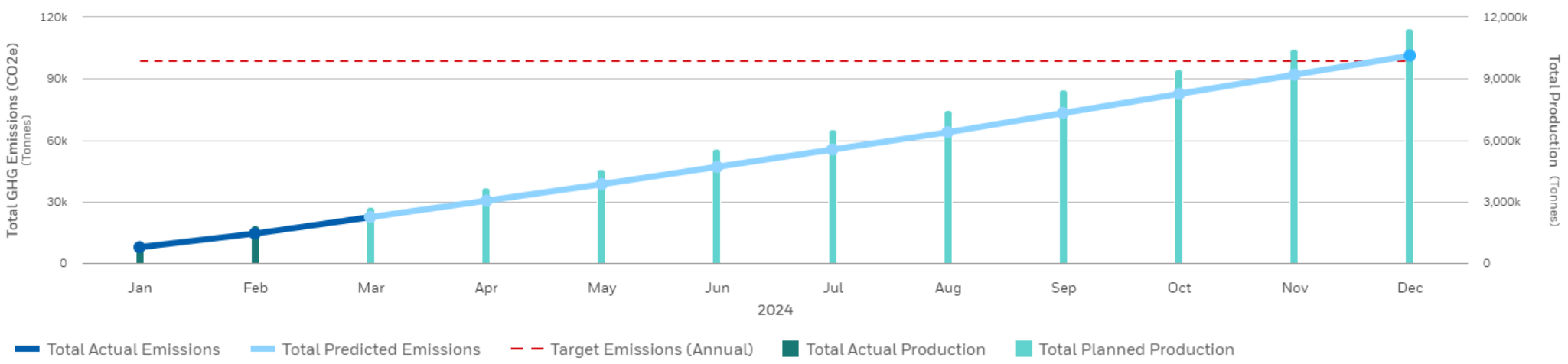
← **Arabia oil field: Emissions Prediction** ⓘ Last Updated: 3/15/2024, 15:09 ⓘ [Recalculate](#) [Generate Report](#)

FINANCIAL IMPACT PREDICTION

Gas Type: **GHG EMISSIONS (CO2e)** Prediction Type: **Financial Impact**

TARGET GHG EMISSIONS (CO2e) (ANNUAL) PREDICTED GHG EMISSIONS (CO2e) (ANNUAL) POTENTIAL FINANCIAL LOSS (ANNUAL) ⓘ

98,568 Tonnes **101,238.062** Tonnes ↗ 2.709% from Target **\$24,030.562** Production Data

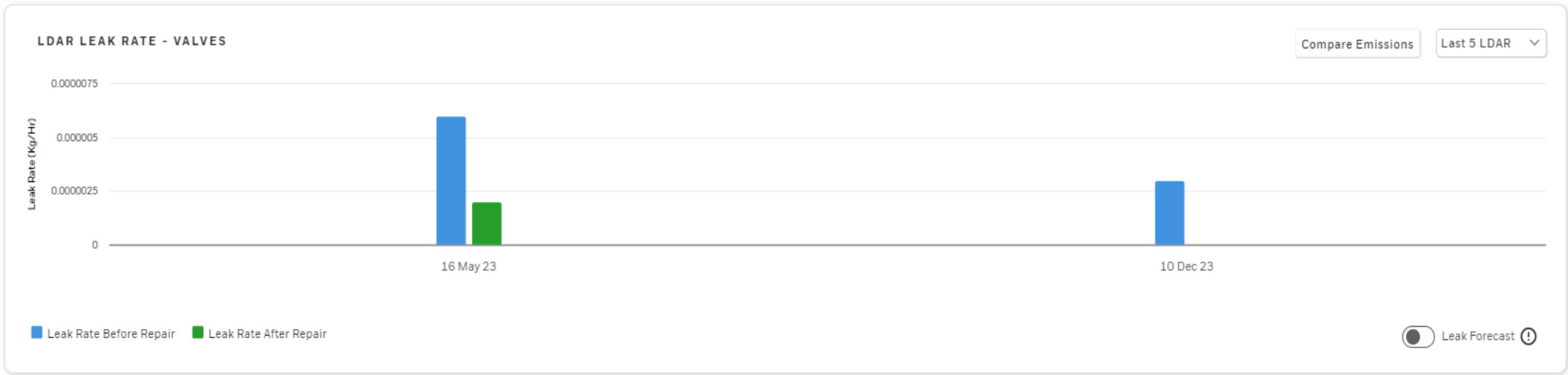


MONTH	TOTAL GHG EMISSIONS (CO2e) (Tonnes)	TOTAL PRODUCTION (Tonnes)
	Actual	Actual
Jan 2024	7,675.969	
Feb 2024	14,371.521	
	Predicted	Planned
Mar 2024	22,377.551	2,749,805.389

Year-end Predictions: Financial impact prediction due to emissions exceedance.

- Assets
- Quick search
- Asset Hierarchy
 - Malibu Enterprise
 - APAC
 - Perth Aluminium plant
 - Terengganu Offshore plant
 - EMEA
 - Arabia oil field
 - AGRU3
 - All_CIPs
 - All_Compressor_blowdowns
 - All_Compressor_starts
 - All_Flanges_L_G
 - All_Gas_Connectors
 - All_Gas_Others
 - All_Open_ended_lines_L_G
 - All_Pneumatic_Devices
 - All_PRVs
 - All_Pump_seals_L_G
 - All_Valves_L_G
 - All_Vessel_blowdowns
 - All_Well_workovers
 - Boiler_3
 - Boiler_4
 - Centrifuge 1
 - Centrifuge 2
 - Compressor 1
 - Compressor 2
 - Compressor 3
 - Direct Emissions Measurements
 - LDAR**
 - Electrical_Consumed_Meter A
 - Electrical_Consumed_Meter B
 - Emergency_flare_3
 - Emergency_generator_IC_engine_3
 - Fleet_vehicles_Refrigeration
 - FOV 1A
 - FOV 1B
 - FOV 2A
 - FOV 2B
 - Gas Turbine
 - Generator 1
 - Generator 2
 - Generator 3
 - Glycol_Dehydrator

LDAR VIEW: Valves

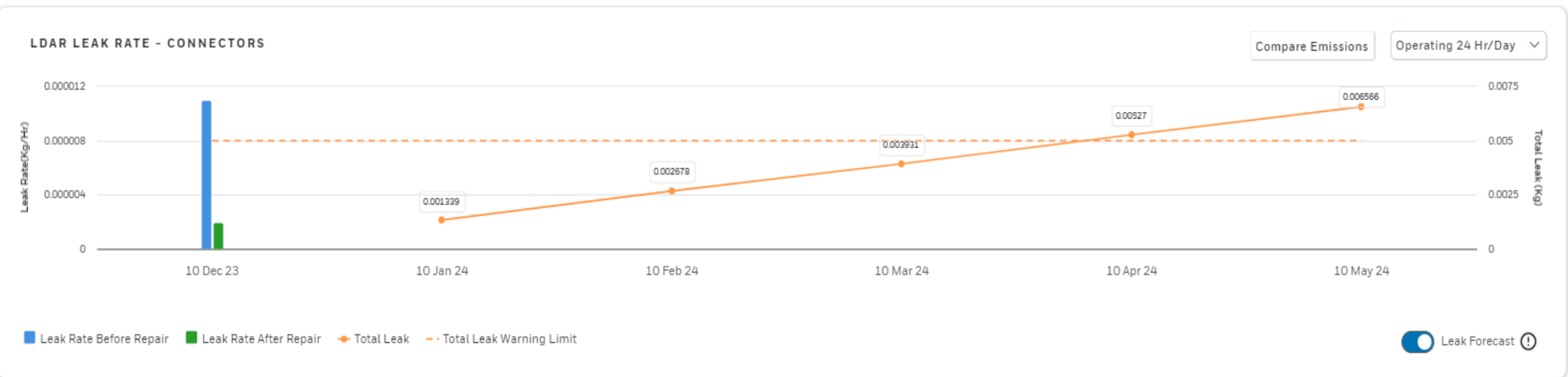


LDAR REPORT DATE	REPAIR DATE	OPERATION TIME (HOURS)	LEAK RATE BEFORE REPAIR (KG/H)	LEAK RATE AFTER REPAIR (KG/H)	COMPONENTS COVERED	ACTION
05 Jan 24	10 Dec 23	720	0.000003	0	16 of 180	View Curated Report
21 May 23	16 May 23	720	0.000006	0.000002	16 of 180	View Curated Report

Leak predication: Before and After leak rate from LDAR

- Assets
- Quick search
- Asset Hierarchy
 - Malibu Enterprise
 - APAC
 - Perth Aluminium plant
 - Terengganu Offshore plant
 - EMEA
 - Arabia oil field
 - AGRU3
 - All_CIPs
 - All_Compressor_blowdowns
 - All_Compressor_starts
 - All_Flanges_L_G
 - All_Gas_Connectors
 - All_Gas_Others
 - All_Open_ended_lines_L_G
 - All_Pneumatic_Devices
 - All_PRVs
 - All_Pump_seals_L_G
 - All_Valves_L_G
 - All_Vessel_blowdowns
 - All_Well_workovers
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 - Boiler_4
 - Centrifuge 1
 - Centrifuge 2
 - Compressor 1
 - Compressor 2
 - Compressor 3
 - Direct Emissions Measurements
 - LDAR**
 - Electrical_Consumed_Meter A
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 - Emergency_generator_IC_engine_3
 - Fleet_vehicles_Refrigeration
 - FOV 1A
 - FOV 1B
 - FOV 2A
 - FOV 2B
 - Gas Turbine
 - Generator 1
 - Generator 2
 - Generator 3
 - Glyco_Dehydrator

LDAR VIEW: Connectors



LDAR REPORT DATE	REPAIR DATE	OPERATION TIME (HOURS)	LEAK RATE BEFORE REPAIR (KG/H)	LEAK RATE AFTER REPAIR (KG/H)	COMPONENTS COVERED	ACTION
05 Jan 24	10 Dec 23	720	0.000011	0.000002	12 of 50	View Curated Report
21 May 23	16 May 23	720	0.000011	0.000002	12 of 50	View Curated Report

Leak predication: Enable users to plan for LDAR based on the leak prediction.

Assets

Quick search

Plant Hierarchy

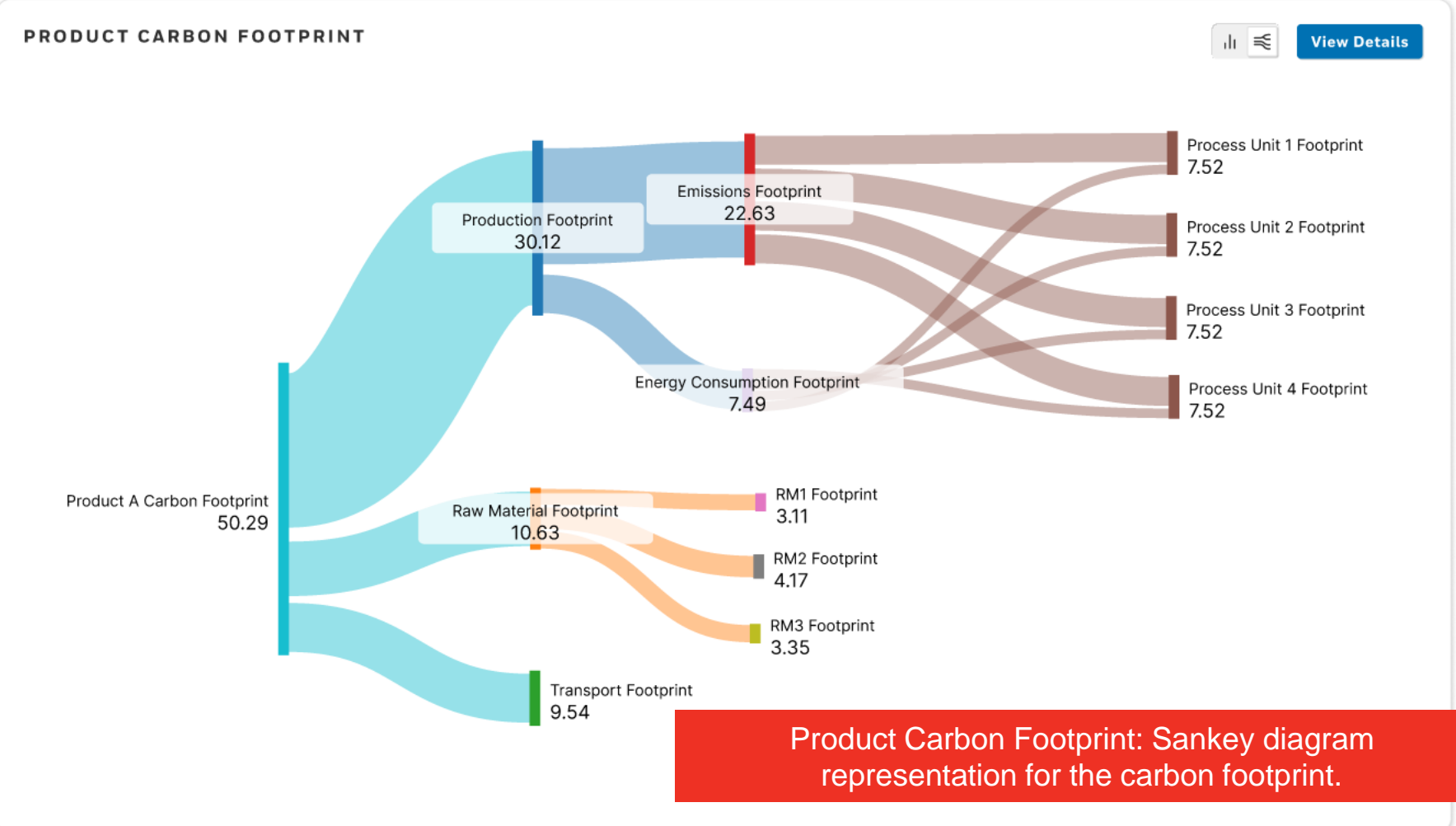
- Malibu Enterprise
 - Region 1
 - Site A**
 - Site B
 - Site C
 - Site D
 - Site E
 - Region 2

Site A

- Emissions View
- Report
- Energy Management
- Emissions Reconciliation
- Market vs Location Based Emis..
- Utility Services Consumption
- Product Carbon Footprint**

Product Carbon Footprint (Cradle to Gate): Product A

PRODUCT CARBON FOOTPRINT	PRODUCTION FOOTPRINT	RAW MATERIAL FOOTPRINT	TRANSPORT FOOTPRINT
50.29 Kg CO ₂ e/Kg ↗ 3.8%	30.12 Kg CO ₂ e/Kg ↗ 3.2%	10.63 Kg CO ₂ e/Kg ↗ 2.8%	9.54 Kg CO ₂ e/Kg ↗ 1.7%



Assets << **Site A** x

Quick search

PlantHierarchy v

- Malibu Enterprise
 - Region 1
 - Site A**
 - Site B
 - Site C
 - Site D
 - Site E
 - Region 2

- Emissions View
- Report
- Energy Management
- Emissions Reconciliation
- Market vs Location Based Emis..
- Utility Services Consumption
- Product Carbon Footprint**

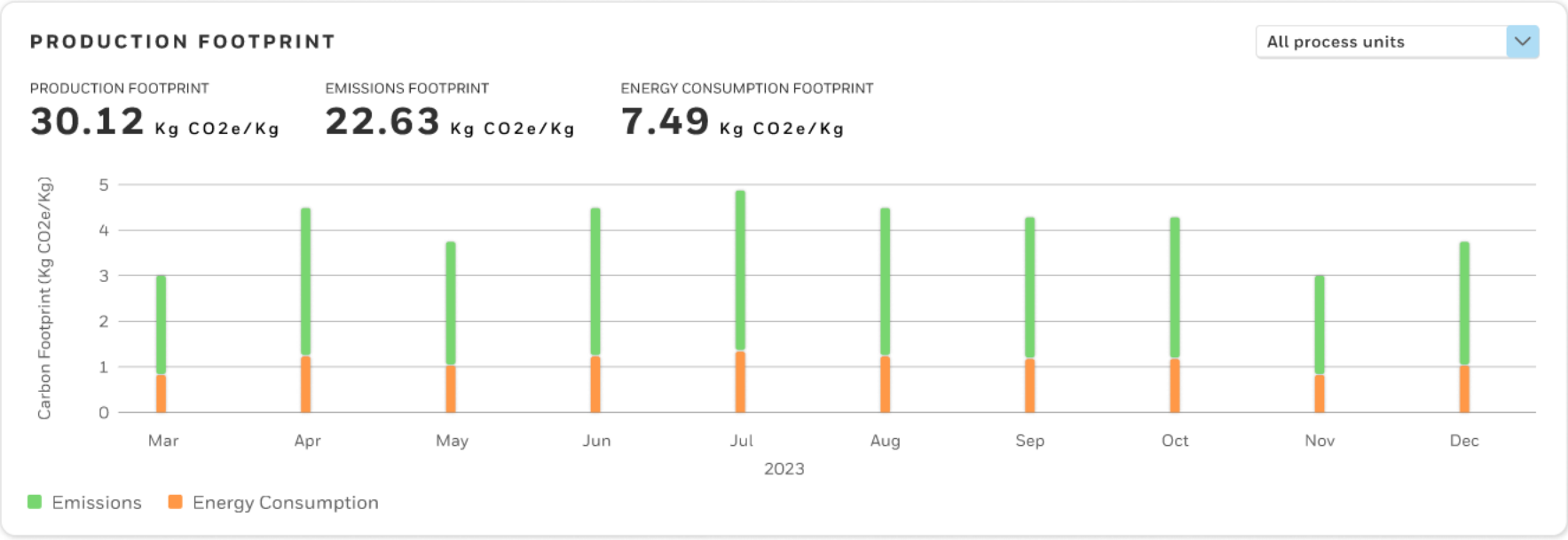
Product Carbon Footprint - Site A ☆

Asset Hierarchy / Malibu Enterprise / Region 1 / Site A

< > YTD

← 🏠 **Product Carbon Footprint (Cradle to Gate): Product A**

Production Footprint Raw Material Footprint Transport Footprint

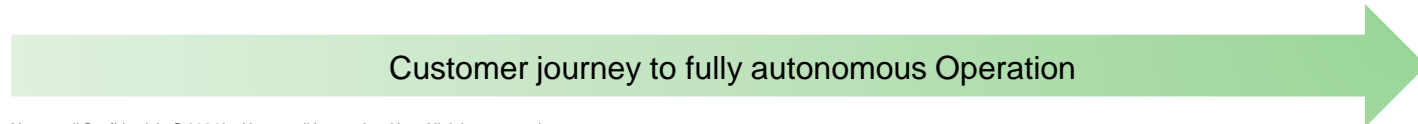
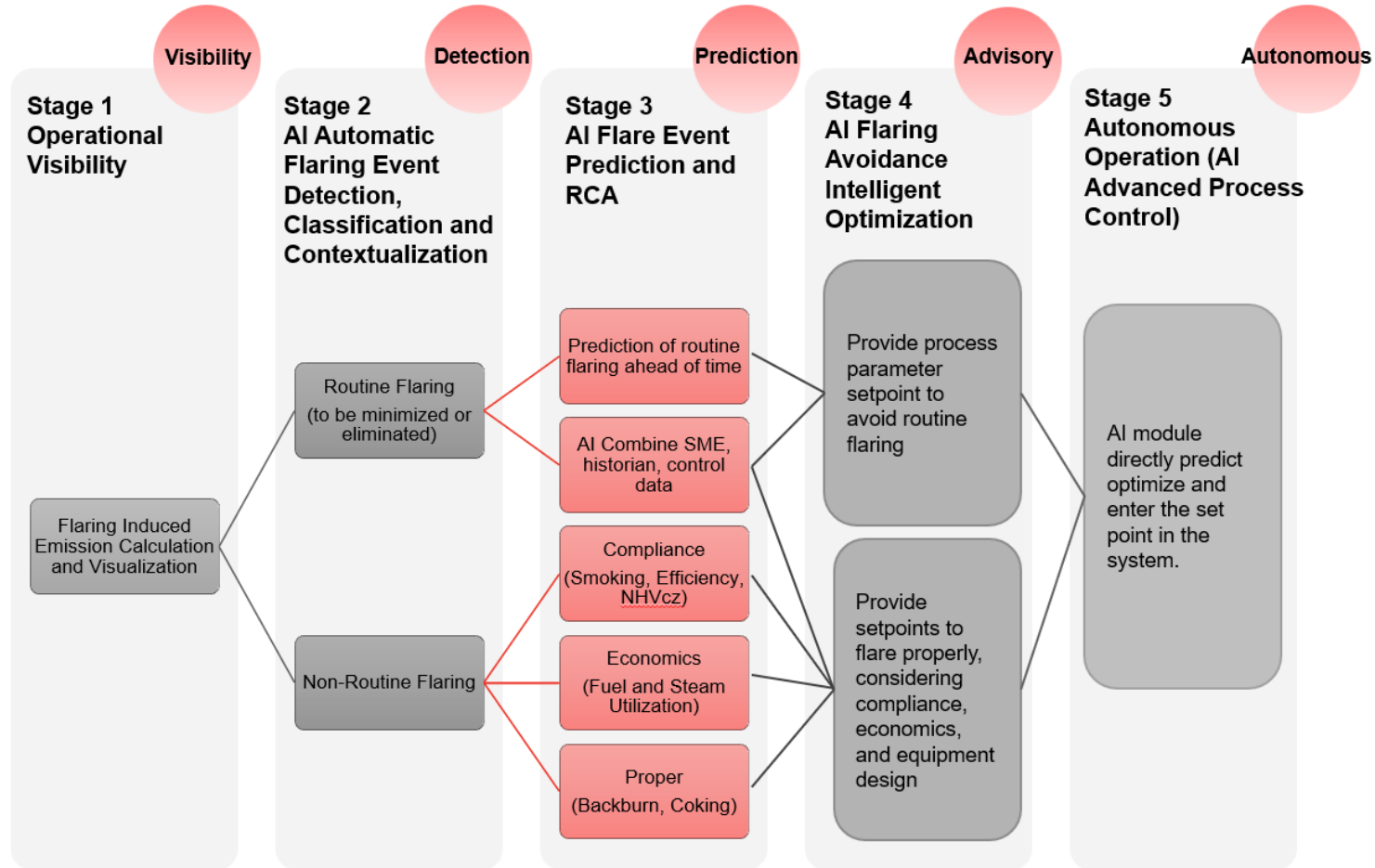


Q Search by Process Unit

PROCESS UNIT	ENERGY CONSUMPTION FOOTPRINT (Kg CO ₂ e/Kg)	EMISSIONS FOOTPRINT (Kg CO ₂ e/Kg)	PRODUCTION FOOTPRINT (Kg CO ₂ e/Kg)
Process Unit 1	2.43	1.09	3.54
Process Unit 2	3.45	2.76	5.21
Process Unit 3	1.32	0.91	2.23
Process Unit 4	2.24	0.91	3.15

Product Carbon Footprint: Drilldown of each lifecycle stage.

FLARE INTELLIGENCE



Assets Site A

Quick search

Plant Hierarchy

- Malibu Enterprise
 - Region 1
 - Site A
 - Flare 101**
 - Flare 102
 - Flare 103
 - Flare 104
 - Flare 105
 - Flare 106
 - Flare 107
 - Flare 108
 - Flare 109
 - Flare 110
 - Flare 111
 - Flare 112
 - Site B
 - Site C
 - Site D
 - Site E
 - Region 2

- Emissions View
- Report
- Energy Management
- Emissions Reconciliation
- Market vs Location Based Emis..
- Utility Services Consumption
- Flare Intelligence**

Flare Intelligence: Flare 101

[View Flare Emissions](#)

Raw Flare Data Categorized Flare Data

PLANNED FLARE VOLUME

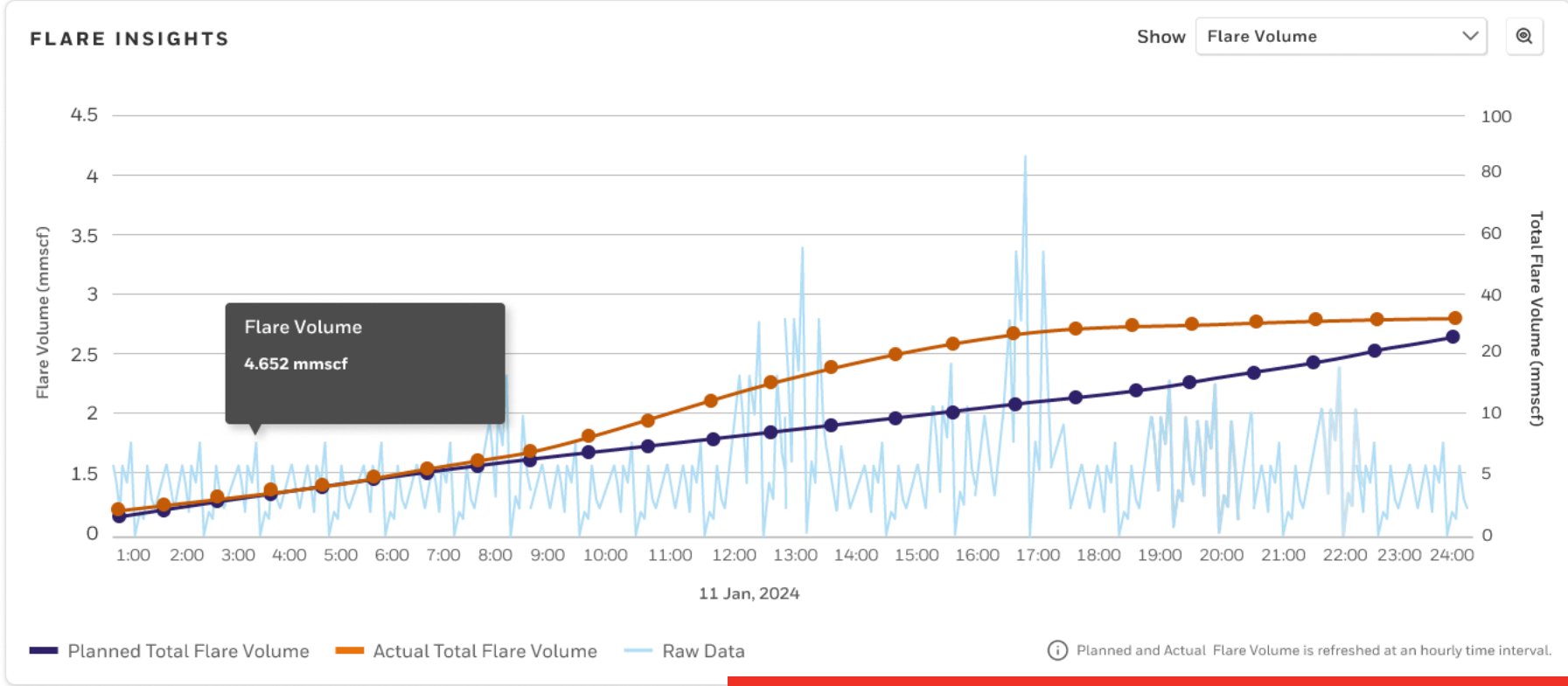
24.001 mmscf

ACTUAL FLARE VOLUME

35.980 mmscf

FLARE EMISSIONS INTENSITY

0.781 Tonnes/Tonnes



Flare Intelligence: Trend view for analyzing Planned (allowable) flare volume vs Actual.

Assets

Quick search

Plant Hierarchy

- Malibu Enterprise
 - Region 1
 - Site A
 - Flare 101**
 - Flare 102
 - Flare 103
 - Flare 104
 - Flare 105
 - Flare 106
 - Flare 107
 - Flare 108
 - Flare 109
 - Flare 110
 - Flare 111
 - Flare 112
 - Site B
 - Site C
 - Site D
 - Site E
 - Region 2

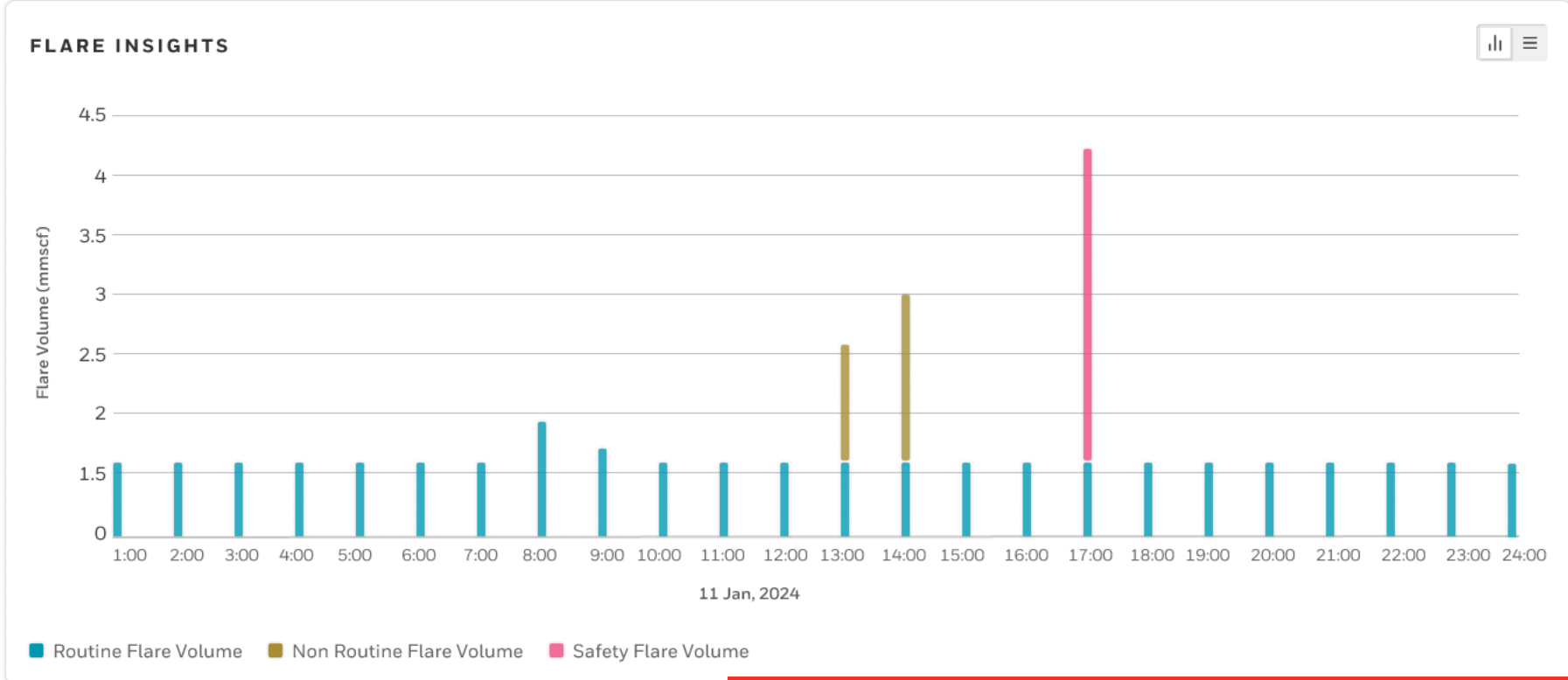
Site A

- Emissions View
- Report
- Energy Management
- Emissions Reconciliation
- Market vs Location Based Emis..
- Utility Services Consumption
- Flare Intelligence**

← 🏠 **Flare Intelligence: Flare 101** [View Flare Emissions](#)

Raw Flare Data Categorised Flare Data

ROUTINE FLARE VOLUME		NON-ROUTINE FLARE VOLUME		SAFETY FLARE VOLUME	
TOTAL	AVG	TOTAL	AVG	TOTAL	AVG
26.313 mmscf	1.152 mmscf	5.315 mmscf	2.313 mmscf	4.352 mmscf	4.352 mmscf



Flare Intelligence: Segregation of flare volume into routine, non-routine and safety.

Assets

Quick search

Plant Hierarchy

- Malibu Enterprise
 - Region 1
 - Site A
 - Flare 101**
 - Flare 102
 - Flare 103
 - Flare 104
 - Flare 105
 - Flare 106
 - Flare 107
 - Flare 108
 - Flare 109
 - Flare 110
 - Flare 111
 - Flare 112
 - Site B
 - Site C
 - Site D
 - Site E
 - Region 2

Site A

- Emissions View
- Report
- Energy Management
- Emissions Reconciliation
- Market vs Location Based Emis..
- Utility Services Consumption
- Flare Intelligence**

← 🏠 **Flare Intelligence: Flare 101** [View Flare Emissions](#)

Raw Flare Data Categorised Flare Data

ROUTINE FLARE VOLUME		NON-ROUTINE FLARE VOLUME		SAFETY FLARE VOLUME	
TOTAL	26.313 mmscf	AVG	1.152 mmscf	TOTAL	5.315 mmscf
				AVG	2.313 mmscf
				TOTAL	4.352 mmscf
				AVG	4.352 mmscf

FLARE INSIGHTS 📊 ☰

🔍 Search [Download](#) ⌵

17-21 of 27 | No filters applied

HOUR	FLARE VOLUME	FLARE CATEGORY	SUB-CATEGORY	COMMENT
Jan 11 2023 17:00	17.012	ROUTINE	NA	🔍
Jan 11 2023 17:00	17.012	SAFETY	Flaring of gas with volatile o..	🔍
Jan 11 2023 18:00	18.012	ROUTINE	Plant/field startup flaring.	
Jan 11 2023 19:00	19.012	ROUTINE	Facility shutdown startup flaring.	
Jan 11 2023 20:00	20.012	ROUTINE	Flaring of gas with H2S.	
Jan 11 2023 21:00	21.012	ROUTINE	Safety testing-related flaring.	

Flaring of gas with volatile o.. ⌵

- Flaring of gas with volatile organic compounds
- Plant/field startup flaring.
- Facility shutdown startup flaring.
- Flaring of gas with H2S.
- Safety testing-related flaring.

Flare Intelligence: Sub-categorization of flare based on WBZRF.

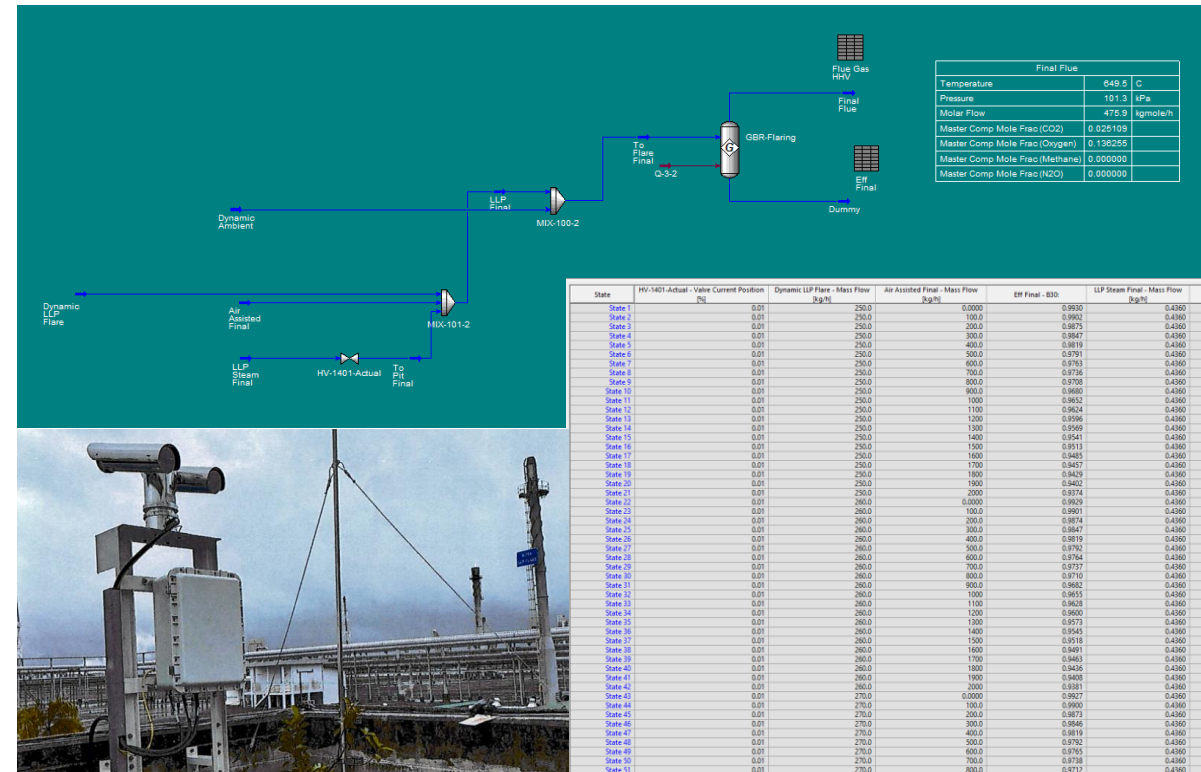
FLARE DESTRUCTION EFFICIENCY PREDICTION

1. Flare Efficiency estimates using historical operating data and matched operating data. First principles models to cover the whole flare stack operating condition ranges.

2. Operating data variables

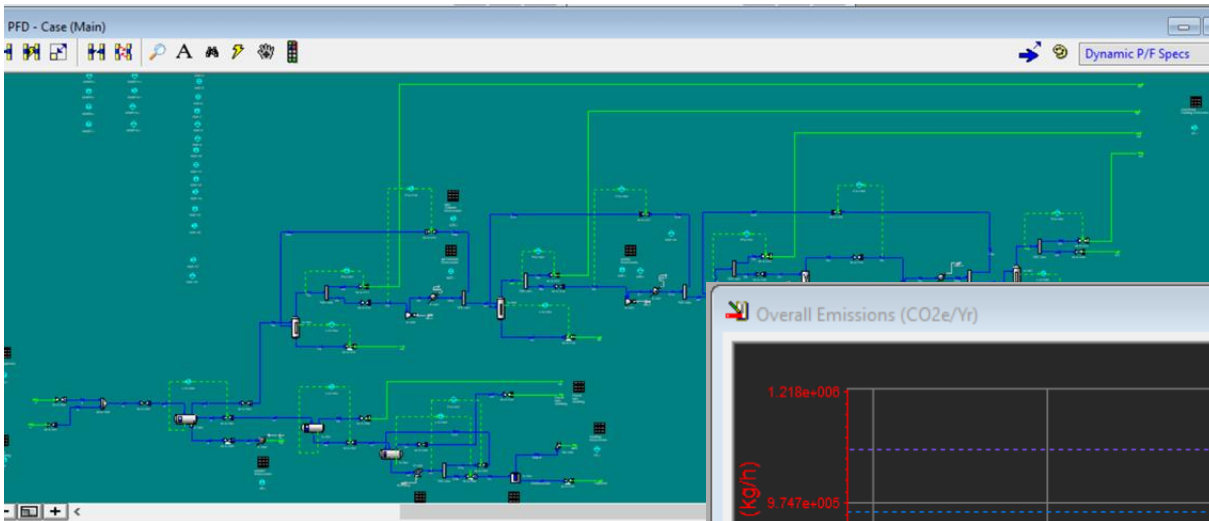
- a) Flare stack configuration
- b) Flare gas flow and composition
- c) Assisted Steam and Assisted Air flows
- d) Wind Speed
- e) Hydrocarbon Destructive Efficiency (DRE)

3. Using AI/ML to include Assisted Steam and Assisted Air flow variables in OGMP DRE equation as these two variables give significant impact in DRE value



ONSHORE PLANT - USE CASE

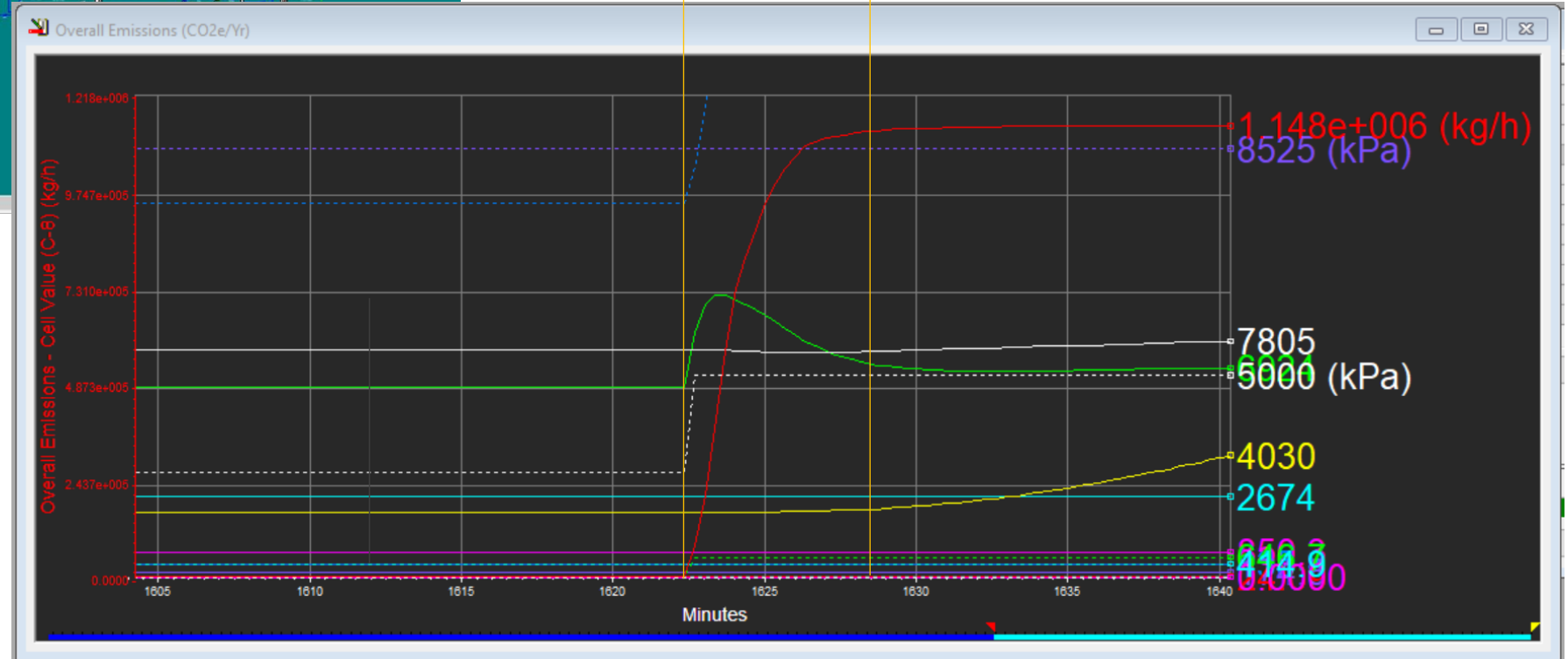
UNISIM dynamic model is used to estimate individual flare volume and composition



~7mins x 5 real time factor = ~35 mins



Operation has roughly 35 mins to react before the flare reaches the maximum volume for a given process upset



WHY HONEYWELL INDUSTRY & TECHNOLOGY AGNOSTIC

Honeywell's enterprise level end-to-end Emissions Management suite provides a harmonizing digital backbone integrating data from multiple disparate sources into a single system of record designed to help you measure, monitor, report and reduce your emissions.

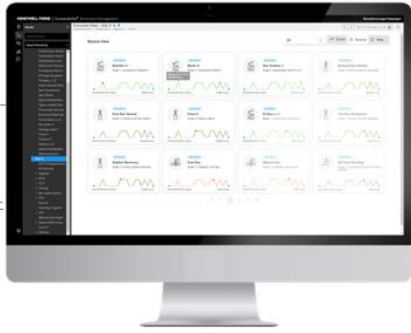
MEASURE

Automated Near Real-Time Emissions Coverage

- Honeywell Rebellion Gas Cloud Imaging
- Third-Party Data (i.e. satellite, drone/aircraft, LDAR)
- IIoT Sensors Honeywell Versatilis™ Signal Scout™

MONITOR & REPORT

Source, Site, Region and Enterprise-Level Trending and Visualization, Analytics, Reporting, Alarming



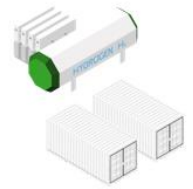
Honeywell Forge Sustainability+ for Industrials | Emissions Management

REDUCE

Enable Automated and Manual Emissions Actions



Energy Efficiency & Optimization (i.e., Asset Performance; Digital Twin; Combustion Control)



- Hydrogen (H₂) transition
- Carbon Capture (CCUS)
- Energy Storage
- Renewable Fuels
- Zero Routine Flaring



Emissions 360 Outcome and KPI Based Service Program

REDUCTION PROGRAMS, INCLUDING E360, CLOSES THE LOOP

MULTIPLE OUTCOME-BASED PATHWAYS

- Global reach and local resource execution.
- Honeywell has a breadth of solutions, so your decarb pathway always matches your business priorities.

READY NOW, REAL RESULTS

- An end-to-end emission management program, including near real-time measurement, monitoring, analytics, operational efficiency, and energy transition solutions at the scale and speed you expect

UNRIVALED EXPERIENCE AND EXPERTISE

- A century of domain experience of design and optimization in industrials including being a chemical manufacturer.
- Honeywell has the history of delivering results that you can count on.



THANK YOU

N. Ramesh Murugan

rameshmurugan.natarajan@Honeywell.com