HONEYWELL EMISSIONS MANAGEMENT

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UNDERSTANDING GHG AND CHALLENGES

HONEYWELL EMISSIONS MANAGEMENT

DIRECT MEASUREMENT TECHNOLOGIES

SUSTAINABILITY+ DIGITAL PLATFORM

FLARE INTELLIGENCE - AI USE CASE

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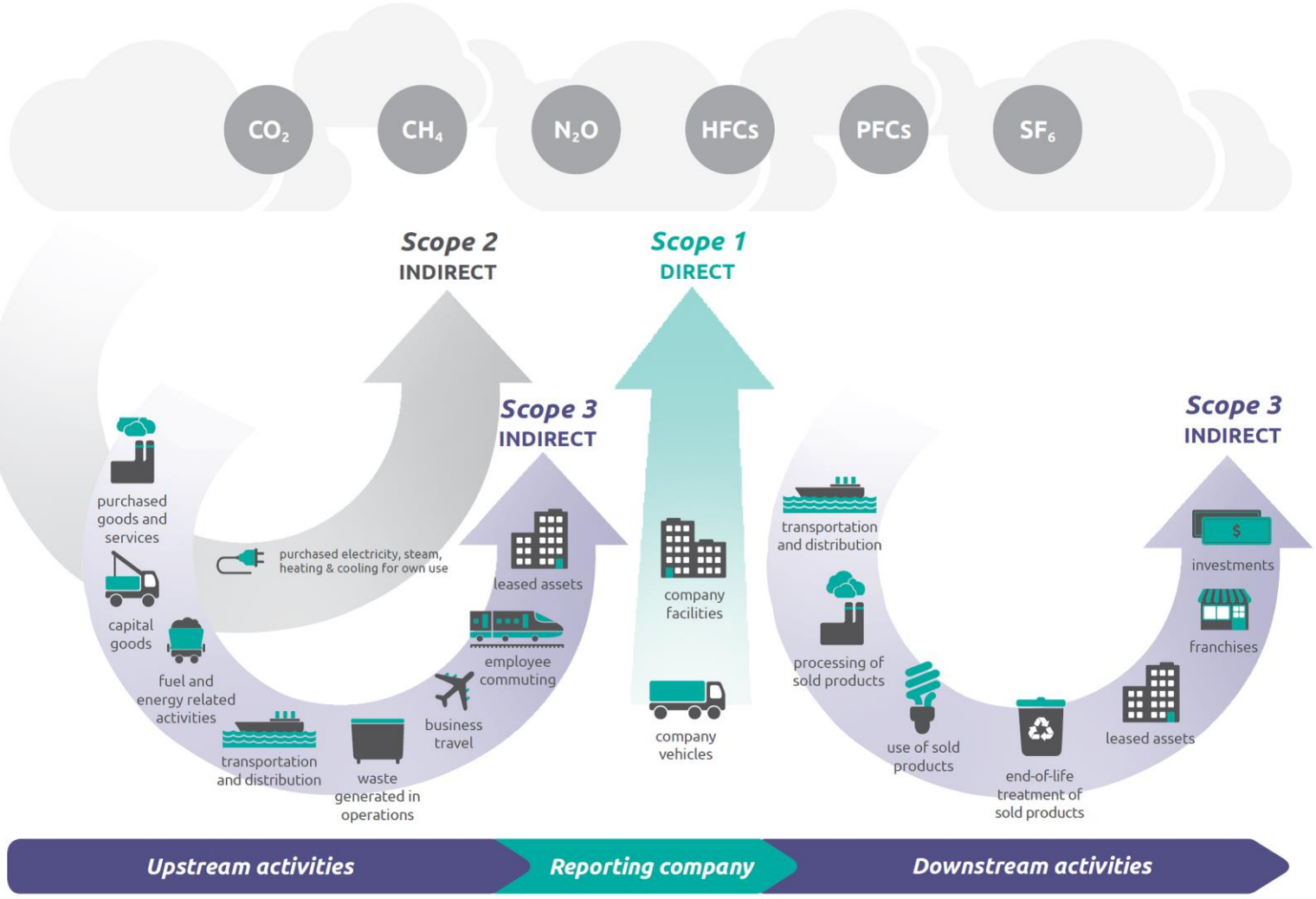
TYPES OF GHG EMISSIONS

- **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

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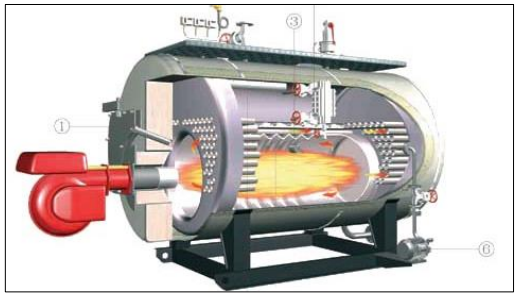
SOURCES OF GHG EMISSIONS

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.

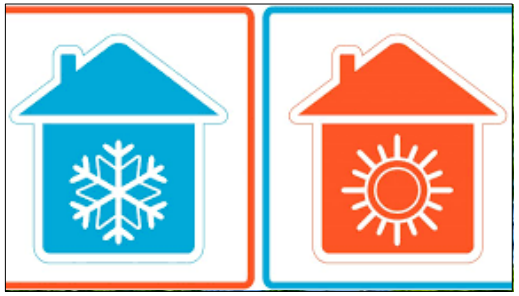
FUGITIVE

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

SCOPE 2

ELECTRICITY

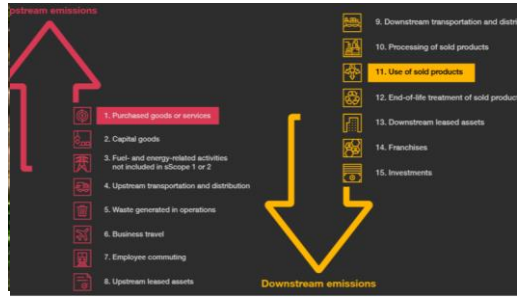
Emissions from the generation of Purchased Electricity that is consumed in its owned or controlled equipment or operations



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.

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CHALLENGES IN ENERGY AND EMISSIONS MANAGEMENT

USER	CHALLENGES	OUTCOME EXPECTED
 **Process / HSE Engineer**	• **Manual data collection** from multiple sources. • **Calculate** energy & emissions footprint in spreadsheet. • **Reconcile data** between engineering calculations and actual monitoring.	• **Automated data collection** and energy & emissions calculation. • **Simplified data wrangling** & reconciliation.
 **Plant / Sustainability Manager**	• **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.	• **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.
 **Chief Sustainability Officer / CEO / CFO**	• **Limited visibility** of enterprise-wide GHG emissions. • **Lack of traceability** for managing & analyzing nonconformance compliance. • **Difficult to perform** manual reporting & audit compliance.	• **Provide standardized**, Interoperable, system agnostic, enterprise-wide energy & emissions monitoring. • **Build Single System** of Energy & Emissions Record. • **Streamline reporting** and audit compliance process.

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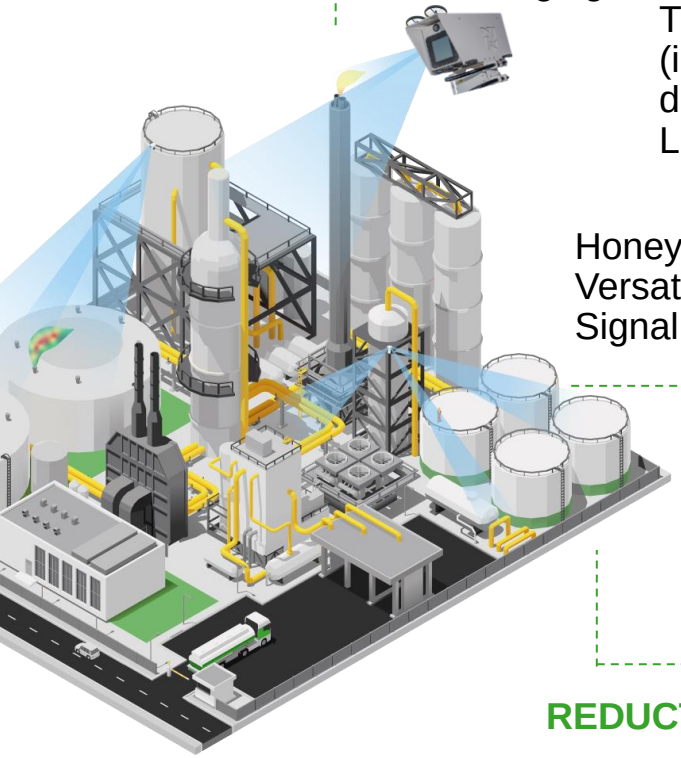
OVERCOMING EMISSIONS CHALLENGES

THE PATH TO NET ZERO

MEASURE

Automated Near Real-Time Emissions Coverage

Honeywell Rebellion Gas Cloud Imaging

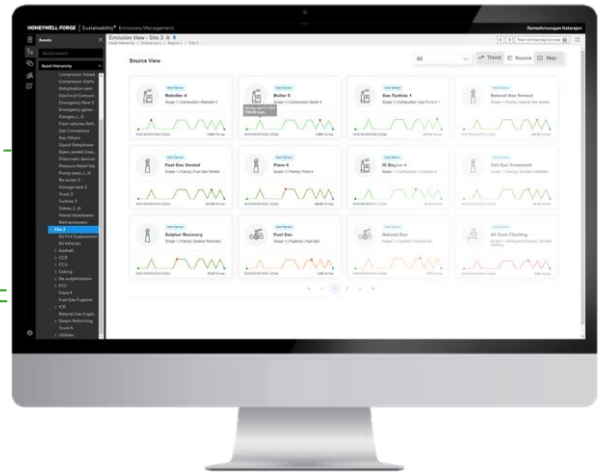


Third-Party Data (i.e. satellite, drone/aircraft, LDAR)

Honeywell Versatilis™ Signal Scout™

MONITOR & REPORT

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

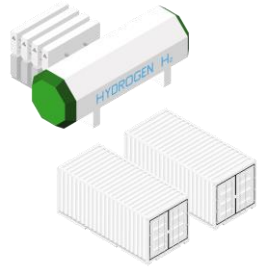


Honeywell Forge Sustainability+ for Industrials | Emissions Management

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 (H_2) 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

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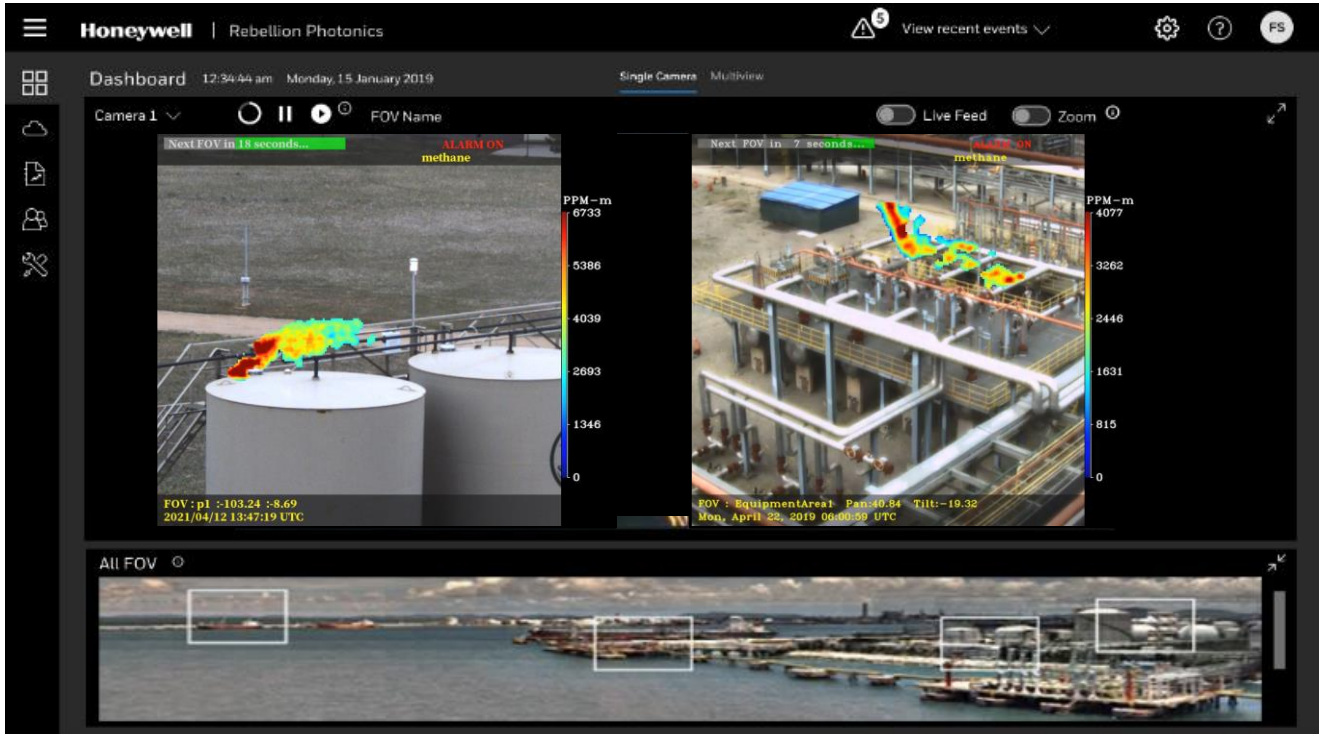
REBELLION GAS GLOUD IMAGING CONTINUOUS VISUAL EMISSIONS MONITORING

CH_4 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



H_2S+CH_4 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!

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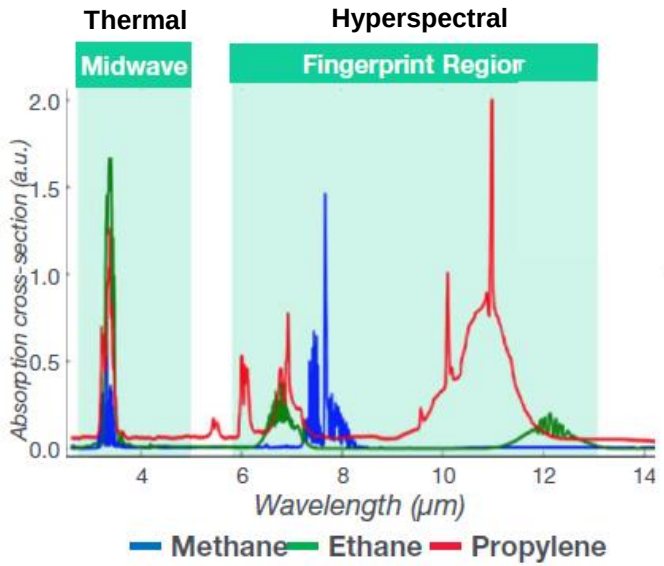
REBELLION GAS CLOUD IMAGING CAMERA

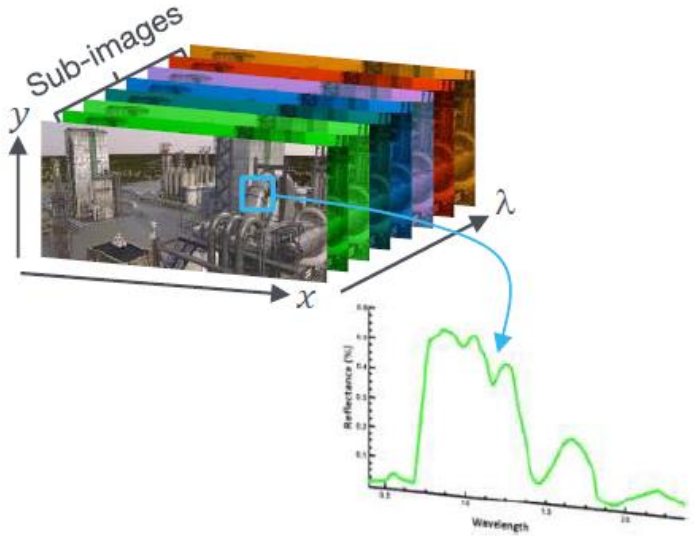
PHYSICS OF THE GCI SYSTEM

GAS FINGERPRINT IDENTIFICATION



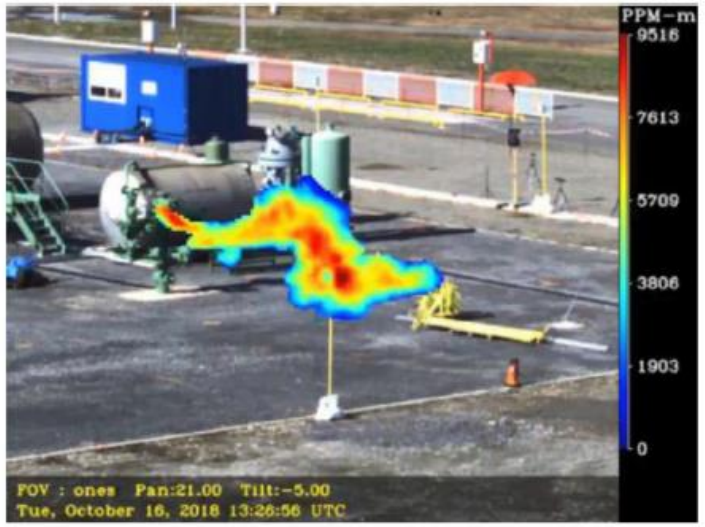
Rebellion utilizes the **fingerprint region** to identify gases and **minimize false alarms** unlike conventional thermal imaging cameras which cannot identify gas signatures

HYPERSPECTRAL ACCURACY



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

PROPORIETRY 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

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VERSATILIS™ SIGNAL SCOUT™

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

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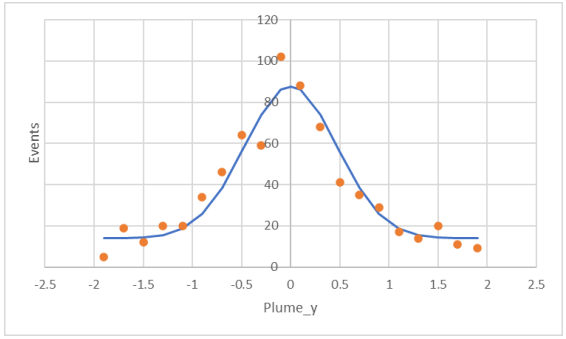
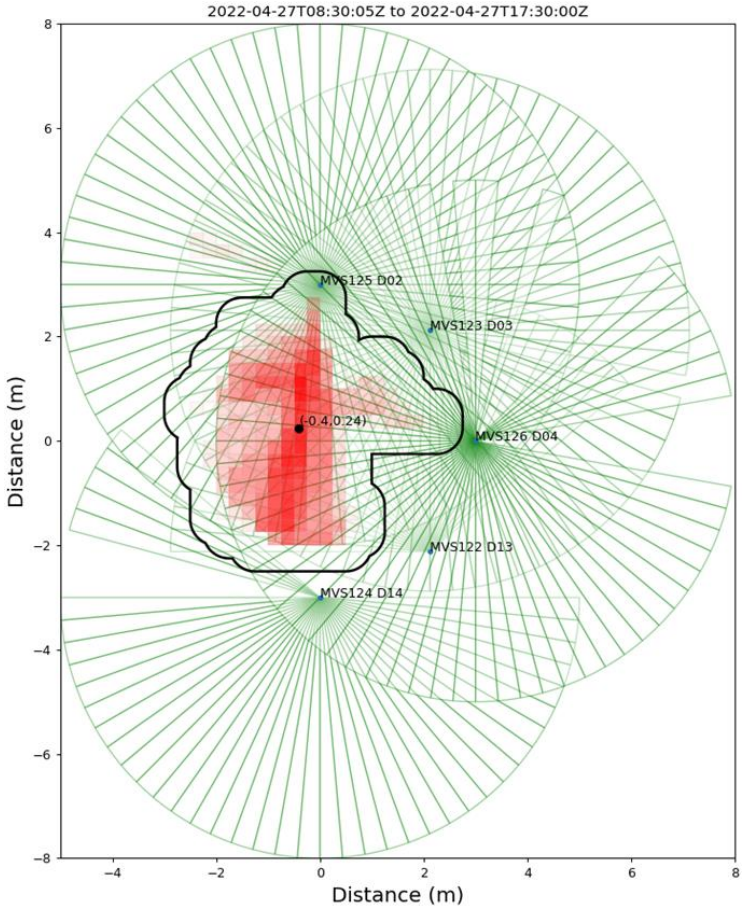
VERSATILIS™ SIGNAL SCOUT™

PROACTIVE LEAK DETECTION WITH SENSORS

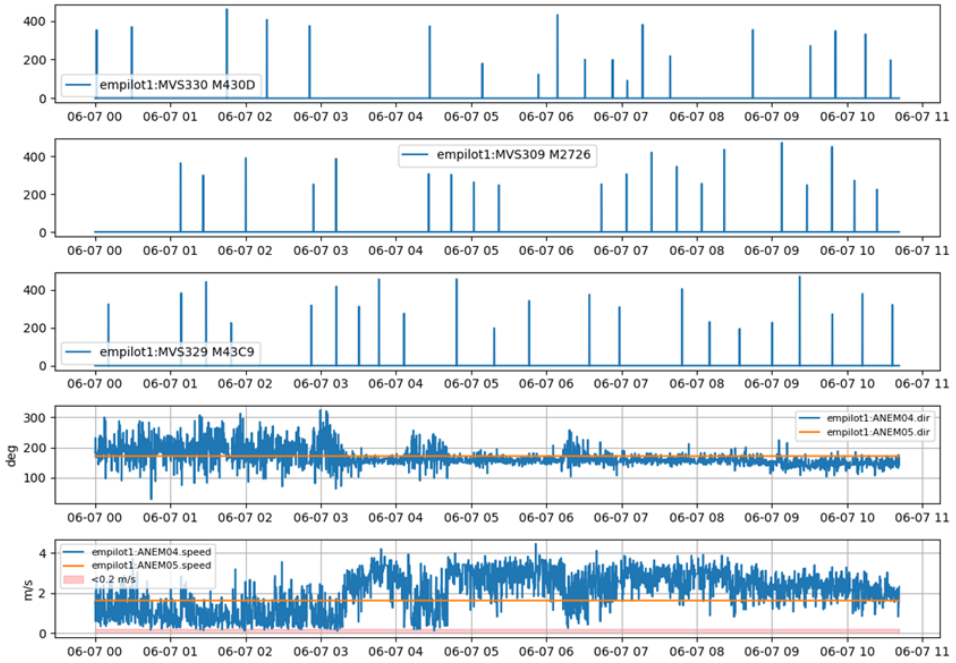
Versatilis™ Signal Scout™





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.



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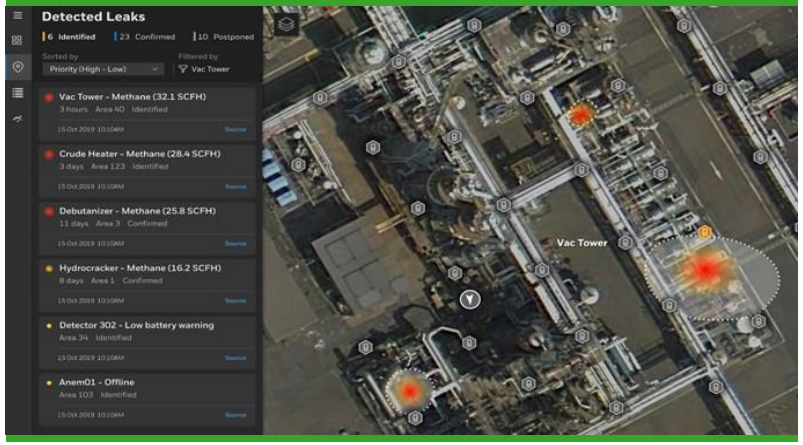
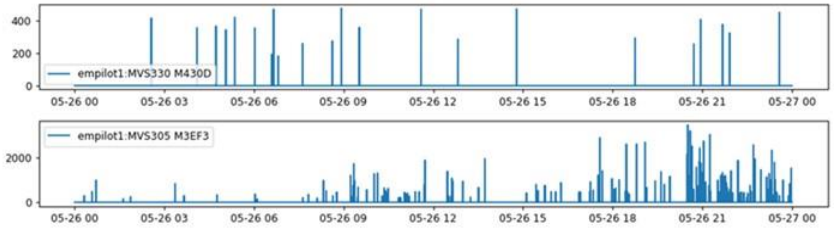
SITE EXAMPLE AND FINDINGS

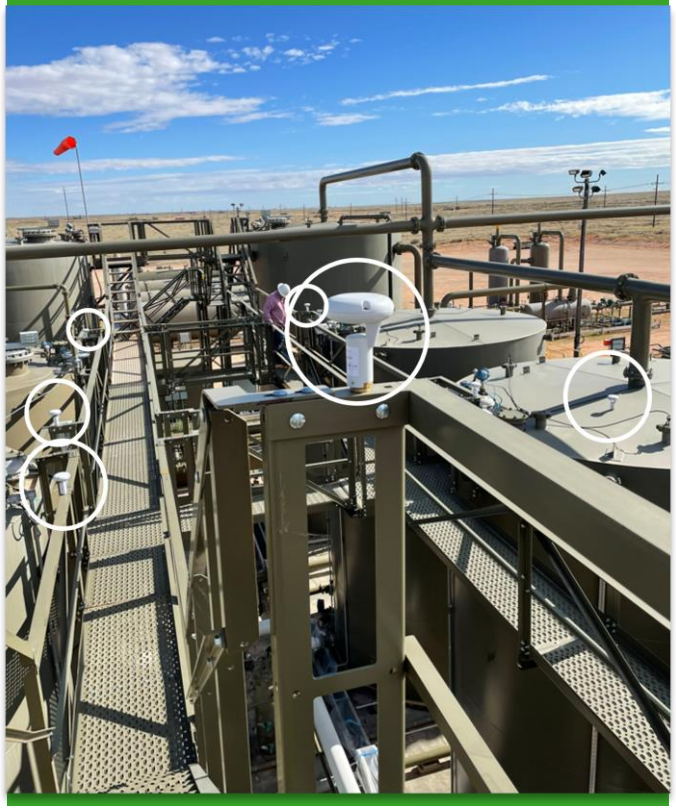
Leak location & inspection area



FUGITIVE



Device Deployment



Industry first breakthrough with hazardous area certified devices

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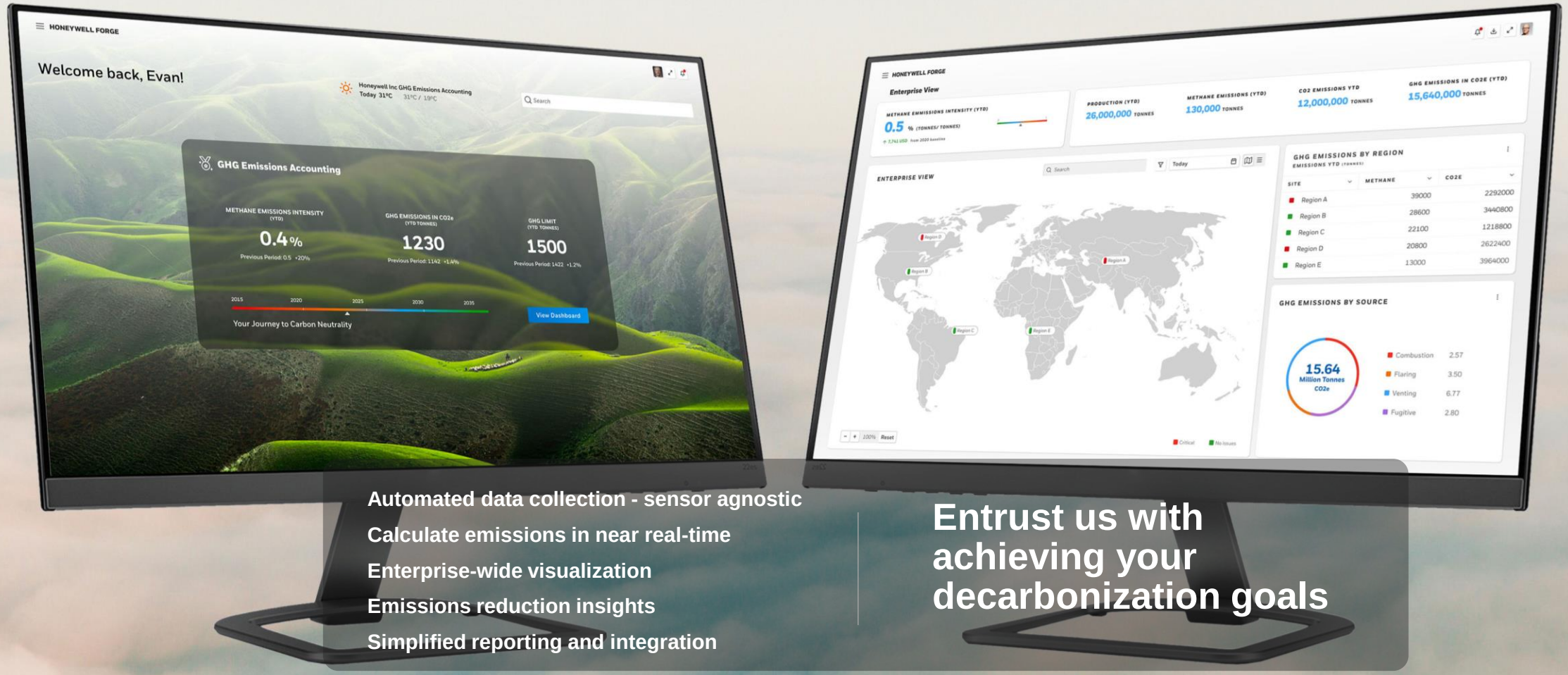
HONEYWELL FORGE

SUSTAINABILITY+ EMISSIONS MANAGEMENT

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.



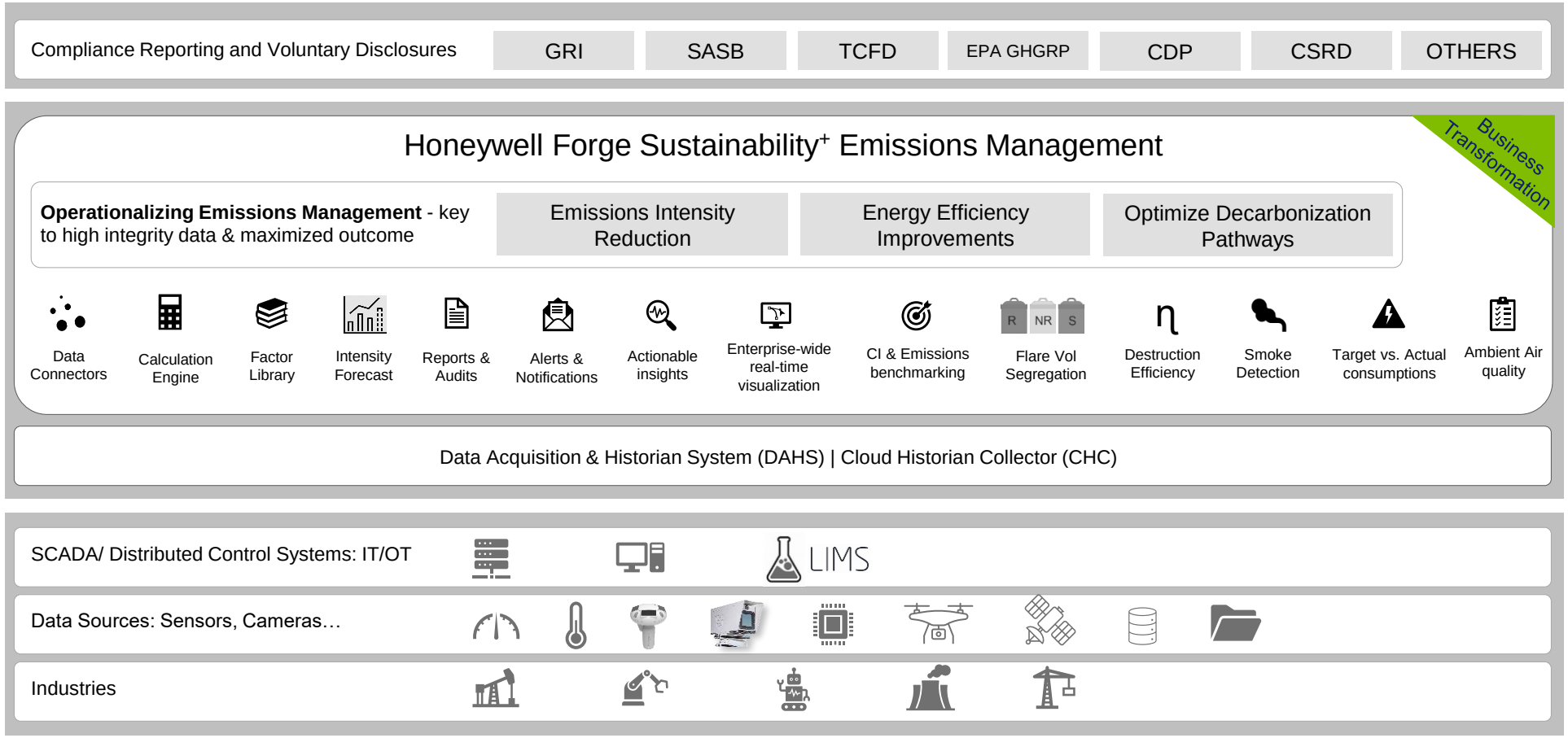
- Automated data collection - sensor agnostic
- Calculate emissions in near real-time
- Enterprise-wide visualization
- Emissions reduction insights
- Simplified reporting and integration

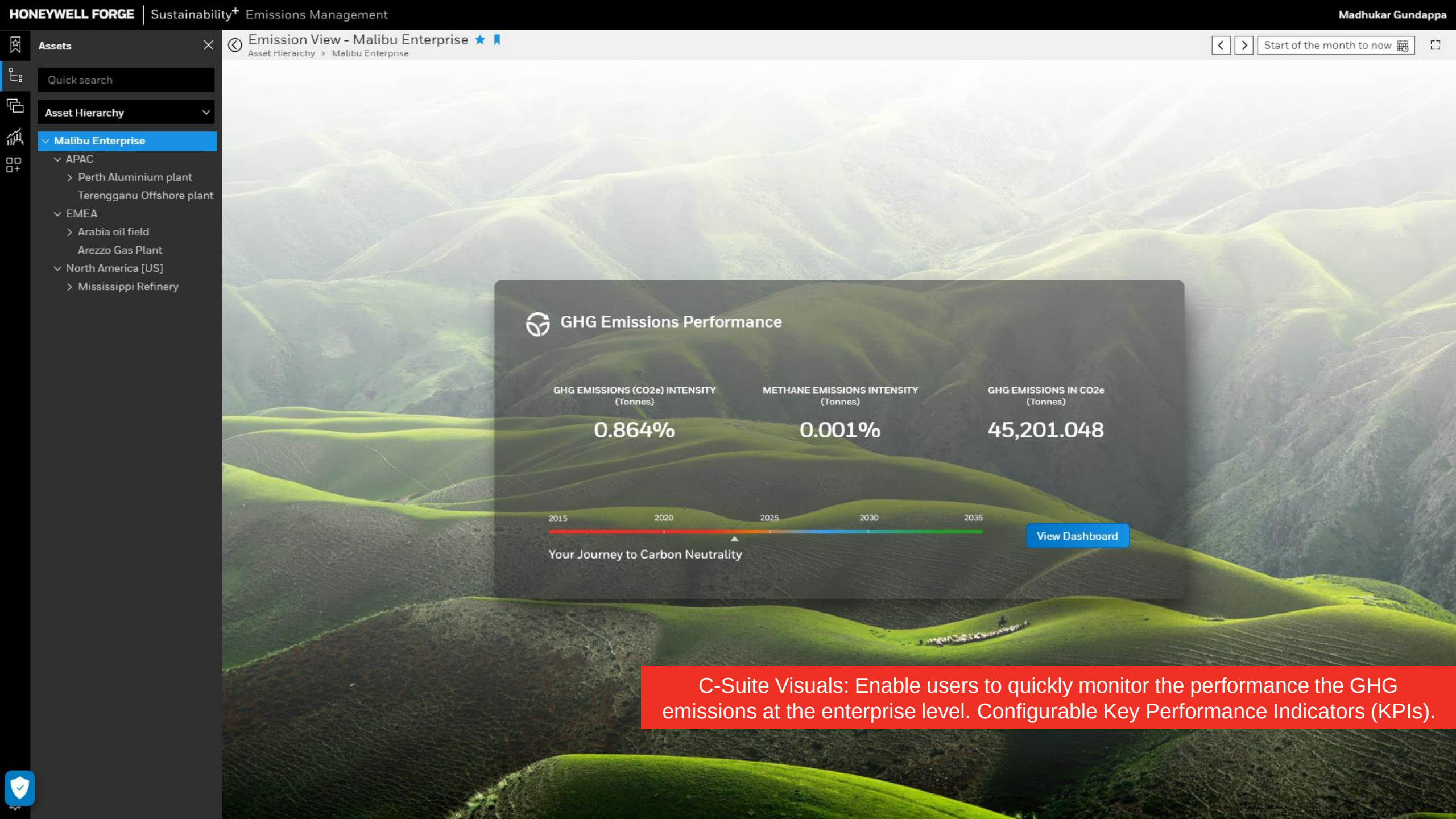
Entrust us with achieving your decarbonization goals

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.




HONEYWELL FORGE | Sustainability+ Emissions Management
Madhukar Gundappa
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
Emission View - Malibu Enterprise
Asset Hierarchy > Malibu Enterprise
Start of the month to now
GHG Emissions Performance
GHG EMISSIONS (CO2e) INTENSITY (Tonnes)
0.864%
METHANE EMISSIONS INTENSITY (Tonnes)
0.001%
GHG EMISSIONS IN CO2e (Tonnes)
45,201.048
2015
2020
2025
2030
2035
Your Journey to Carbon Neutrality
View Dashboard
C-Suite Visuals: Enable users to quickly monitor the performance the GHG emissions at the enterprise level. Configurable Key Performance Indicators (KPIs).

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

Emission View - Malibu Enterprise
Asset Hierarchy > Malibu Enterprise

Start of the month to now

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

GHG EMISSIONS (CO2e)

INTENSITY

Current 1.085 % TONNES/TONNES
Maximum 1.1 % TONNES/TONNES

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

Region:North America [US]
Region:EMEA
Region:APAC

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

15%
Critical
No issues
Target not set

Assets

Quick search

Asset Hierarchy

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    - Terengganu Offshore plant
  - EMEA
    - Arabia oil field
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Emission View - Malibu Enterprise
Asset Hierarchy > Malibu Enterprise

Start of the month to now

Malibu Enterprise

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

INTENSITY

Current 1.097 % TONNES/TONNES Maximum 1.1 % TONNES/TONNES

Region:North America [US]

Region:EMEA

Region:APAC

Enterprise Visuals: Drill down to monitor Emission Intensity Trend

15%

Critical No issues Target not set

Arabia oil field

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

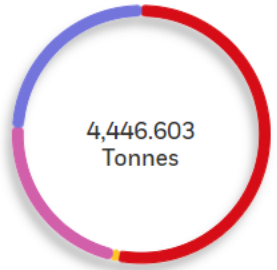
TOP 3 EMITTING SOURCE TAGS

BOILER 3
0 TONNES

FLEET VEHICLE REFRIGERATION
0 TONNES

ALL VESSEL BLOWDOWNS
0 TONNES

GHG EMISSIONS BY SOURCES



Scope 1

- Combustion
- Flaring
- Fugitives
- Venting and Process

Scope 2

- Purchased Electricity

Scope 3

- Travel

View Details

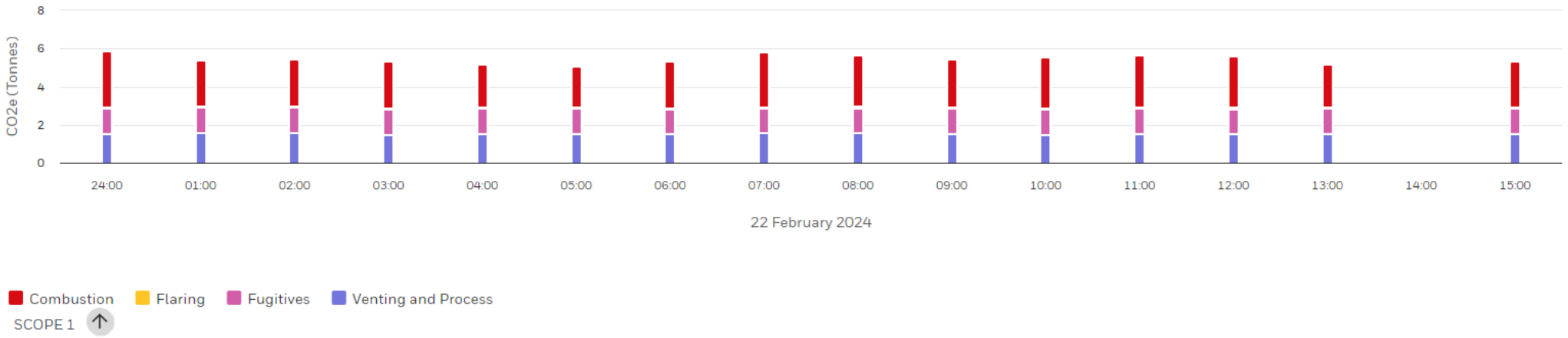
Site Visuals: Monitor the overall GHG emissions by categories, intensity and top 3 critical emission sources.

Trend View : Arabia oil field

Trends | Source | Map

BY SOURCES | BY UNITS

GHG EMISSIONS BY SOURCES



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.

Source View : Arabia oil field

Trends | Source | Map

EMISSIONS BY SOURCES

1 - 12 of 26 | No filters applied

Rank 1		GHG EMISSION (CO2e)
Boiler 3	Scope 1 | Combustion | Boilers	24.446 Tonnes
Fleet Vehicle Refri...	Scope 1 | Fugitives | Vehicles	19.5 Tonnes
All Vessel Blowdowns	Scope 1 | Venting and Process | ...	17.721 Tonnes
IC Engine3	Scope 1 | Combustion | Diesel Co...	7.83 Tonnes
AGRU3	Scope 1 | Venting and Process | ...	5.572 Tonnes
Boiler 4	Scope 1 | Combustion | Boilers	2.627 Tonnes
Reboiler 3	Scope 1 | Combustion | Heaters	1.579 Tonnes
Turbine 3	Scope 1 | Combustion | Turbines	1.539 Tonnes
IC Engine3	Scope 1 | Combustion | Fleet Veh...	0.845 Tonnes
Emergency Flare3	Scope 1 | Flaring | Flares	0.835 Tonnes
All Gas_others	Scope 1 | Fugitives | Others	0.22 Tonnes
All Valves_L_G	Scope 1 | Fugitives | Valves	0.15 Tonnes

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

Beaumont: Storage Tank Area 101

Rebellion Camera

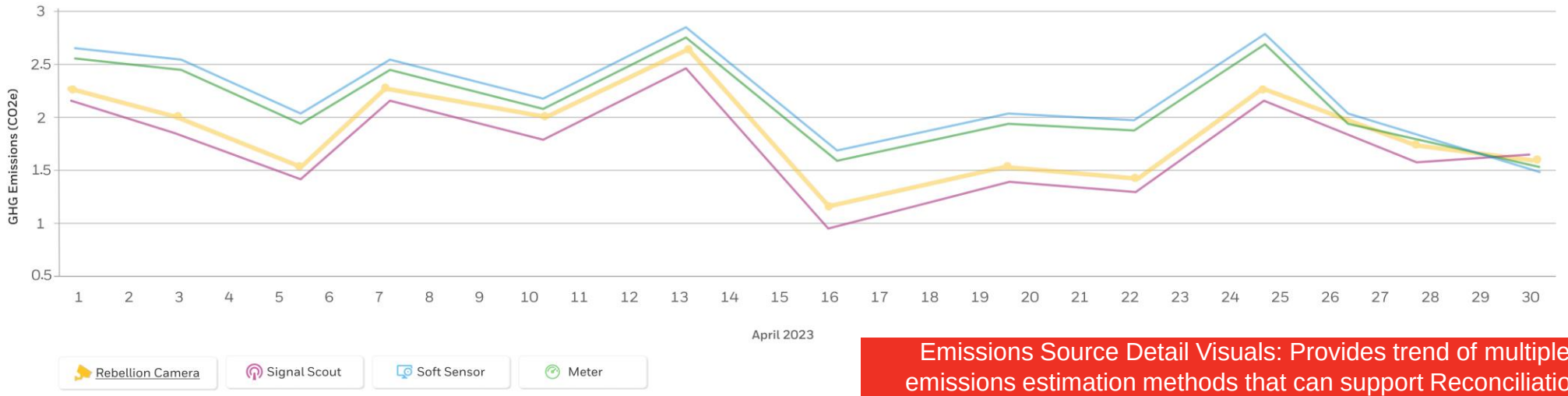
STORAGE TANK AREA 101
Scope 1 | Fugitive | Area

1.45 Tonnes
ACTUAL GHG EMISSIONS

CONTRIBUTION OF STORAGE TANK AREA 101 (TONNES)

1400	2.85	1.45
SCOPE 1 TONNES	FUGITIVE TONNES	STORAGE TANK AREA 101 TONNES

TREND AS PER RANK INPUT



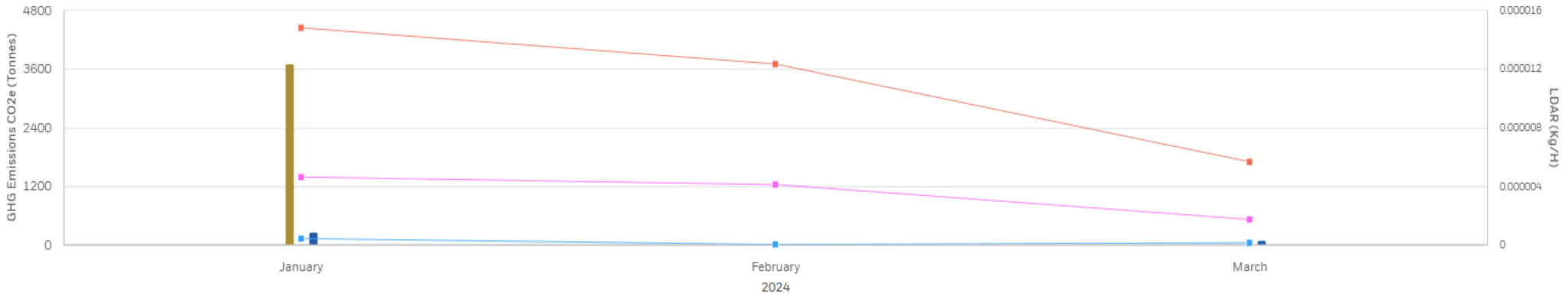
Emissions Source Detail Visuals: Provides trend of multiple emissions estimation methods that can support Reconciliation between measurement methods.

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	-	-

Emissions Reconciliation

GHG EMISSIONS (CO2e) COMPARISON BY MEASUREMENT METHODS

Scope 1 Emissions



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
  - APAC
    - Perth Aluminium plant
    - Terengganu Offshore p...
  - EMEA
    - Arabia oil field
    - Arezzo Gas Plant
  - North America [US]
    - Mississippi Refinery

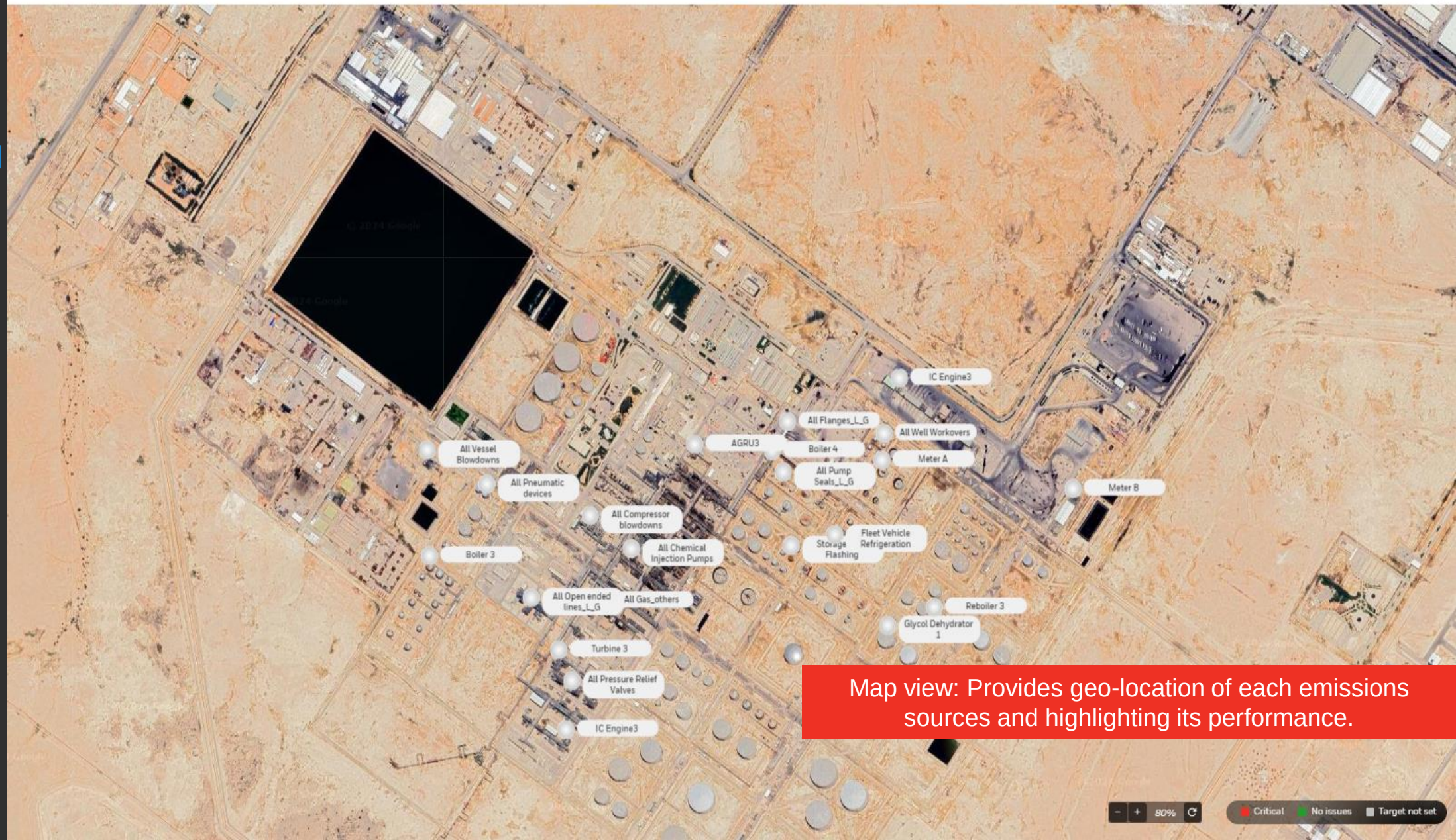
Emission View - Arabia oil field

Asset Hierarchy > Malibu Enterprise > EMEA > Arabia oil field

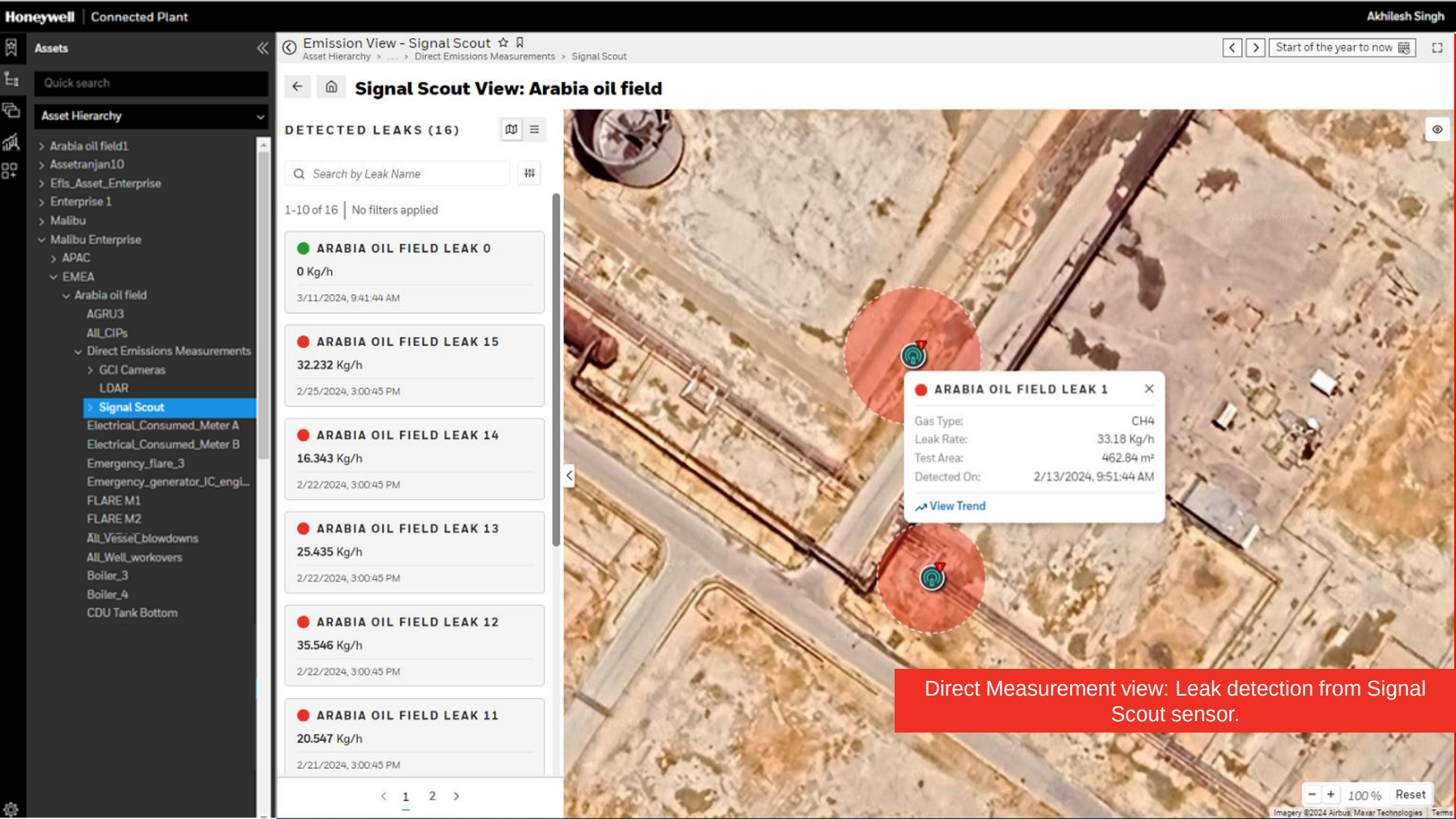
Start of the day to now

Map View : Arabia oil field

Trends | Source | Map



Map view: Provides geo-location of each emissions sources and highlighting its performance.


Honeywell | Connected Plant
Akhilesh Singh
Assets
Quick search
Asset Hierarchy
Arabia oil field1
Assetranjan10
Efls_Asset_Enterprise
Enterprise 1
Malibu
Malibu Enterprise
APAC
EMEA
Arabia oil field
AGRU3
All_CIPs
Direct Emissions Measurements
GCI Cameras
LDAR
Signal Scout
Electrical_Consumed_Meter A
Electrical_Consumed_Meter B
Emergency_flare_3
Emergency_generator_IC_engi...
FLARE M1
FLARE M2
All_Vessel_blowdowns
All_Well_workovers
Boiler_3
Boiler_4
CDU Tank Bottom
Emission View - Signal Scout
Asset Hierarchy > ... > Direct Emissions Measurements > Signal Scout
Start of the year to now
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
1 2
ARABIA OIL FIELD LEAK 1
Gas Type: CH4
Leak Rate: 33.18 Kg/h
Test Area: 462.84 m²
Detected On: 2/13/2024, 9:51:44 AM
View Trend
100 %
Reset
Imagery ©2024 Airbus, Maxar Technologies
Terms
Direct Measurement view: Leak detection from Signal Scout sensor.

GCI Camera View: Site A

DETECTED LEAKS (56)

Search by Leak ID

1-10 of 56 | No filters applied

LEAK112
1.25 Tonnes/Hr
Jan 02, 2024 | 16:04

LEAK110
0.23 Tonnes/Hr
Jan 02, 2024 | 16:04

LEAK109
1.23 Tonnes/Hr
Jan 02, 2024 | 16:04

LEAK108
1.23 Tonnes/Hr
Jan 02, 2024 | 16:04

LEAK107
1.23 Tonnes/Hr
Jan 02, 2024 | 16:04

LEAK106
1.23 Tonnes/Hr

Energy Management

ENERGY CONSUMPTION
TARGET (MMBTU) 6.12K
ACTUAL (MMBTU) 4.375K

GHG EMISSIONS (CO2e)
4.002K Tonnes

ENERGY SAVINGS/LOSS
1.745K MMBTU

EMISSIONS AVOIDED/EXCEEDED
-94.717 Tonnes

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

View Details

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

Arabia oil field: Emissions Prediction

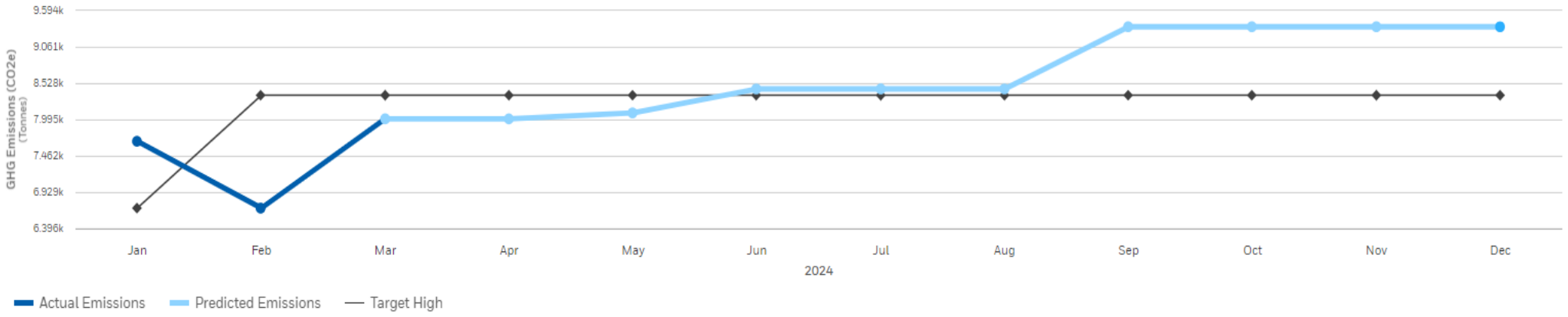
Last Updated: 3/15/2024, 15:09 Recalculate Generate Report

EMISSIONS PREDICTION

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

CURRENT (YTD)	TARGET (ANNUAL)	PREDICTED (ANNUAL)
14,371.521 Tonnes	98,568 Tonnes	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.

Arabia oil field: Emissions Prediction

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

FINANCIAL IMPACT PREDICTION

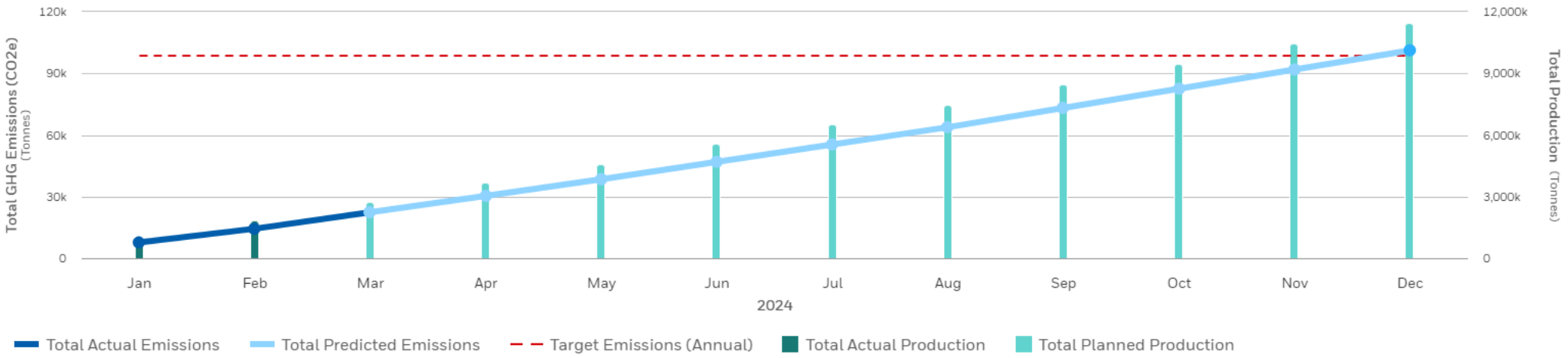
Gas Type: GHG EMISSIONS (CO2e) | Prediction Type: Financial Impact

TARGET GHG EMISSIONS (CO2e) (ANNUAL)
98,568 Tonnes

PREDICTED GHG EMISSIONS (CO2e) (ANNUAL)
101,238.062 Tonnes ↗ 2.709% from Target

POTENTIAL FINANCIAL LOSS (ANNUAL)
$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 predication due to emissions exceedance.

LDAR VIEW: Valves

LDAR LEAK RATE - VALVES

Compare Emissions | Last 5 LDAR

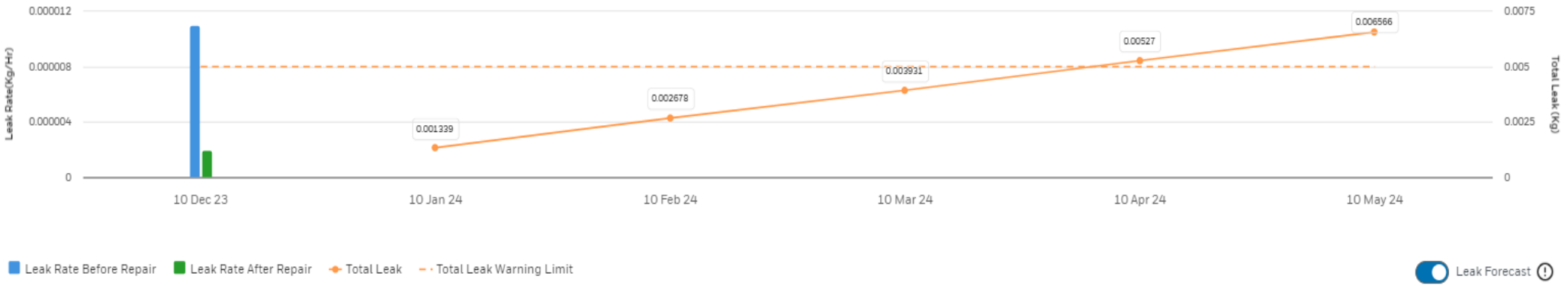
LDAR REPORT DATE	REPAIR DATE	OPERATION TIME (HOURS)	LEAK RATE BEFORE REPAIR (KG/H)	LEAK RATE AFTER REPAIR (KG/H)	COMPONENTS COVERED	ACTION
05 Jan 24	10 Dec 23	720	0.000003	0	16 of 180	View Curated Report
21 May 23	16 May 23	720	0.000006	0.000002	16 of 180	View Curated Report

Leak predication: Before and After leak rate from LDAR

LDAR VIEW: Connectors

LDAR LEAK RATE - CONNECTORS

Compare Emissions | Operating 24 Hr/Day



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

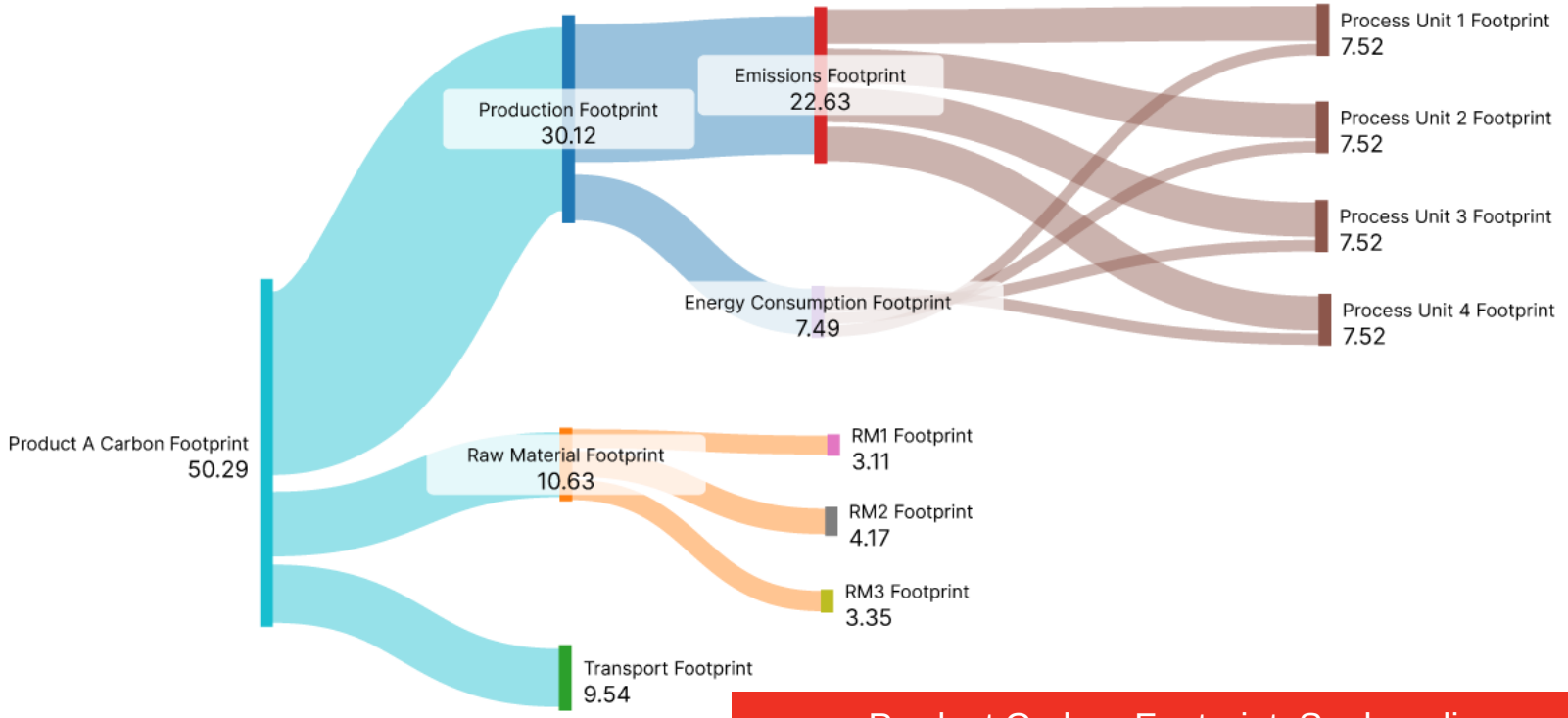
Leak predication: Enable users to plan for LDAR based on the leak prediction.

Product Carbon Footprint (Cradle to Gate): Product A

PRODUCT CARBON FOOTPRINT	PRODUCTION FOOTPRINT	RAW MATERIAL FOOTPRINT	TRANSPORT FOOTPRINT
50.29 Kg CO2e/Kg ↗ 3.8 %	30.12 Kg CO2e/Kg ↗ 3.2 %	10.63 Kg CO2e/Kg ↗ 2.8 %	9.54 Kg CO2e/Kg ↗ 1.7 %

PRODUCT CARBON FOOTPRINT

View Details



Product Carbon Footprint: Sankey diagram representation for the carbon footprint.

Assets
Quick search
PlantHierarchy
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

Production Footprint | Raw Material Footprint | Transport Footprint

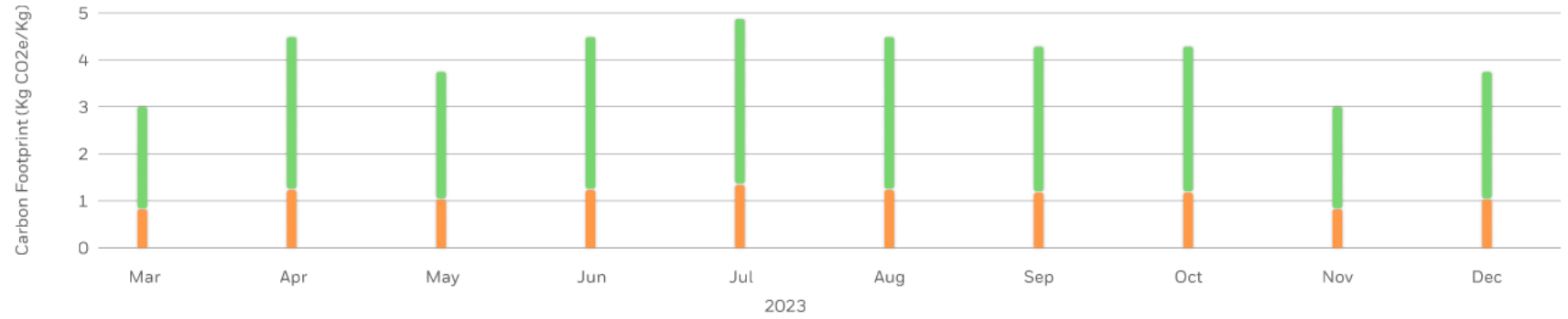
PRODUCTION FOOTPRINT

All process units

PRODUCTION FOOTPRINT **30.12** Kg CO2e/Kg

EMISSIONS FOOTPRINT **22.63** Kg CO2e/Kg

ENERGY CONSUMPTION FOOTPRINT **7.49** Kg CO2e/Kg

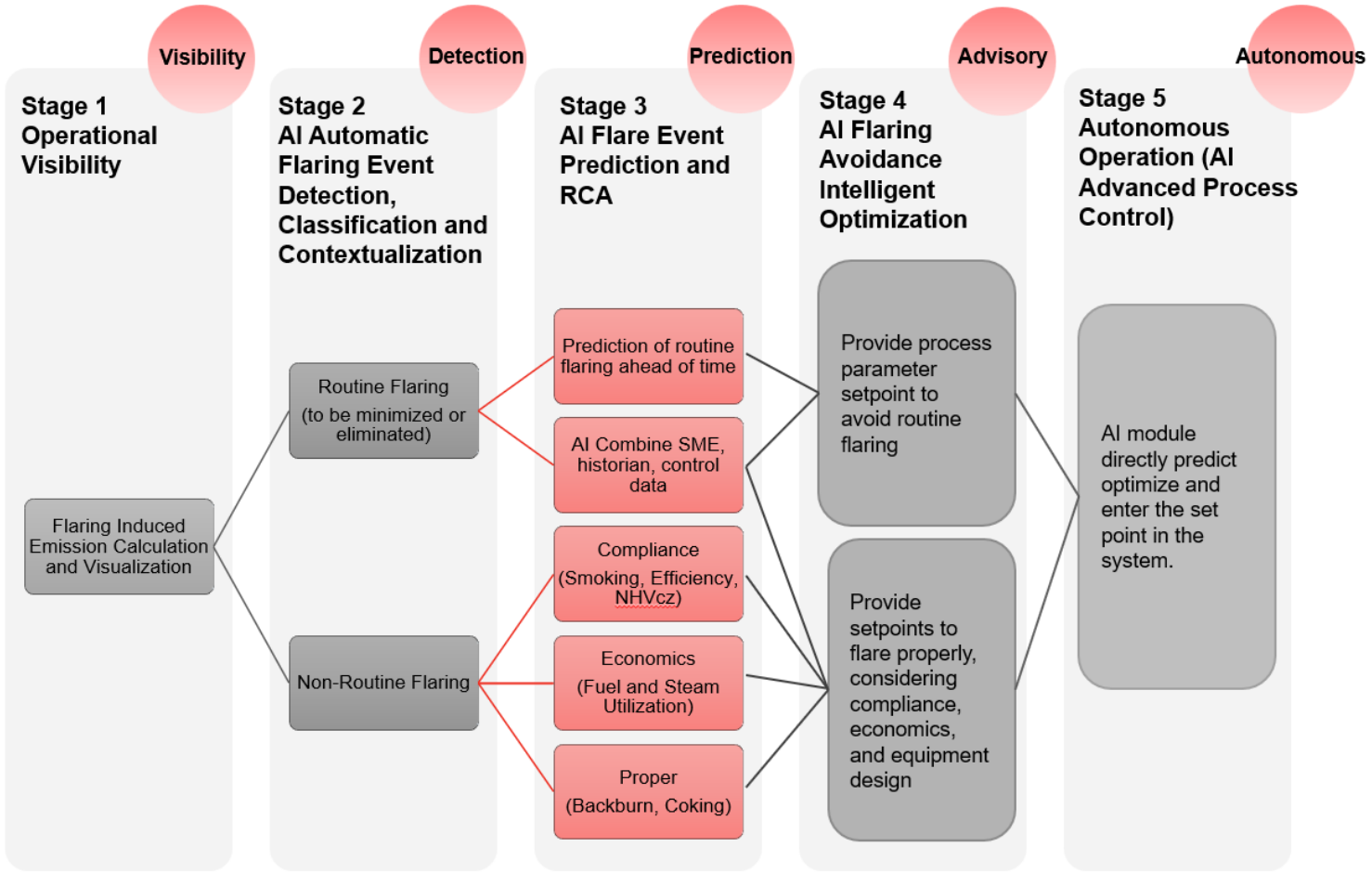


Search by Process Unit

PROCESS UNIT	ENERGY CONSUMPTION FOOTPRINT (Kg CO2e/Kg)	EMISSIONS FOOTPRINT (Kg CO2e/Kg)	PRODUCTION FOOTPRINT (Kg CO2e/Kg)
Process Unit 1	2.43	1.09	3.54
Process Unit 2	3.45	2.76	5.21
Process Unit 3	1.32		
Process Unit 4	2.24		

Product Carbon Footprint: Drilldown of each lifecycle stage.

FLARE INTELLIGENCE



Customer journey to fully autonomous Operation

Flare Intelligence: Flare 101

View Flare Emissions

Raw Flare Data | Categorised Flare Data

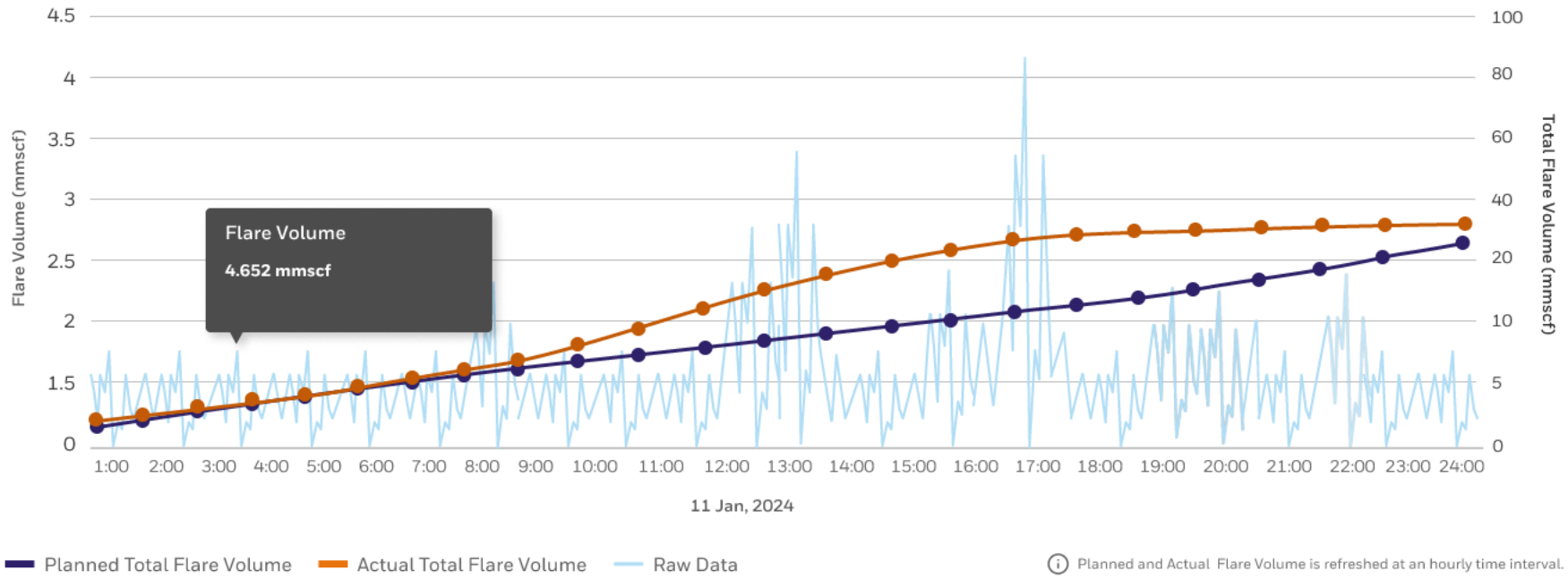
PLANNED FLARE VOLUME
24.001 mmscf

ACTUAL FLARE VOLUME
35.980 mmscf

FLARE EMISSIONS INTENSITY
0.781 Tonnes/Tonnes

FLARE INSIGHTS

Show: Flare Volume



Planned and Actual Flare Volume is refreshed at an hourly time interval.

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

Assets
Quick search
PlantHierarchy
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 - Site A
Asset Hierarchy / Malibu Enterprise / Region 1 / Site A
All of Today

Flare Intelligence: Flare 101

View Flare Emissions

Raw Flare Data | Categorised Flare Data

ROUTINE FLARE VOLUME

TOTAL	AVG
26.313 mmscf	1.152 mmscf

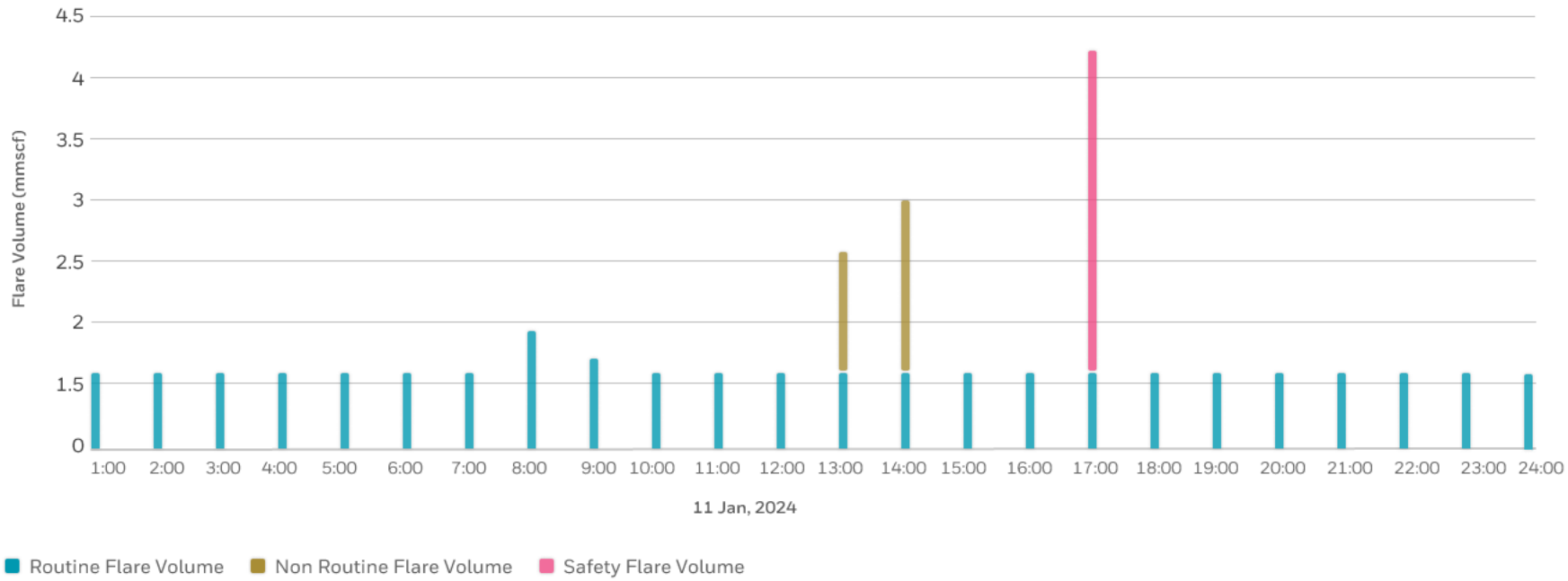
NON-ROUTINE FLARE VOLUME

TOTAL	AVG
5.315 mmscf	2.313 mmscf

SAFETY FLARE VOLUME

TOTAL	AVG
4.352 mmscf	4.352 mmscf

FLARE INSIGHTS



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

Assets
Quick search
PlantHierarchy
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
TOTAL 26.313 mmscf
AVG 1.152 mmscf

NON-ROUTINE FLARE VOLUME
TOTAL 5.315 mmscf
AVG 2.313 mmscf

SAFETY FLARE VOLUME
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		
Jan 11 2023 | 19:00	19.012	ROUTINE		
Jan 11 2023 | 20:00	20.012	ROUTINE	NA	
Jan 11 2023 | 21:00	21.012	ROUTINE		

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

1 2 3 4 5

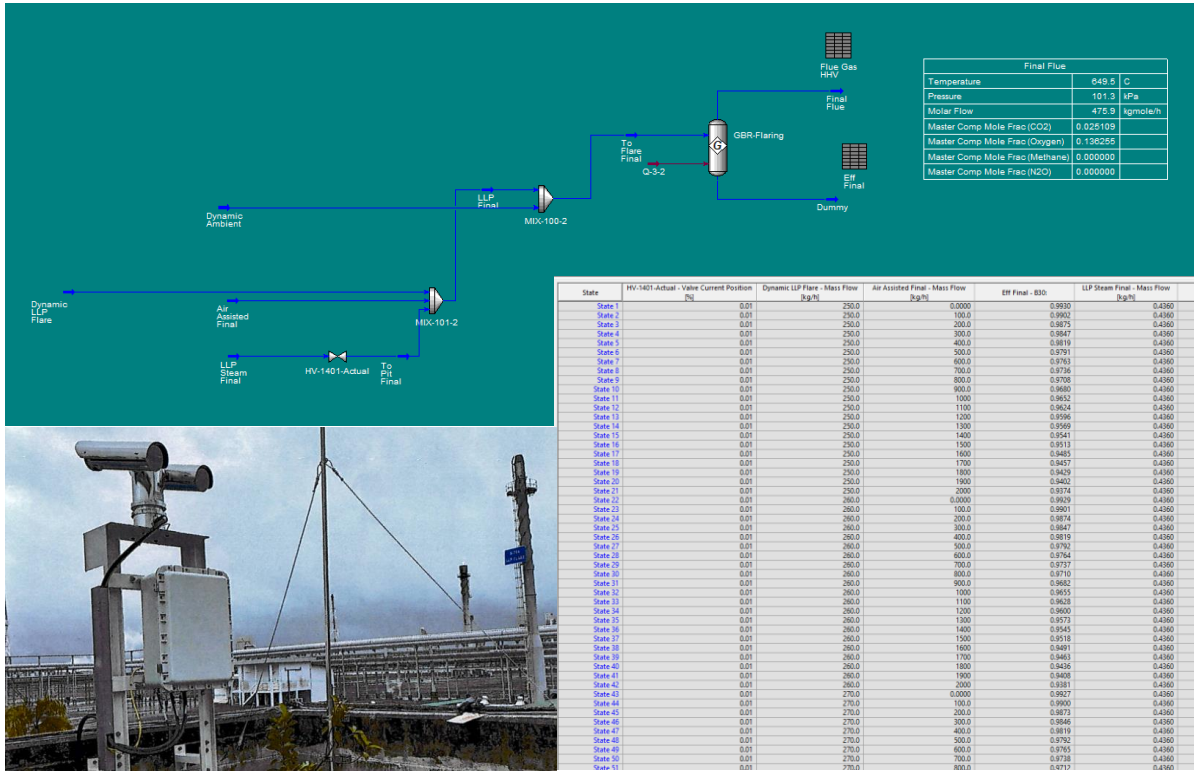
Flare Intelligence: Sub-categorization of flare based on WBZRF.

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.

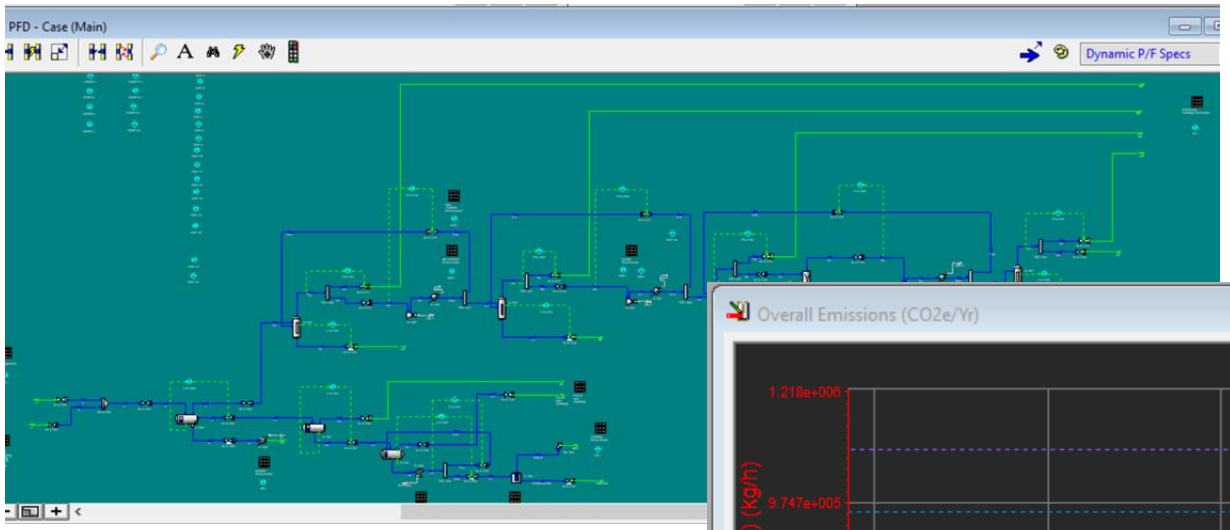
2. Operating data variables
   a) Flare stack configuration
   b) Flare gas flow and composition
   c) Assisted Steam and Assisted Air flows
   d) Wind Speed
   e) Hydrocarbon Destructive Efficiency (DRE)

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

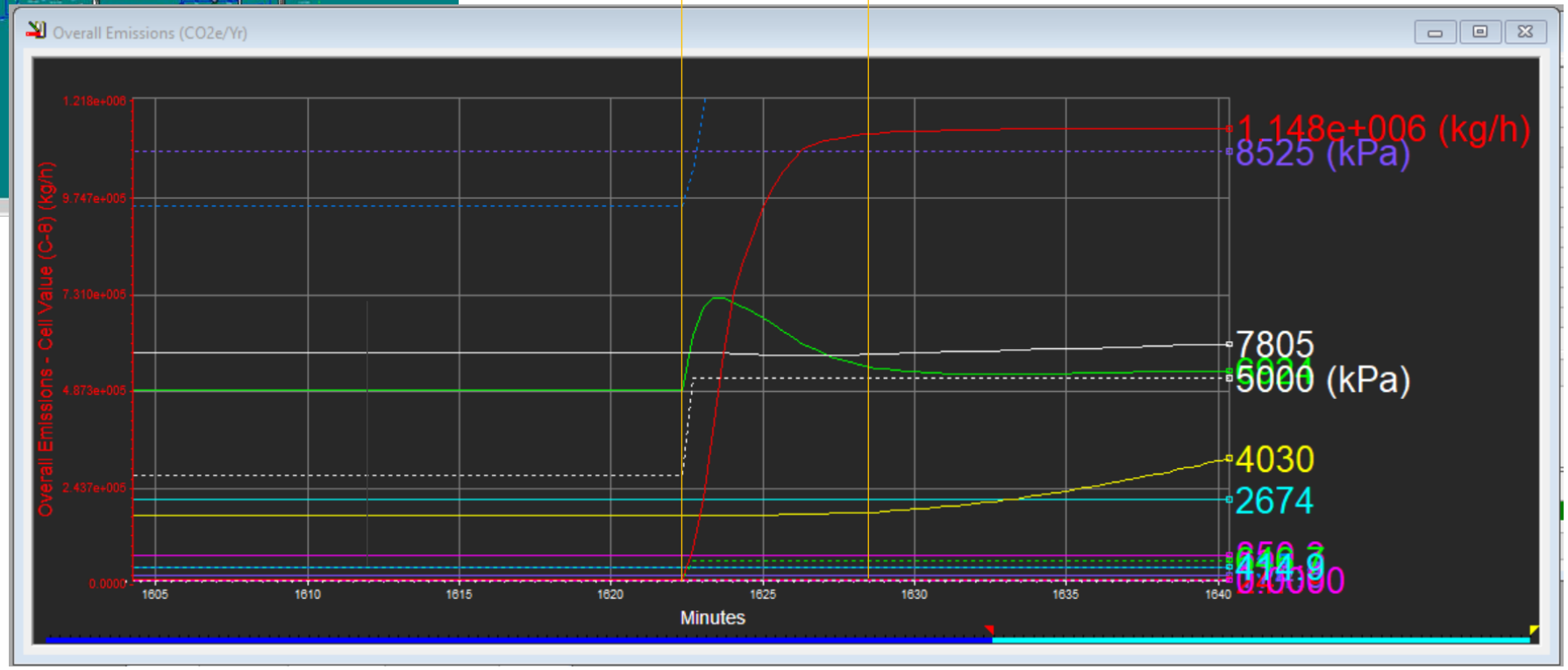


ONSHORE PLANT - USE CASE

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



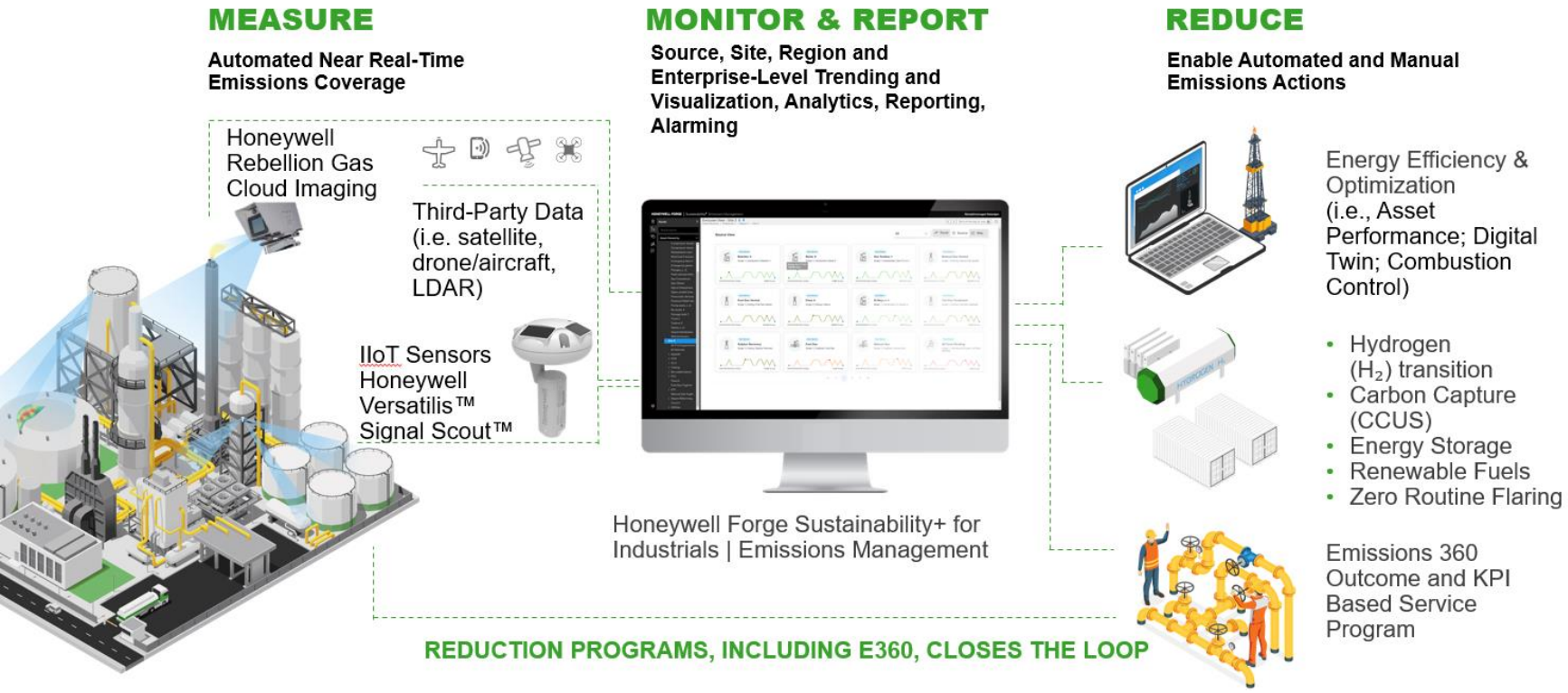
~7mins x 5 real time factor = ~35 mins



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.



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

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rameshmurugan.natarajan@Honeywell.com

Honeywell