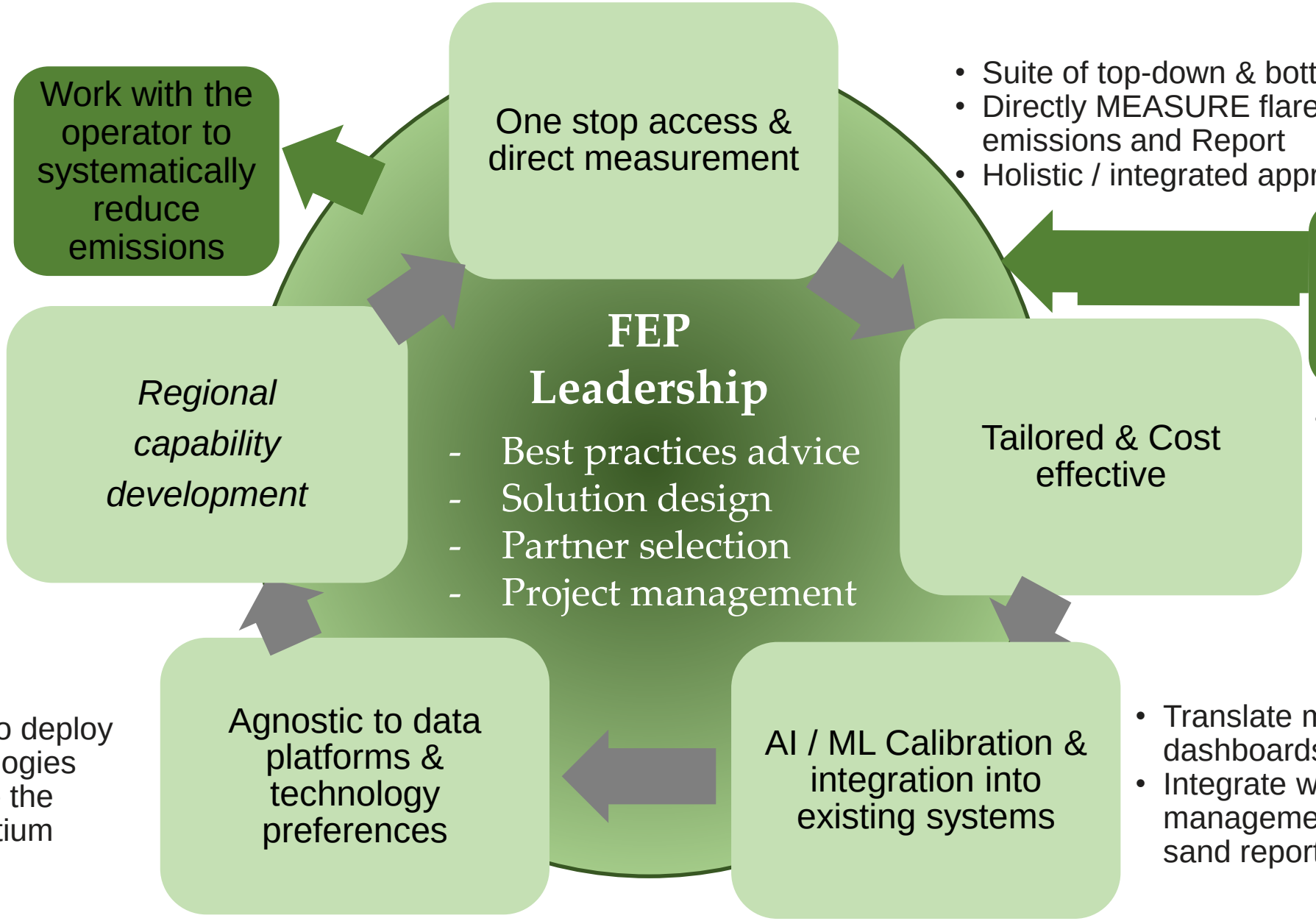
Energy solutions for a changing world

Measuring and Eliminating Flaring & CH_4 emissions

PIDX London
June 22nd, 2022

Overview Proposal & Value Proposition



- Suite of top-down & bottom-up technologies
- Directly MEASURE flare and CH4 emissions and Report
- Holistic / integrated approach

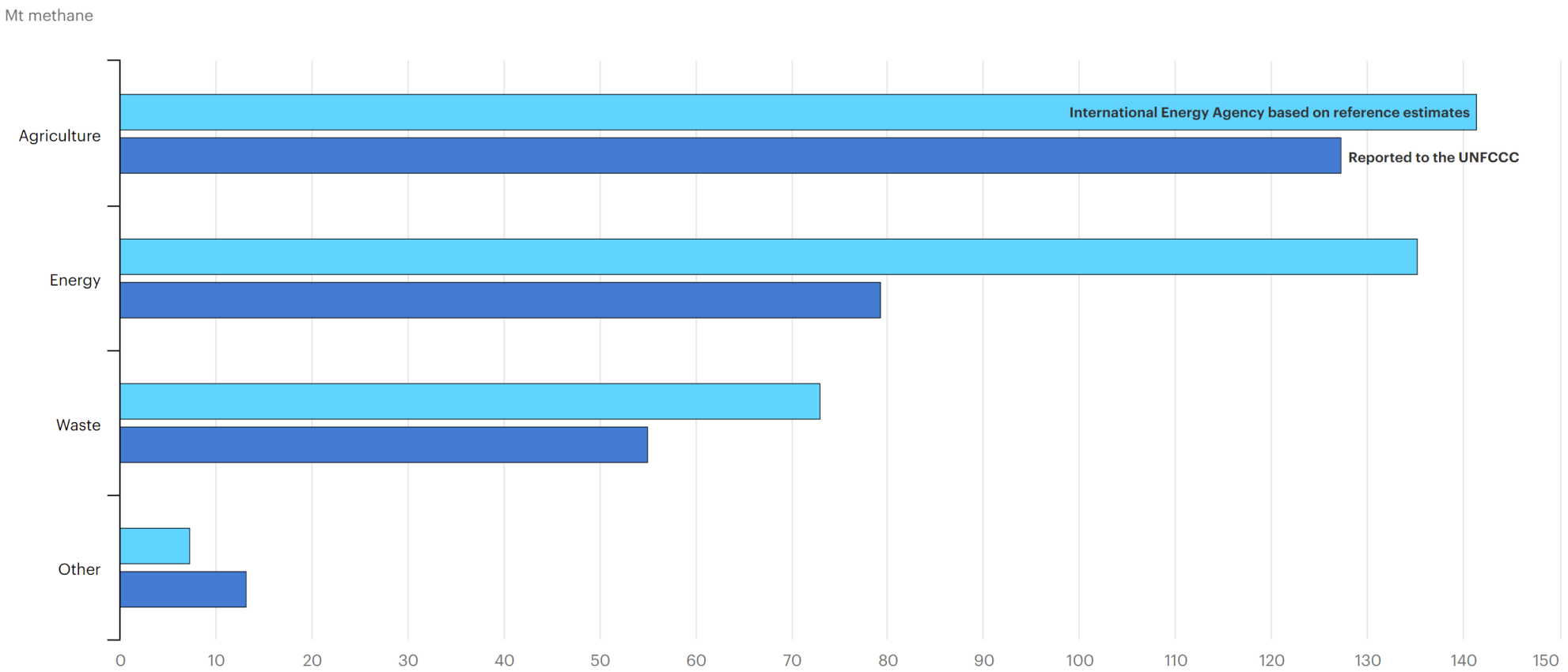
- Fit for purpose solutions for each situation

- Sensor test centre

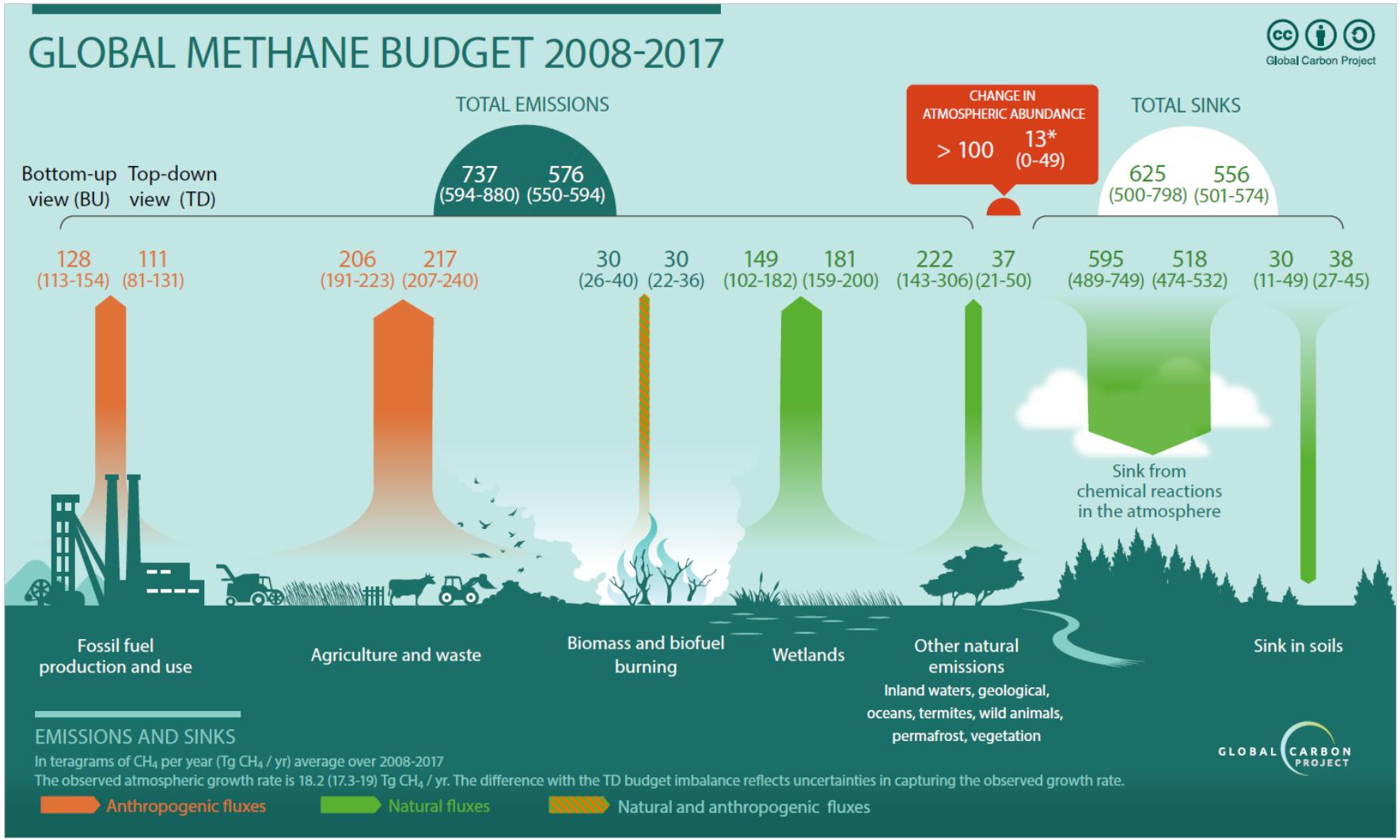
- Open to deploy technologies outside the consortium

- Translate measurements into dashboards
- Integrate with operational management decision tools sand reporting systems

Reporting of Methane- IEA 2022



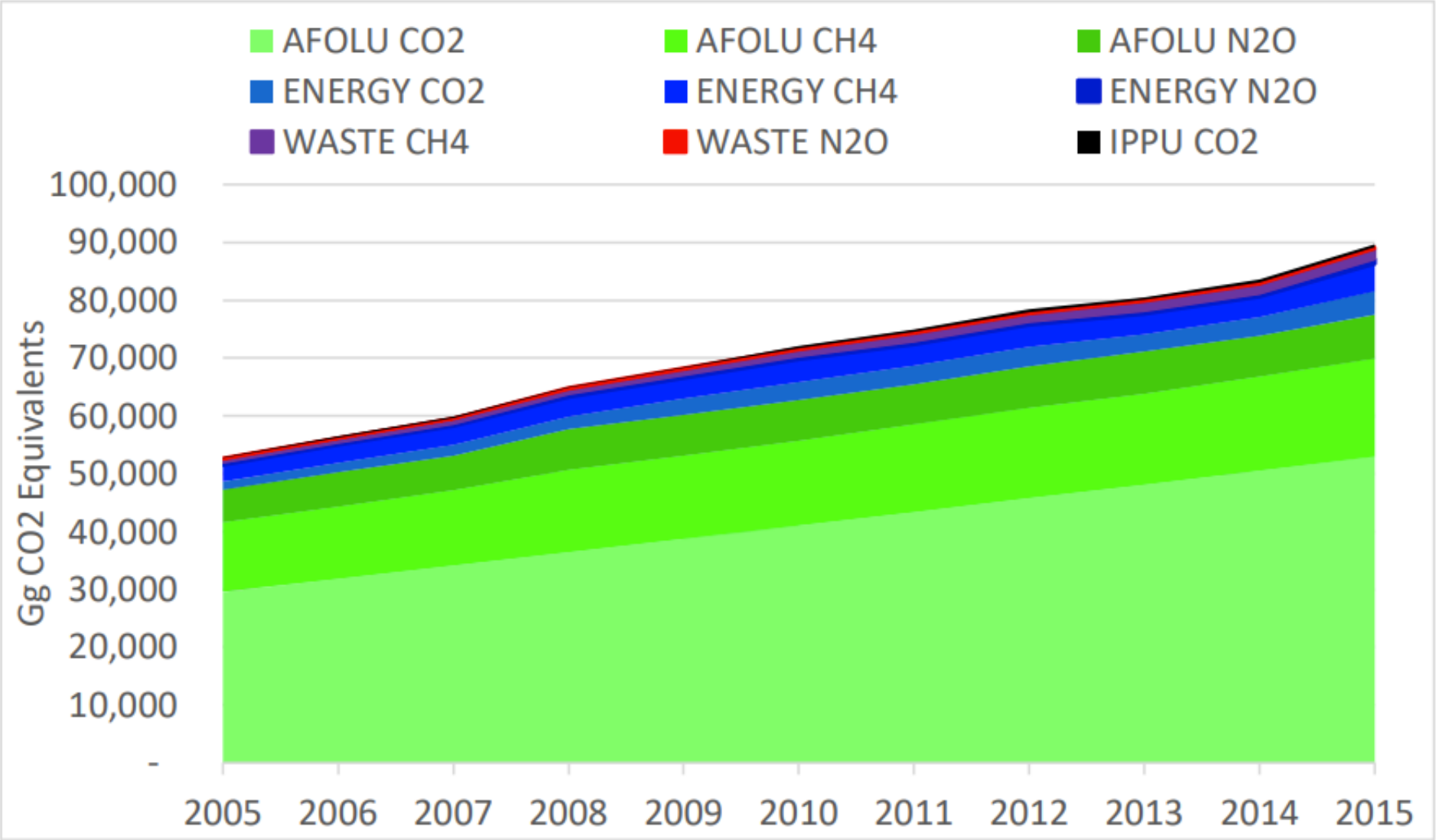
The Methane Budget



Biomass
Measured emissions (ranging from 5–28 mg m^{-2} hr^{-1}) were found to be an order of magnitude greater than those simulated by land surface models (ranging from 0.6–3.9 mg m^{-2} hr^{-1}), suggesting much greater emissions from tropical wetlands than currently accounted for.

https://doi.org/10.1029/2021GB007261

Uganda GHG Inventory Report 2019



MWE. (2019). Uganda's First Biennial Update Report to the United Nations Framework Convention on Climate Change. Ministry of Water and Environment, Kampala.

Greenwashing?

- The environmental, social, and governance (ESG) data provided in firms' sustainability reports is often **unaudited**. If ESG information disclosed by firms is not reliable, a firm's greenwashing behavior can be a barrier to integrating ESG factors into investment decisions.
- …….. "greenwashers" are firms which seem very transparent and reveal large quantities of ESG data but perform poorly in ESG aspects. By creating peer-relative greenwashing scores for a cross-country dataset comprised by **1925 large-cap firms**, we measure the extent to which large-cap firms engage in greenwashing.

https://www.sciencedirect.com/science/article/abs/pii/S0275531919309523

The O&G Majors GHG Reporting 2020

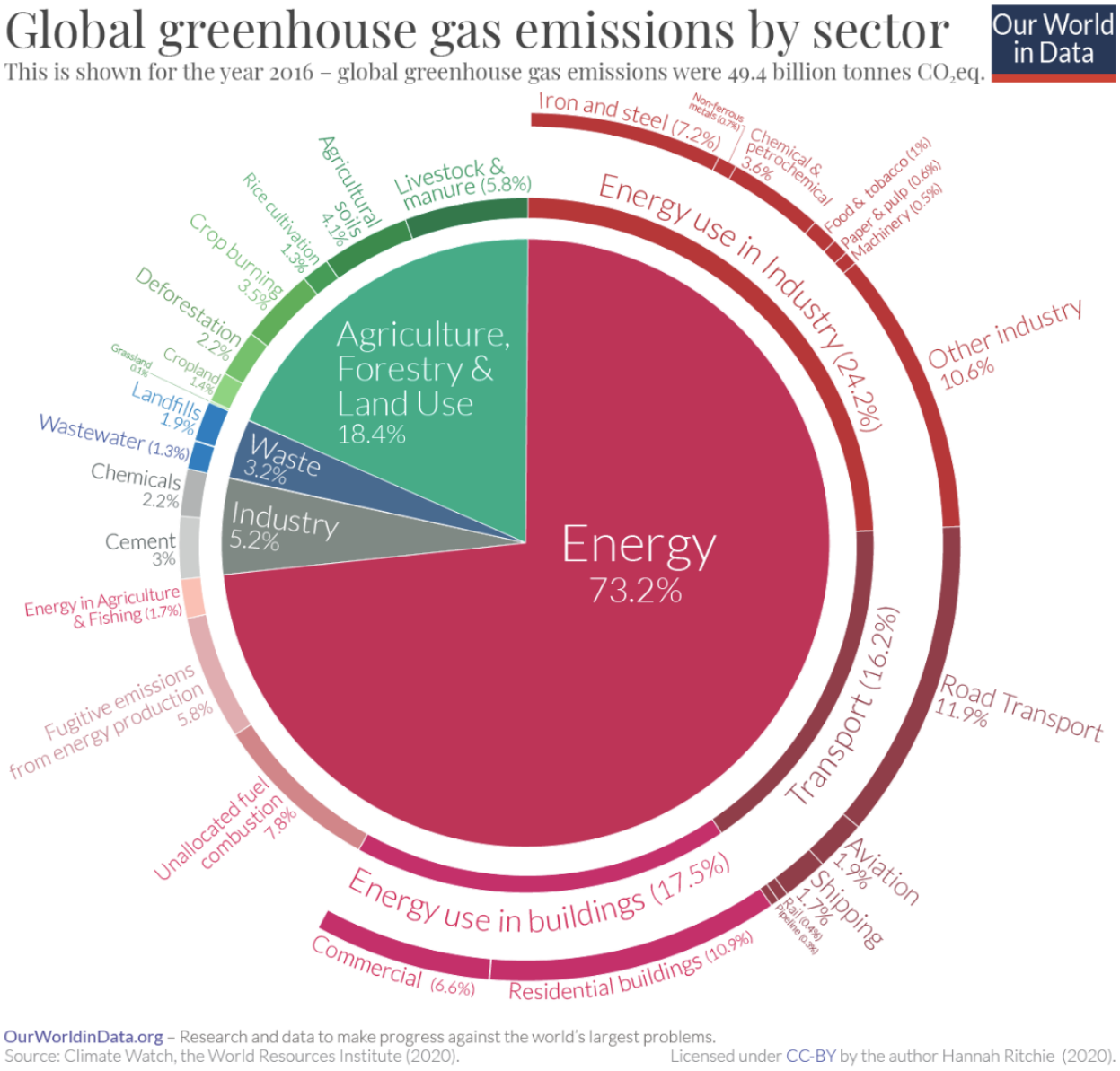
Item\Company	A	B	C	D	E	F
1. 2020 GHG Report						
2. Linkage to 2020 Executive Remuneration						
3. ~3 Year GHG Ambitions						
4. Link to ~3 Year Executive Remuneration						
"Greenwashing" Overview						

Table 2 – FEP evaluation of European Majors 2020 GHG emissions report

	Clear - Comprehensive - Quantitative
	Debateable – Partial - Qualitative
	Questionable - Absent

Table 1 – FEP "traffic-light" system to identify European Majors 2020 GHG Emissions Reporting performance

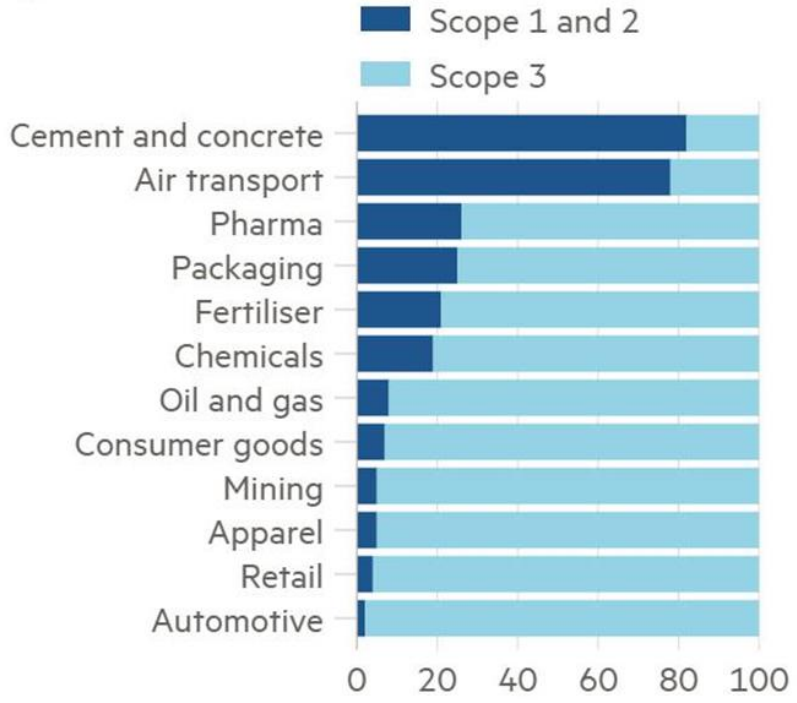
Source of Emissions



Scope 3 Emissions are Challenging to Report

About 80% of total emissions from most business sectors are scope 3

Type of emissions by sector



Source: WBCSD based on data from GreenGauge, CDP and McKinsey & Company

© FT

Several operating companies we've spoken to don't know that their suppliers are Scop3 emission sources

Methane Elimination Plans- BP

Methane measurement

Our plans to install methane measurement at all our existing major oil and gas processing sites continued in 2021 with the ongoing installation of enhanced metering, software for flare efficiency and predictive emissions monitoring on gas turbines in line with our three-year timeframe.

At our US onshore operations we trialled new technologies for site level emissions detection and continued using drones and aircraft with methane sensors.

Methane reduction activity

Across our US onshore operations, we are working to achieve zero routine flaring by 2025 or sooner. This includes installing air assisted flares to improve combustion efficiency and thermocouple sensors on all flare stacks that notify bp operations teams of unlit flares. All bpx flares have auto-ignitors to attempt to remotely reignite extinguished flames.

At a number of our North Sea assets, we made improvements such as optimizing the restart sequence of our operations and changing operational parameters to minimize the potential for flares to extinguish under high winds.

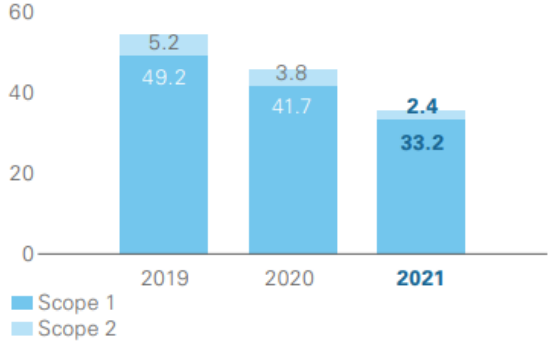
Our actions on methane reduction enable our businesses to capture value by supplying the gas to customers. Otherwise the gas would be wasted with both an economic loss and an adverse impact on emissions.

Technology improvements

Technologies to detect and measure methane are evolving at pace. A flexible approach to using different technologies allows us to move towards increased continuous site and source-level measurement systems as more advanced technology becomes available. We use different methods, including drones, aircraft, satellites and fixed video monitoring. We continue to monitor emerging technologies to assess their potential as methane measurement tools.

Scope 1 (direct) and Scope 2 (indirect) GHG emissions (operational control boundary)[a]

($MtCO_2e$)



Our progress in 2021

We made further progress against our operational emissions reduction targets in 2021. Our combined Scope 1 and Scope 2 emissions, covered by aim 1 were 35.6$MtCO_2e$, a decrease of 35% from our 2019 baseline of 54.4$MtCO_2e$. The total decrease of almost 19$MtCO_2e$ includes 14.7$MtCO_2e$ in divestments and 2.6$MtCO_2e$ in sustainable emission reductions (SERs)[b]. Compared with 2020 (45.5$MtCO_2e$), Scope 1 and 2 emissions in 2021 decreased by 22%.

This means that while we have exceeded our 2025 target, we have more work to do to achieve our overall net zero aim by reducing emissions while bringing new projects online.

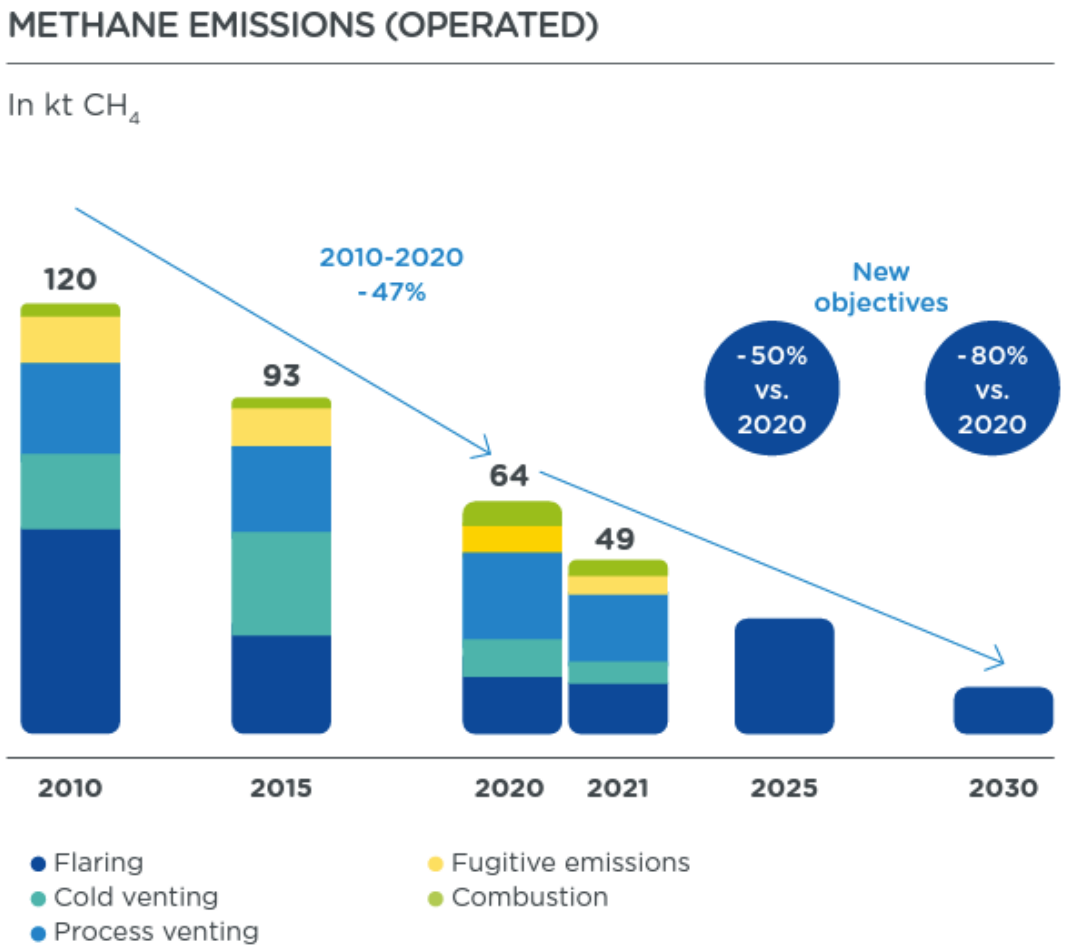
Scope 1 (direct) emissions, covered by aim 1, were 33.2$MtCO_2e$ in 2021, a decrease of 20% from 41.7$MtCO_2e$ in 2020. Of those Scope 1 emissions 32.0$MtCO_2e$ were from CO_2 and 1.1$MtCO_2e$ from methane[c]. Emissions decreased due to divestments, delivery of SERs and other permanent operational changes.

Scope 2 (indirect) emissions decreased by 1.4$MtCO_2e$, to 2.4$MtCO_2e$ in 2021, a 37% reduction compared with 2020. This decrease resulted from lower carbon power agreements, including at our Gelsenkirchen site, and the divestment of our petrochemicals business at the end of 2020.

In 2021 compared with 2020:

- Divestments accounted for 9.3$MtCO_2e$ of the Scope 1 and Scope 2 emissions decrease including the divestment of our operations in Alaska, our petrochemicals business and bpx energy divestments.
- The delivery of SERs reduced Scope 1 and 2 emissions by 1.6$MtCO_2e$ (in addition to the 1$MtCO_2e$ delivered in 2020).
- Other permanent reductions in 2021 included the repurposing of Kwinana refinery (0.7 $MtCO_2e$. reduction) and cessation of production at Foinaven FPSO (0.2 $MtCO_2e$. reduction).
- Temporary production-related changes accounted for an increase of 1.1$MtCO_2e$ associated with higher activity levels, particularly in refining, and temporary flaring increases in 2021.
- Total hydrocarbons flared increased from 831kt to 967kt in 2021 due to operational variances including temporary flaring associated with a new production start-up.

TotalEnergies is Addressing Methane Emissions



Measuring methane emissions more accurately

Methane emissions have numerous and dispersed sources. TotalEnergies is a pioneer in detecting and quantifying emissions across the entire value chain.

The Company operates a site for testing methane emissions measurement technology. Known as the TADI complex[2], it is unparalleled in Europe; only one comparable site exists worldwide, in the United States[3].

In addition, TotalEnergies is speeding up deployment of its drone-mounted methane detection technology, AUSEA[4], at all of its operated sites starting in 2022 *(see sidebar)*.

Ausea consists of a miniature dual sensor mounted on a drone, capable of detecting methane and carbon dioxide emissions, while at the same time identifying their source.

TotalEnergies Reported Methane Emissions

		Operated				Equity Share			
GHG EMISSIONS		**2021**	**2020**	**2019**	**2015**	**2021**	**2020**	**2019**	**2015**
Scope 1 – Direct GHG emissions	Mt CO_2e	34* (33)	38* (36)	41	42	49	52	55	50
Methane emissions	kt CH_4	49	64	68	94	51	-	-	-
BREAKDOWN BY PRODUCT									
Upstream Oil & Gas Operations	kt CH_4	48	62	66	92	48	-	-	-
Integrated Gas, Renewables & Power, excluding upstream gas operations	kt CH_4	<1	<1	<1	0	2	-	-	-
Refining & Chemicals	kt CH_4	1	1	1	1	1	-	-	-
Marketing & Services	kt CH_4	0	0	0	0	0	-	-	-
BREAKDOWN BY REGION									
Europe: E.U. 27 + Norway + UK + Switzerland	kt CH_4	7	12	15	9	5	-	-	-
Eurasia (including Russia)/Oceania	kt CH_4	1	3	3	33	16	-	-	-
Africa	kt CH_4	23	31	39	49	18	-	-	-
Americas	kt CH_4	18	18	10	3	12	-	-	-

Current realities!

- The Oil & Gas Industry is under intense scrutiny regarding GHG Emissions and Flaring:
- ***Under-reporting by companies operating there is widely observed in work by independent bodies (using satellites, fixed wing aircraft).***
- By extrapolation, we might assume that under-reporting of GHG Emissions is a problem across all industries….

Must do better!

'Public' Reporting:

- Found in Annual Reports, Sustainability Reports, sometimes on Websites:
  - ➢ Majors = Reasonably comprehensive but diverse, heterogeneous
  - ➢ E&Ps = with one or two exceptions, partial, incomplete, non-existent
  - ➢ 'Foundation Industries' = indistinguishable from E&Ps

'Bottom-up' Reporting:

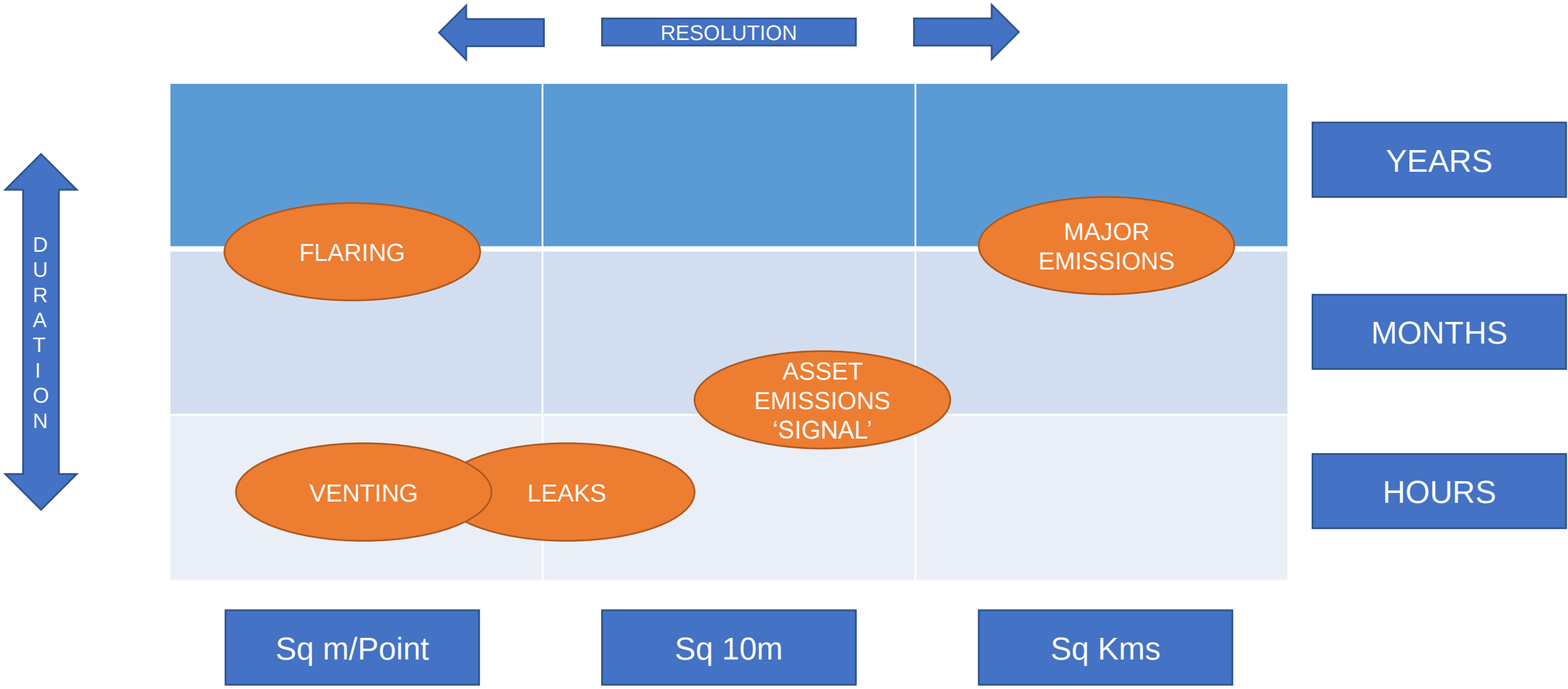
× Usually based on 'engineering estimates', not operational measurements

?? How can a company Measure - and thus accurately Report - Operated (and Equity) flaring and GHG emissions?

?? How can a company accurately document – and report – GHG emissions within its Supply Chain?

Without reliable measurement, how can Mitigation plans and promises be assessed and delivered?

Temporal & Spatial Dimensions of monitoring & measurement



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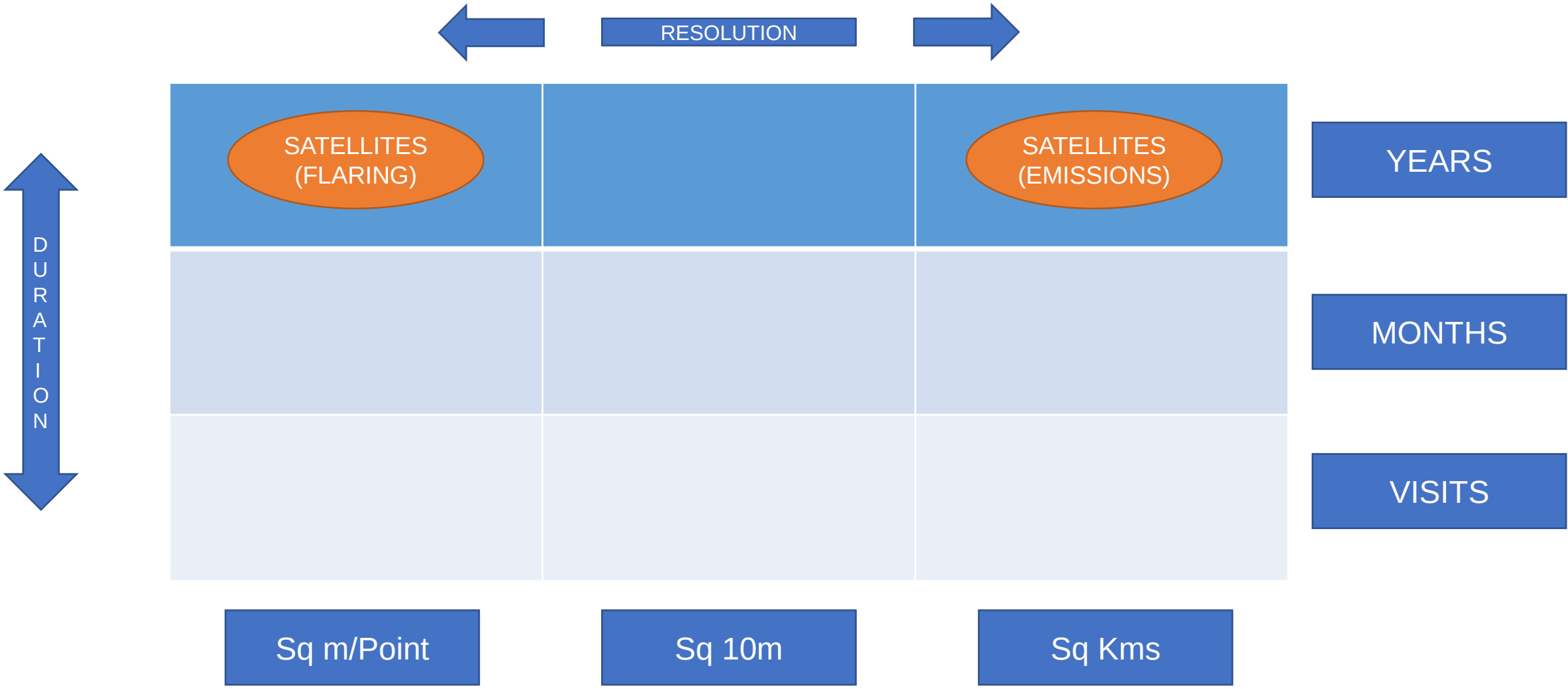

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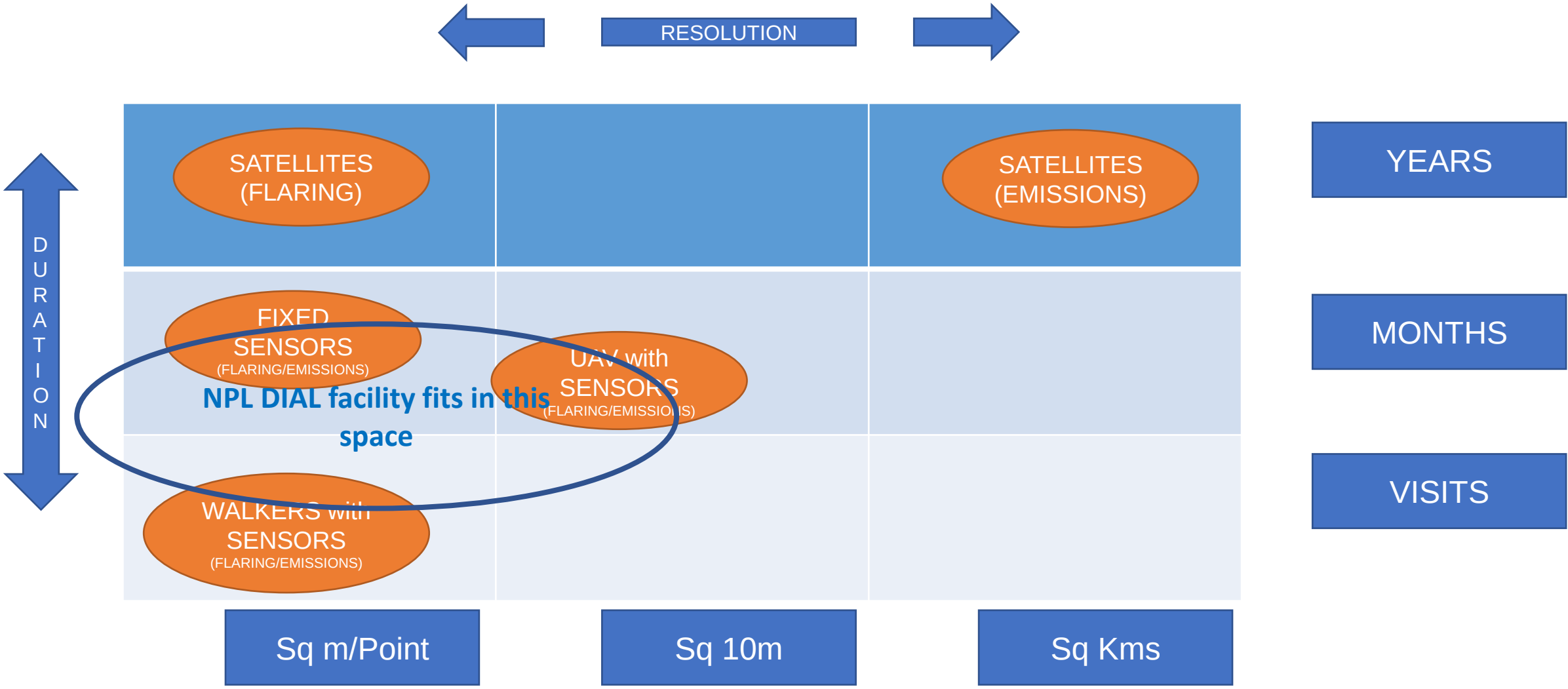

Digital Technologies

Future Energy Partners Flaring & Venting Outline Program

2022 | 2022 | 2022 | 2023+

Project initiations & validations

eMission Software Inc

Systematic reporting

"QUICK WINS" definition & implementation

- 10 year satellite flare history
- Flare recognition software calibrations
- PPE-sensor validation trials
- Define KPIs, reporting standards

Initial Contracts for advice & implementation projects

- Project – specific element selection
- Piloting and validation of technologies / solutions
- Tailoring & integration with operator & OGA reporting systems

Initial full project identification & definition

Full project implementations

Project level contracting of elements from FEP consortium members & others
Detailed design to integrate with operator systems

Ongoing validation, optimization & implementation by technical element

Terrabotics

Provide 10 years of flare history

intelliflare.ai

Flare measurement calibration trials

QLM Sensor deployed on platforms

Offshore QLM LiDAR trials

QLM Enabling Net Zero

Ongoing drone / LiDAR combination development

inzpire RevolutionInDefence

Offshore drone / camera validation trials

Establish sensor testing centre in Aberdeenshire with National Physical Laboratory *

2ValueSolutions

Ongoing PPE-sensor validations

Stand-alone demonstrations

Incture

Data Integration/KPI definition - reporting standards to match operators OMS and OGA requirements

Available now | Follow-on stages

* Sensor testing centre is subject to funding.

Conclusion

1) What gets measured gets done!
   - Reporting is seriously underestimating emissions..especially CH4
2) Reporting needs simplification and consistency and $$$
3) Consistent regulation and monitoring/enforcement is missing

FUTURE ENERGY Partners

eMission Software Inc

Terrabotics Space to Earth Analytics

inzpire RevolutionInDefence

QLM Enabling Net Zero

2ValueSolutions

Incture

Energy solutions for a changing world

Measuring and Eliminating Flaring & CH_4 emissions

Thank you!!