



Monetising **flared gas** ... innovative applications of proven technology

EPRG & CEEPR International Energy Policy Conference
Session: "A reality check on energy technology – are today's
tools fit for purpose?"

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Executive summary

Gas has a key role in the transition, but we must address emissions

- Gas is widely seen as a transition fuel to help to drive decarbonisation
- Most players expect gas consumption to increase significantly
- But there is lot of waste, and a large economic and environmental impact

The GHG problem is fixable ... with today's technologies

- Flaring and methane emissions are becoming increasingly transparent
- Existing proven technologies can deliver at no net cost
- Certification technologies are already driving change

... but new approaches and business models are needed

- **The business as usual approach isn't working; real change will need:**
 - New incentives
 - New operating models
 - New technologies
- It Must, Can and Pays to be done!

Agenda

Gas has a key role in the transition, but we must address the GHG emissions challenge

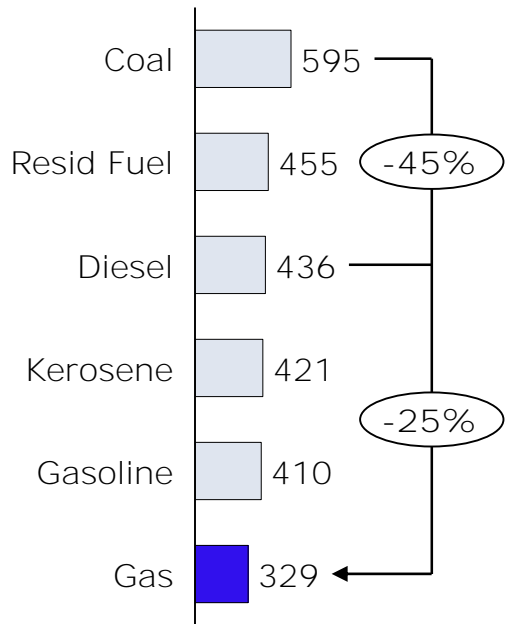
The GHG problem is fixable with today's proven technologies

But technology is not the barrier: systemic change needs innovative approaches and business models

Gas is widely seen as a transition fuel, and its increasing market share is helping to drive decarbonisation ...

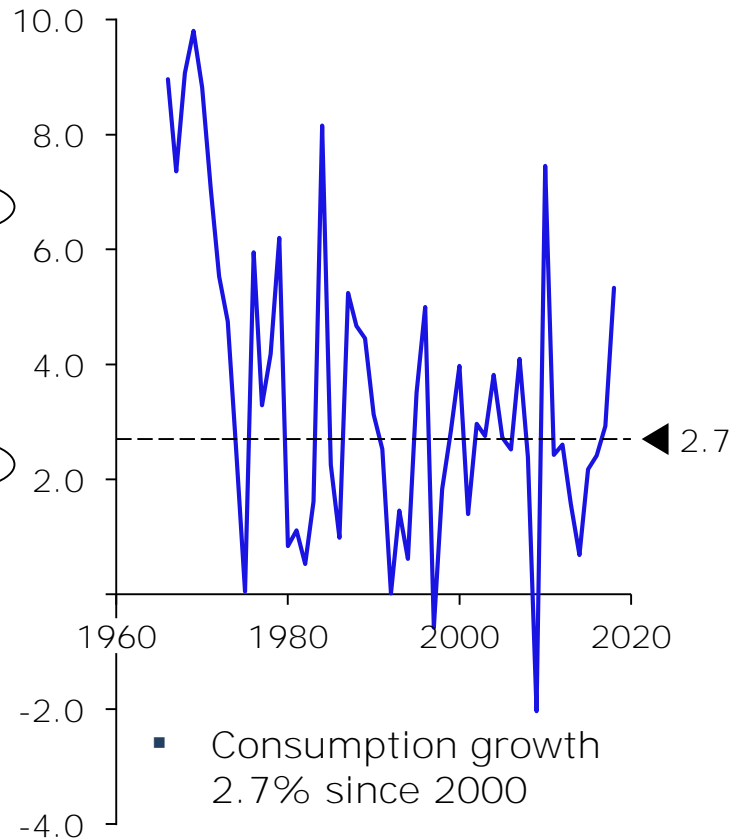
Gas has lower GHG intensity ...

Total GHG intensity (kgCO₂e/boe)



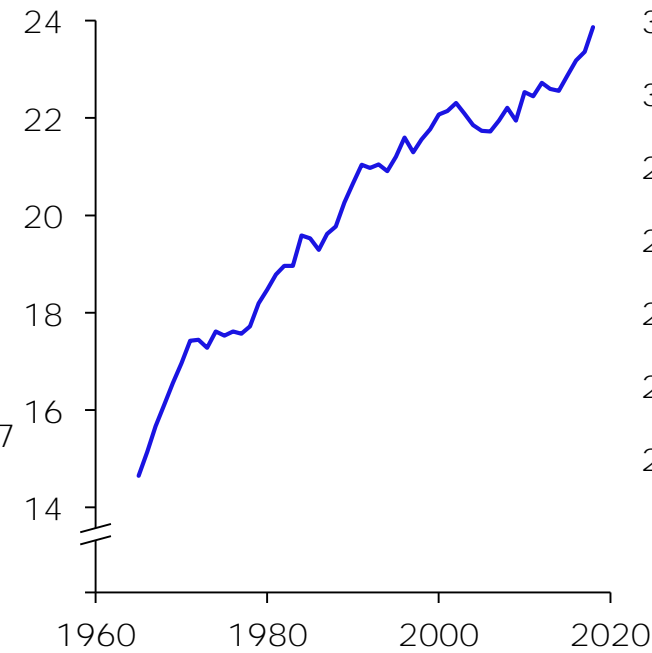
... and robust growth ...

Gas growth rate (% on prior year)



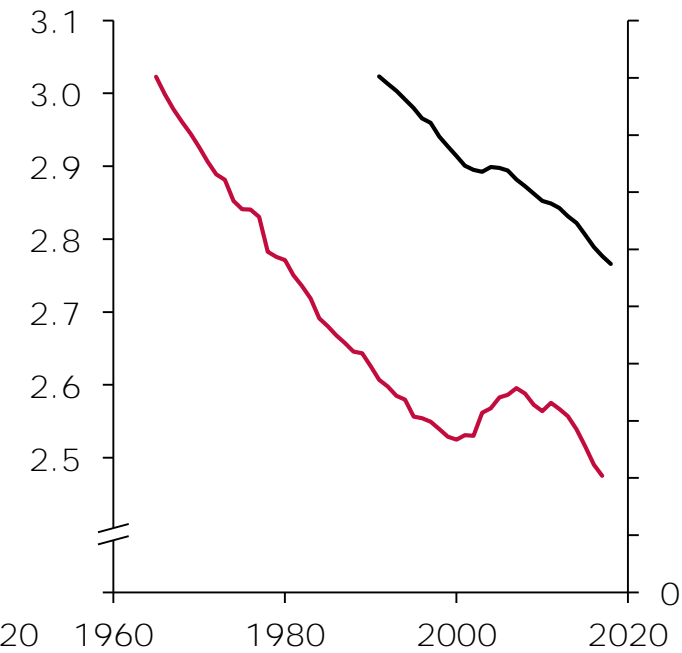
... building market share ...

Market share (% primary)



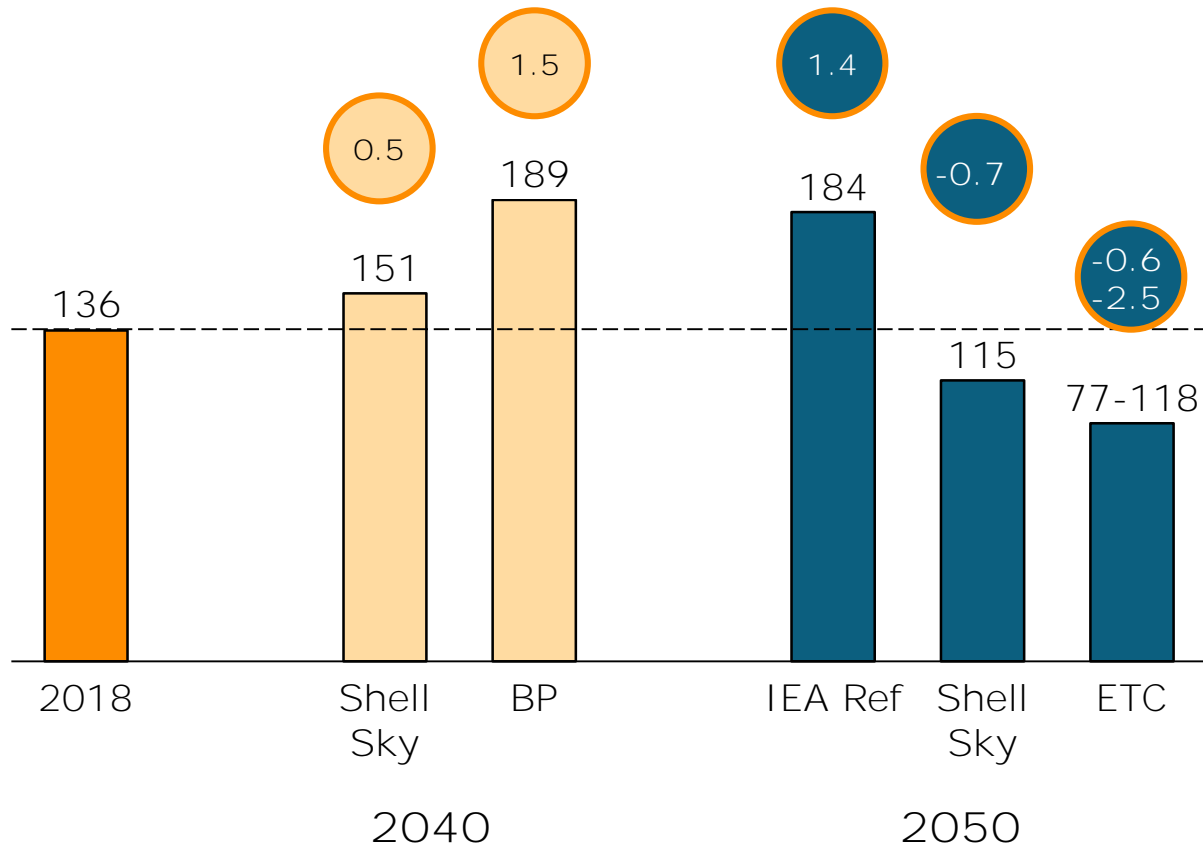
... driving decarbonisation ...

CO₂ intensity (tonnes / toe)
CO₂ intensity (g CO₂ / \$ GDP)



... and gas is expected to grow in the medium term, but the outlook in 2050 is, for gas, more challenging

Gas consumption outlook
EJ per year



Commentary

CAGR (%)

Wide range of outlooks, but with Asia and rest of China underpinning demand increase, partly by shift from coal:

- **BP: "Rapid Transition" & "Less Globalisation"** scenario sees expanded role of gas, with much higher market share
- **Shell "Sky":** sees strong gas growth in the shorter term, but losing share to stronger renewables
- **ETC "Mission Possible":** believes that gas will be replaced in core areas, remaining only for critical sectors (e.g. "Hard to Abate")

... but the industry's social license to operate is challenged by 273 BCM of gas is waste, increasing emissions and missing revenue

END USE

occurs when the gas is combusted in the end use



Primarily CO₂ with some CH₄

OPERATING

gas used in operations to power facilities



Primarily CO₂

FLARING

burning of waste gas (often incompletely)



Primarily CO₂ with some CH₄

VENTING

the deliberate release of methane



Primarily CH₄

LEAKING

the accidental release of methane



Primarily CH₄



Emissions: 273 BCM

Methane emissions are challenging, given 84x potency vs CO2

VENTING

the deliberate release of methane

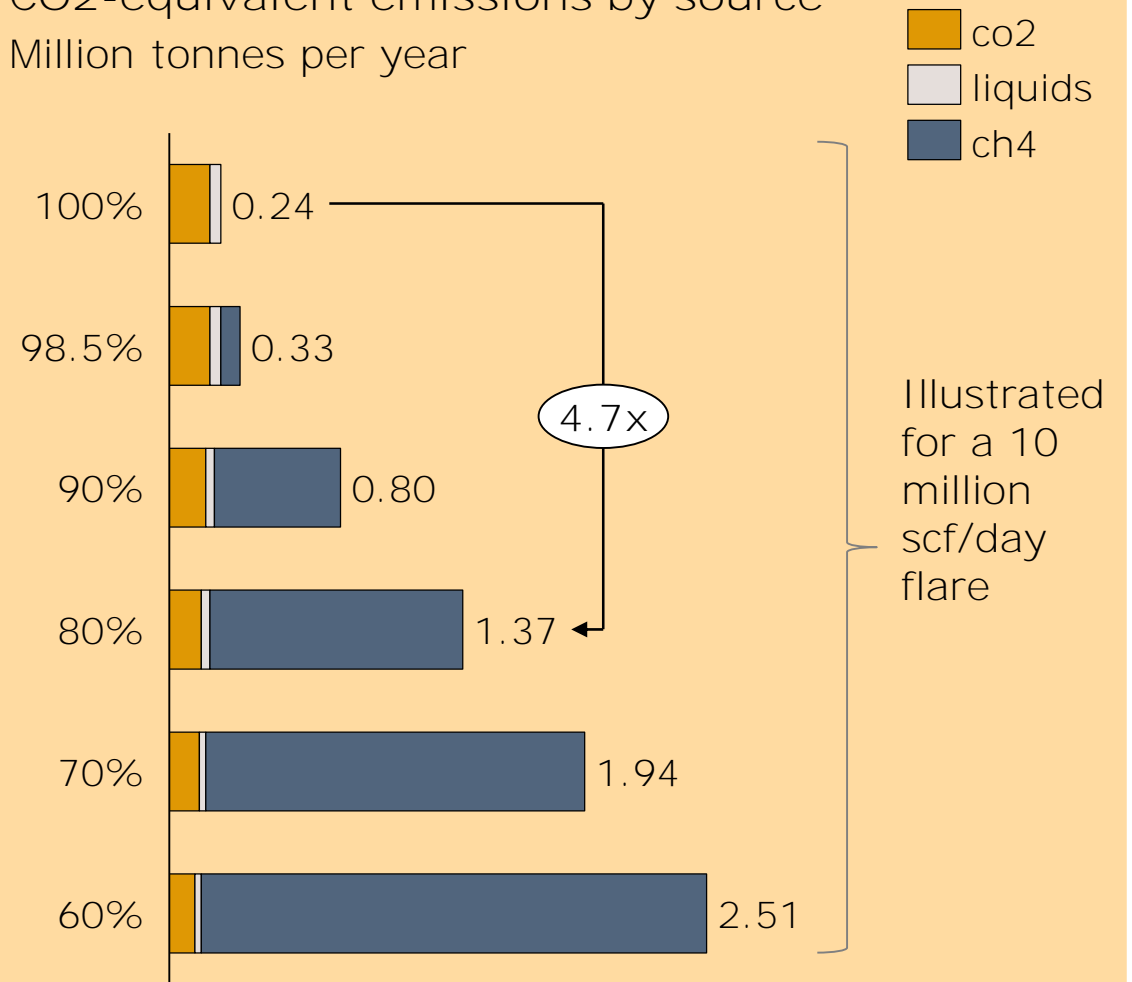
LEAKING

the accidental release of methane

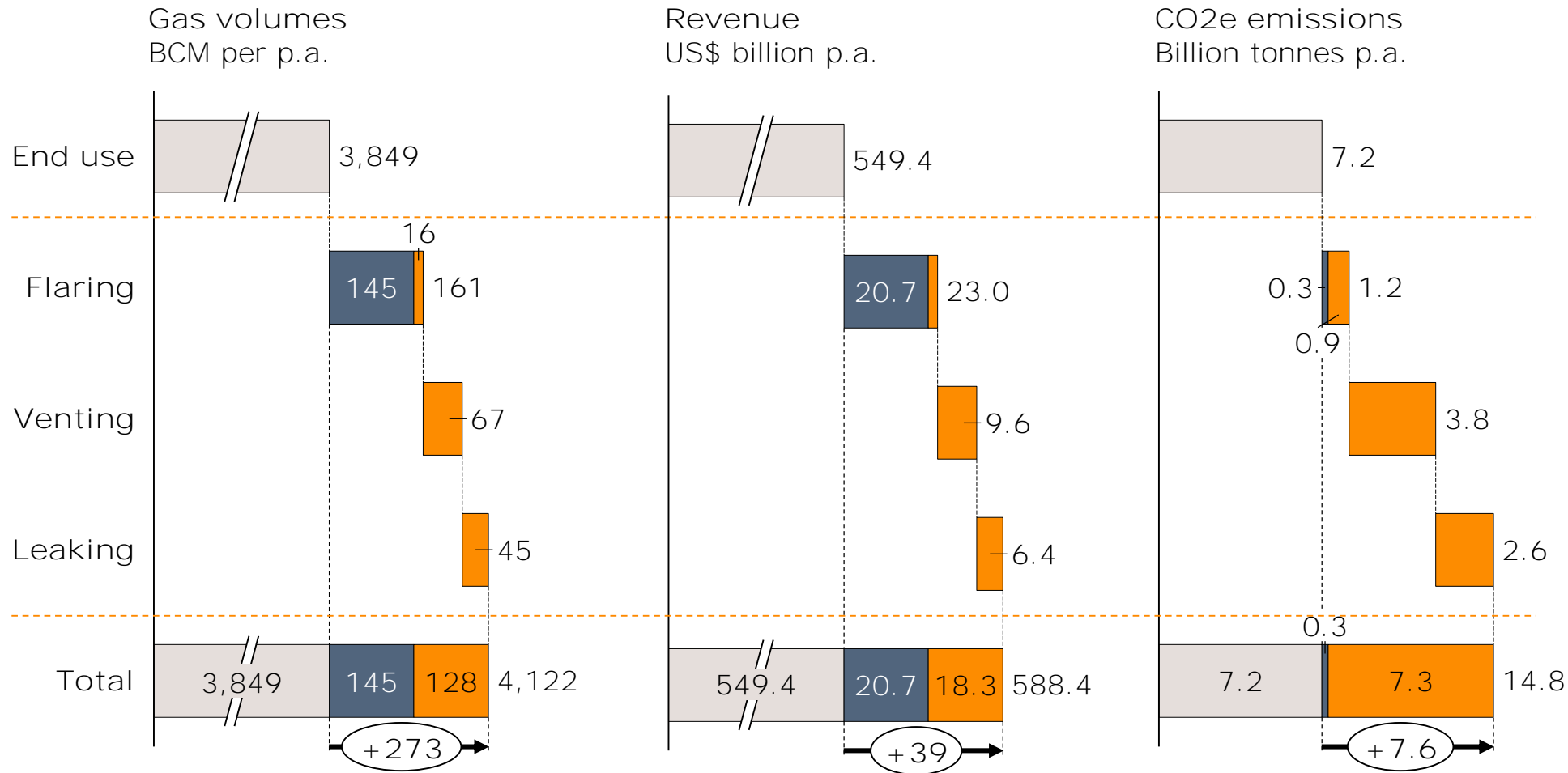


FLARING

CO₂-equivalent emissions by source
Million tonnes per year



Wasted gas is a large economic opportunity and doubles the CO₂-equivalent emissions of natural gas



- CO₂
- CH₄
- Flaring alone is equivalent to consumption of whole of Africa, or 30% of Europe
- Missed revenue \$39 billion per year (at \$4/mmbtu) – some 7% of total
- CO₂-equivalent emissions from natural gas are >100% greater when methane emissions are included

Note: gas priced at approx. global average of 4 \$/MMBTU. CO₂e emissions from methane estimated using a multiple of 84 of that of CO₂, based on a 20-year timescale. We assume methane slip is 10% at flares, due to incomplete combustion and that natural gas is predominantly methane.

Source: BP Statistical Review of World Energy (2019); World Bank / GGRF / NOAA (2019); IEA World Energy Outlook (2019); Capterio estimates

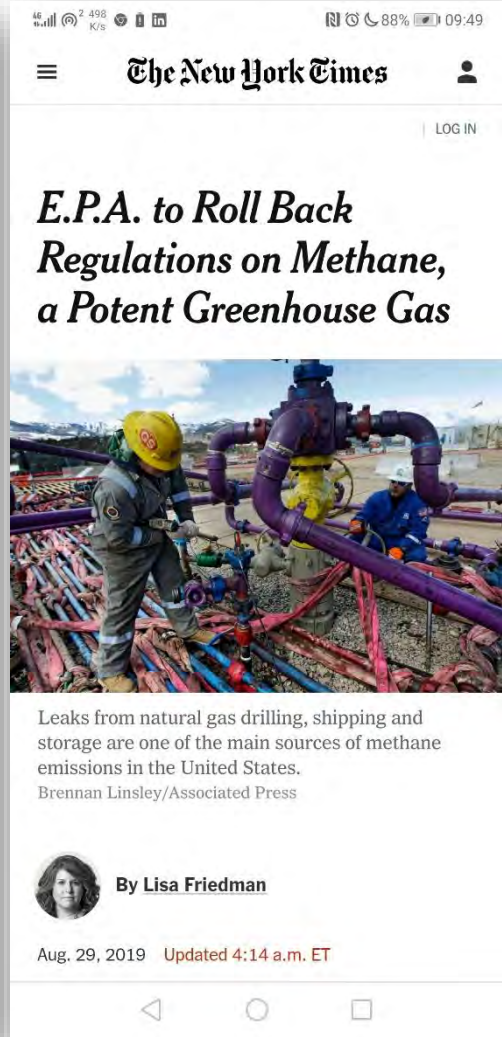
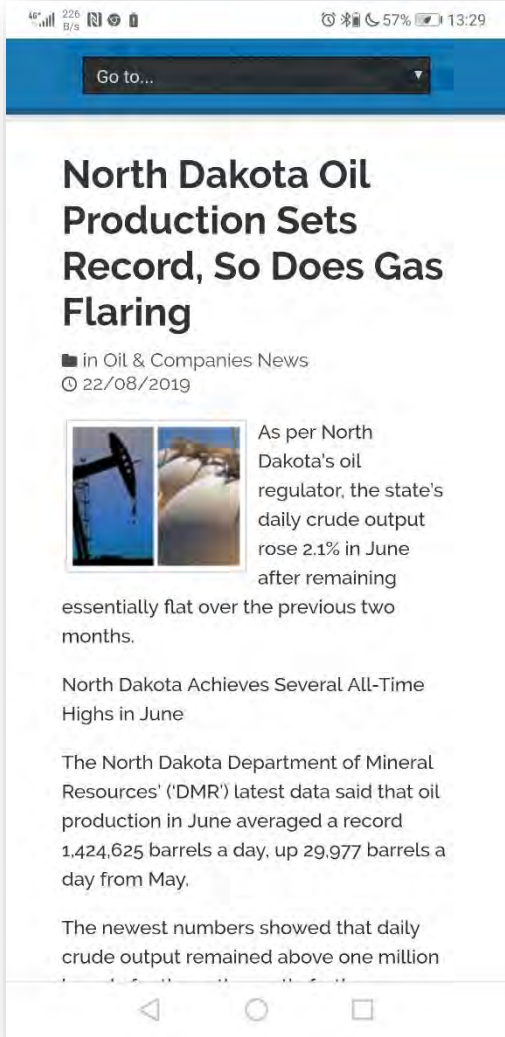
Agenda

Gas has a key role in the transition, but we must address the GHG emissions challenge

The GHG problem is fixable with **today's proven technologies**

But technology is not the barrier: systemic change needs innovative approaches and business models

Emissions from the natural gas system are daily news ... with many companies making commitments



OGCI members:



NOCs and others:

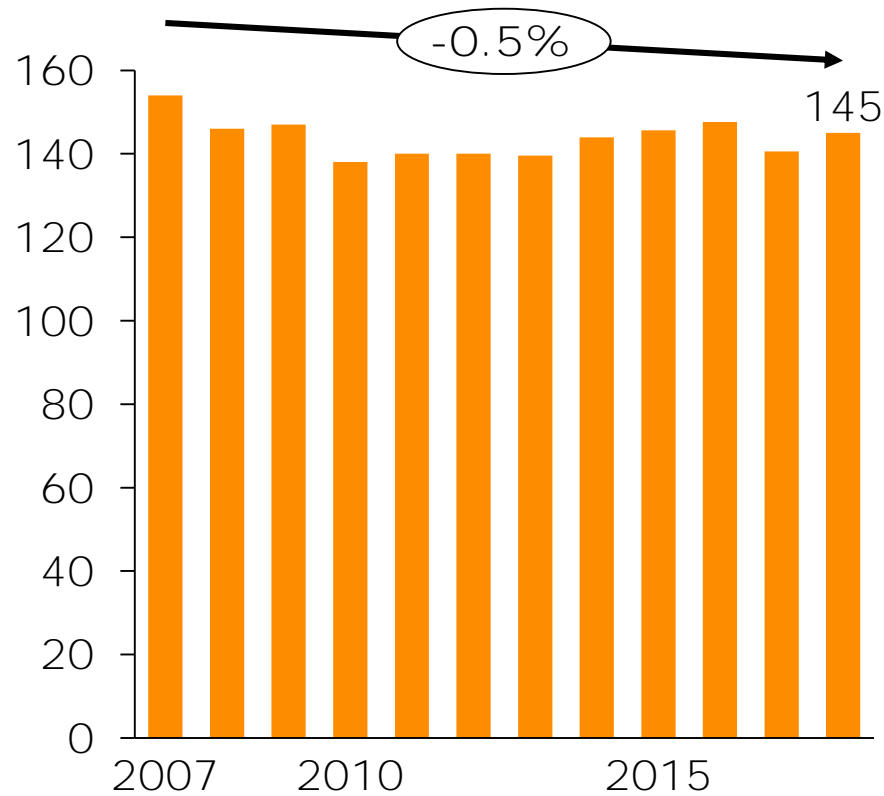


- Flaring up
- Regulation down
- Guarantees of origin?

Source: Literature searches

“Business as usual” has not made material progress on flaring due to 3 main factors

Global flared gas has not materially **reduced in a decade ...**
 BCM p.a.



... due to ...

- 1

Lack of awareness from the consumers, market and/or operators

- Awareness lacking
 - Lack of measurement / standards
 - Some operators are in denial

- 2

Capture not sufficiently commercially attractive

- Low value of gas capture
 - High unit cost
 - Lack of infrastructure

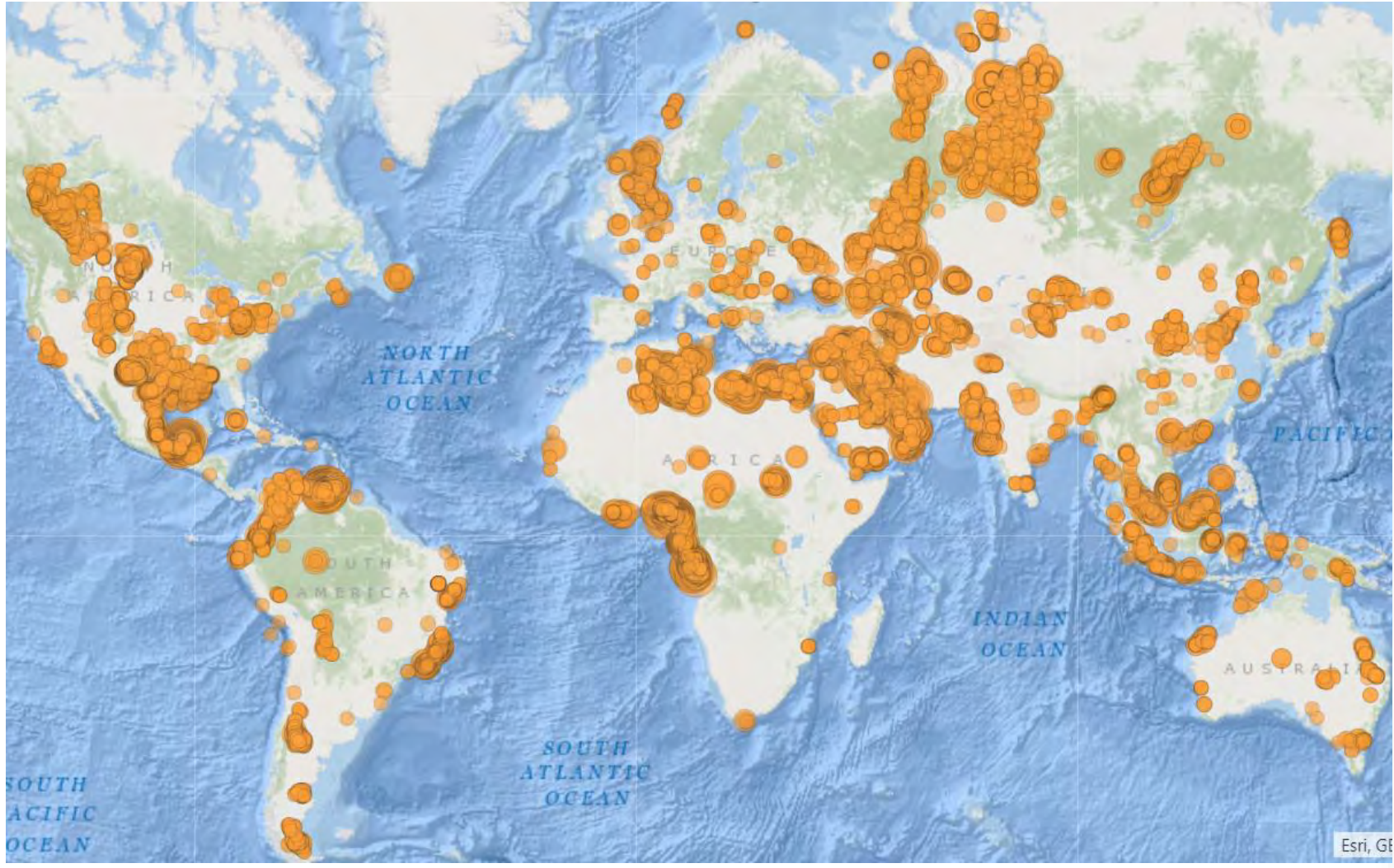
- 3

Capture is commercially attractive, but not operationally deliverable

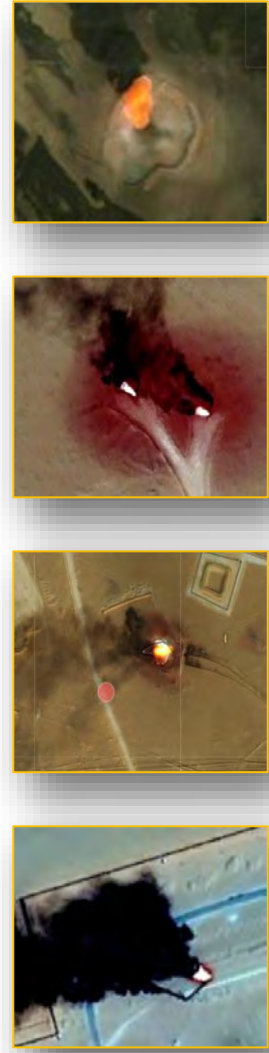
- Lack of funding from partners
 - Challenging bureaucracy
 - Lack of execution capacity

Capterio has developed a new global tool to inspect each of the 10,000 flares globally and yield unique insights

Global and country view of flares

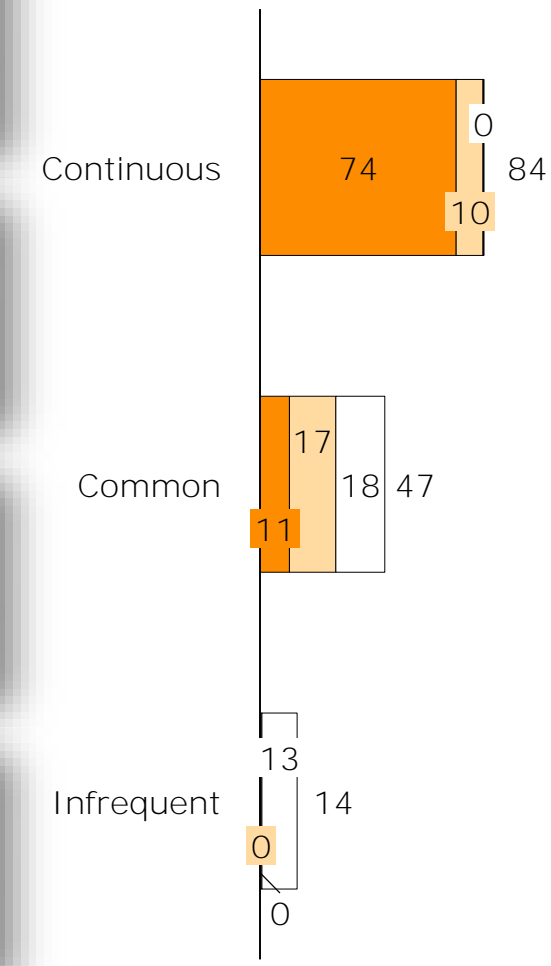


Site view



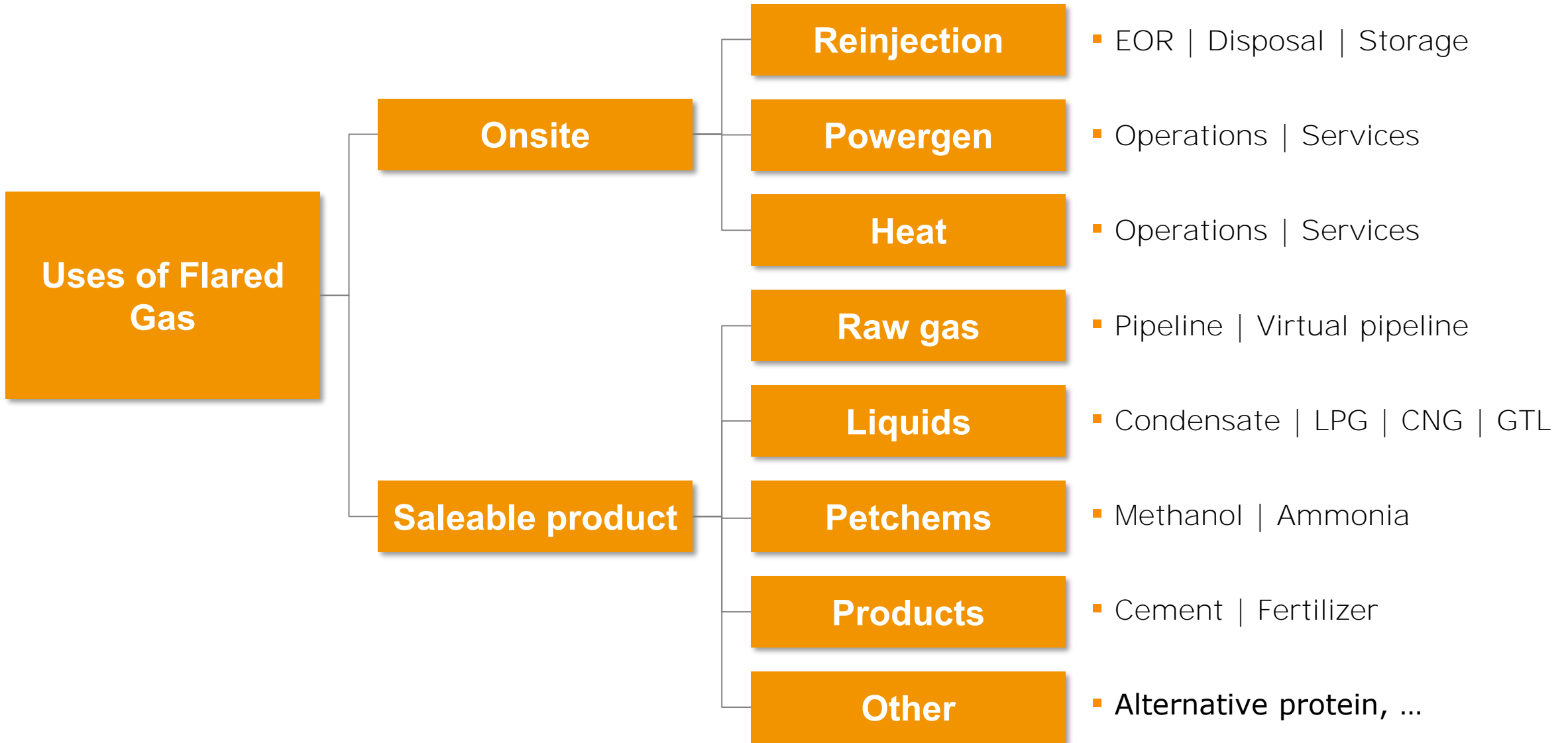
Flare frequency by flare size

- Large
- Medium
- Small

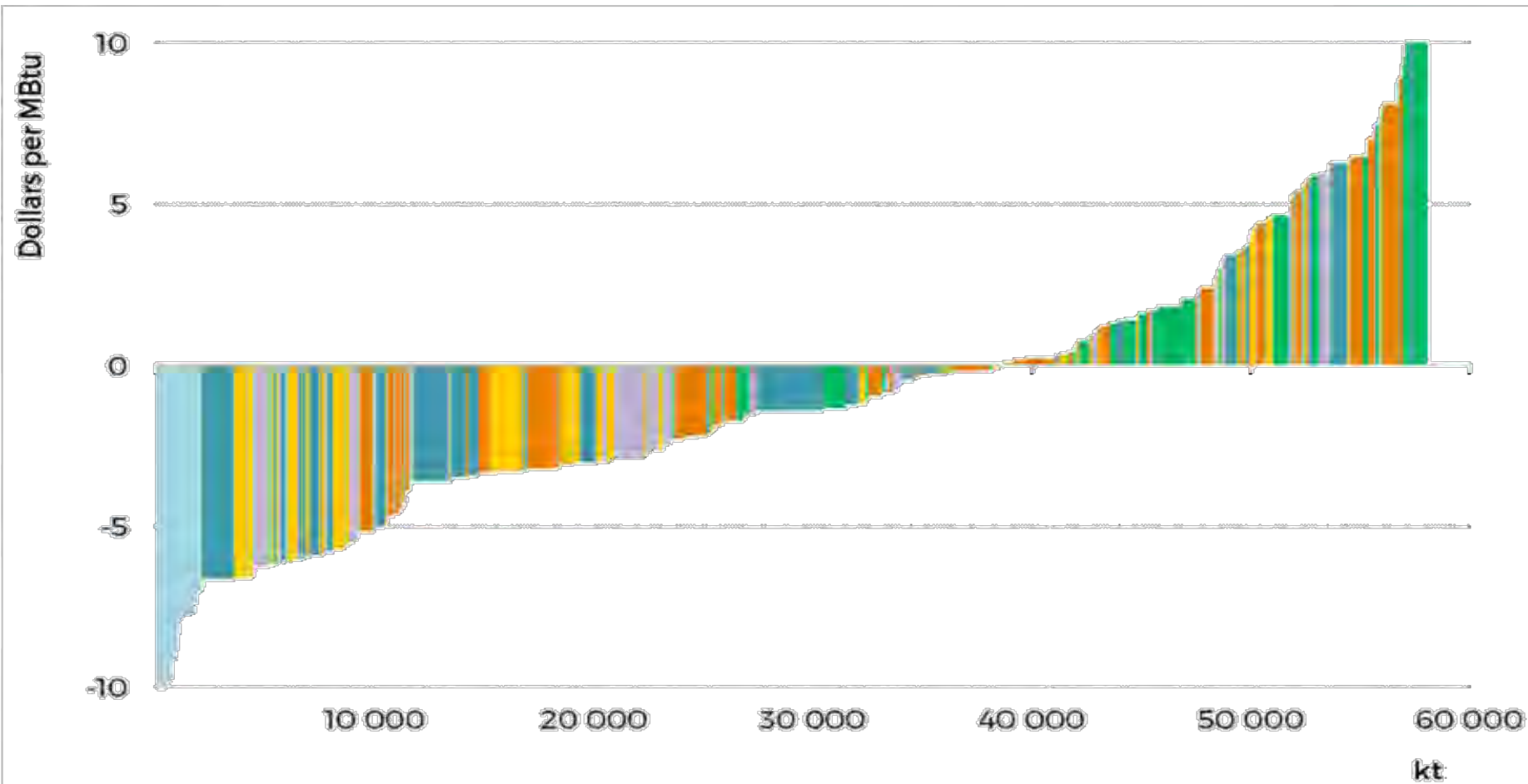


Source: Capterio Global Flare Tool; NOAA / GGFR / Colorado School of Mines

There are several proven technology options to monetise waste gas



Projects demonstrate that capturing flared gas with innovative, modular and scalable solutions can work with strong IRRs

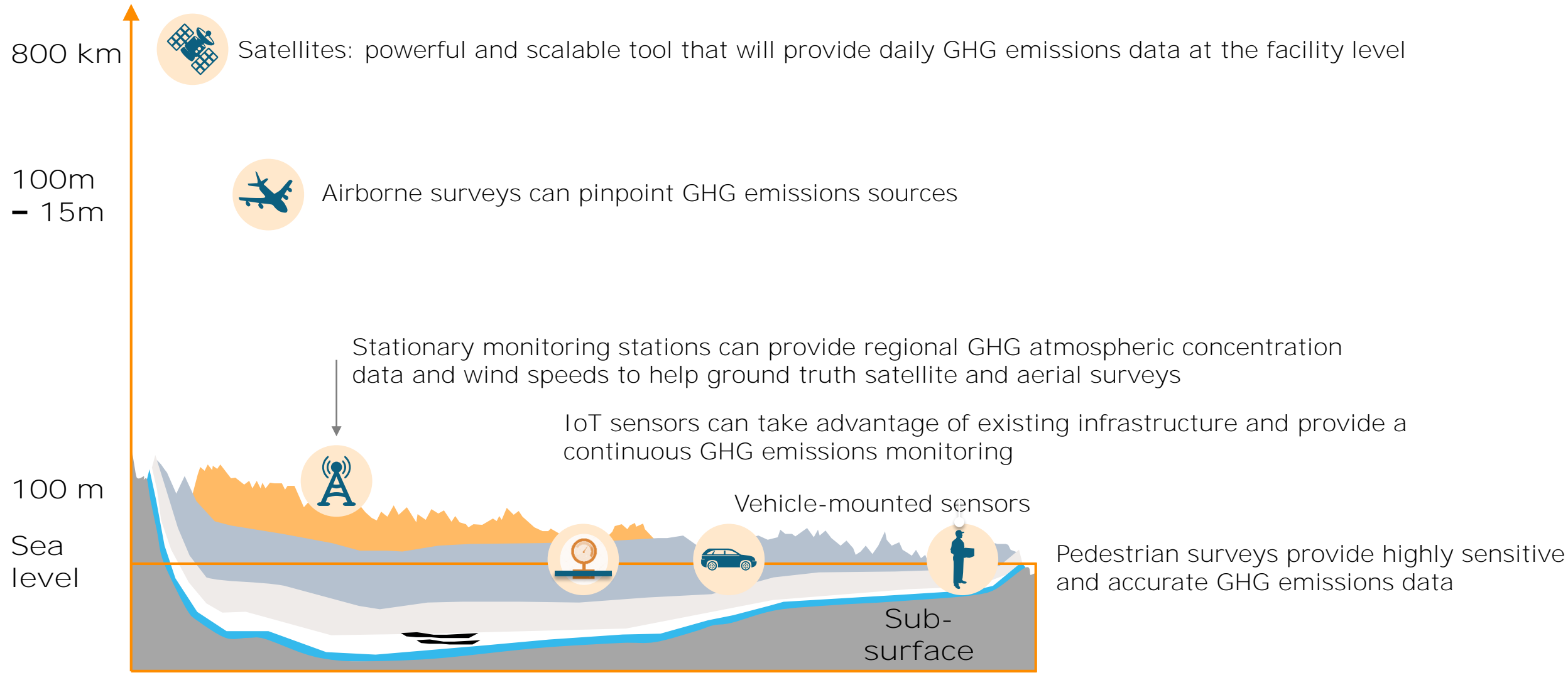


- ✓ Standardised
- ✓ Modular
- ✓ Plug and Play
- ✓ Limited FEED

- ✓ Reusable
- ✓ Rapid deployment
- ✓ Low cost

- ✓ Attractive IRRs

New technologies help to monitor and measure emissions, but so far, no all-seeing method, so integrating datasets is key ...



Source: SYSTEMIQ; RMI

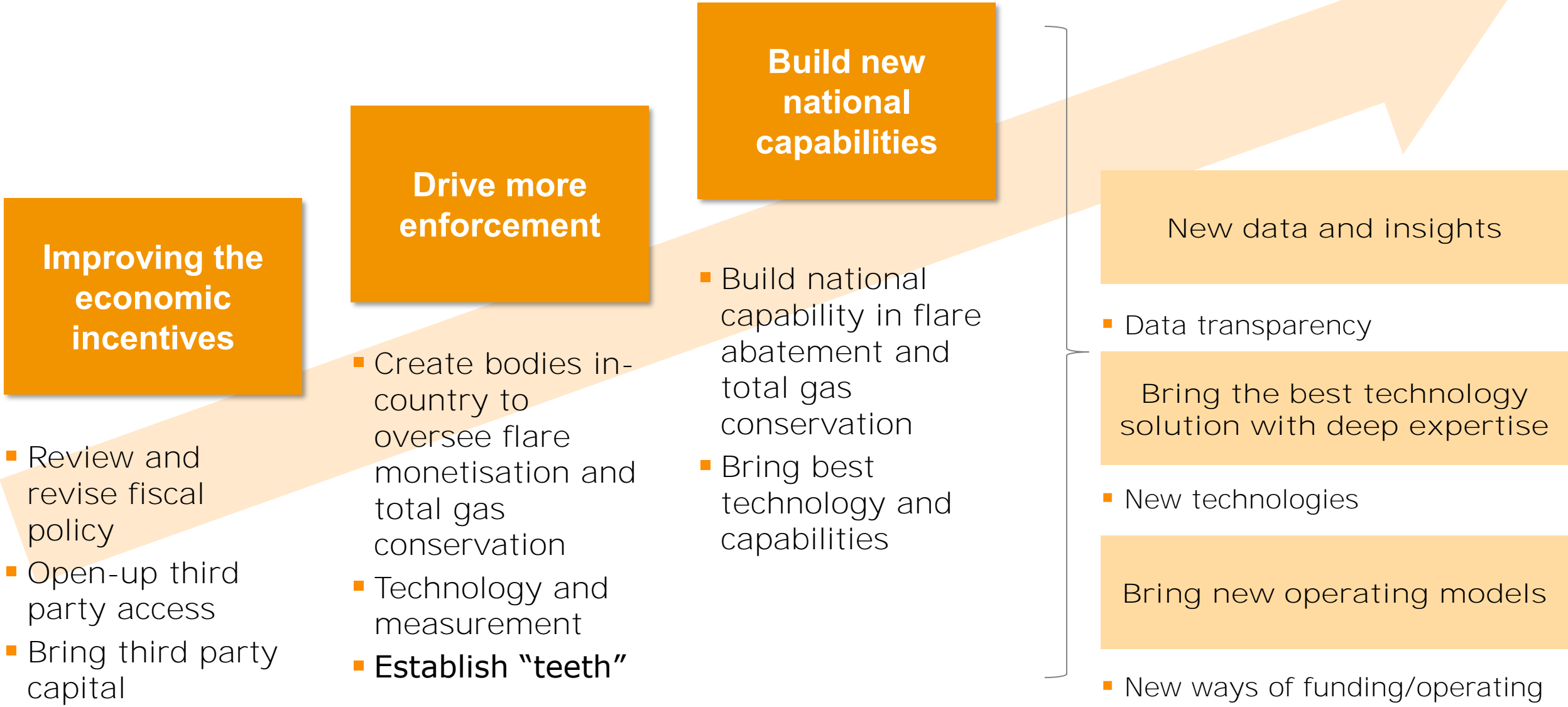
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To drive real change in the upstream, many countries will need to consider change, supported by new types of players



A very clear message is becoming evident ...

M



IT MUST BE DONE

It's critical to the industry – and the planet – that the GHG emissions of natural gas are reduced

C



IT CAN BE DONE

Technologies can be applied in upstream production and downstream consumer areas to drive change

P



IT PAYS TO DO IT

Solving the issues are a triple win: for asset owners, national government, consumers (and the planet)

A photograph of a gas flare at an industrial site, showing a large, bright orange and yellow flame rising from a black metal structure against a clear blue sky. The flare is positioned on the left side of the slide, partially overlapping the orange background.

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