Petroleum Exploration Society of Great Britain

GEOSCIENCE in the ENERGY TRANSITION

Special Interest Group

PESGB

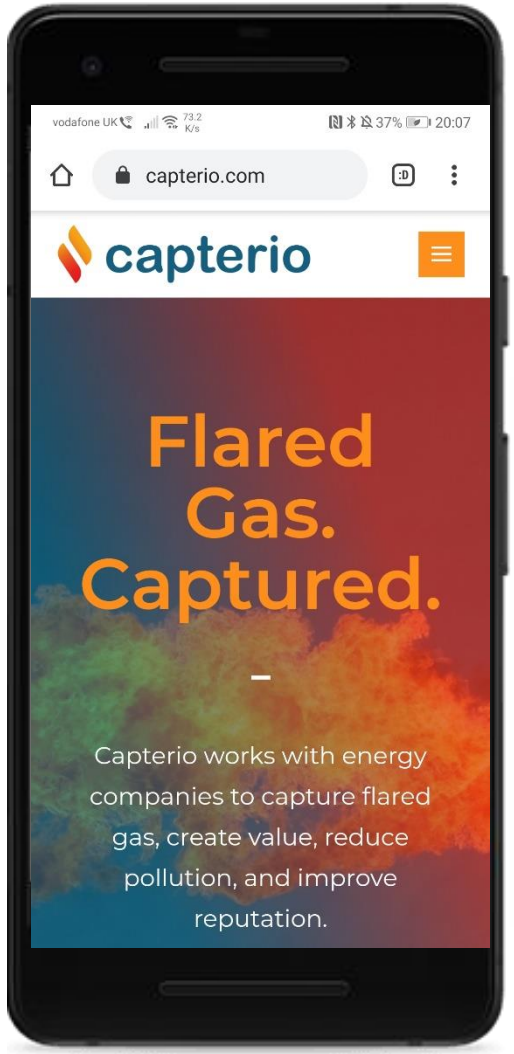
FLARING: THE $20 BILLION DECARBONISATION LEVER

Dr Mark Jonathan Davis
CEO, Capterio

mark.davis@capterio.com
+44 7552 050 089

FREE for PESGB members – Thursday 18th June - 6pm

Capterio is a project developer focussing on monetising flared gas



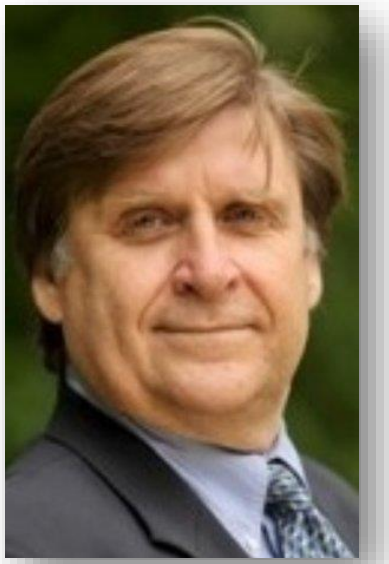
www.capterio.com

Monetising flared gas to create value, reduce pollution and improve reputations

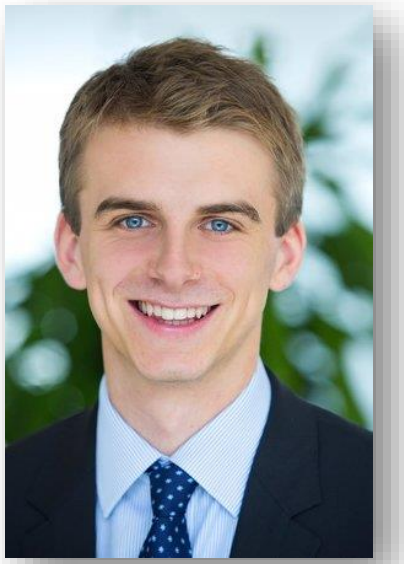
We bring together assets, technologies and financing

We invest in on-the-ground flare monetisation projects, powered by data and AI

- **Dr Mark Davis**
- *CEO*
- Geophysicist



- **Brian Hepp**
- *COO*
- Process engineer



- **John-Henry Charles**
- *Commercial analyst*
- Geologist

- **Dr Stuart Lake**
- *Senior Advisor*
- Geologist

Source: Capterio

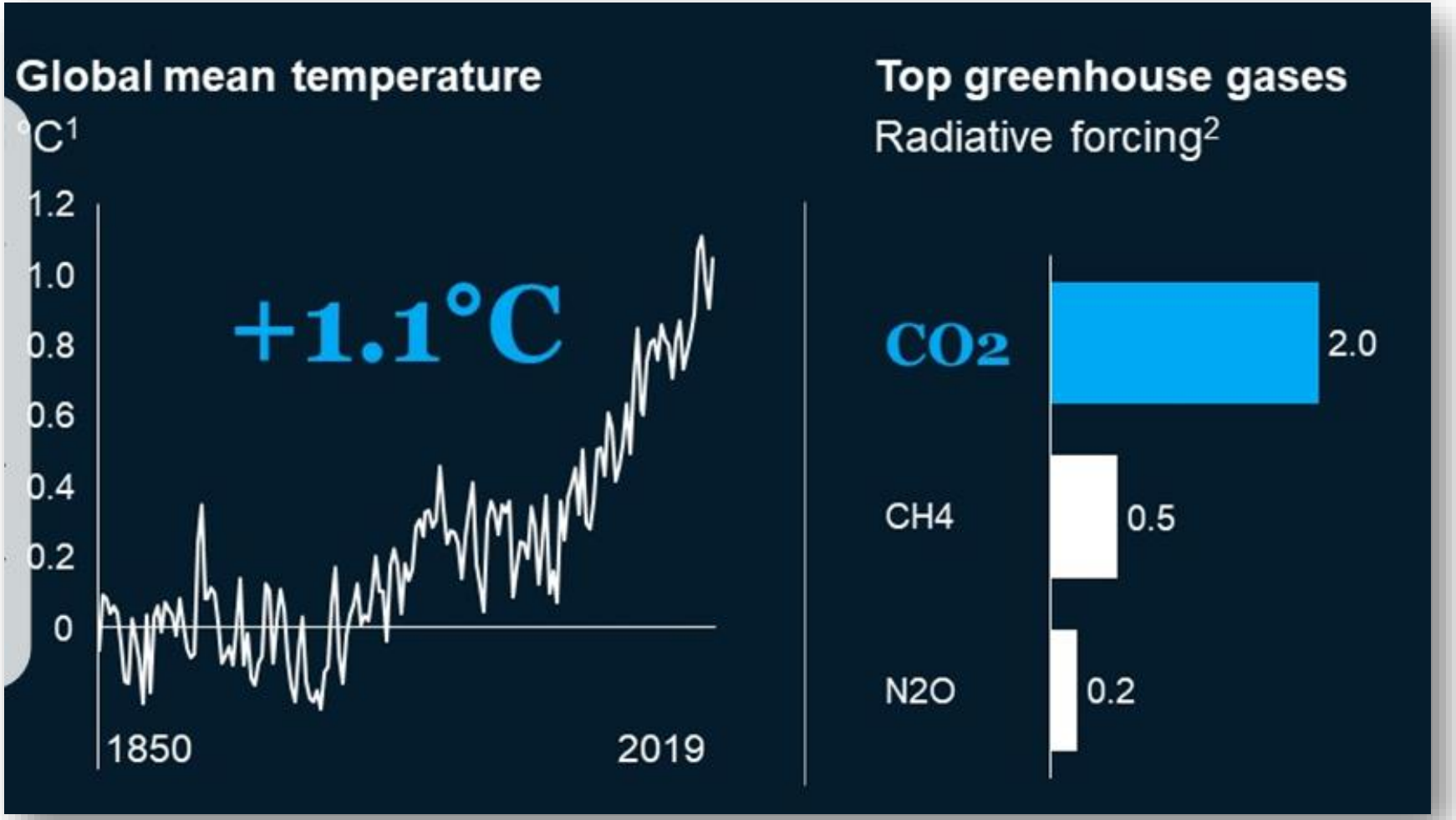
Agenda

Gas flaring today: what and why

Solving gas flaring: how

The role of the geoscientist in gas flaring

The climate crisis is an unprecedented challenge. Oil and gas companies have a key role … and many are leading the path to net zero



- Global warming has already reached +1.1 degrees, driven mostly by CO2
- We emit more than 40 Gt of CO2 per year (34 Gt from energy)
- 4 ways to reduce emissions
  1. Reduce demand
  2. Change how we power our lives
  3. Scale up a "carbon management" industry
  4. Tackle "other" emissions
- Oil and gas industry must – and wants – to be part of the solution
- COVID-19 is accelerating the imperative and arguably is a "fire drill" for change

Source: McKinsey article: Climate math: What a 1.5-degree pathway would take?, 5 May 2020; BP Statistical Review of World Energy (2020)

Flaring is a major source of economic and environmental waste

- Flaring is the deliberate combustion of waste natural gas, usually "associated gas" from oil production
- Flaring generally happens because dealing with the gas (disposal, or to a useful product) is often or sometimes deemed uneconomic
- Flaring is a large source of economic and environmental waste and is becoming increasingly unacceptable
- Few regions report data publicly

Source: Capterio

Flaring is a major source of economic and environmental waste

Source: Capterio Global Flaring Intelligence Tool (GFIT), NOAA

There was a time when exploration success symbolised by flaring …

Gas discovered in Sharjah for the first time in 37 years

The Sharjah National Oil Corporation and its Italian partner ENI, have announced a successful new discovery of natural gas and condensate onshore at the Mahani field in Sharjah.

The discovery at Mahani-1 exploration well, with flow rates of up to 50 million standard cubic feet per day, comes within the first year of the partnership and represents the first onshore discovery of gas in the Emirate since the early 1980's.

Mahani-1 well was drilled at a total depth of 14,597 feet, which resulted in the discovery of gas with the associated capacitors in the formation of the Thumama. The size of the discovery will be estimated in time in light of expectations for further evaluation and development.

The Mahani-1 exploration well, located in the Area B Concession, is the first exploration well drilled by SNOC following the acquisition of a new 3D seismic survey covering the territory, the national energy company said in a statement. SNOC, which is the operator of Area B, and ENI both hold a 50% stake in the discovery as part of a Concession Agreement that was signed in early 2019. The two companies are also partners in the Concession Areas A and C, also located onshore Sharjah.

Sheikh Ahmed Bin Sultan Al Qasimi, Deputy Ruler of Sharjah and Chairman of Sharjah Oil Council, congratulated His Highness Dr. Sheikh Sultan Bin Muhammad Al Qasimi, Supreme Council Member and Ruler of Sharjah, on the historic discovery that is set to bolster the Emirate's resources and contribute to its energy reserves, creating sustainable development and positive economic environment in the country.

A Mahani field in Sharjah.
WAM

His Highness emphasised that the Mahani discovery fulfills the Emirate's commitment to make reliable and sustained gas supplies available throughout the United Arab Emirates. Sharjah provides strategic energy infrastructure to help the nation meet the growing demand for energy by residential, industrial and public utility consumers. This will also help attract more investments into Sharjah's industrial sector.

Sheikh Ahmed Al Qasimi said that the discovery supports Sharjah's development process and will work to bring about major transformation in the industrial and commercial fields in the Emirate, by providing it with energy resources and attracting top global companies and institutions to invest in various sectors of Sharjah.

Speaking on the occasion, Sheikh Sultan Bin Ahmed Al Qasimi, President of SNOC, congratulated the people of the Emirate on the exciting new discovery, which will reflect positively on the economic sector in Sharjah and the goals of sustainable development, energy security, decent livelihoods and the wellbeing of people, as envisioned by the Sharjah Ruler.

He pointed out that the new gas field constitutes an important addition to support the Emirate's economy, which is classified as strong and stable, and would enhance its economic competitiveness. He expressed confidence that this would help attract more industrial investments to Sharjah and generate greater revenue resources, contributing to the Emirate's stability and financial sustainability.

The Chairman of SNOC stressed that Sharjah enjoys a number of unique advantages that make it one of the vibrant global economic centres for its financial dynamism, high GDP and its economic diversity, in addition to low public sector debt and fiscal deficit.

For his part, Sheikh Khalid Bin Abdullah bin Sultan Al Qasimi, Chairman of the Department of Seaports and Customs, Sharjah, underscored the strategic importance of the gas field discovery and its role in bolstering the economic status of Sharjah in line with the vision of the Ruler of Sharjah.

Sheikh Khalid Bin Abdullah Bin Sultan Al Qasimi said that the discovery marks a major achievement for the Emirate and would help reinvigorate all sectors by generating more industrial and commercial projects. "Since energy is one of the key drivers of development, the Mahani discovery would significantly augment the economic capabilities and industrial output of the Emirate and support its financial resources in a way that achieves more of the prosperity that the Emirate has witnessed for decades," emphasised the senior Sharjah official.

WAM

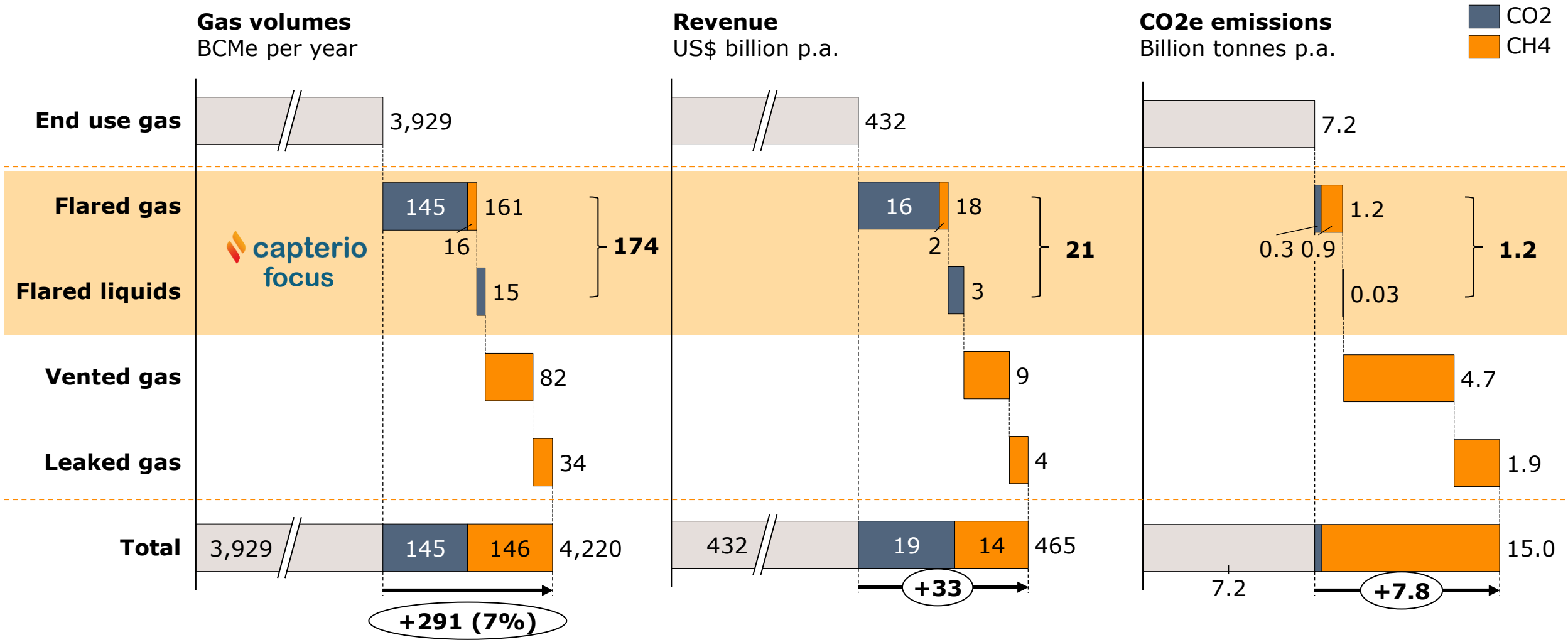
MORE: P4,B19

SHARJAH

The discovery will reflect positively on the economic sector and the goals of sustainable development, energy security, decent livelihoods and the wellbeing of people, as envisioned by the Sharjah Ruler.

Source: Newspaper article, Q1 2020

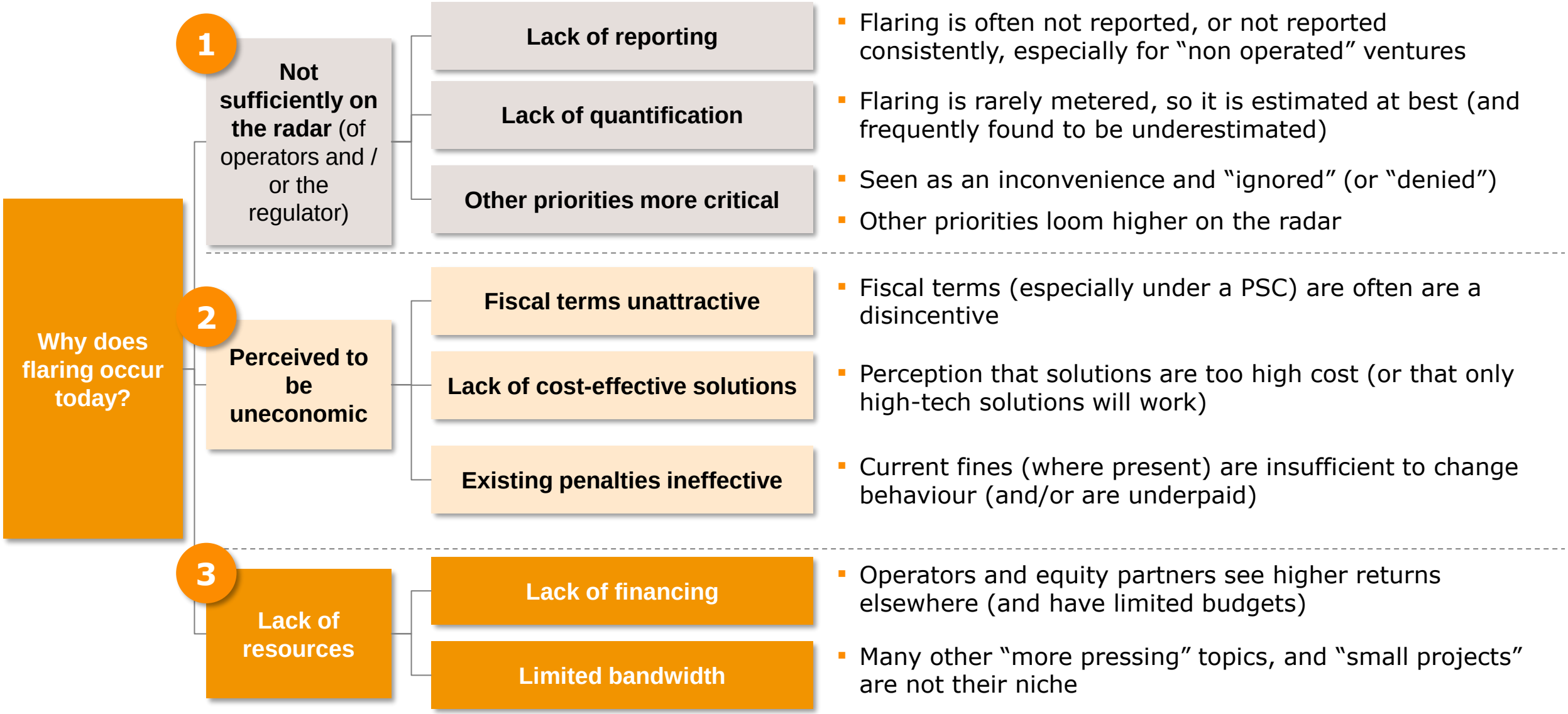
Flaring is a major source of emissions and revenue loss



Note: gas assumed at global average of $3/MMBTU and oil at $40/bbl. CO2e emissions from methane estimated using a multiple of 84 of that of CO2, based on a 20-year timescale. Assume combustion efficiency is 90% at flares, due to incomplete combustion & natural gas is predominantly methane. Assuming 15 barrels of liquids are emitted per mmscf of gas.

Source: BP Statistical Review of World Energy (2020); World Bank / GGFR (2019); IEA World Energy Outlook (2020); Capterio estimates

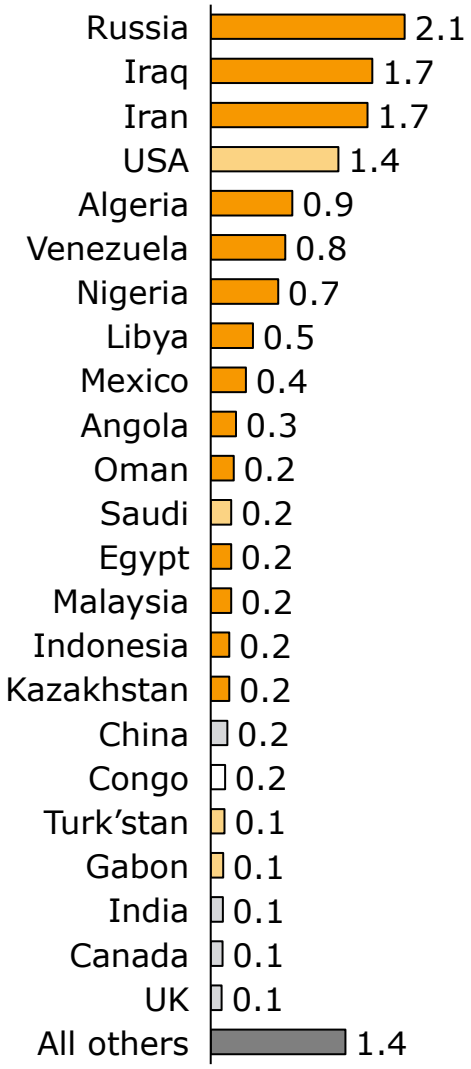
Our research identifies 3 "root causes" to gas flaring



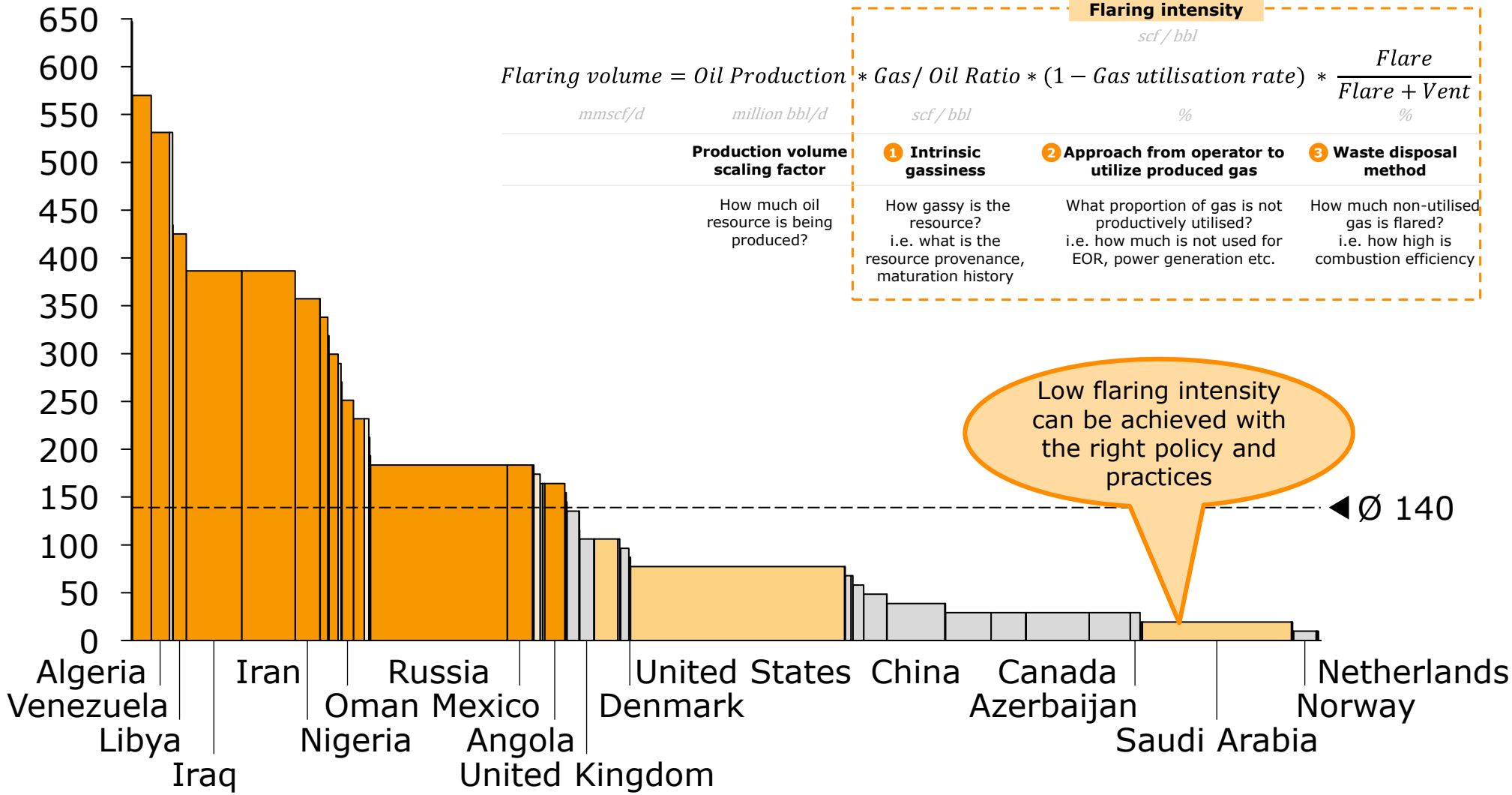
Source: Capterio

Countries have widely-differing performance on gas flaring

Gas flaring
bcf/d, 2018



Gas flaring compared to oil production
Scf per barrel of production per day, coloured by rank of absolute flaring volume



Flaring intensity

$$\underset{\text{mmscf/d}}{Flaring\ volume} = \underset{\text{million bbl/d}}{Oil\ Production} * \underset{\text{scf / bbl}}{Gas/\ Oil\ Ratio} * \underset{\%}{(1 - Gas\ utilisation\ rate)} * \underset{\%}{\frac{Flare}{Flare + Vent}}$$

Production volume scaling factor	1 Intrinsic gassiness	2 Approach from operator to utilize produced gas	3 Waste disposal method
How much oil resource is being produced?	How gassy is the resource? i.e. what is the resource provenance, maturation history	What proportion of gas is not productively utilised? i.e. how much is not used for EOR, power generation etc.	How much non-utilised gas is flared? i.e. how high is combustion efficiency

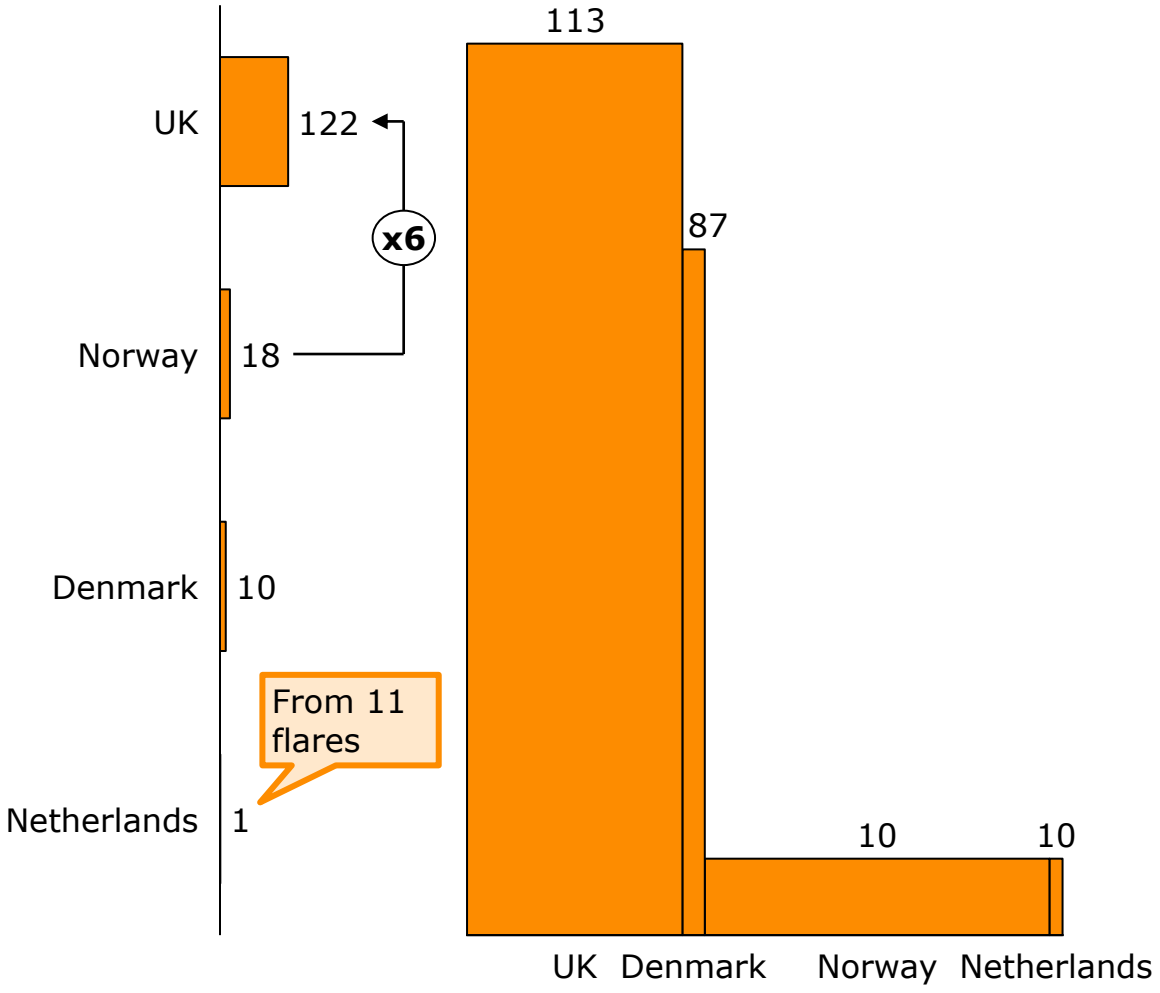
Low flaring intensity can be achieved with the right policy and practices

Source: Capterio analysis; World Bank; BP Statistical Review of World Energy. Excluding Yemen, Syria, Gabon, Cameroon, Uzbekistan

Norway and Netherlands have lowest flaring intensities in Europe

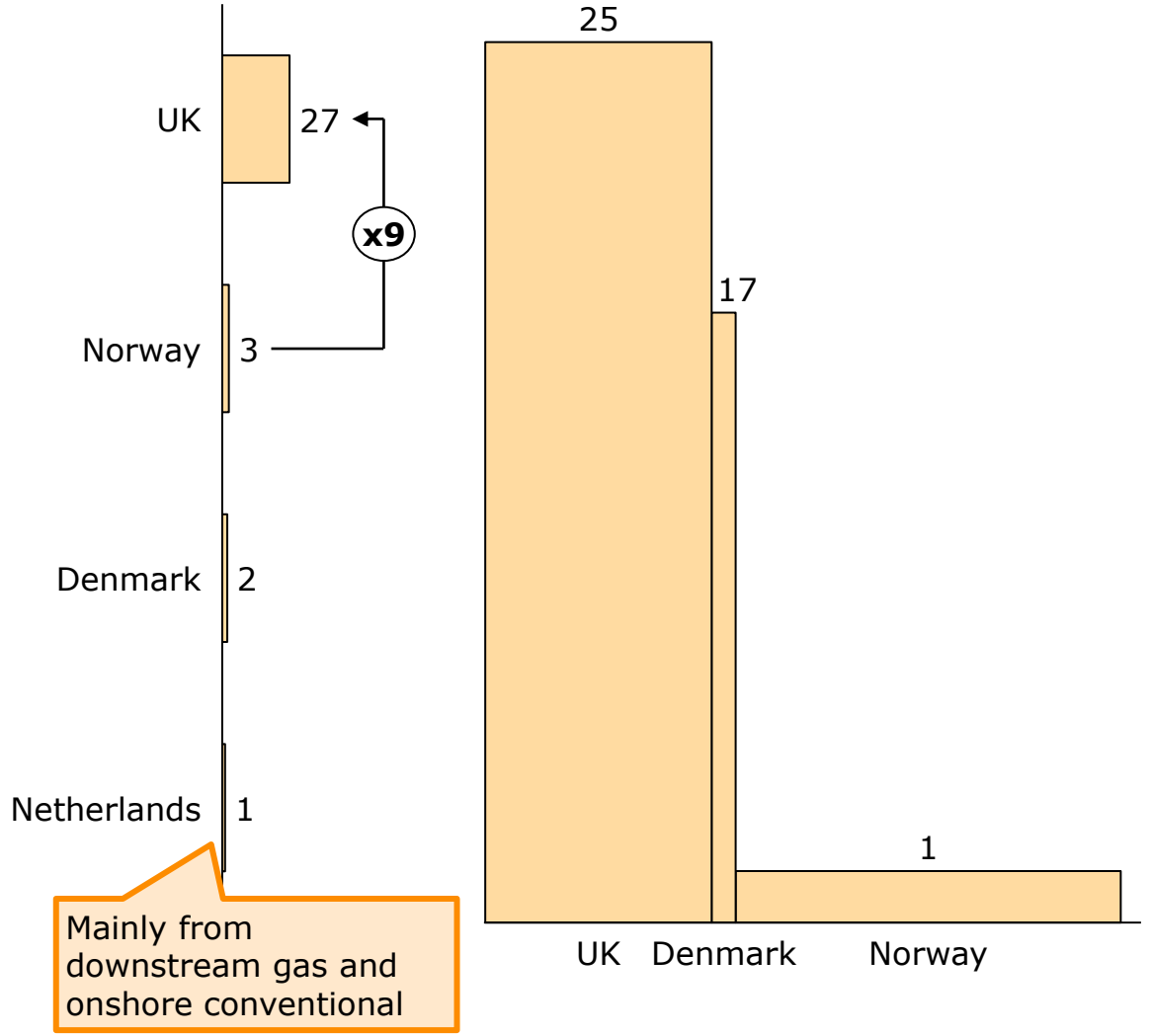
Gas flaring
Mmscf/d

Gas flaring compared to oil production
Scf per barrel vs million barrels per day



Venting
Mmscf/d

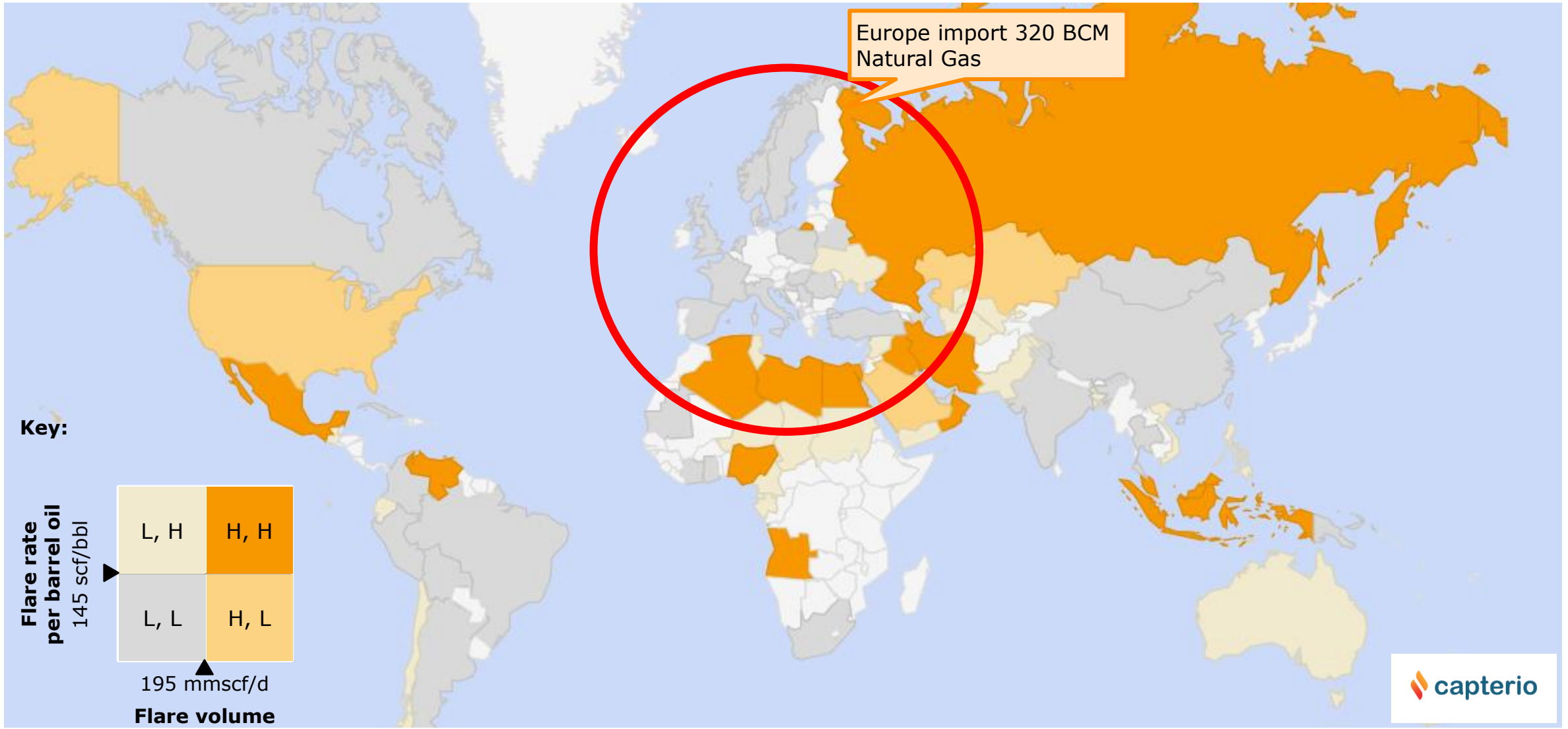
Venting compared to oil production
Scf per barrel vs million barrels per day



Source: IEA, BP Statistical Review, World Bank GGFR, Capterio

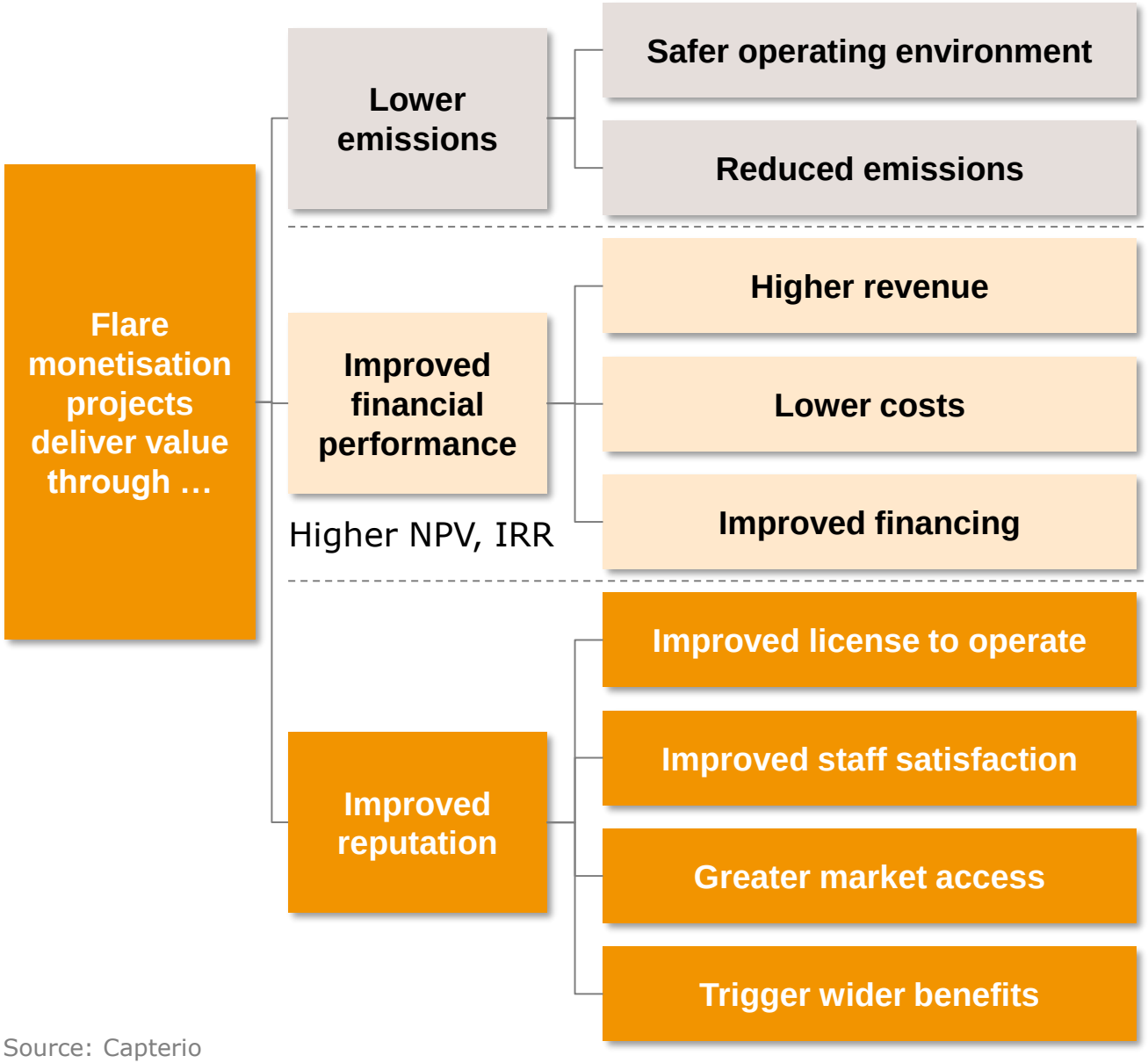
Gas consumers will increasingly be choosing "lower emission" gas

Gas flaring scale (volume flared) and intensity (flares per barrel of oil production) map



Source: Capterio analysis; World Bank; BP Statistical Review of World Energy

There are several advantages of flare optimisation projects



- Reduced risk of accidents | Healthier operating conditions
- Lower emissions of CO2, CH4, NOx, SOx, black carbon
- More product to sell, better uptime, greater reserves and field life, better market access
- Lower powergen costs, lower downtime & maintenance, longer equipment life, lower penalties, lower risk
- Improved access to financing, investability and lower cost of capital
- Improved reputation with NOC, government and better community relations
- Better internal company perception / Better motivated staff with lower turnover
- Greater market share (or pricing potential) associated with lower supply-chain emissions
- Improve country / NOC reputation | Stimulate new capability / industry development | Create jobs in this an other sectors | Attract greater in-country investment

Source: Capterio

Agenda

Gas flaring today: what and why

Solving gas flaring: how

The role of the geoscientist in gas flaring

There are many technologies that can reduce gas flaring, but to solve it, we need to address each of the root causes

- Local operations
  - Reinjection — EOR | Disposal | Storage
  - Powergen — Operations | Services
- Saleable product
  - Raw gas — Pipeline | Virtual pipeline | CNG
  - Liquids — Condensate | LPG | GTL | LNG
  - Petrochemicals — Methanol | Ammonia | Urea
  - Products — Cement | Fertiliser | Bio services
  - Other — Computing | Other

capterio main focus

- Many companies assume that "leading technology" is required to solve flaring
- But technology is, in general, not the issue in non-OECD countries

Source: Capterio

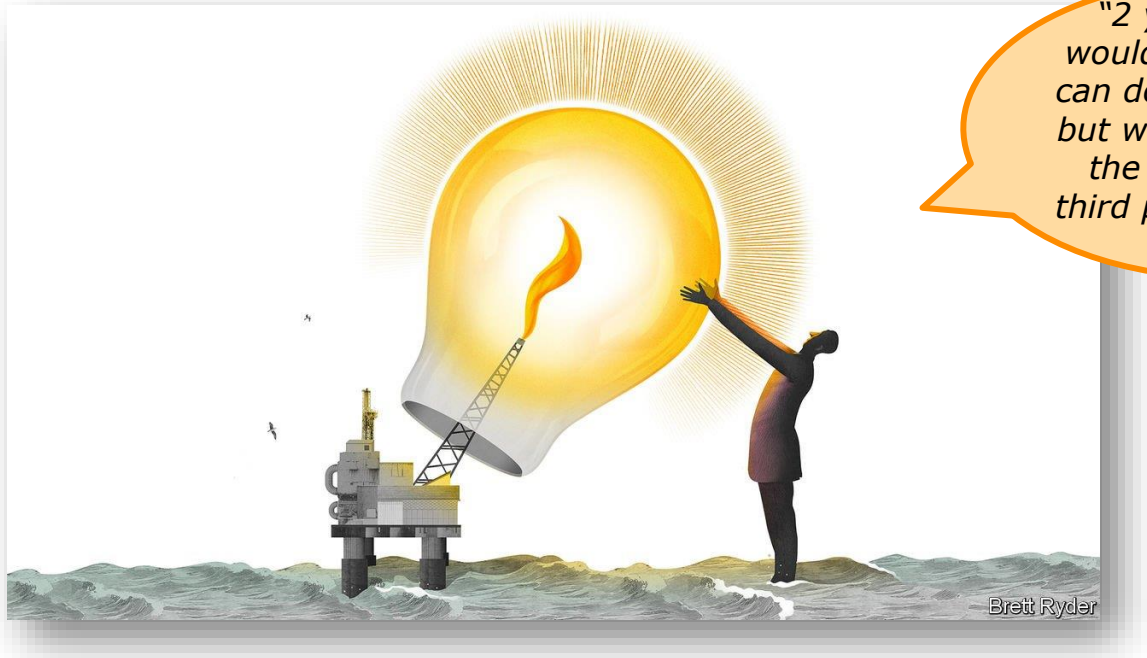
New business and operating models can accelerate change

Root causes

Not sufficiently on the radar

Perceived to be uneconomic

Lack of resources



"2 years ago we would have said 'we can do it ourselves' – but we didn't. Now is the right time for third party funding" - IOC

- Simpler organisations
- Better accountability
- Greater flexibility
- More impact focus
- Provide bandwidth to free-up focus

- Mismatch of "intent" and "execution capacity"
- Many flare reduction projects require "small" investments and are "non-core"
- To deliver flare capture projects, industry needs more innovative, nimble, flexible, and efficient approaches that bring third-party capital and resources

"In today's capital-constrained world we are very interested to find innovative commercial structures" - IOC

"We are missing business models to take companies and scale them" – Pratima, OGCI CEO

Source: Capterio

Agenda

Gas flaring today: what and why

Solving gas flaring: how

The role of the geoscientist in gas flaring

Geoscientists and explorers have a critical role in reducing flaring

Bridge between exploration and development

- Ensure excellent communication between disciplines
- Planning around reservoir and fluid performance
- Upfront analysis for associated gas (avoid retrofits)

Accelerate waste gas storage or use

- Identify upfront disposal / storage / EOR opportunities
- Accelerate CCS (and CCUS)

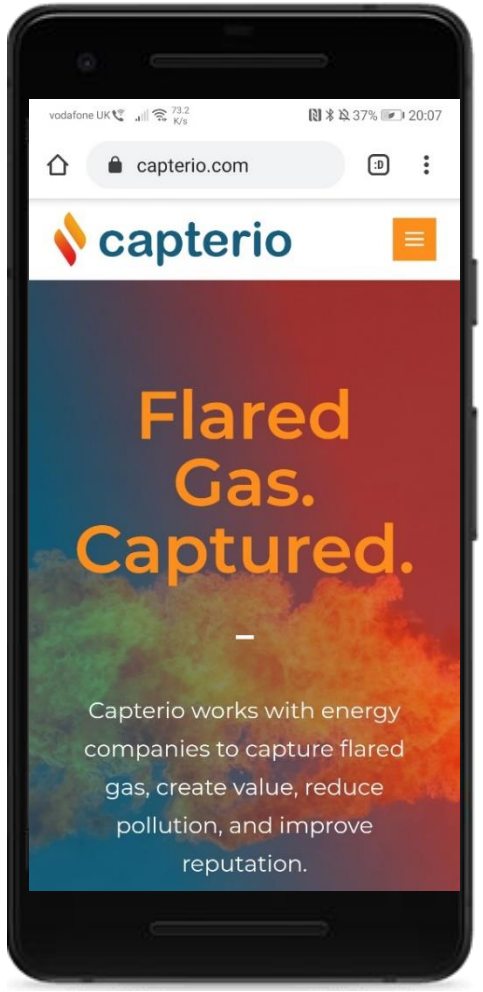
Offer creative challenge and consciousness

- Use the geoscientist's big picture integrative thinking skills set (akin to "play-based exploration")
- Be part of the consciousness of the firm
- Ask the difficult questions

Source: Capterio

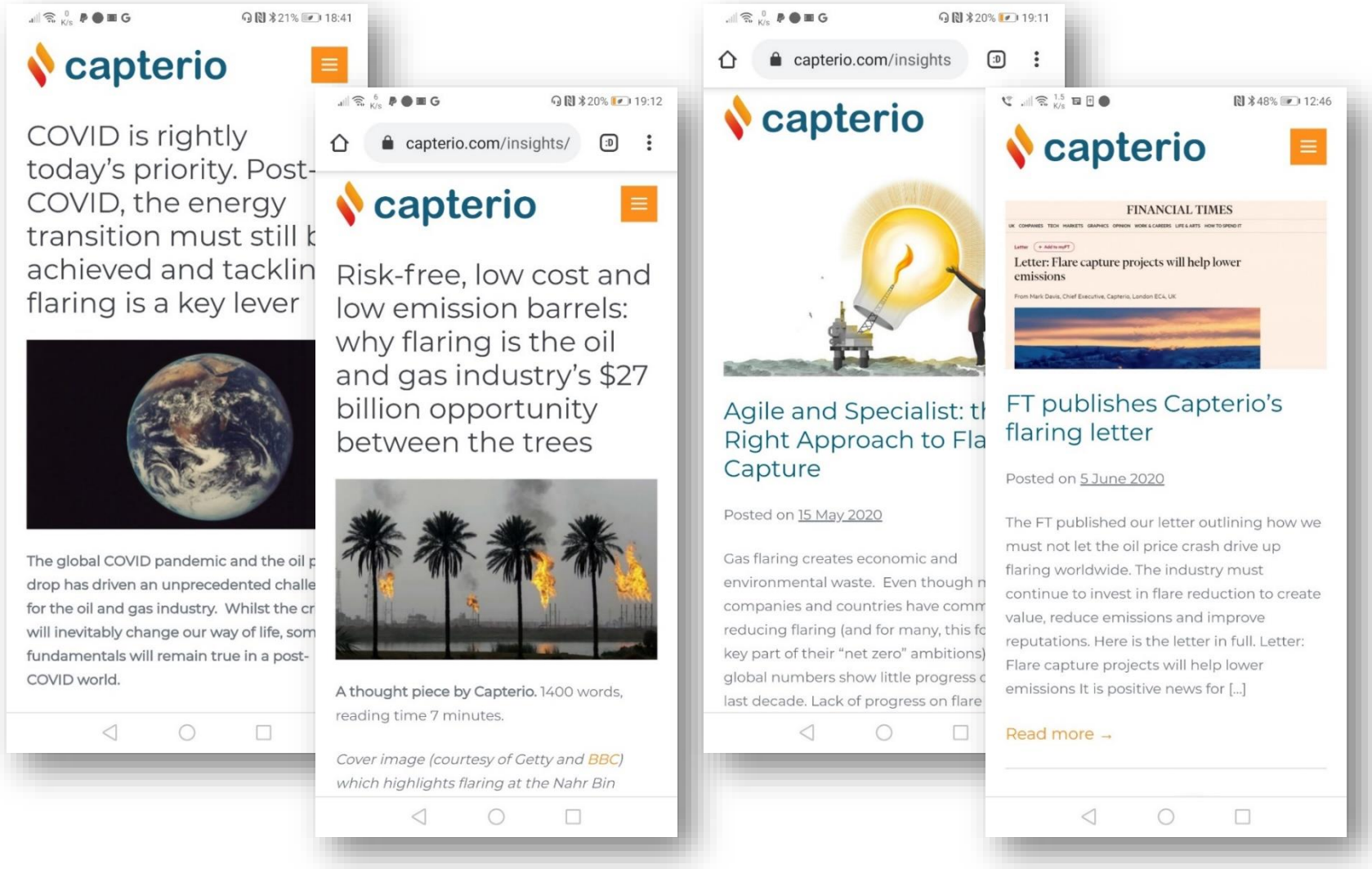
We are looking for partners

We are expanding our portfolio



www.capterio.com

… and you may also like to find out more on www.capterio.com



Source: Capterio

Petroleum Exploration Society of Great Britain

GEOSCIENCE in the ENERGY TRANSITION

Special Interest Group

PESGB

FLARING: THE $20 BILLION DECARBONISATION LEVER

Dr Mark Jonathan Davis
CEO, Capterio

mark.davis@capterio.com
+44 7552 050 089

FREE for PESGB members – Thursday 18th June - 6pm