# Monetising flared, vented and leaked gas

# A new solution to a difficult problem?

**Finding Petroleum Conference** 

13 November 2018

Mark Davis, SYSTEMIQ

mark.davis@systemiq.earth



S Y S T E M



# Natural gas has a "dirty little secret" in part due to methane emissions from flaring, venting and leaking

Flared, vented and leaked emissions can be reduced profitably, but not by a "business as usual" approach

Systemic change in methane will need innovative business models, such as "CH4.CO"



### GAS IS WIDELY SEEN AS A TRANSITION FUEL. ITS INCREASING MARKET SHARE IS HELPING DECARBONISATION, BUT IS NOT SUFFICIENT



 Gas market share has been increasing at 100 bps per decade

- Decarbonisation has been underway, partly due to gas substitution
- Emissions rising to 33 billion tonnes of CO2 in 2017

### THE ADVANTAGE OF GAS, VS COAL, IS UNDER THREAT AS GHG EMISSIONS FROM CO2 AND CH4 ARE SIGNIFICANT

Gas may not be that "clean" when methane is included ...

CO2 emitted

in upstream

operations

**CO2** emitted

from flaring

CH4 emitted from flaring,

venting and

leaking

2

3

Drivers of GHG emission

intensity

Methane is 84 to 86 times more
intense as a GHG than CO2, on a 20-year basis

### Methane leaks

### A dirty little secret

Natural gas's reputation as a cleaner fuel than coal and oil risks being sullied by methane emissions

... because methane is a potent GHG



Print edition | Business >
Jul 23rd 2016

 There is no single way to compare the equivalence of the warming potential of CH4 vs CO2

 We use a 20-year timeframe as a starting point

 Using this, the emission intensity must be 2.7% for natural gas to be cleaner than coal

SYSTEMIQ

### NATURAL GAS LOSSES IN THE ENERGY SYSTEM ARE MATERIAL, AND DERIVE FROM CO2 AND METHANE

### Simplified Sankey chart of the losses in the natural gas supply chain



ILLUSTRATIVE AND SIMPLIFIED

- Globally, overall efficiency of the natural gas system is estimated to be 36%
- Losses from upstream, midstream and downstream conversion total some 64%, with a few percent % is as CH4 (flaring, venting, leaking, transportation) and remainder CO2

# GLOBALLY, CO2e EMISSIONS ARE 2X HIGHER WHEN METHANE IS INCLUDED, AND THE FIX IS WORTH \$35B PER YEAR



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

5

### BUT SUPPLY SOURCES VARY SIGNIFICANTLY – LEADING TO A WIDE SPAN OF GHG FOOTPRINT OF EU GAS IMPORTS TODAY

### Gas imports into Europe: CO2e intensity vs volume

Volume (x axis) vs CO2e intensity (y axis)



ILLUSTRATIVE

- In 2017, 408 BCM of gas was imported into EU, dominated by Russia, Norway, LNG and Algeria
- Large variations in the CO2e intensity of gas
- Cleaning up gas from Russia and Algeria, then LNG would have a significant impact on gas GHG footprint of gas in Europe

Note: Intensity factor is tonnes of CO2e per BCM of gas Source: SYSTEMIQ; McKinsey analysis

# Natural gas has a "dirty little secret" in part due to methane emissions from flaring, venting and leaking

Flared, vented and leaked emissions can be reduced profitably, but not by a "business as usual" approach

Systemic change in methane will need innovative business models, such as "CH4.CO"



# **"BUSINESS AS USUAL" HAS NOT MADE MATERIAL PROGRESS ON THE ISSUE OF FLARING IN A DECADE ... DUE TO 3 MAIN FACTORS**

## Global flared gas has not materially reduced in a decade ...

rially ... due to ...

BCM p.a.



### ... with large flaring from shale in US



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

Capture not sufficiently **commercially** attractive

Capture is commercially attractive, but not **operationally** deliverable

- Consumers and market awareness lacking
- Lack of measurement (or standards)
- Some operators are in denial
- Low value of gas capture
  - Subsidised pricing
  - Poor / lack of fiscal terms
- High unit cost
- Difficulty attracting funding
- Lack of infrastructure
- Lack of funding from partners
- Usurped by other priorities
- Challenging bureaucracy
- Lack of execution capacity
- Challenging country context

### BUT THE GOOD NEWS IS THAT MANY COMPANIES ARE TAKING A LEADERSHIP ROLE WITH ANNOUNCEMENTS AND COMMITMENTS



- April 2018: targeting methane intensity of 0.2%
- Reports multiple initiatives to reduce methane emissions

 Sep 2018: committed a target to maintain methane emissions intensity below 0.2% by 2025



- Sep 2018, committed to an average of 0.2% methane emissions by 2025
- Committed to 350,000 tonne methane reduction p.a.

 Zero Routine Flaring

**OTHERS** 

- COP 21
   Paris
- MGP
- Country initiatives
- Other company statements

### NOT EXHAUSTIVE

- "Unless we address methane leakage, the role of gas as a transition fuel, let alone as a destination fuel, will be in question"
- Many admirable commitments, however
  - Commitment from majors are only for their operated
- emissions (scope 1 & 2), and typically don't include methane slip after well hear
  - Aggregate represents <1% of the total methane O&G emissions of 76 million tonnes

q

### HOWEVER, THE CHALLENGE IS THAT THE BIGGEST EMISSIONS ARE **DOMINATED BY COUNTRIES IN WHICH IT IS HARD TO DO BUSINESS**



leaked gas are

magnitude; we

as desirable place

possibly of a

proxy

Source: World Bank GGFR, 2018, World Bank; BP Statistical Review of World Energy

### **MEASUREMENT IS CLEARLY KEY TO THE SOLUTION**

Satellite



Aerial



Site based



- GHG sat (2016)
- Sentinal 5P (2017) 7 km x 7 km
- EDF MethaneSat (2021)
- JPL/California 30 m x 30 m
- Drone
- Aero

- Range of technologies
- Range of measurement
- quality (rate, volume, sensitivity,
  - resolution, ...)

- Bagging
- Sniffing
- Optical methods

### THERE ARE SEVERAL PROVEN TECHNOLOGY OPTIONS TO MONETISE WASTE GAS

### Gas gathering . 4 On-site use Conversion into marketable products Gas treatment and processing Captive Raw gas Heat niection electricit LPG. Petroche GTL Dry gas CNG Electricity Liauids micals Pipeline Truck - Train - Tanker LPG = Liquefied Petroleum Gas; CNG = Compressed Natural Gas; LNG = Liquefied Natural Gas; GTL = Gas To Liquids





### There are a range of monetisation options ... ... and the solutions are mostly well-known

Solutions	Description
Waste gas to electricity	Micro-turbine/gas engine electricity generation for: installation power, or field power, or national/local grid
Waste gas to gas products	Waste gas gathering, water and contaminants removal and skid mounted- modular. Separation for dry gas – CNG, LPG and NGLs
Waste gas to <b>liquids</b>	Skid-mounted modular plants that convert waste gas to: LNG, synthetic diesel (methanol, ammonia and propylene)
Infrastructure to minimize <b>venting and</b> <b>leaking</b>	Technology and services for leak detection/repair and no-low venting (e.g. vapour recovery units, compressor reliability & availability services, rod- packing and dry seal replacement, low emission valves, no bleed pneumatic controllers and pumps, plunger lifts and velocity tubing)



Natural gas has a "dirty little secret" in part due to methane emissions from flaring, venting and leaking

Flared, vented and leaked emissions can be reduced profitably, but not by a "business as usual" approach

Systemic change in methane will need innovative business models, such as "CH4.CO"



### SYSTEMIQ FUNDS AND INCUBATES EARLY STAGE VENTURES THAT DRIVE THE ENERGY TRANSITION

S Y S T E M I Q

## **CH4.CO**

### Advisory and investment firm seeking to drive system-wide change

- Clean energy, materials and land use
- Organiser of industry-wide coalitions such as the Energy Transitions Commission
- Focus on new business ventures aligned with a sustainability agenda, through early stage investments and partnerships with disruptive start ups, or by incubating companies internally



- CH4.CO is an early-stage venture incubated by SYSTEMIQ and co-venture partners
- Core focus is the "low methane gas" agenda

### **OUR "CH4.CO" INTERNATIONAL VENTURE WILL ADDRESS 2 CORE ISSUES**



FIX



CERTIFY



- Existing technology deployment
- Novel business models
- Capture methane flaring, leaking and venting at scale

- In partnership with SYSTEMIQ and industry, develop a market for GHG intensity
- Deliver certification and assurance, for specific gas contracts
- Establish a digital trading mechanism for certificates

### WE BELIEVE THAT OUR APPROACH TO "FIX" HAS MAJOR ADVANTAGES OVER THE "BUSINESS AS USUAL APPROACH"

### **Best technology**



- Brings best-available + integrated technology to each situation
- Delivered and executed by experts
- Technology agnostic

### Focussed



- Business model innovation
- Solely focussed on delivering outsourced execution
- Deep and repeatable expertise

### **Fully-funded**



- Fully-funds investments
- No cash calls required by operator, IOC or NOC
- Assumes revenue share with asset owners and governments

### Offers peace of mind



 Offers peace-of-mind, allowing operators to operate





### **OUR CERTIFICATION BUSINESS WILL BE ESTABLISHING MARKETS** FOR LOW GHG INTENSITY GAS

Compression

### **Certification will support** premium pricing ...



... by certifying all the key elements of the gas supply chain ...



associated and non-associated gas

Include

Address the "entire system", and also to include LNG

Partner with leading experts

### WE ARE LOOKING FOR PARTNERS TO JOIN OUR CONSORTIUM



**CH4.CO** 

... is looking to scale up our operations and is looking for partners for ...

### **Upstream company:**

- Measurement technologies and solutions
- Upstream technology solutions
- Operational leadership
- Partner IOCs
- Partner NOCs

# Downstream company:

- Coalitions of buyers and sellers
- B2B and B2C approach

# Monetising flared, vented and leaked gas

# A new solution to a difficult problem?

**Finding Petroleum Conference** 

13 November 2018

Mark Davis, SYSTEMIQ

mark.davis@systemiq.earth



S Y S T E M

