

Fugitive emissions measurements from shale gas exploitation

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6th Smart Grids & Cleanpower Conference

3-4 June 2014, Cambridge, UK

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What is NPL?



- World-leading science and technology laboratory
- Directly-owned by BIS
- 550+ staff
- Working with and for business, academia and government
- Science with impact



What are Fugitive Emissions?

- Emissions which are not controlled
 - Generally from seals, valves, or other components
- Emissions estimated from leak detection and repair programmes – the most common way of controlling emissions in the Oil / Gas sector
- Regulations are usually based on models and calculated emissions



Why do we care about fugitive emissions?

- Health and safety
- Methane global warming potential 86 (GWP_{20}) and 34 (GWP_{100}) times that of CO₂
- No direct emission regulation specifically on methane
- UK GHG reduction targets under Climate Change Act
- Reported under national inventories
- Reported under permit/licence?
- Concerns from US experience – opportunity in Europe to understand emissions before regulation
- Economic waste

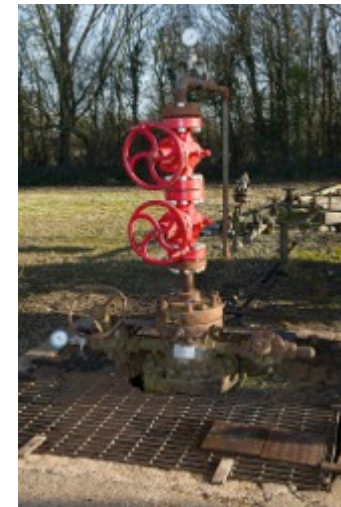
Call for measurement

- DECC – September 2013
 - .. there should be a detailed scientific research programme of methane measurement, aimed at better understanding and characterising sources and quantities of methane emissions associated with shale gas operations

- Commission - January 2014
 - .. Member States should ensure that the operator monitors the following operational parameters:
 - (e) *air emissions of methane, other volatile organic compounds and other gases that are likely to have harmful effects on human health and/or the environment*

Potential fugitive emissions from unconventional gas

- Different stages
 - Drilling
 - Hydraulic Fracturing
 - Well Testing
 - Production
- Venting (pressure relief, actuators)
- Leaks (piping and components, processing)
- Flares (flare efficiency)
- Tanking/removals





Climate KIC: FuME Project

(Quantifying Fugitive Methane Emissions from hard-to-tackle sites and sources)



Project partners



Aim



What?

- To create a commercial Methane Measurement Service for municipal waste water treatment plants, shale gas extraction and gas distribution industries

How?

- Apply and enhance two existing technologies and develop and test new continuous monitoring instruments

Justification



- High GWP of methane, 24-72 CO₂e
- Regulation of methane is increasingly likely
- Recovered fugitive emissions such as methane are a saleable gas
- Cost-effective: 35 % of methane abatement options have a net profit and low mitigation costs can lead to large emission reductions

Current state of the art



- Differential Absorption Lidar (DIAL) provides identification and quantification of methane emissions from fugitive and area sources
 - Mainly applied so far to landfill and large gas / refinery / petrochemical facilities
 - Provides relatively short term ‘spot’ measurements
- Point sensors provide continuous measurement at a specific location
 - Cavity ring down systems (e.g. Picarro, Tiger Optics) accurate but high cost
 - Can use reverse modelling to estimate emissions – but need methodology to define best locations for sensors
 - A number of low cost sensors commercially available, but less accurate
- Open path systems
 - Developed for other gases, generally used for safety monitoring in methane context
- Models provide forecast concentrations based on knowledge of source terms
 - Easy to implement and validated in direct dispersion mode
 - Very detailed meteorological and dispersion models required for inverse mode
 - Relatively complex to implement in inverse mode

Products



Several products/services developed by the project, aimed at cost effective continuous monitoring of fugitive methane, for example

- Methane Impact Assessment and Sensor Placement tool
 - Designed as a screening tool, to allow the industrial facility to carry out scenario comparison and sensor network optimisation
- Methane Measurement Service
 - Continuous monitoring system of CH₄ emissions of an industrial site using a network of sensors and inverse modelling
 - Several versions depending upon the size and complexity of the site (including for example DIAL remote sensing measurements to provide high-accuracy snapshot and calibrate sensors)
- Methane boundary Fence Leak Detection Instrument
 - Open path sensor for long term boundary fence measurements
 - May come with inverse modelling

The above may change based on the results of the research

Main outputs



- Methane measurement service and individual products
- Set of guidelines per industry for fugitive methane emission measurement best practice
- Standards development:
 - CEN standard on fugitive emissions from the oil and gas sector
 - Proposal for a new work item based on the methodology that we develop to committee TC264
 - Feed into the relevant Best Available Technology Reference (BREF) committees at the JRC

The above may change based on the results of the research

Thank you!

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Centre for Carbon Measurement



Climate data

Provide confidence and reduce uncertainties in climate data used for monitoring and modelling



Carbon markets & accounting

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Low carbon technologies

Accelerate development and assess performance of low carbon technologies