



A Change in the Wind

Flaring Combustion Efficiency And it's regulatory relevance

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Environmental Implications of Flaring



There is a NEED to improve our control of the quantities of Methane which are emitted to the atmosphere via flaring from oil and gas production facilities because, Methane has an impact on atmospheric warming estimated to be more than 84 times greater than CO2 (over 20 years).

Therefore, if we can reduce the quantities of Methane emitted to atmosphere it creates the potential to slow down global warming in the near term and buy us time to transition towards renewable energies

- 6** **50% methane emission reduction by 2030**
Industry will halve methane emissions by 2030 (against a 2018 baseline) in accordance with overall emission reduction targets.
- 5** **UKCS methane intensity below 0.20% by 2025**
Industry will adopt the 'stretch' OGCI methane intensity target of 0.20% by 2025 to drive short-term operational efficiency.
- 4** **Zero Routine Flaring before 2030**
Industry will aim to meet the World Bank 'Zero Routine Flaring by 2030' initiative, with individual assets seeking to accelerate compliance where possible before 2030.
- 3** **Asset MAP**
Operators will develop a Methane Action Plan for each individual asset by Q4 2022, including measurements and quantifications, flare and vent management plans, and abatement plans.
- 2** **Measuring methane**
Operators will seek to validate methane quantification wherever practicable.
- 1** **International alignment**
The industry will seek to align to international standards and reporting principles.



Zero Routine Flaring 2030

The effects of Combustion Efficiency

Flaring from oil and gas production facilities is the process of burning the various hydrocarbon components which make up the waste, or excess gas produced and thereby converting these to Carbon Dioxide.

The term associated with the effectiveness of a flare is **Combustion Efficiency**.

$$CE = 1 - 0.00166e^{\left(\frac{0.317 * Windspeed}{(ExitVel * g * Dia)^{0.33}}\right)} \left(\frac{LHV_{CH4}}{LHV_{Flare}}\right)^3$$

Where:

Dia: diameter of the flare pipe

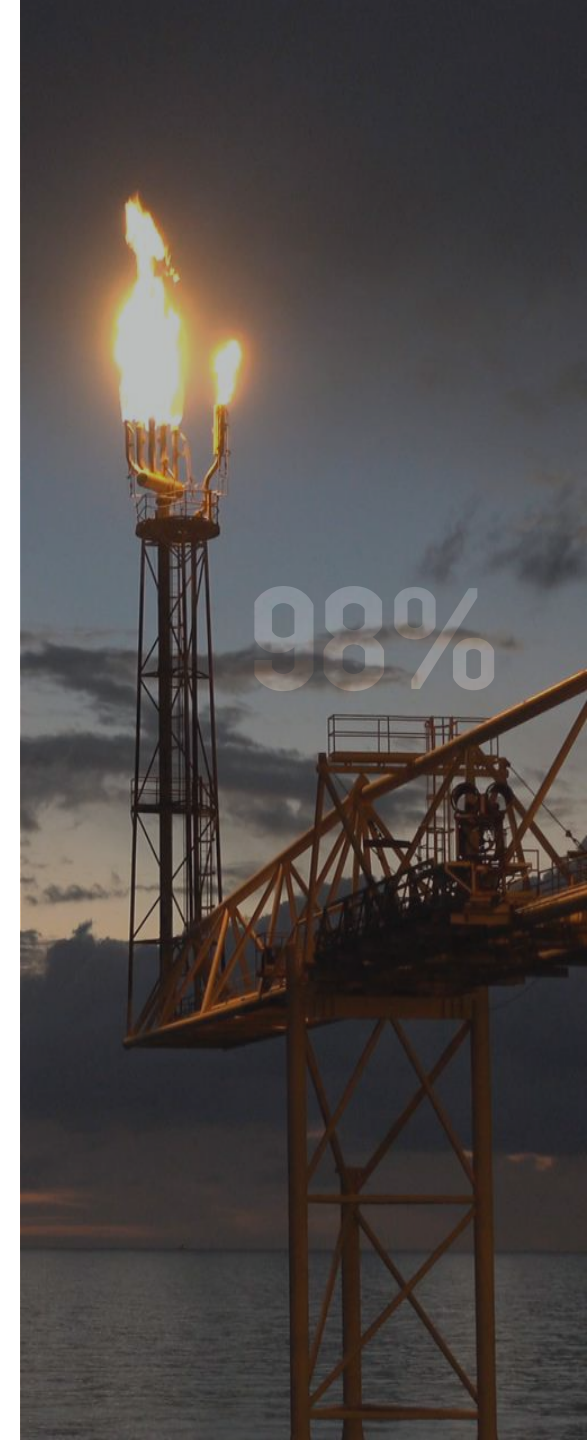
g: gravitational constant

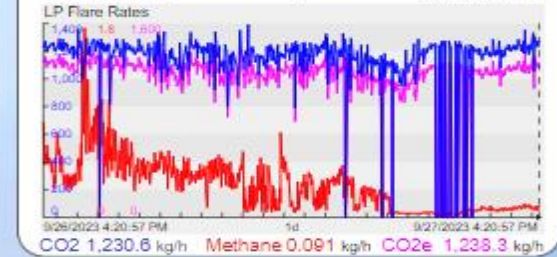
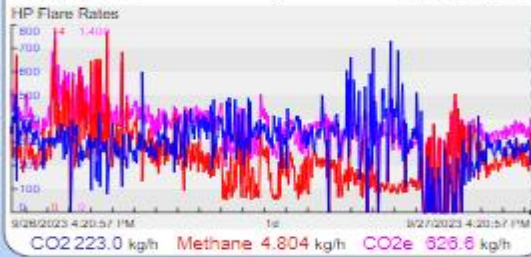
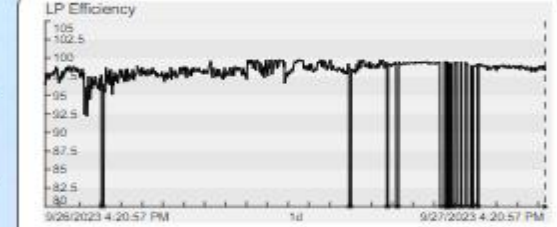
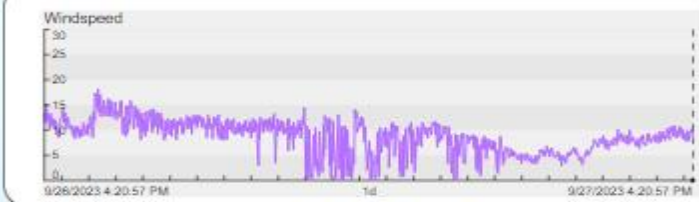
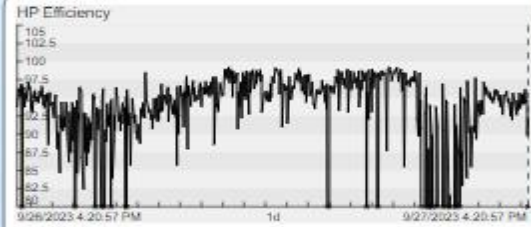
LHV_{CH4}: lower heating value of methane

LHV_{Flare}: lower heating value of the flare gas composition

ExitVel: velocity of the gas within the flare pipeline

Windspeed: localised speed of the prevailing wind





A tonne of hydrocarbon will burn to give approx 3t of CO2 (for example methane - a tonne of methane combines with atmospheric oxygen gives 2.75t of CO2).

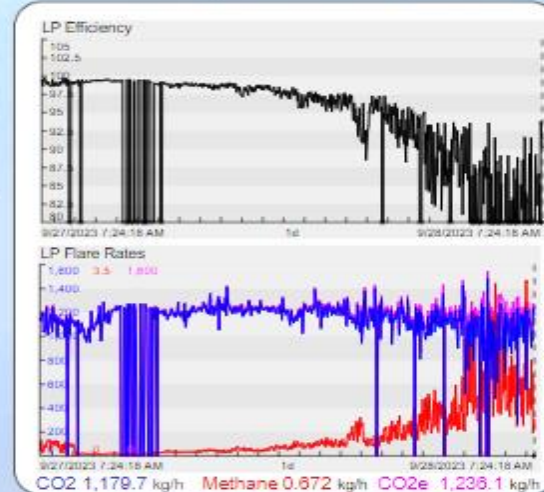
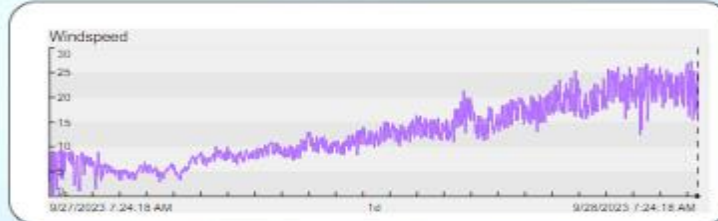
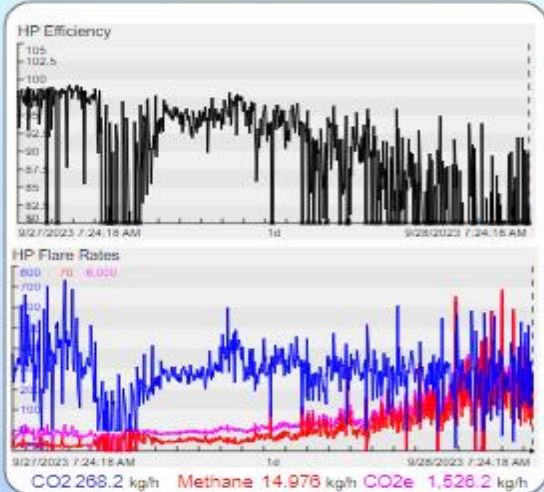
The CO2e is the mass of CO2 + mass of Methane x Methane warming potential - set to 84 in the inputs.

HP Flare

	Produced	Methane	CO2	CO2e
Curr. Day	2.5 t	0.0314 t	2.9 t	5.5 t
Prev. Day	6.2 t	0.1106 t	8.9 t	18.2 t

LP Flare

	Produced	Methane	CO2	CO2e
Curr. Day	4.6 t	0.00115 t	11.0 t	11.1 t
Prev. Day	11.0 t	0.01094 t	27.0 t	28.0 t



A tonne of hydrocarbon will burn to give approx 3t of CO2 (for example methane - a tonne of methane combines with atmospheric oxygen gives 2.75t of CO2).

The CO2e is the mass of CO2 + mass of Methane x Methane warming potential - set to 84 in the inputs.

HP Flare

	Produced	Methane	CO2	CO2e
Curr. Day	0.4 t	0.0305 t	0.4 t	2.9 t
Prev. Day	5.9 t	0.1794 t	6.9 t	22.0 t

LP Flare

	Produced	Methane	CO2	CO2e
Curr. Day	0.7 t	0.00172 t	1.4 t	1.5 t
Prev. Day	11.0 t	0.00760 t	26.7 t	27.4 t

Zero Routine Flaring 2030

Flaring Governance



North Sea
Transition
Authority

Annual Flare Consent

**Petroleum Production Licence No(s). X123, Y123
and Z123**

Consent to Flare Gas

1. This Consent is given on the condition that:
 - a) gas shall not be flared as mentioned in paragraph 1 at an average daily rate that exceeds 32.33 tonnes; and
 - b) this Consent shall terminate if any participating licensee has their licence revoked; surrenders the licence; or withdraws from the terms of the mutually agreed flaring application.



Department for
Energy Security
& Net Zero

UK ETS Installations

For fuel burnt in turbines we convert 100% to CO₂ (government defined oxidation factor of 1) but for flare source streams we only convert 98% (government defined oxidation factor of 0.98).

Meaning that 2% is classed as un-combusted gas (with a high level of methane) which is currently not included in ETS reporting.



THANK
YOU

Dynamic Reporting

Operators should look to put the mechanisms in place, like Combustor, to dynamically report flare CE.

Governing Changes

Collaboration with NSTA and DESNZ to make changes to the relevant flaring regulations to allow for CE manipulation.

Educate a Greater Understanding

Continue to aim for zero routine flaring by 2030 but meanwhile educate our community to understand that an increase in flaring can directly reduce overall emissions.