



Oil & Gas
Authority

Emissions Monitoring Report Annex

Additional technical details and sources to accompany
the analysis in the OGA's 2021 Emissions Monitoring Report

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1.0 IPCC Data – upstream oil and gas categories

GHG emissions from the UK upstream oil and gas industry can be extracted from the National Atmospheric Emissions Inventory dataset using the following relevant Intergovernmental Panel on Climate Change (IPCC) categories:

IPCC Code	Source	Activity name
1A1cii	Upstream oil production – fuel combustion	Gas oil
1A1cii	Upstream oil production – fuel combustion	Gas oil
1A1cii	Upstream oil production – fuel combustion	Natural gas
1A1cii	Upstream oil production – fuel combustion	Natural gas
1A1cii	Upstream oil and gas production – combustion at gas separation plant	LPG
1A1cii	Upstream oil and gas production – combustion at gas separation plant	OPG
1B2a2	Upstream oil and gas production – process emissions	Non-fuel combustion
1B2a2	Petroleum processes	Oil production
1B2b3	Upstream oil and gas production – process emissions	Non-fuel combustion
1B2a4	Upstream oil and gas production – oil terminal storage	Non-fuel combustion
1B2b4	Upstream oil and gas production – gas terminal storage	Non-fuel combustion
1B2a3	Upstream oil and gas production – offshore oil loading	Crude oil
1B2a3	Upstream oil and gas production – offshore oil loading	Crude oil
1B2a1	Upstream oil and gas production – offshore well testing	Exploration drilling: amount of gas flared
1B2b1	Upstream oil and gas production – offshore well testing	Exploration drilling: amount of gas flared
1B2c2i	Upstream oil and gas production – flaring	Non-fuel combustion
1B2c2ii	Upstream oil and gas production – flaring	Non-fuel combustion
1B2c1i	Upstream oil and gas production – venting	Non-fuel combustion
1B2c1ii	Upstream oil and gas production – venting	Non-fuel combustion

1.1 IPCC Data – Caveat

A caveat associated with using the NAEI dataset is that the total is understood to include emissions from a liquified natural gas (LNG) import terminal and from two combined heat and power (CHP) plants which are adjacent to upstream facilities, at Sullom Voe and Teesside respectively. The OGA does not consider these facilities to be part of the UK upstream oil and gas industry. Unfortunately, these values can't be removed from the dataset. The total emissions from these three facilities are estimated to comprise a very small proportion of the total dataset.

2.0 Global warming potential factors

Non-carbon dioxide greenhouse gases have been converted to carbon dioxide equivalent (CO₂) units using global warming potential (GWP) factors presented in the IPCC's Fifth Assessment Report¹ (table 8.7, page 714). The GWP factors used are with the inclusion of climate-carbon feedbacks (cc fb) and over a one-hundred-year timescale.

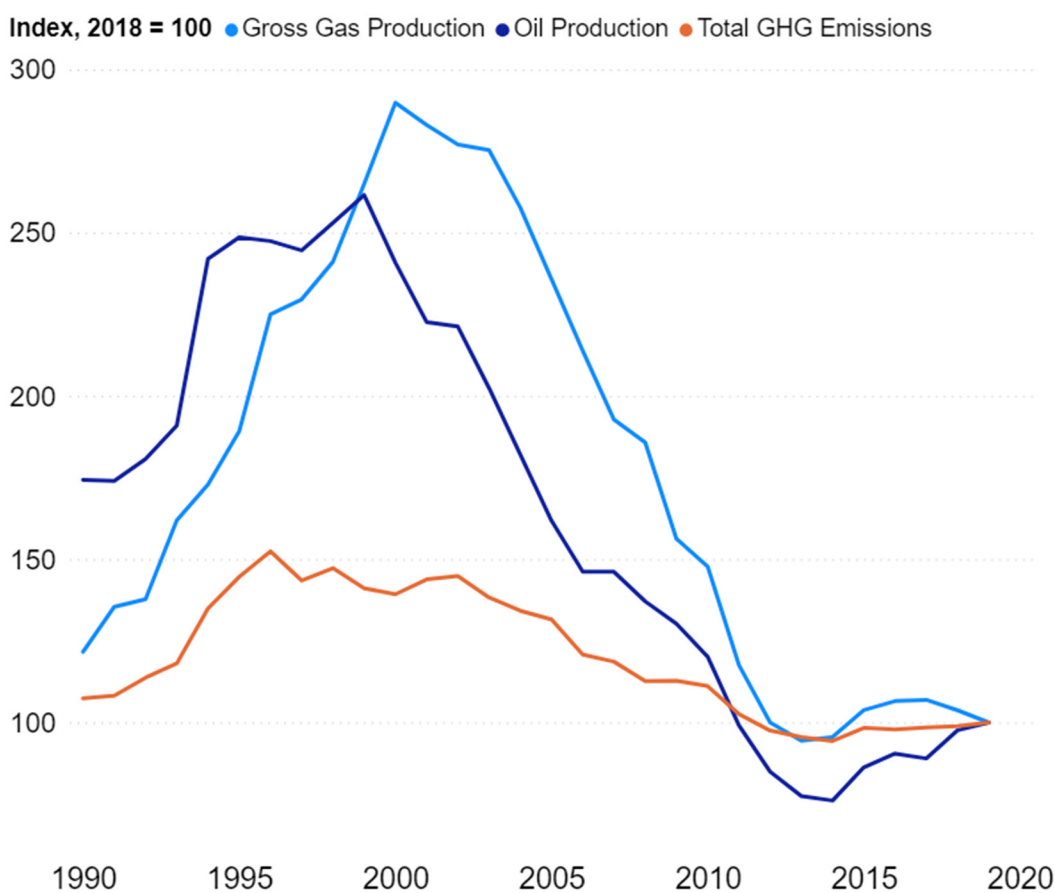
Greenhouse gas	GWP 100 (cc fb)
Carbon Dioxide (CO ₂)	1
Methane (CH ₄)	34
Nitrous Oxide (N ₂ O)	298

¹ https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5_all_final.pdf

3.0 Relationship between emissions and oil and gas production

Figure 1 shows the relative change of UK upstream oil and gas GHG emissions and production from 1990 to 2018.

Figure 1: UK Upstream oil and gas GHG emissions and production, 1990-2018

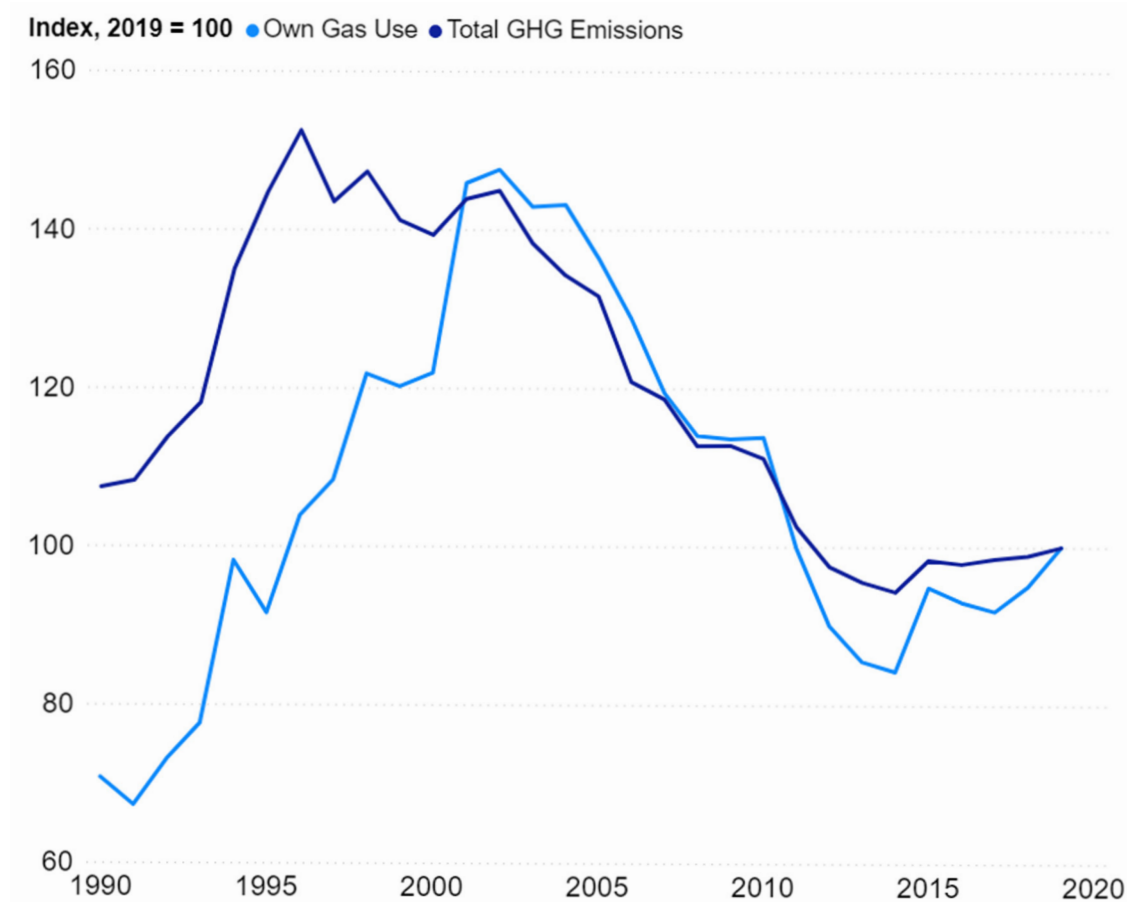


Source: NAEI, OGA

4.0 Relationship between gas utilisation and overall emissions

Figure 2 shows the relative change of upstream utilisation of produced gas and overall emissions from 1990 to 2019. The two track each other well from around 2000 onwards.

Figure 2: Upstream utilisation of produced gas and overall emissions, 1990-2019



Source: NAEI, OGA

5.0 Business as usual scenario emissions projection methodology

The OGA has produced a bottom-up business-as-usual projection of the sector's GHG emissions based on recent emissions histories for all onshore and offshore installations and expected closure dates based on latest UK Stewardship Survey² data for each installation. An allowance has also been made for a handful of major new developments which would materially increase GHG emissions. Inclusion of a new field in this list is without prejudice to BEIS or the OGA granting consent to development.

The OGA projection is disaggregated by GHG (CO₂, CH₄ and N₂O) and into the following activities:

EEMS category	Corresponding IPCC codes
Gas consumption	11A1cii (part) – upstream oil and gas production – combustion of natural gas
Fuel oil consumption	11A1cii (part) – upstream oil and gas production – combustion of LPG & OPG
Diesel consumption	11A1cii (part) – upstream oil and gas production – combustion of gas oil
Gas flaring	1B2c2i & 1B2c2ii – upstream oil and gas production – flaring
Direct process	1B2a2, 1B2b3, 1B2a4 & 1B2b4 – process emissions
Oil loading	1B2a3 – upstream oil production – oil loading
Gas venting	1B2c1i & 1B2c1ii – upstream oil and gas production – venting
Fugitives	No IPCC match (trivial, assumed zero)
Other	
Exploration flaring	1B2a1 & 1B2b1 – upstream oil and gas production – offshore well testing – gas flared

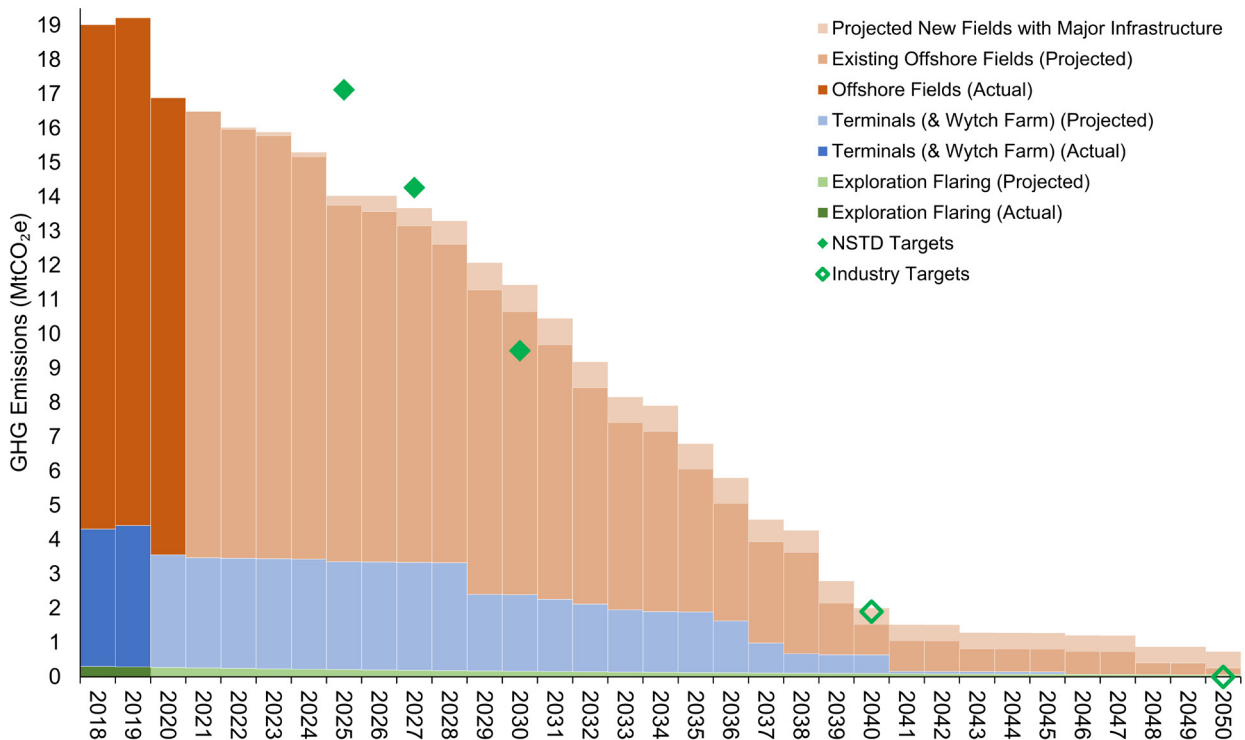
² <https://www.ogauthority.co.uk/exploration-production/asset-stewardship/surveys/>

For existing offshore installations which are expected to be in use after 2020 we have been guided by Environmental and Emissions Monitoring System (EEMS)³ data for 2018–2020. For onshore terminals and Wytch Farm we have based the projection on EU ETS verified emissions for 2018–2020 with the split between GHGs and activities informed by the difference between the relevant NAEI totals and the EEMS totals for offshore installations.

Emissions from exploration flaring are assumed to decline at 5% a year.

The overall projection of GHGs (using AR5 with feedback GWPs) is summarised in the following chart:

Figure 3: Actual/projected BAU CO₂e emissions



Source: NAEI, OGA

The projection assumes no additional abatement measures (for example from electrification or reduction in routine flaring).

³ <https://www.gov.uk/guidance/oil-and-gas-eems-database>

6.0 Electrification emissions abatement potential methodology

The OGA has produced a low, central and high case assessment of the sector's GHG abatement potential from the electrification of offshore facilities. This has been based on the following:

- A detailed list of installations targeted for electrification and whether the installation is estimated to be fully or partially electrified.
- Installation level power demand data calculated from data submitted to EEMS.
- Recent emissions histories for relevant installations and expected closure dates based on latest UK Stewardship Survey data for each installation.
- Projected UK electricity grid emissions factors, sourced from the latest available data from BEIS⁴.
- Assumptions of 70% abatement for a fully electrified installation and 42% for a partially electrified installation.
- Variables between each of the modelled cases are:
 - Installations in scope
 - Whether facilities are fully or partially electrified
 - Projected UK electricity grid emission factors
 - Facility shut-down date

⁴ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1024043/data-tables-1-19.xlsx

7.0 Flaring emissions abatement potential methodology

The OGA has produced a projection of emissions abatement from the cessation of routine flaring by 2030. This estimate is acknowledged to be very much a low case as work is already being performed to cut routine before 2030 by operators. The methodology for estimated abatement via zero-routine flaring by 2030 is:

- Calculate historic trends of routine flaring per installation using OGA flaring consents application data.
- Using this, assign each facility a predicted proportion of routine flaring going forwards.
- Produce a projection of flaring emissions out to 2050 using flare profiles provided in the UK Stewardship Survey and flare volume to CO₂ emission factors.
- Aggregate future installation level emissions attributed to routine flaring and subtract this from the total flaring emissions profile.

