

Oil and Gas Production Statistics

Methodology Guide

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Introduction

The upstream [Oil and Gas Production Statistics](#) published by the Scottish Government include estimates of oil and gas production activity occurring in Scottish adjacent waters. The statistics include estimates of production volumes, approximate sales income, operating costs and capital expenditure arising from the extraction of crude oil, natural gas liquids (NGLs) and natural gas.

These statistics are produced to meet the need for a wide variety of information on the oil and gas industry in Scotland. A document describing their [initial development](#) and original methodology was published in November 2013. Between 2013 and 2015, a series of quarterly statistics releases were published and the methodology was subject to continuous development in response to better information about data sources, improved quality assurance procedures, and consultation with users. This paper describes the data sources and methods used to produce current releases of the statistics.

General Methodology Approach

All estimates for Scotland are derived from statistics for total UK activity produced by BEIS (formerly DECC). Where possible, UK activities are allocated between the Scottish and Rest of UK (RUK) portions of the UKCS using data relating to individual oil and gas fields. This approach ensures that the results accurately reflect the location of activities. Estimates for the Scottish portion of the UK Continental Shelf are based on activities within the Scottish adjacent waters boundary, which was defined during the devolution of fisheries management policy and is described in the Scottish Adjacent Waters Boundary Order (1999). The use of alternative boundaries is possible. The Scottish Government uses this zone in economic statistics which include estimates of Scottish offshore activity, such as Quarterly National Accounts and Government Expenditure and Revenue Scotland (GERS). For economic statistics it has become known as the 'illustrative geographical share' of UK offshore activities.

The statistics rely on a database which records the location of all oil and gas field on the UKCS and links them to other relevant data. All fields in quadrants north or south of the sea boundary defining the Scottish portion of the UKCS can be easily allocated to Scotland or to the Rest of the UK (RUK). Some quadrants straddle this line, and the locations of fields within these are assigned manually using individual [quadrant maps](#). Fields are classified as being either oil fields (which produce crude oil, NGLs and

associated gas) or gas fields (which produce dry gas, NGLs and condensate). Further information on oil and gas fields on the UKCS can be found on the [BEIS website](#).

Oil and Gas Production Volume Statistics

The UK Department for Business, Energy & Industrial Strategy (BEIS) produces official statistics for energy supply and demand in the UK. These are published in quarterly [Energy Trends](#) and annually in the [Digest of UK Energy Statistics \(DUKES\)](#). As well as these statistical publications, BEIS also publishes monthly data which reports activity for each oil and gas field currently in production. The location of each field is known and can be mapped to either the Scottish or Rest of UK (RUK) zones of the UKCS, allowing the production totals in Energy Trends and DUKES to be apportioned between areas.

Licensees operating on the UK Continental Shelf are required to make monthly returns on their production of hydrocarbons to BEIS. This information is compiled in the [Petroleum Production Reporting System \(PPRS\)](#). The PPRS is used to report flows, stocks and uses of hydrocarbon from well-head through to final disposals from a pipeline or terminal and is the major source of the information underlying the oil and gas statistics. In the Scottish Government production statistics, well-head production figures for each field are constrained to annual terminal receipt totals published in tables [F.1, F.2 and F.3](#) of DUKES, and then to quarterly UK totals in the Energy Trends publication.

These constraints are used because terminal data is more accurate than well-head production, as the oil that leaves a terminal has been stabilised (that is any water, natural gas liquids or other organic compounds have been removed from the crude oil).

Methodology

Monthly production for each oil and gas field is extracted from the BEIS website. These data are subject to revision due to the timeliness of information supplied by oil and gas companies, therefore the latest available information for all time periods is used by the Scottish Government. The methodology for production statistics is summarised below:

- **Oil Fields** data is reported monthly in terms of the well-head volumes of extracted liquids and associated gases, both of which can include NGLs which are separated during processing.
- **Gas Fields** data is reported monthly in terms of the well-head volumes of dry (non-associated) gas and liquid condensate. Condensate is classed as an NGL, and dry gas also contains NGLs which are separated during processing.
- Each field is mapped to an onshore oil or gas terminal, detailed in DUKES tables F.1 (crude oil) and F.2 (natural gas). Estimates of the average NGL content for fields linked to each terminal is derived on an annual basis using DUKES table F.3.
- Using this information, monthly estimates of production of crude oil, NGL and natural gas are produced for each field, and from this the total well-head production from oil fields in Scotland and RUK zones of the UKCS are summed together.
- **Crude Oil and NGL** estimates are constrained to total UK indigenous production in tonnes reported by BEIS in Table 3.1 of Energy Trends and Tables F.1 and F.3 of DUKES. These estimates relate to production received at UK terminals.
- **Natural Gas** estimates are constrained to both total net and gross gas production reported by BEIS in Table 4.2 of Energy Trends and Table F.2 of DUKES in cubic metres. Net production is defined as gross gas production *less* producers' own use of gas.

UK control totals

All production statistics published in Upstream Oil and Gas Statistics are constrained to and are consistent with the following UK level statistics published by BEIS:

[Quarterly Energy Trends](#)

- Crude oil and NGL statistics from ET 3.1: Supply and use of crude oil, natural gas liquids and feedstocks
- Natural gas statistics from ET 4.2: Natural gas production and supply

[Digest of UK Energy Statistics \(DUKES\)](#) – Annex F (online only)

- Crude Oil Production by terminal from F.1
- Natural gas production by terminal from F.2
- NGL production by terminal type from F.3

Production units

The production data published by BEIS is presented in various volumetric, mass and energy units. BEIS report Crude oil and NGLs in tonnes, and natural gas in both GWh and standard cubic metres¹.

All estimates are converted into the standard energy unit of Tonnes of Oil Equivalent (toe) to allow for comparison between liquids and gases. A tonne of oil equivalent is the amount of oil, gas or NGL equivalent to 11,630 kWh or 41.868 GJ.

The data is converted to TOE using the latest conversion factors consistent with UK energy balances in DUKES/Energy Trends Table 1.1.

In approximate terms, the following conversion factors are appropriate.

Crude Oil: 1 tonne = 1.09 toe

NGL: 1 tonne = 1.16 toe

Natural Gas: 1,000 standard cubic metres = 0.92 toe

Outputs

Although production data is available on a monthly basis, estimates are calculated for quarters (three month periods) and constrained to Energy Trends and DUKES. These quarterly estimates are then summed to produce annual totals for both calendar and financial years. The estimates of production in Scotland are also presented as a percentage of the corresponding UK Continental Shelf totals.

Estimates of production are published for total UKCS activity (including onshore), total UK offshore activity, and activity occurring in the Scottish portion of the UKCS (including small amounts of onshore activity in some years).

¹A standard cubic metre of gas is the amount of gas in a cubic metre at standard conditions – temperature of 15 C°, and pressure of 1.01325 bars.

Oil and Gas Income & Expenditure Statistics

Statistics on '[income from and expenditure on UK Continental Shelf exploration, development and operating activities](#)',¹ are published annually by the Oil and Gas Authority (OGA). Within this, estimates of production revenue (approximate sales values), operating costs and capital expenditure are reported for the total UKCS. These are based on an annual survey of extraction companies.

Field level data on operating revenues and expenditure are not publicly available. Estimates of commercial activity arising from activities on the Scottish portion of the UKCS are therefore modelled using analytical data acquired from a commercial vendor. These apportionments between Scottish and RUK oil and gas fields are currently based on data derived from the Wood Mackenzie [Global Economic Model \(GEM\)](#), supplied quarterly. This includes information covering annual production, prices, operating costs and capital investment for offshore fields as well as onshore Wytch Farm. Estimates for other onshore fields, as well as some decommissioned fields, are imputed by the Scottish Government.

Methodology

Estimates of income and expenditure arising from extraction activities on the Scottish portion of the UKCS are created in a similar manner to the production statistics detailed above. The detailed methodology is summarised below:

- **Approximate sales income** (also known as 'production revenues' in some publications) is initially estimated for each oil and gas field on a monthly basis by valuing monthly production volumes at current market prices for oil and gas. This step ensures that sales income closely follows production volumes while accounting for any trends in price. However, oil and gas is generally not traded at spot prices and these initial revenue estimates are only indicative of levels and trends.
- The next step of the model is to constrain the initial sales revenue series for each field to annual figures derived from prices and volumes in the commercial data source, which are judged to provide a more accurate guide to true sales income from each field.
- Estimates for any fields unmatched between the BEIS and commercial data source are imputed using average prices calculated at this stage. The imputation method uses average prices for the main product types specific to each sector of the UKCS². Monthly estimates are then summed to quarters.
- Finally, these quarterly estimates of approximate sales income from each field are summed for the Scottish and RUK portions of the UKCS and constrained to the annual totals in the BEIS statistics.
- **Operating costs** for each field are estimated based on the annual data from the commercial data source, up to and including the year of the latest quarter. The within-year trends in operating costs are modelled to move in line with production activity on a quarterly basis. These quarterly estimates for each field are then summed and constrained to the annual totals in the BEIS statistics.
- **Capital Expenditure** on each field is estimated based on the annual data from the commercial data source. Within-year trends in capital expenditure are not expected to follow production activity trends, and therefore the annual totals are split evenly

² The sectors are Northern North Sea, Central North Sea, Southern Gas Basin, West of Britain (which includes the Irish Sea and west of Shetland), and Onshore.

across the year. These estimates for each field are summed for each portion of the UKCS and constrained to the annual totals in the BEIS statistics.

- **Other Income** relates to tariffs from the use of pipelines and terminals, and other revenues of operators and production licensees. Estimates for individual fields are derived from annual tariff income data in the commercial data source. These are constrained to the annual totals in the BEIS statistics. There is currently no estimation of this income by BEIS and the UK figures have been rolled forward flat since 2009. In order to be consistent with annual BEIS data, we constrain to these annual totals and these are split evenly between the four quarters of the year until updated figures become available.

UK control totals

All income and expenditure statistics published in Oil and Gas Production Statistics are constrained to and consistent with the following variables in the OGA Income and Expenditure statistics.

- Production value of crude oil is constrained to “Oil Sales” figures
- Production value of NGL is constrained to “NGL Sales” figures
- Production value of natural gas is constrained to “Gas Sales” figures
- Operating costs are constrained to "Operating Costs" less “decommissioning costs”.
- Capital Expenditure costs are constrained to the "Capital Expenditure Total” figures.
- Other income (tariff revenues) are constrained to the “Other Income” figures.

Additionally, estimates of total UKCS expenditure for the latest quarter and financial year are provisionally estimated forward from the last OGA year using the underlying data for each field produced from the production and commercial data.

Outputs

The income and expenditure estimates are produced on a quarterly basis and then summed to produce annual totals for both calendar and financial years. The results for Scotland are also presented as a percentage of the corresponding UK Continental Shelf totals.

Estimates are published for total UKCS activity (including onshore), total UK offshore activity, and activity occurring in the Scottish portion of the UKCS (including small amounts of onshore activity in some years).

Uses of these statistics

The Oil and Gas production statistics were developed in response to clear demand from users of economic statistics for a wider range of information on the industry in Scotland. In recent years, oil and gas extraction has accounted for up to 10-20% of total Scottish GDP when an illustrative share of offshore output is included in the figures. However, this offshore activity has not been included in the core economic statistics produced for Scotland, which are based on EU regional accounts concepts and relate to the onshore economy only.

There has been a strong demand for the development of statistics about Scotland's Oil and Gas production and revenues for many years. For example, The Scottish Government's Council of Economic Advisors identified it as a priority area of work for the Scottish Government as early as 2008³. In response to this recommendation analysts in the Office of the Chief Economic Adviser have developed a variety of statistics and consulted users and sector experts to develop a credible methodological approach. The production, income and expenditure statistics are one strand of this programme.

Among known users of the statistics are energy analysts and economic advisers within the Scottish Government; Marine Scotland include oil and gas production information in their analysis of offshore activities in the Scottish portion of the North Sea; and the ONS Regional Accounts team use the information on the splits between offshore and onshore activity in the production of annual regional Gross Value Added estimates for the UK. The statistics are also used in the production and development of other economic statistics as detailed below.

Other Scottish oil and gas statistics

The Scottish National Accounts Programme (SNAP) has been developing a range of additional oil and gas statistics. Some of these are now established national statistics, while others remain in development as experimental statistics. These cover other aspects of the oil and gas industry and its contribution to the economy.

Gross Value Added (GVA)

Estimates of the Gross Value Added (GVA) of the oil and gas extraction activity occurring on the Scottish portion of the UKCS are included in the national statistics publication [Quarterly National Accounts Scotland](#). These estimates illustrate the contribution of oil and gas extraction to a measure of Scottish GDP which includes this geographical share of UK offshore activity. It is produced using the income approach to GDP, based on estimates of compensation of employees (COE) and companies' gross operating surplus (GOS).

Commodity Balances, Exports and Imports of oil and gas

Estimates of [supply and demand, imports and exports of oil and gas](#) have been in development as part of the experimental statistics published between 2013 and 2015. These remain in development and will continue to be produced as the following experimental statistics:

- Production and demand for oil and gas products, published as part of the energy commodity balance for Scotland in the annual Energy In Scotland compendium. These estimates are consistent with trade reported by the petroleum production

³ First Annual Report of the Council of Economic Advisers: December 2008
<http://www.gov.scot/Publications/2008/12/04092147/12>

industry as reported by BEIS, and may not exactly match national accounts measures of trade. Components of these estimates were previously published between 2013 and 2015 within the quarterly SNAP release and could be added to Oil and Gas Production Statistics in future when the methods are accepted as official (not experimental) statistics.

- The national accounts unit are currently developing annual Supply and Use satellite accounts for the oil and gas extraction industry and a geographical share of its activity in Scotland. This aims to bring the industry statistics into line with national accounts concepts and make them consistent with other core economic statistics for Scotland and the UK. There has also been interest in developing a better understand the wider impacts on the Scottish and UK economies from the oil and gas industry, sometimes known as the total value added by the industry.
- Work is ongoing to combine supply and use statistics with the trade estimates to produce an experimental addition to the quarterly national accounts, of Scottish GDP by category of expenditure (GDPe) including a geographical share of extra regio activity. This aims to estimate total gross fixed capital formation, exports and imports (and the net trade balance) for Scotland including a geographical share of UK oil and gas activity. The early development of these statistics were published between 2013 and 2015 within the quarterly SNAP release.

Links

Scottish Government Oil and Gas Statistics:

<http://www.gov.scot/Topics/Statistics/Browse/Economy/oilgas>

First version of SNAP Oil and Gas Statistics methodology guide

<http://www.gov.scot/Topics/Statistics/Browse/Economy/SNAP/expstats/oilandgas/methodology>

BEIS field location maps:

https://itportal.decc.gov.uk/web_files/gis/quadmaps/quadmaps.htm

Oil and Gas Authority (OGA) oil and gas field data: <https://www.ogauthority.co.uk/data-centre/data-downloads-and-publications/field-data/>

BEIS Quarterly Energy Trends: <https://www.gov.uk/government/collections/energy-trends>

Digest of UK Energy Statistics (DUKES):

<https://www.gov.uk/government/collections/digest-of-uk-energy-statistics-dukes>

Petroleum Production Reporting System (PPRS) by field:

https://itportal.decc.gov.uk/pprs/full_production.htm

DUKES Annex F – internet content only: <https://www.gov.uk/government/statistics/digest-of-united-kingdom-energy-statistics-2015-internet-content-only>

Income from and Expenditure on UK Continental Shelf Exploration, Development and Operating Activities: <https://www.ogauthority.co.uk/data-centre/data-downloads-and-publications/ukcs-income-and-expenditure/>

Wood Mackenzie Global Economic Model (GEM): <http://public.woodmac.com/public/home>

Energy In Scotland Compendium:

<http://www.gov.scot/Topics/Statistics/Browse/Business/Energy/Compendium2014>

Marine Scotland National Marine Plan Interactive (NMPI) portal:

<https://marinescotland.atkinsgeospatial.com/nmpi/>

ONS Regional Accounts:

<http://www.ons.gov.uk/ons/taxonomy/index.html?nscl=Regional+Accounts>

Quarterly National Accounts Scotland (QNAS):

<http://www.gov.scot/Topics/Statistics/Browse/Economy/QNAS>

