

Just Transition Review of the Scottish Energy Sector

Project Ninian – baseline data updates

Reliance Restricted

14 March 2025



Reliance Restricted

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Project Ninian – updated data

14 March 2025

Dear Sir/Madam

In accordance with our engagement letter dated 10 February 2025, we have prepared our report in relation to the updates to the Scottish Government's Just Transition review of the energy sector (Project Ninian).

Purpose of our report and restrictions on its use

This report was prepared on your instructions solely for the purpose of the Scottish Government and should not be relied upon for any other purpose. Because others may seek to use it for different purposes, this report should not be quoted, referred to or shown to any other parties except as permitted under the Engagement Letter. Additionally, we have agreed that you may publish the whole of this report as a single document without amendment or redaction as a portable document format (pdf) file on the world wide web.

In carrying out our work and preparing our report, we have worked on the instructions of the Scottish Government. Our report may not have considered issues relevant to any third parties. Any use such third parties may choose to make of our report is entirely at their own risk and we shall have no responsibility whatsoever in relation to any such use.

At the time of writing this report O&G prices have been significantly impacted by war in Ukraine and the full economic consequences of this geopolitical risk cannot be fully predicted. Although we do not expect it to alter the underlying conclusions, any period of prolonged high prices will have an impact on future production forecasts. Historical geopolitical events have impacted oil prices but other factors, such as the response from other O&G producing nations will also need to be considered.

Scope of our work

Our work in connection with this assignment is of a different nature to that of an audit. Our report to you is based on inquiries of, and discussions with, Scottish Government. We have not sought to verify the accuracy of the data or the information and explanations provided by officials of the Scottish Government.

The report provides baseline data updated from our original issued paper, known as 'Project Ninian', which was prepared by EY and published by SG in February 2023. Scottish Government's Directorate for Energy and Climate Change is seeking external expertise to partially refresh key offshore oil and gas baseline data sets from the Ninian reports, updating them to the most current year available. This includes preparing data tables, one diagram, and a concise report detailing the methodologies used, specifically updating the baseline evidence from Chapter 1 of the main Ninian report from 2019 to the latest anticipated year, generally expected to be 2022 or possibly extending to 2023.

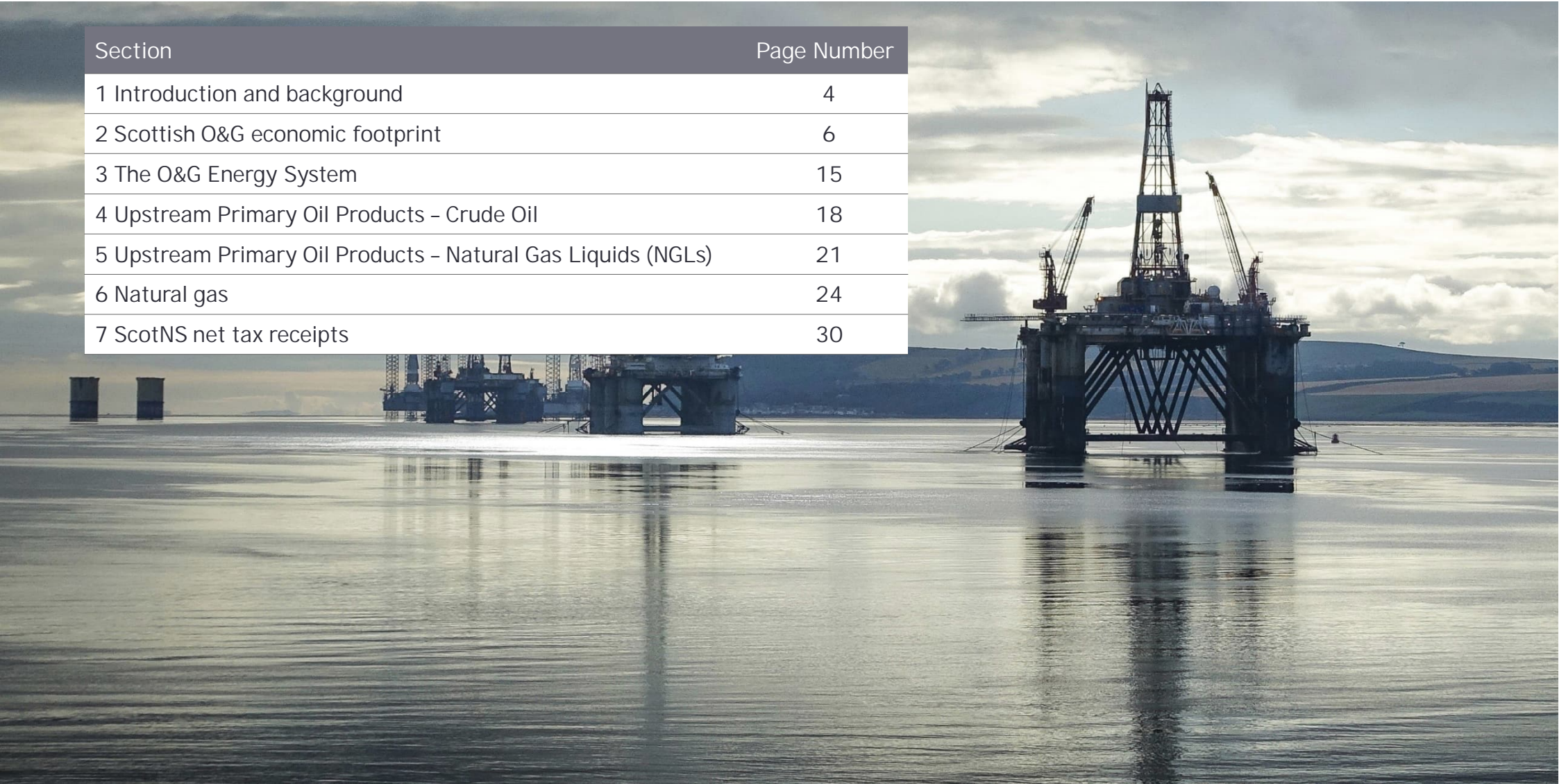
If you would like to clarify any aspect of this review or discuss other related matters then please do not hesitate to contact us.

Yours faithfully

Ernst and Young LLP

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Introduction and background

Introduction, context and scope

Background and Context

On 3 March 2023, the Scottish Government published the findings of the independent analysis titled "Energy System and Just Transition," which supports the draft Energy Strategy and Just Transition Plan (ESJTP). This analysis, referred to as "Project Ninian," was conducted by Ernst & Young LLP ("EY") under the guidance of an independent panel of experts.

The Scottish Government is now seeking external expertise to undertake a partial refresh of several core data sets originally published in the Ninian reports, with the aim of updating this information to the most current year available. The majority of the original data used in the Ninian analysis is based on a baseline year of 2019.

The Scottish Government has commissioned EY to conduct this update, building upon our original report which was published in February 2023, to further review the oil and gas sector in Scotland.

You have requested the update of a series of data tables, accompanied by one diagram and a concise covering report detailing the methodologies employed. This update will specifically address the following elements of the baseline evidence from Chapter 1 of the main Ninian report, transitioning the data from 2019 to the latest available year, which is generally anticipated to be 2022, or possibly extending to 2023 in certain instances.

Purpose of this report

The scope of this report is to update the following data tables and diagrams, transitioning the baseline data from 2019 to the most recent year for which data is available:

Scottish oil & gas sector employment (direct, indirect and induced) and Gross Value Added (GVA) total impact.

- GVA per job and mean income generated by the Scottish oil & gas extraction and support sector; including regional dimensions.
- Sector detail based on Scottish input-output tables on the economic footprint of the O&G supply chain as per table 10 and detail on O&G sector sales by sector as per table 11 of Chapter 1.
- Oil and gas expenditure and investment in the Scottish North Sea, broken down into exploration/extraction and decommissioning.
- Scotland's oil & gas import/export flows – including information on the scale of Scottish oil & gas production compared to Scottish consumption levels. This element should include both data tables and also an updated version of the Sankey diagram summarising the flows.

- Production, import and export trends (including GHG emissions implications) of Upstream Primary Oil Products, broken down into Crude Oil (Section 8) and Natural Gas Liquids.
- Production, consumption, import and export trends of Natural Gas.

Our approach

Please see section 3 for a description of our approach for developing the economic footprint analysis. Our analysis in sections 4-7 reflects the originally methodology adopted in Ninian Chapter 1. We have, however, updated the base data from 2019 to 2022. All other assumptions and limited remain consistent with our original analysis.

Report limitations

This report should not be read alone but in conjunction with the original Project Ninian report. We acknowledge the reality that Scotland is a member of the United Kingdom and part of an integrated UK O&G sector, and that any production, imports or exports is done at a UK level. However, given the context and purpose of the report, it has been written entirely from a Scottish perspective. There are a number of ways in which Scottish data could be separated from rUK, including by geography, % of population and GDP.

We have been unable to update the diagrams on page 84 of the original Ninian Report, which compares global emissions from imports. This is due to the source data, derived from the Paper, Stanford University, IEA, MIT, and Sea Distances Org, remaining unchanged since the release of our original report.



Scottish O&G economic footprint

ScotNS existing economic footprint - introduction

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ScotNS economic footprint

Our economic analysis provides an overview of the economic contribution and the scale of employment of the Scottish offshore O&G sector in 2022, as well as analysis of the role the O&G sector in the wider economy.

To do this, we:

- ▶ Estimated the existing (2022) gross value added (GVA) and employment of the sector, including the direct, indirect and induced impacts.
- ▶ Estimated how the GVA and employment of the sector has changed between 2019 and 2022.
- ▶ Considered the GVA per job and mean income across the Scottish economy.
- ▶ Analysed the position of the O&G extraction sector in the rest of the economy, including the O&G sector supply chain (i.e. key sectors that contribute to O&G extraction) and sectors that currently depend on O&G extraction output.

The contents of this section and scope for this phase does not include considering the contribution of the sector to Scottish or UK exports or the net trade position over time. The current analysis only includes the economic impact of the upstream O&G extraction and support services and does not consider the full economic impact of other downstream activities that rely on O&G, such as petroleum manufacturing sectors.

The methodology used is consistent with that applied in Chapter 1 of the Project Ninian Just Transition review of the Scottish Energy Sector.

The most recent 2022 data has been used in this update – the analysis has been limited by the publication schedule of the ONS. The main input to GVA reporting is the Annual Business Survey (ABS) for which the 2023 results are expected to be released in June 2025, the Business Register and Employment Survey (BRES) for which the 2023 results were released in November 2024, and the Input-Output supply and use tables for which the 2023 results are expected to be released in October/November 2025.

ScotNS existing economic footprint – key findings

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Estimating 2022 economic footprint

The purpose of this section is to quantify the economic impact of Scotland's (offshore upstream) O&G industry. This has been defined as the following sectors¹:

- Extraction of crude petroleum and natural gas – referred to as 'O&G extraction' (Standard industrial classification of economic activity code SIC 06)
- Support activities for petroleum and natural gas extraction – referred to as 'O&G extraction support' (SIC 091, a component of SIC09 – Mining support service activities)

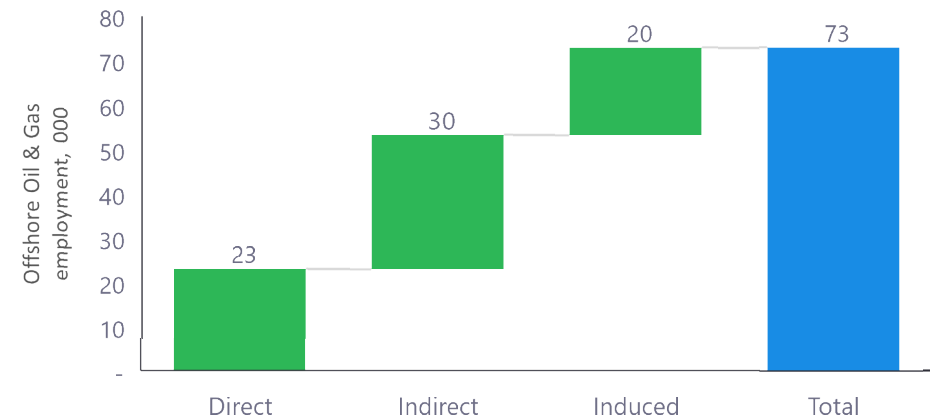
The analysis considers the contribution made by the O&G sector in Scotland towards GVA and employment. The economic contribution is comprised of three categories:

- Direct: impacts resulting from O&G sector activities and spending.
- Indirect: economic activity that occurs in the O&G industry's supply chain.
- Induced impacts: additional activity elsewhere in the economy, supported by spending of O&G sector employees and those employed in the O&G industry's supply chain.

Employment and GVA total impact

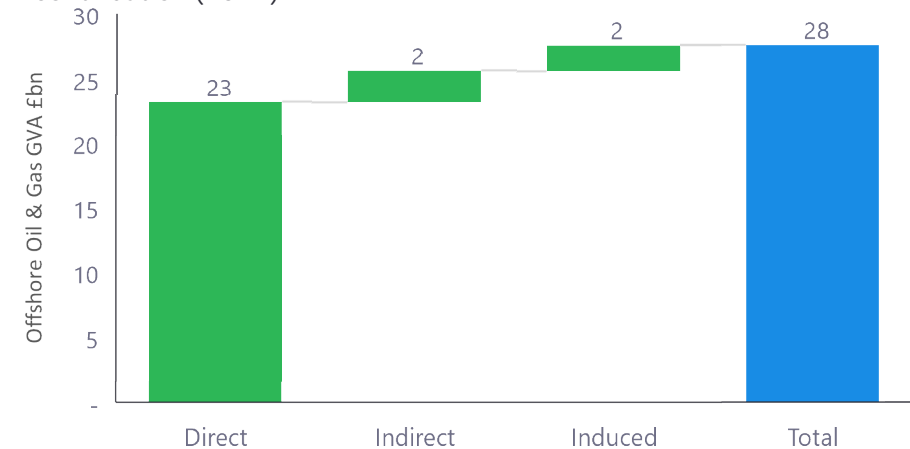
- It is estimated that 73,000 (2019: 79,000) jobs were supported by Scotland's O&G sector in 2022, comprising 23,000 direct (2019: 25,000), 30,000 indirect (2019: 32,000) and 20,000 induced jobs (2019: 22,000). This contribution is equivalent to 3% of all of Scotland's total employment. Of the 23,000 direct jobs, 98% were located within Aberdeen City and Aberdeenshire. Scotland's direct employment accounts for 84% of the total direct employment in the UK O&G industry, hence Scotland's O&G sector supports a significant proportion of the total O&G supply chain.
- In 2022, the O&G sector is estimated to have contributed a GVA of £28bn to Scotland's economy (2019: £18bn), amounting to £23bn direct (2019: £13bn), £2bn indirect (2019: £3bn) and £2bn induced GVA (2019: £2bn). This contribution is equivalent to 13% of Scotland's total GDP (including a geographical share of UK Extra-Regio activity).
- The direct GVA accounts for 84% of the total GVA contribution of the O&G sector in Scotland, a relatively high proportion that reflects the nature of the O&G sector, in particular, the degree of commercial risk and price volatility (e.g. oil prices), and its capital intensity. A high proportion of the direct GVA accrues to capital investors (rather than employees), reflecting the price volatility with O&G exportation, and hence the high GVA contribution is either reinvested or paid to shareholders. This is reflected in the fact that the GVA per job of the O&G extraction sector is £2.3m (2019: £1.1m), over 27 times higher than the average for the Scottish economy as a whole. A significant proportion is also paid to the UK government through taxation.

Employment contribution (2022)



Source: EY analysis, BRES

GVA contribution (2022)



Source: EY analysis, ONS

1. This analysis covers the economic footprint of the listed sectors. The full economic impact from other related downstream sectors, and sectors that require extracted O&G as a direct input is not included in this analysis.

ScotNS existing economic footprint methodology

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Economic impact methodology

In order to assess the direct, indirect and induced impacts, a set of economic multipliers drawn from "Input-Output" tables are applied to the direct GVA and employment of companies in the O&G sector to derive the additional indirect and induced impacts.

A multiplier is an estimate of the extent to which each unit of output of the sector requires the production of a number of supporting units of goods and services in other sectors of the UK/Scottish economy as inputs into the O&G sector's production. The production of each unit of input also requires the application of labour – i.e., it supports employment.

The Office for National Statistics (ONS) publishes a statistical report called the 'Input-Output tables', which outlines the relationships between different industries and how the outputs from one industry are used as inputs into another. Input-Output tables provide a consistent representation of national economic accounts, illustrating interdependencies between industries.

The methodology used in this study is based on this approach. It quantitatively estimates how a unit of GVA and employment in the O&G sector leads to additional GVA and employment across the O&G sector's supply chain and the wider economy as illustrated in Diagram 1.

Direct impacts

The direct impacts or contribution of the Scottish O&G sector have been calculated using official data on sector and regional GVA and employment:

- Employment: obtained 2022 BRES¹ data for Scottish jobs in SIC 06 and 091

Table 4: Direct employment data (2022)³

	Direct employment (employees)
06 O&G extraction	9,020
091 O&G extraction support	14,000
Total	23,020

- GVA: obtained 2022 annual business survey² data for SIC 06. For SIC 091, a GVA estimate has been calculated based on taking 99.8% of the total GVA of SIC 09 (mining support services), as employment within SIC 091 makes up 99.8% of total

1. 2022 Business Register and Employment Survey : open access, ONS Crown Copyright Reserved [from Nomis]

2. Annual Business Survey, COUNTRY AND REGION BY SECTION AND DIVISION, 2022

<https://www.ons.gov.uk/businessindustryandtrade/business/businessservices/datasets/uknonfinancialbusinesseseconomyannualbusinesssurveyregionalresultsectionsas>

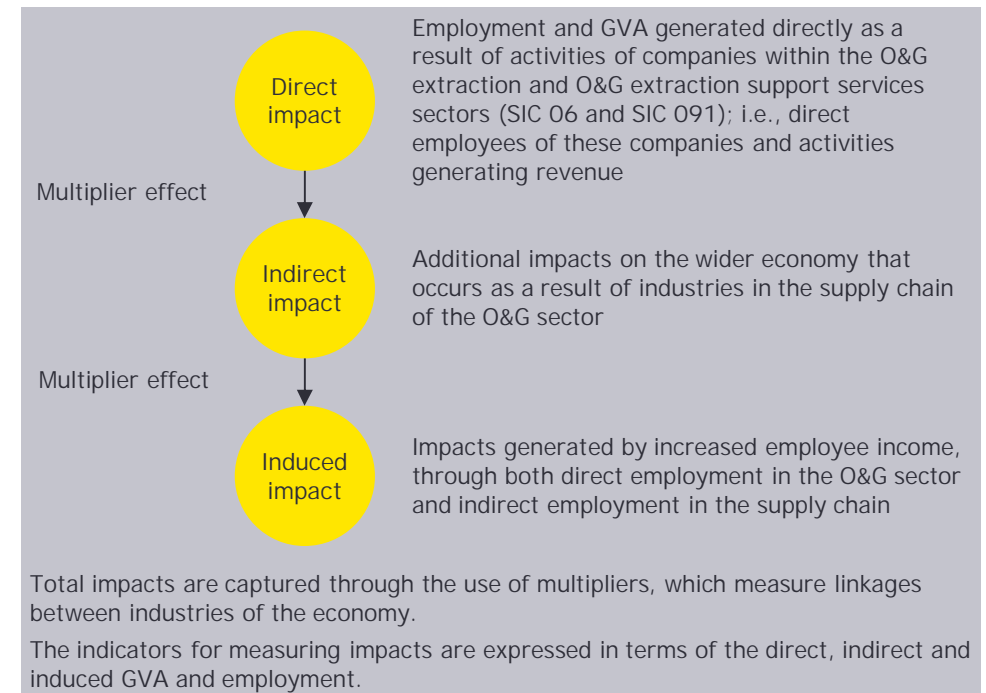
3. Although the 2023 multipliers, hence the indirect and induced jobs cannot be calculated, the direct jobs for 2023 are 9,105 for 06 O&G extraction and 13,000 for 091 O&G extraction support hence a total of 22,015

Scottish employment in SIC 09 (based on 2022 BRES data), and it is assumed this same proportion is reflected in GVA of the sub-industry (as more detailed data for GVA by a lower level SIC code is not available compared to that provided for employment data).

Table 5: Direct GVA data (2022)

	Direct GVA (£m)
06 O&G extraction	21,054
091 O&G extraction support (estimate, taking 99.8% of SIC 09 GVA)	2,158
Total	23,212

Diagram 1: Economic Impact Methodology



ScotNS existing economic footprint methodology (cont'd)

Indirect and induced impacts

To calculate the indirect and induced contribution that the Oil & Gas sector makes to Scotland's economy, we first estimate the size of the sector for the entire UK, and then estimate the proportion of this that resides in Scotland. The steps are explained below:

1. Calculating UK O&G sector multipliers: The UK GVA and employment multipliers of SIC 06 and SIC 09 have been calculated, using EY's economic impact model. These multipliers are adjusted to remove overlapping effects between each sector¹.
 - The multipliers are driven by the underlying structure of the UK economy. For instance, they reflect current intermediate consumption by firms (their supply chain spending) and final consumption expenditure (demand) by households. This data is collected and updated regularly by the ONS to be reflected in new releases of the Input-Output and Supply and Use tables.
 - The multipliers are assumed to remain stable in our forecast. While it can be expected that the structure of the UK economy will change over time, this would be a gradual process, and precise changes are difficult to predict. Hence it is reasonable to use the latest multipliers for future projections.
2. Calculating UK wide O&G sector impact: The multipliers are applied to UK direct employment and GVA figures (these direct figures are described on the previous page) to calculate the total UK-wide impact (including indirect and induced). At a UK level, the O&G industry is expected to contribute £48.2bn in GVA and support over 200,000 jobs.

Table 6: UK Employment and GVA total impacts (2022)

UK employment	Direct	Indirect	Induced	Total
06 O&G extraction	11,400	87,813	52,534	151,746
091 O&G extraction support	16,000	1,897	16,527	51,499
Total	27,400	106,784	69,061	203,245

UK GVA (£m)	Direct	Indirect	Induced	Total
06 O&G extraction	29,791	5,920	4,186	39,897
091 O&G extraction support	2,904	2,668	2,749	8,322
Total	32,695	8,588	6,936	48,219

1. This is to ensure the "direct" employment and GVA of the support services sector is not reflected in the indirect impact of the O&G extraction sector. As spending on support services is part of the supply chain of the O&G extraction sector.
2. An approximation for supply chain spend has been used as intermediate consumption data for SIC 06 in official Scottish I-O tables does not include the offshore economy, source: <https://www.gov.scot/publications/scottish-national-accounts-programme-whole-of-scotland-economic-accounts-project/>

3. Estimating the Scottish share of UK indirect/induced impacts: This has two components:
 - a. The spend by the Scottish O&G sector in its supply chain by sector has been estimated using Scottish Satellite Accounts² and adjusted to 2022 spend, by assuming the same relative change as observed in direct GVA between 2016 and 2022. Page 15 contains further detail on the industries within Scotland's O&G extraction supply chain.
 - b. The proportion of the spend that occurs in Scotland itself is then estimated. This is derived by calculating the Scottish proportion of UK GVA and employment for each sector in Scotland's O&G extraction sector supply chain, and then deriving an overall weighted average share across all sectors. This implies that Scotland accounts for 28% of overall UK's O&G supply chain jobs, and 29% of GVA.
4. Applying the Scottish supply chain share estimate to calculate indirect and induced impacts: It is assumed that the Scottish O&G supply chain is distributed across the UK based on Scotland's share of UK employment and GVA of each industry. The 28% and 29% supply chain estimates have been applied to total UK wide estimates of indirect and induced employment and GVA to estimate Scotland's indirect and induced impacts. For 091 O&G extraction support the Great Britain jobs figure has been used as the UK equivalent is not publicly released. These indirect and induced impacts form part of the total impact outlined in the table below.

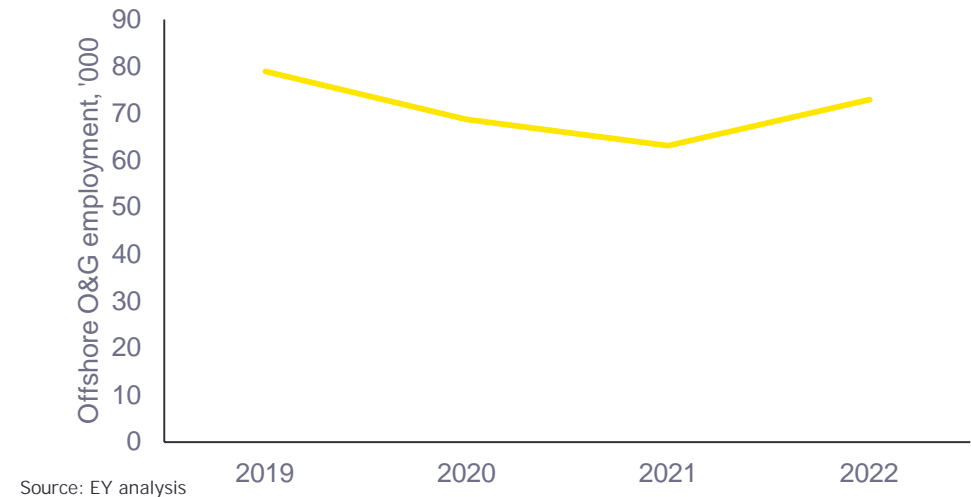
Table 7: Scottish Employment and GVA total impacts (2022)

Scottish Impact	Employment	GVA (£m)
Direct	23,020	23,212
Indirect	30,315	2,451
Induced	19,605	1,980
Total	72,940	27,643

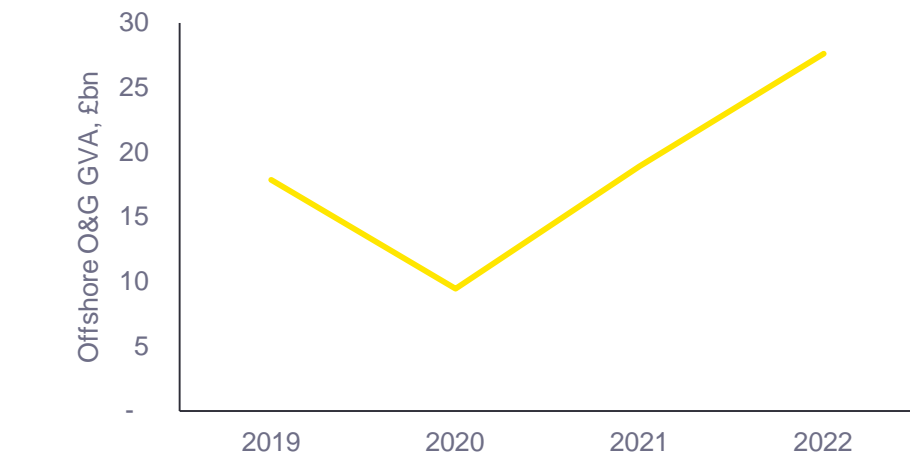
ScotNS economic footprint since original publication

- ▶ Since 2019 Scotland's O&G production has fallen from 93 million tonnes of oil equivalent (mtoe) to 76 mtoe¹ in 2022 however GVA in this time period has risen from £18bn to £28bn driven predominantly by rising oil prices.
- ▶ GVA is heavily influenced by oil prices, which have been volatile since 2019, particularly during the COVID-19 pandemic in 2020. During this period, the price per barrel of Brent Crude fell from \$64.17 to \$43.21, contributing to the decline in GVA for that year.
- ▶ In 2022, the Brent Crude oil price² rose to \$98.89 per barrel, largely due to the aftermath of Russia's invasion of Ukraine, representing an increase of over 50% compared to 2019 oil prices. This is further supported by data from the Scottish Government that shows total O&G sales rising from £24.7bn in 2019 to £49.7bn in 2022¹.
- ▶ However, as production has fallen so has total employment, based on direct, indirect, and induced employment, in offshore oil and gas within Scotland from 79,000 in 2019 to 73,000 in 2022
- ▶ Since 2022 oil prices have fallen to \$79.84 per barrel in 2024 hence it is likely that GVA will decline especially in the context of further falls in Scottish O&G production that decreased to 68.2 mtoe in 2023¹.

Total employment (direct, indirect, induced)



Total GVA (direct, indirect, induced)



1. [oilandgassupplementarytables1998-2022.ods](#)
 2. [Sproule Price Forecast - Sproule](#)

GVA per job and mean income across sectors

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This page considers the GVA per job and mean incomes generated by the Scottish O&G extraction and extraction support sectors relative to other parts of the Scottish economy, to understand how the sector's GVA contribution is benefiting direct workers in the O&G sector (rather than this value being transferred outside Scotland), and to understand the relative value of the sector for its employees compared to the rest of the economy.

GVA per job and mean income comparisons

The table on the right outlines the estimated direct GVA per job in the Scottish offshore O&G industry (SIC 06 & 091), the energy sector and the economy as a whole. GVA per direct job for O&G extraction (SIC 06) is £2.3m GVA per job – over 27 times higher than for the Scottish economy as a whole (2019: £1.1m). The relatively high value of O&G extraction GVA per job reflects the relatively high returns expected in the O&G sector, given the degree of commercial risk and price volatility. A large proportion of the GVA may therefore be paid out as dividends to shareholders, as well as paid to government through taxation. Further consideration would be needed to estimate the proportion of value retained within Scotland.

Employees in the O&G extraction sector earn a mean income of £98.1k, while mean incomes in O&G extraction support are £65.2k. Again, both of these figures are well above the Scottish average of £36.0k.

The GVA per job of the Scottish economy in all sectors excluding O&G is £75.2k, which is 10% below the whole economy average. Therefore, there is a risk that the transition away from O&G could leave the Scottish economy smaller, and with lower average incomes.

Table 9: GVA per job and mean income¹ comparison

£	Scotland – whole economy	Scotland – O&G extraction (SIC 06)	Scotland – O&G extraction support (SIC 091)	Scotland – all sectors excluding O&G	Aberdeen – all sectors, excluding O&G	Scotland – Electricity (SIC 35.1/SIC 35) ³
GVA per direct job (2019)	72,296	1,145,418	122,422	67,637	68,831	235,685
Mean income (2019)	28,666	87,751	50,504	28,191	Data unavailable	43,628

1. The distribution of incomes may differ by sector; however, we have not specifically analysed this due to lack of publicly available data on median incomes or percentile distributions.

2. All figures are for 2022, except for Scotland Electricity GVA per job, which is 2021 due to lack of data availability for 2022.

3. GVA per job data is for SIC 35.1 which includes electric power generation, transmission and distribution, mean income data is for SIC 35 which includes electricity, gas, steam and air conditioning sectors. This is due to lack of further available data at lower level SIC codes for mean income.

Table 10: GVA per job and mean income¹ comparison

£	Scotland – whole economy	Scotland – O&G extraction (SIC 06)	Scotland – O&G extraction support (SIC 091)	Scotland – all sectors excluding O&G	Aberdeen – all sectors, excluding O&G	Scotland – Electricity (SIC 35.1/SIC 35) ³
GVA per direct job ²	83,667	2,334,146	154,153	75,157	75,077	224,075
Mean income (2022)	36,020	98,052	65,193	35,552	Data unavailable	57,166

GVA per job and income comparison



Source: EY analysis based on ONS and BRES data

The O&G extraction sector supply chain

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This section highlights the key sectors that sit within the O&G extraction supply chain. The economic contribution of these sectors is captured via the calculated indirect impact of the Scottish O&G extraction industry.

Supply chain of O&G extraction

- The industries that supply the Scottish O&G extraction sector are listed in the table to the right. The spend by the O&G extraction industry with each of these sectors is termed “intermediate consumption”. This has been estimated based on the 2016 SG Satellite Accounts, as outlined on page 12. The % attributable to each sector of the economy has therefore remained unchanged from 2019 and instead the immediate consumption by O&G has been scaled to the 2022 actuals.
- Support services and machinery and equipment are the largest two sectors in Scotland’s O&G extraction supply chain, comprising approximately 25% (£5.7bn) and 21% (£4.8bn) of intermediate consumption.
- Financial services is the third largest sector in the supply chain, comprising 11% (£2.6bn). Other key sectors include repair and maintenance, O&G extraction (inter-industry intermediate consumption) and employment services.
- There are challenges with measuring how much of the Scottish O&G extraction sector’s supply chain spending takes place within Scotland. The indirect and induced impacts of this supply chain on Scotland’s total GVA and employment is dependent on how much of the supply chain is located within Scotland, or elsewhere in the UK. We have assumed Scotland’s share of the O&G extraction supply chain reflects Scotland’s GVA and employment in each industry in the supply chain.

Table 11: Scottish O&G extraction intermediate consumption by sector (i.e., supply chain spend by sector)

Sector	Intermediate consumption £m	% of O&G supply chain
Mining Support	5,740	25%
Machinery and equipment	4,760	21%
Financial services	2,592	11%
Repair and maintenance	1,885	8%
O&G extraction, metal ores and other	1,745	8%
Employment services	1,006	4%
Fabricated metal	571	2%
Water transport	526	2%
Rental and leasing services	467	2%
Architectural services etc	391	2%
Air transport	363	2%
Construction	361	2%
Computer services	330	1%
Iron and Steel	313	1%
Other ²	1,858	8%
Total	22,908	100%

Source: EY analysis based on Scottish Government Satellite accounts

1. <https://www.gov.scot/publications/scottish-national-accounts-programme-whole-of-scotland-economic-accounts-project/>

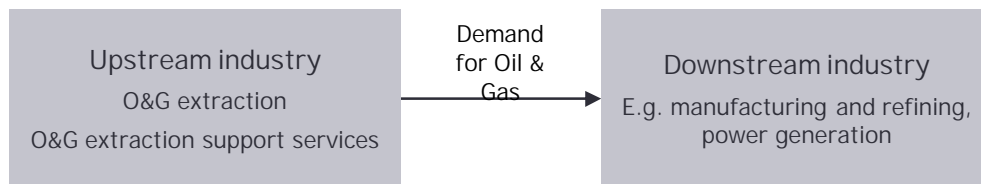
2. ‘Other’ includes: legal activities, computer, coke, petroleum and petrochemicals, head office and consulting, electricity costs (amongst other sectors).

The importance of the O&G extraction sector in the wider economy – downstream activities

Scottish sectors that consume O&G extraction

- ▶ The O&G extracted by the Scottish O&G industry is a key input into a number of other sectors of the Scottish economy. In particular, companies that purchase O&G as a key input into their own production, including: producers of refined oil products, the wider petrochemical sector, and energy generation. The economic contribution of this downstream activity has not been included in the scope of the calculation of the impact of the Scottish O&G sector but should be considered to give a complete picture of the importance of O&G to the Scottish economy.

Demand for O&G along value chain



- ▶ To understand the scale of downstream activities, UK Input-Output tables¹ have been used to estimate the domestic demand for Scottish offshore O&G extraction by sector. Intermediate demand for Scotland's O&G extraction is assumed to be across the same sectors as the UK O&G extraction industry as a whole, but demand across sectors has been adjusted to total 2022 direct Scottish O&G GVA levels. The estimated intermediate demand for Scottish O&G by sector is shown in the table on the right.
- ▶ Manufacturing of petroleum products is the largest sector demanding 42% of the UK's consumption of O&G extraction output. Outside of this sector, the two largest sectors with demand for O&G extraction are the electricity and gas sectors. In 2019 manufacturing of petroleum products comprised 72% of O&G demand with electricity and gas making up only 21%.
- ▶ The scope of this work does not include an assessment of how a contraction in O&G extraction would impact downstream sectors.

Table 12: Estimated demand for Scottish O&G extraction by sector

Sector	Intermediate demand £m	% of O&G demand
Manufacture Of Coke And Refined Petroleum Products	15,406	42%
Electric power generation, transmission and distribution	10,742	29%
Manufacture of gas; distribution; steam and aircon supply	9,027	24%
Extraction Of Crude Petroleum And Natural Gas and Mining Of Metal Ores	941	3%
Manufacture of petrochemicals	222	1%
Manufacture of other basic metals and casting	164	0%
Manufacture of basic iron and steel	208	1%
Other ²	400	1%
Total	37,111	100%

Source: EY analysis based on ONS UK supply and use tables

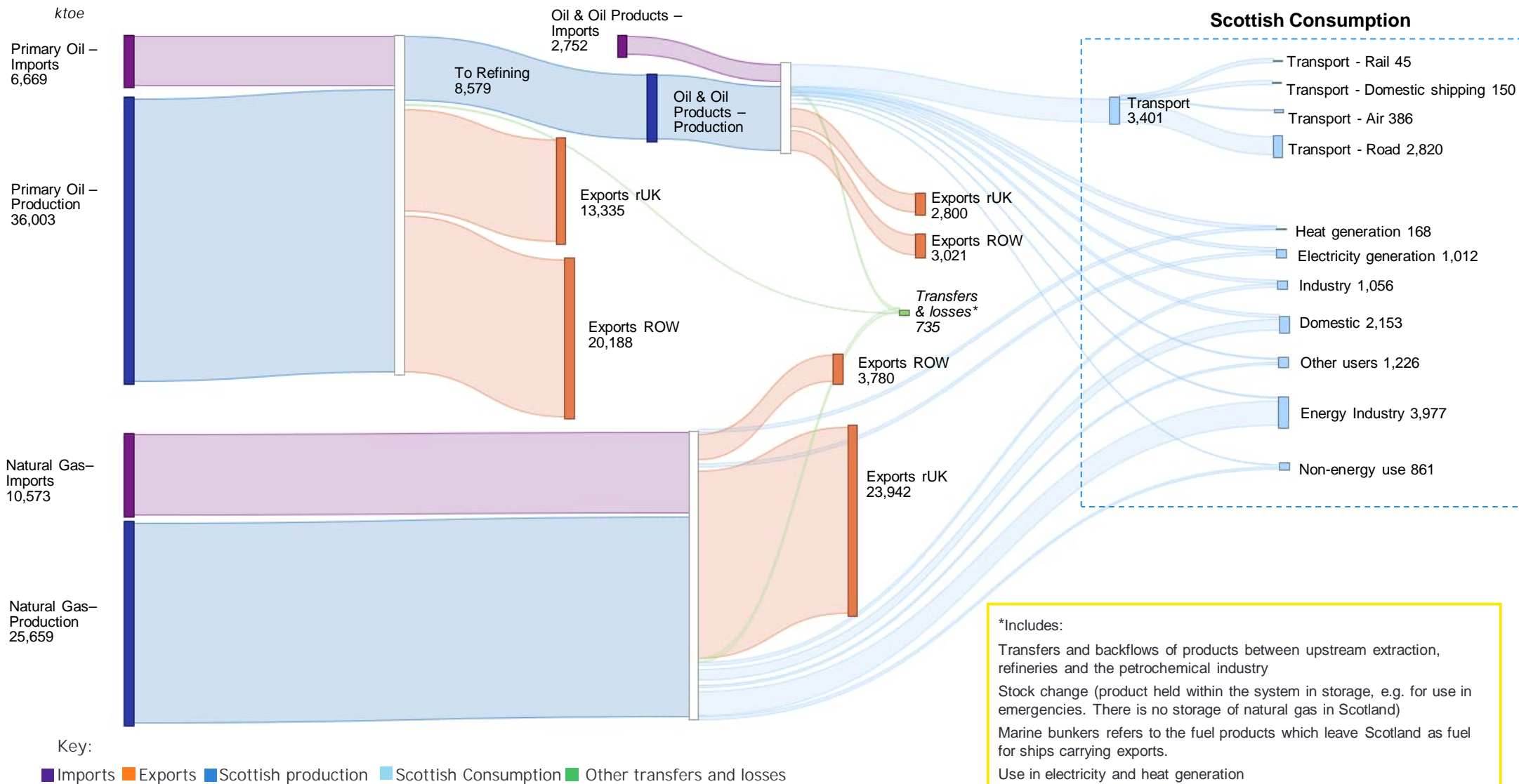
1. <https://www.ons.gov.uk/economy/nationalaccounts/supplyandusetables/datasets/inputoutputsandusetables>

2. 'Other' comprises of architectural and engineering activities, manufacturing of dyestuff and agrochemicals, repair of computers and goods, other mining and quarrying amongst other sectors.



3 The O&G Energy System

Scotland's O&G flows (2022)



Source: SG - oil and gas physical commodity balances 1998-2022

[Oil and gas production statistics - gov.scot](https://gov.scot/oil-and-gas-production-statistics)

***Includes:**

Transfers and backflows of products between upstream extraction, refineries and the petrochemical industry
 Stock change (product held within the system in storage, e.g. for use in emergencies. There is no storage of natural gas in Scotland)
 Marine bunkers refers to the fuel products which leave Scotland as fuel for ships carrying exports.
 Use in electricity and heat generation
 Losses from the National Grid, including leaks and theft

Scotland’s O&G flows (2022)

Home	1 Introduction and background	5 Upstream Primary Oil ...
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The Sankey Diagram – How O&G flows around Scotland

The Sankey diagram on Slide 16 shows a snapshot of Scotland’s O&G flows in 2022. The width of the bars are proportional to the relative volume and clearly illustrate Scotland’s position as a net exporter, as well as the scale of ScotNS production compared to Scottish consumption levels.

We expect the proportion of primary oil that is used for refining to reduce in the future with the closure of Grangemouth Refinery.

The diagram has been created on a similar basis as the original Shakey Diagram on page 79 of the original Ninian Report.

4

Upstream Primary Oil Products – Crude Oil

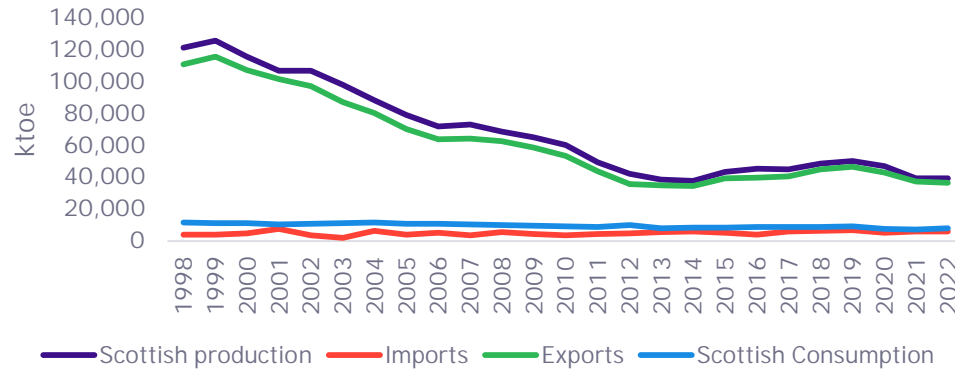


Crude Oil

Pattern of production, import and export

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Primary Oil Products



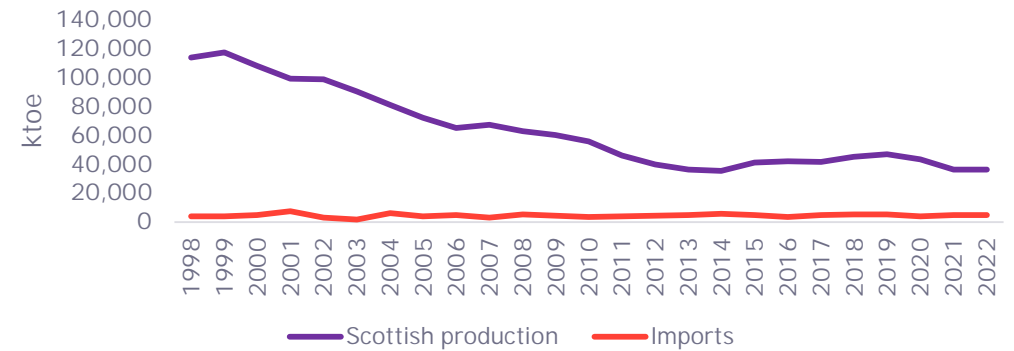
Source: SG - oil and gas physical commodity balances 1998-2022

We have updated the diagrams from page 82 of the original Ninian Report, revising the baseline data from 2019 to 2022.

Scottish production

Scottish production of Primary Oil Products (which includes both crude oil and NGLs) has reduced significantly over the last 23 years as North Sea fields have depleted, from a peak total production of 125,644ktoe in 1999 to 36,003ktoe in 2022, a c71% drop. Despite this, production long-term a significantly larger inflow to the system than imports, as illustrated by the Sankey diagram. The downward trajectory is driven by the long term decline in new investment and depletion of existing ScotNS fields.

Crude Oil - Imports Vs Production



Source: SG - oil and gas physical commodity balances 1998-2022

Imports

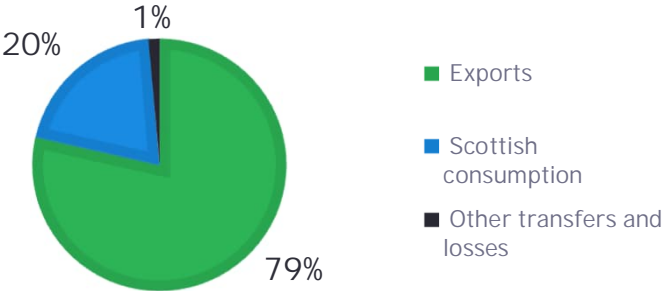
Scotland has zero imports of crude oil from rUK, but 15% of the country's total energy source (production plus imports) is imported from overseas. Total imports of crude oil have fluctuated somewhat over the years, but crucially these fluctuations do not correlate to declining production. In 2022, Scotland imported a total of 6,669ktoe crude oil from overseas.

Crude Oil

Pattern of production, import and export (cont'd)

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Primary Oil Products – End Use (2022)



Source: SG - oil and gas physical commodity balances 1998-2022

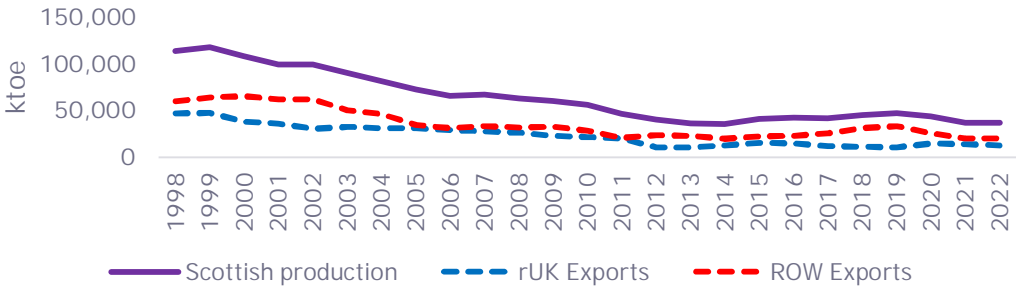
We have updated the diagrams from page 83 of the original Ninian Report, revising the baseline data from 2019 to 2022.

End Use

The vast majority of Scotland's source Primary Oil Products are exported, with only 20% consumed in Scotland. Primary Oil Products are exclusively consumed by Grangemouth refinery where they are transformed into usable end products. The historical data, however, does not reflect the closure of the Grangemouth Refinery. None of Scotland's imported Primary Oil Products are subsequently exported. Scottish consumption of crude oil has reduced slightly over the last 23 years, but not in proportion to the decline in North Sea production. It is more likely that changes in demand are driven by recent shifts towards low-carbon alternatives, rather than directly as a result of reducing North Sea supply.

A very small portion of Primary Oil Products is neither exported nor transformed in the refining process. This "other" portion is made up of transfers – NGLs that are reclassified as they move between refineries and the petrochemical industry. Transfers do not leave the system as a usable end product. The "other" also consists of stock change – a very small portion of upstream Primary Oil Products which are held within the system in storage.

Crude Exports vs. Production



Source: SG - oil and gas physical commodity balances 1998-2022

Exports

In 2022, Scotland exported 12,698ktoe of crude oil to rUK, and 18,880ktoe to ROW. Exports to ROW have reduced by 69% compared to 1998, while exports to rUK have dropped more drastically, a 73% decrease compared to 1998.

These have both declined over the last 23 years in line with declining production, although they have started to stabilise in recent years. The figures suggest that rUK is more sensitive to declining Scottish production, compared to exports to ROW, although we note that the downward trajectory of ROW exports seems more closely to mirror the trajectory of declining Scottish production. It is also important to note that exports to rUK include production from ScotNS which is piped to terminals in England, and may subsequently be loaded for export to ROW but is not captured as such in these statistics.

As a net exporter of high-quality crude oil, traders in the Scottish O&G sector are protected somewhat from oil price increases. The UK as a whole on the other hand is a net importer and therefore benefits more when prices decline as they can make necessary purchases cheaper. Policy makers must consider such market factors when making decisions about the future of the Scottish O&G sector.



5 Upstream Primary Oil Products – Natural Gas Liquids (NGLs)

Natural Gas Liquids

Trends in production, use and exports

Production and Imports

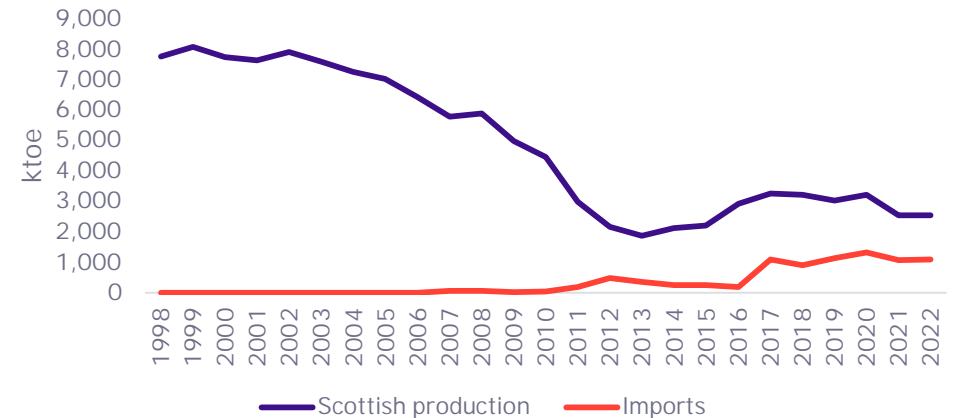
Scotland historically did not import any NGLs as production came directly from North Sea fields or the cracking process at NGL facilities such as Mossmorran. Scotland only began importing when production started to decline more sharply in the mid 2000s, indicating a stronger correlation between declining production and NGL imports than the crude oil case.

In 2014, Ineos received planning permission to build an ethane storage tank at its site in Grangemouth. The tank was designed to hold over 60,000 cubic metres of ethane, a key feedstock for petrochemical manufacturing, shipped from the Texas Gulf to substitute for declining North Sea supplies and facilitate the expanding petrochemical facilities.

Imports of NGLs from the US also contain a small portion of ethane derived from US shale gas. Although shale gas is primarily composed of methane, a natural gas, it is shipped to Scotland in a liquefied state and so is included in the data set as an NGL. Shale gas is extracted by hydraulic fracking of bedrock, a process which is currently banned in Scotland and therefore could not be replaced by Scottish production. Grangemouth was one of the first refineries in the UK to import shale gas from the US in 2016, extracting ethane from the gas to create plastic pellets used in general manufacturing. Therefore, imports of NGLs are driven by declining North Sea production as well as price advantage of importing from the US, unlike imports of crude oil which are driven solely by price advantage of trading on the global market and not at all by production levels. In both cases the same principle applies that the wider market factors at play are ultimately out of Scottish policy makers' control.

The data shows the increase and levelling off of NGL production levels since 2013 while imports have continued to rise. This is likely due to the construction of Ineos' new ethane Tanker.

NGL – Imports vs. Production



Source: SG - oil and gas physical commodity balances 1998-2022

We have updated the diagrams from page 86 of the original Ninian Report, revising the baseline data from 2019 to 2022.

Source: SG Commodity Balances, Exports and Imports of Oil, Gas and Petroleum 2019

Natural Gas Liquids

Trends in production, use and exports

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Exports

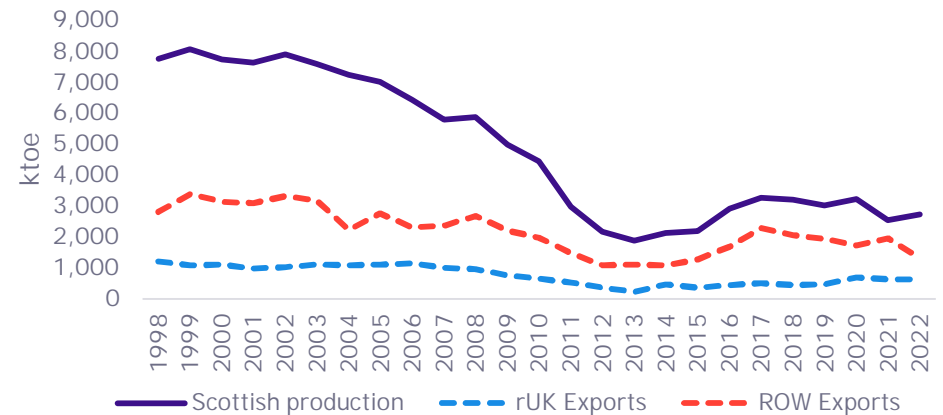
In 2022, Scotland exported 637ktoe of NGLs to rUK, and 1,308ktoe to ROW, significantly smaller volumes than the export of any other product, but a significant portion of total NGL production.

The graph indicates that the downward trajectory of NGL exports to ROW is more in line with declining production than the trajectory of exports to rUK. This is similar to the relationship between crude oil exports to ROW and crude oil production, and is also impacted by similar global market factors which result in Scotland both importing and exporting NGL products depending on what is most economically advantageous on the market.

These findings indicate that ROW exports are most likely to be affected by the continuing decline of North Sea production, as opposed to seeing big changes to imports, domestic demand or rUK exports.

Scotland currently benefits from its position as a net exporter to ROW in the midst of rising commodity prices. However, if ROW exports continue to decline as a result of declining North Sea production and Scotland begins importing more O&G goods than it exports, it would no longer be sheltered from price increases.

NGL Exports vs. Production



Source: SG - oil and gas physical commodity balances 1998-2022

We have updated the diagrams from page 87 of the original Ninian Report, revising the baseline data from 2019 to 2022.



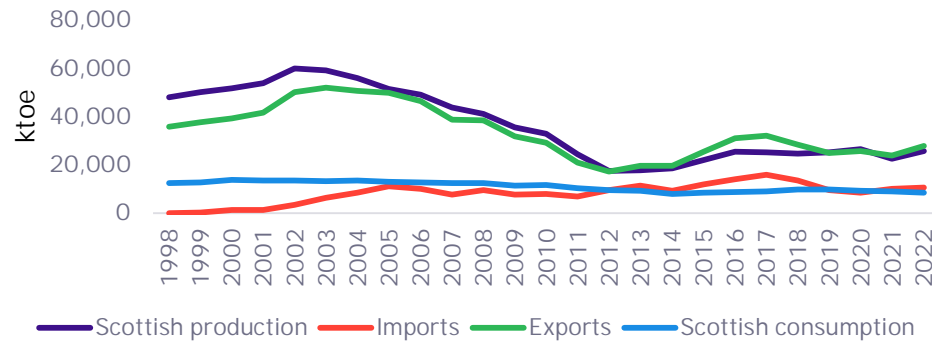
6 Natural Gas

Natural gas

Gas Network and Production

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Natural Gas



Source: SG - oil and gas physical commodity balances 1998-2022

We have updated the diagrams from page 89 & 90 of the original Ninian Report, revising the baseline data from 2019 to 2022.

Natural Gas

Natural gas was first discovered in the North Sea in the 1960s, and by the late 1970s was the preferred heating source for both industry and domestic properties following a UK Government campaign to move the country away from coal and town gas consumption. ScotNS production of natural gas peaked in 2000 and has since been in decline, as shown in the graph above. Scotland's electricity generation became coal-free when the Longannet power station, the last and largest coal-fired power plant in Scotland, ceased operations in 2016.

Natural Gas – Imports vs. Production



Source: SG - oil and gas physical commodity balances 1998-2022

Imports vs. Production

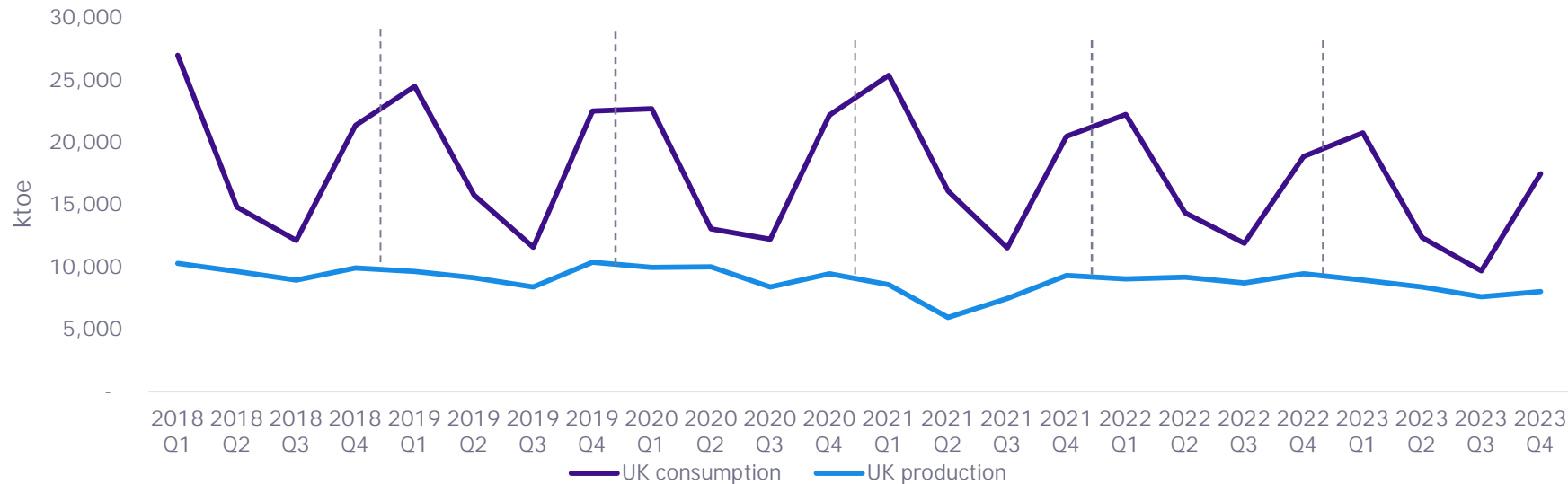
Although ScotNS production has declined, Scottish demand for natural gas has remained relatively steady over the last 23 years. As a result, Scotland has had to supplement the declining production by importing natural gas from Norwegian fields via the FLAGS, SAGE and Vesterland pipelines. Imports have steadily increased since the early 2000s, with Scotland importing 10,573ktoe of natural gas in 2022, 29% of the total gas supply. Scotland produced 25,659ktoe of natural gas in 2022, considerably higher than Scottish demand of 8,496ktoe.

Natural gas

Imports trends and Seasonality of demand

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Seasonality of Gas Demand



Source: BEIS Energy Trends 4.1 Natural gas supply and consumption

We have updated the diagram from page 90 of the original Ninian Report, revising the baseline data from 2020 to 2023.

Seasonality of demand

The data suggests that a very small portion of imported natural gas comes from rUK, which is counterintuitive considering the volume of exports from ScotNS to rUK. The reason for this anomaly is twofold. Firstly, Scotland is part of the UK National Grid and does not have its own separate gas network that recognises the land border. Secondly, unlike production levels, gas demand fluctuates seasonally. As discussed in the introduction, part of the National Grid's function is to ensure that the gas system is balanced across each day and so gas is often moved back and forward between Scotland and rUK to meet fluctuating daily demand. The volatile nature of gas consumption across the UK National Grid highlights the need to consider energy security as Scotland currently has zero storage of gas.

Natural gas

End use and Export trends

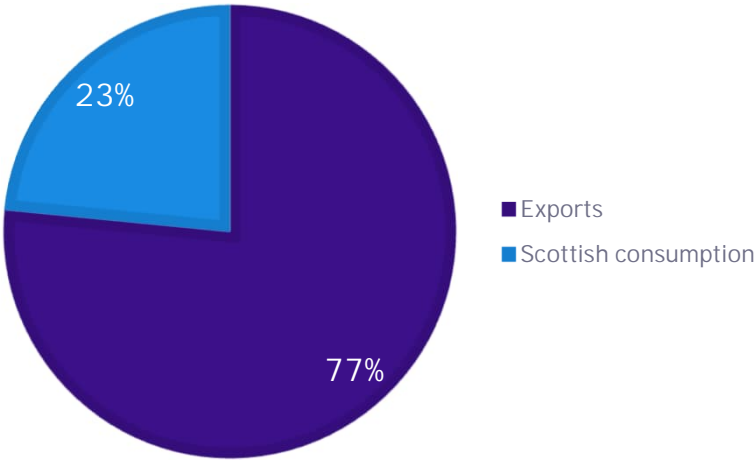
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Scottish consumption

Scotland consumes proportionally more gas than oil products. In 2022, total Scottish consumption of refined oil and oil products was 5,430ktoe, compared to natural gas consumption of 8,496ktoe. Scottish consumption of natural gas equates to 23% of natural gas primary energy (imports plus Scottish production).

Total Scottish consumption has remained relatively steady over the last 23 years in comparison to declining Scottish production.

Natural Gas – Total End Use (2022)



Source: SG - oil and gas physical commodity balances 1998-2022

We have updated the diagrams from page 91 of the original Ninian Report, revising the baseline data from 2019 to 2022.

Natural gas

End use and Export trends

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Energy Industry

Natural gas is consumed in many different ways, but upstream O&G producers that use gas in the extraction process account for 42% of total Scottish consumption of natural gas in 2022. Energy Industry use also includes use by refineries.

As the upstream process needs to use natural gas in the course of producing O&G products, the NSTA often report “net natural gas” figures in its production data. Net natural gas production refers to gross production less producers’ own use, i.e., the portion consumed by the process and not available for sale to end users.

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Domestic

Natural gas also continues to play a large role in heating Scotland and is the primary fuel source for domestic properties in Scotland

Transformation (i.e., electricity or heat generation)

13% of Scotland’s consumption of gas relates to use for electricity or heat generation. The primary demand is to supply Electricity generators, but a small portion also relates to the use of gas for heat generation in district heating schemes across Scotland.

Industry

Industry accounts for 10% of Scotland’s gas consumption as it is used as a source of both heat and power in the production of goods such as iron and steel, non-ferrous metals, mineral products, chemical products, vehicles production, food, beverages, textiles, leather, paper, printing, and in construction.

Other Final Users

Other final users include Agriculture, where natural gas is used to power machinery and irrigation systems, the commercial sector which uses gas to heat buildings and water, and public administration where it is used to deliver public lighting and other public services.

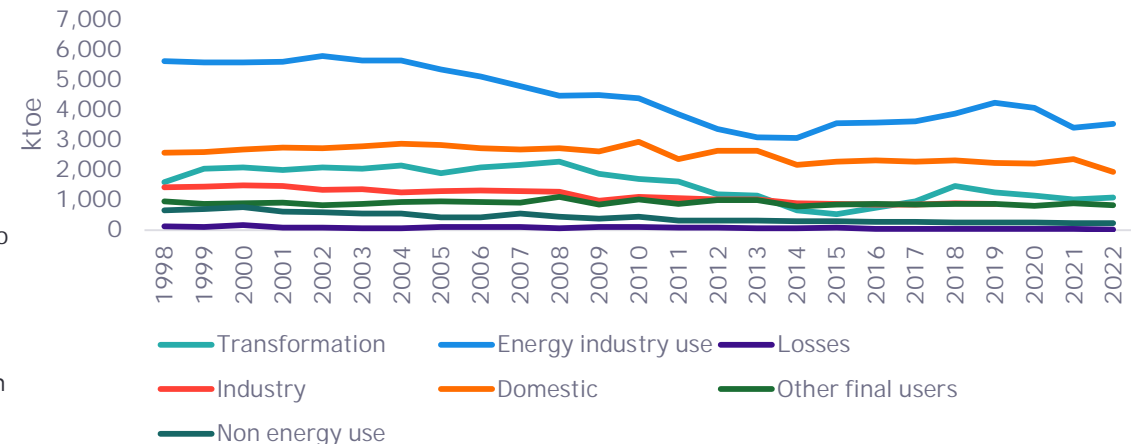
Losses

Natural gas losses occur downstream and include metering differences, theft and leakage. These have been estimated by BEIS using the LDZ Shrinkage Assessment and Adjustment report (published by National Grid), with the Scottish figure apportioned relative to Scottish natural gas consumption.

Non energy use

Non-energy use refers to gas used as feedstock for petrochemical plants in the chemical industry as raw material to produce ammonia (an essential intermediate chemical in the production of nitrogen fertilisers) and methanol.

Scottish consumption of Natural Gas Over Time



Source: SG - oil and gas physical commodity balances 1998-2022

We have updated the diagrams from page 91 of the original Ninian Report, revising the baseline data from 2019 to 2022.

Natural gas

End use and Export trends (cont'd)

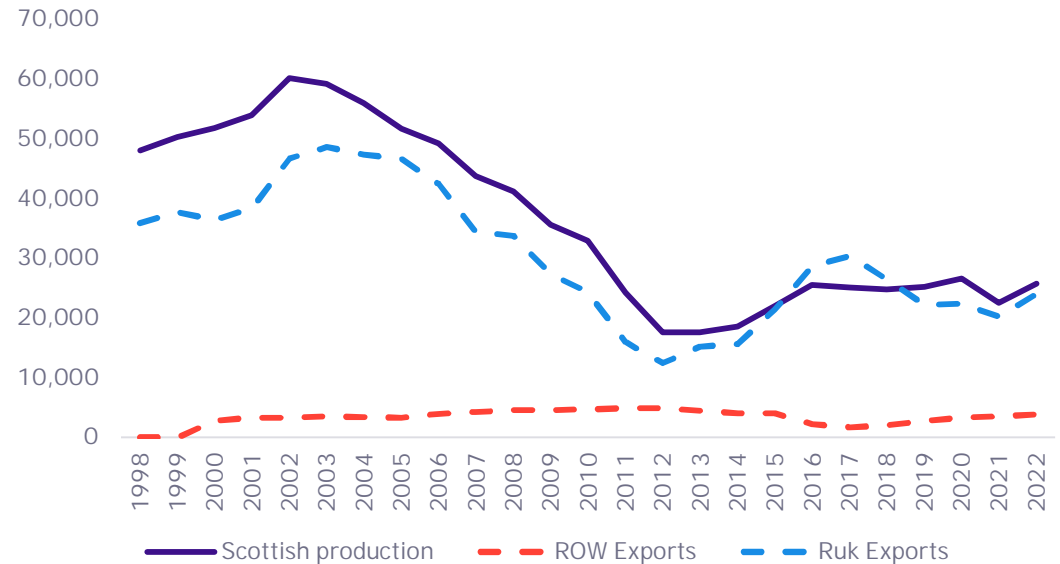
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Exports

The majority of Scotland's production of natural gas is exported to rUK. Natural gas accounted for 60% of Scotland's total O&G exports to rUK in 2022. Exports of natural gas to rUK have been closely correlated to Scottish production and therefore have been heavily impacted by the declining North Sea supply. Scotland's exports of natural gas to ROW are minimal, with only a small percentage of Scottish natural gas exported to the Republic of Ireland via the UK-Ireland Interconnector. However, we note that it is possible that some Scottish exports to rUK are subsequently exported to ROW via the IUK interconnector with Belgium or the Balgzand to Bacton Line (BBL) to the Netherlands, and that these re-exports are not accurately captured in the data set.

Natural gas production in the UKCS began to increase from 2014, with 2015 seeing the largest year on year increase since production peaked at the beginning of the century. This was due to the development of new gas fields as well as lower maintenance levels than 2014. We note that the data shows that exports to rUK actually exceeded Scottish production between 2016 and 2018. This is an example of the National Grid balancing demand across the system. Upstream exports go directly from ScotNS fields to gas terminals in rUK, as per the pipe infrastructure discussion, but any Norwegian gas imported to Scotland and not used can also be subsequently re-exported to rUK, causing exports to be higher than production levels.

Natural Gas - Exports Vs Production



Source: SG - oil and gas physical commodity balances 1998-2022

We have updated the diagram from page 92 of the original Ninian Report, revising the baseline data from 2019 to 2022.



7

ScotNS net tax receipts

ScotNS net tax receipts

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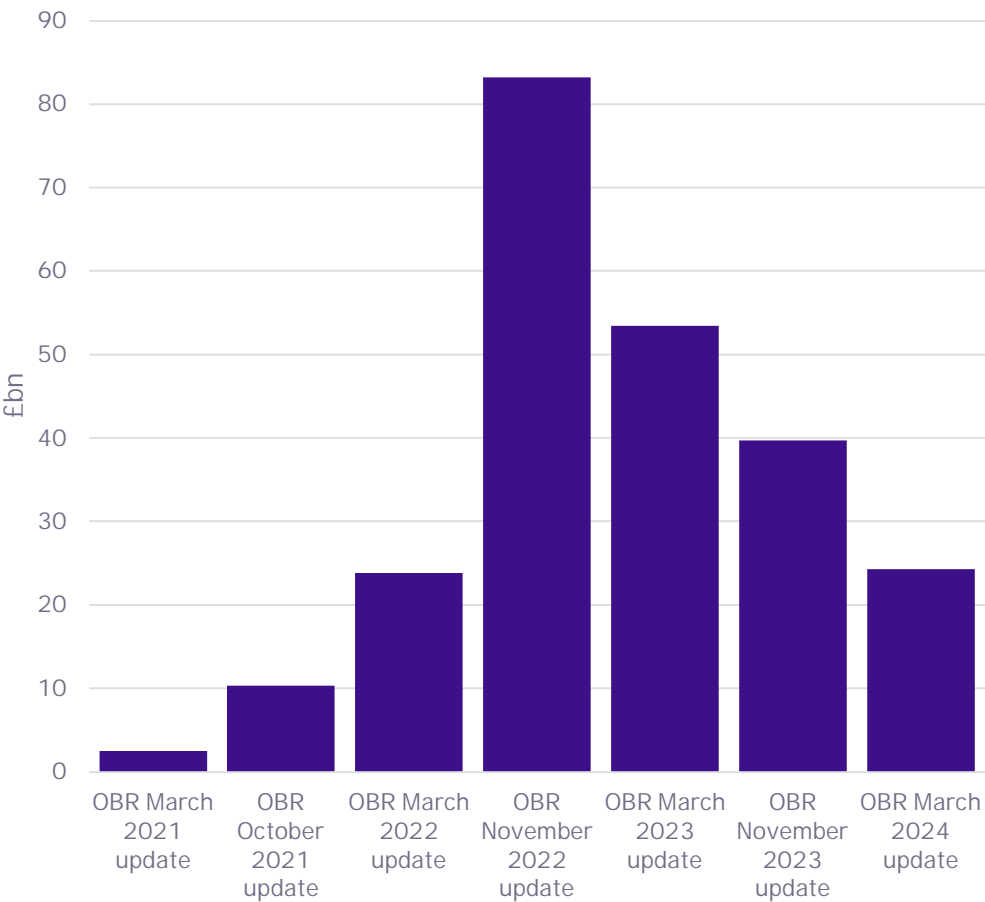
Net tax receipts from the ScotNS

The accompanying graph illustrates the projected North Sea tax revenues derived from successive Office for Budget Responsibility (OBR) reports, presented on a rolling seven-year basis and utilising the most current data available.

This most recent forecast reveals an uplift in anticipated North Sea tax revenues when compared to the data presented in the original Ninian Report, now estimated at £24.3 billion as of March 2024, compared to £10.3 billion in October 2021.

This has been due to a change in the macroeconomics of the global oil and gas sector, culminating in favourable market conditions, technological advancements, and strategic policy initiatives that have collectively enhanced the outlook for North Sea tax revenues.

OBR O&G Corporation Tax and PRT cumulative forecast (rolling 7 year period)



Source: OBR

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The other data tables that they want updated have sources from Scottish Government Satellite accounts and ONS - I haven't looked at these in detail but based on these referred sources I think the updated data should all be publicly available.