

Executive Summary

This bulletin summarises recent trends in the Scottish oil and gas industry, and the future outlook for the sector, with a specific focus on investment, production, prices and the tax revenue generated by the industry.

The key results are summarised below:

- The Bulletin shows that the UKCS remains the largest oil producer in the EU by a large margin and the second largest gas producer in the EU. It also highlights that oil and gas production in the UKCS appears to be approaching a turning point where it could level-off or improve over the medium term. The latest production data shows output in April 2015 increased by 9.8% compared to the same month last year, as a number of large fields came back on stream following the completion of maintenance work.¹ In addition, it is expected that 12 new field developments could begin production this year. While there are a range of forecasts for future production, Oil and Gas UK's central forecast is for production to increase by approximately 17% between 2014 and 2019.
- Over the long-term, there remain considerable opportunities to extend production, with up to 23 billion recoverable barrels of oil equivalent remaining in the UKCS as summarised below.²
 - The industry expects a further 6.3 billion boe will be produced under current investment plans.
 - There are up to 4 billion boe of further reserves currently in companies' plans, which could be produced with further investment.
 - Further potential exists from up to 3.5 billion boe of discovered resources, which are not currently technically or economically producible but could be viable in the future.
 - Finally there are estimated to be up to 9 billion boe of 'yet-to-find' resources.
- Achieving this full potential can only be delivered with the correct regulatory and fiscal regime and further measures to reduce the UKCS cost base. For example, it is estimated that the full and swift implementation of the Wood Review's recommendations alone could lead to an additional 3-4 billion boe of the recoverable reserves being produced over the next 20 years.
- The combination of rising capital investment and operating costs has resulted in UKCS expenditure reaching record levels for four successive years. This has put pressure on companies' cash flow and taxable profits. While the cyclical pattern of capital investment is likely to have peaked in 2014, financial conditions in the industry are expected to remain challenging in 2015. This highlights the importance of sustainable cost efficiency programmes and the need to explore options to extend field life and

¹ <http://www.ons.gov.uk/ons/rel/iop/index-of-production/april-2015/stb-iop-april-2015.html>

² <http://www.oilandgasuk.co.uk/economics.cfm>

delay decommissioning. For example, Oil and Gas UK have highlighted the need for 20% to 40% efficiency improvements through cost reductions and brownfield investment. Achieving these targets is key to ensuring the long-term sustainability of the UKCS.³

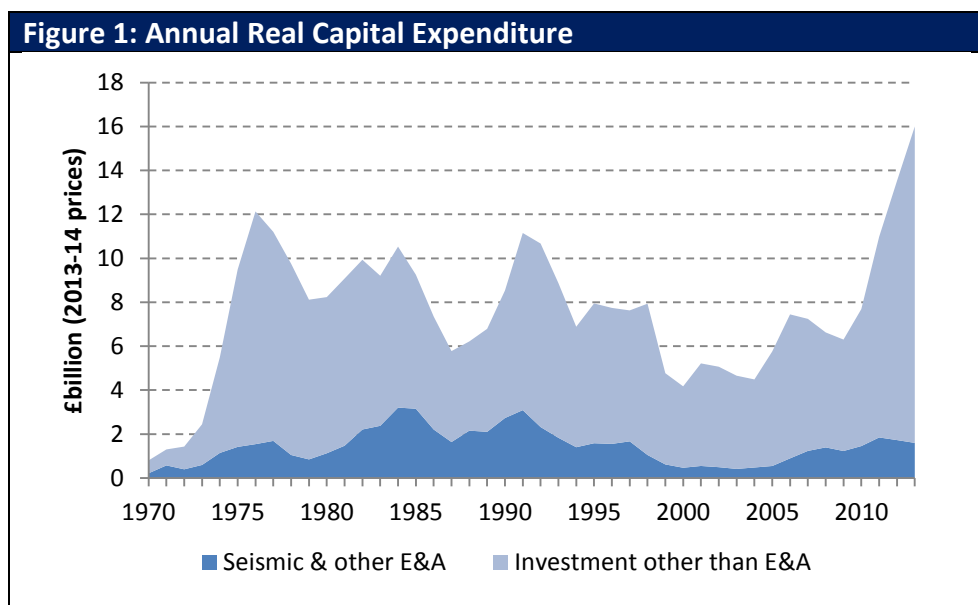
- The challenging economic conditions facing the North Sea industry have prompted industry, and other stakeholders, including the Scottish Government, to put forward proposals to reform the fiscal regime. This led to a number of policy announcements at Budget 2015, which are likely to have a positive impact across the basin. While the measures will depress government tax revenues in the short-term, in the longer-term they are expected to boost production and investment, and in turn future revenues.
- A number of scenarios for the outlook of Scottish North Sea tax revenues are presented in Section 5 of this Bulletin. The analysis demonstrates that the forecasts are sensitive to the assumptions used, and the path of future tax revenue will be greatly influenced by companies' ability to reduce their cost base and improve both production efficiency and exploration levels.
- This Analytical Bulletin focuses on the tax receipts paid directly by North Sea companies through taxes on the profits from oil and gas production. In addition to these revenues, North Sea operators also pay a range of other taxes, including business rates and employer national insurance contributions. Employment supported by the sector also generates further tax revenue for the Exchequer. It is estimated that the sector currently supports around 200,000 jobs across Scotland and international sales from the Scottish oil and gas supply chain reached £11.2 billion in 2013 – accounting for more than 50 per cent of total sales.⁴

³ <http://www.oilandgasuk.co.uk/publications/viewpub.cfm?frmPubID=869>

⁴ <http://www.scottish-enterprise.com/knowledge-hub/articles/insight/record-oil-and-gas-supply-chain-sales>

1. Investment and Expenditure

Since 1970, cumulative UKCS capital expenditure has totalled more than £330 billion in 2013-14 prices.⁵ Figure 1 shows the annual investment in the UKCS has averaged between £7 billion and £8 billion per annum in real terms over this period.



Capital investment has more than doubled over the last five years. In 2014, capital investment reached a record £14.8 billion.⁶ This increase in capital investment reflects three factors.

Firstly, there has been a marked shift towards more complex field developments which are often characterised by low permeability reservoirs, high-pressure/high-temperature (HP/HT) reservoirs, deep-water, and heavy oil. The scale of many new projects has also grown. For example, according to Oil & Gas UK, twelve projects accounted for half of all capital expenditure in 2014.

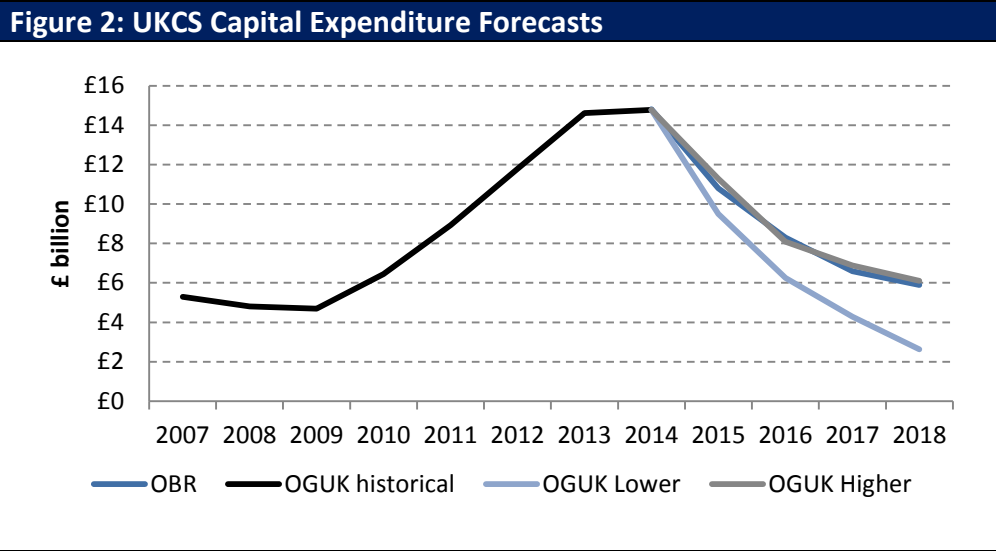
Secondly, as the North Sea matures, the spending required to maintain and upgrade ageing infrastructure, and to develop brownfield projects, continues to rise. Such expenditure accounted for just over half of all investment spending in the North Sea last year.⁷

Finally, there has been a high level of cost inflation in the sector. Such inflation is not unique to the UKCS. However, over the last decade, unit development costs have increased in the UKCS at a much faster rate than other regions. Oil & Gas UK estimate that unit development costs peaked at £17.40 per boe in 2013, this compares to unit development costs of less than £4 per boe in 2004.

⁵ DECC, "Income from and expenditure on UKCS exploration, development and operating activities: annually 1970-2013"

⁶ Oil & Gas UK – Activity Survey 2015 - excludes decommissioning capital expenditure, and other exploration and appraisal (E&A) expenditure.

⁷ Wood Mackenzie, Upstream Service



As Figure 2 details, both the Office for Budget Responsibility (OBR) and Oil & Gas UK forecast that capital expenditure will decline as several large fields reach completion. Oil & Gas UK's lower forecast refers to investment that has been sanctioned as of 2014, whilst their higher forecast includes additional investment that could be made in the right conditions. The latter is broadly in line with the OBR forecast which takes account of the measures announced in Budget 2015.

Capital investment receives a 100% first year capital allowance which has an immediate impact on tax receipts. All other things being equal, lower levels of capital expenditure will improve company cash flows and tax receipts in the short-term. However, it is important to retain a sustainable level of investment in order to ensure the longevity of UKCS production.

While capital investment is expected to follow a downward trend over the next few years, the OBR forecast that decommissioning expenditure will increase from £1 billion in 2014 to £2 billion per year from 2016 to 2019. Tax relief is given for decommissioning costs at the point that they are incurred and if decommissioning expenditure produces an overall loss for a year, the loss may be carried back against previous ring-fenced profits. As such, the forecast increase in decommissioning expenditure is likely to reduce tax revenues over the next five years.

Operating Expenditure

Operating expenditure and unit operating costs in the UKCS have also increased over the last decade, from £4 per boe in 2003 to around £18 per boe in 2014.⁸

As highlighted by the Oil and Gas Authority, around 50% of operating cost inflation in the UKCS is directly related to higher input costs, such as rising salaries and costs of equipment, which have been driven in part by rising oil prices in the past. Activity, such as increased

⁸ <http://www.oilandgasuk.co.uk/cmsfiles/modules/publications/pdfs/EC044.pdf>, Figure 35

maintenance work accounts for 20% of cost inflation, and reduced production accounted for the remaining 30%.⁹

This increase in operating costs is higher than the estimated level of upstream operating cost inflation observed globally. For example, the IHS CERA Upstream Operating Costs Index reports that operating costs have more than doubled compared to 2000 levels globally.¹⁰

The combination of rising capital investment and operating costs has resulted in total UKCS expenditure reaching record levels for four successive years. As a result, the industry is estimated to have generated a negative cash flow in both 2013 and 2014. While the cyclical pattern of capital investment is likely to have peaked in 2014, Oil and Gas UK expect the cash flow position in 2015 to remain negative. This highlights the importance of sustainable cost efficiency programmes and the need to explore options to extend field life and delay decommissioning. The need to achieve cost efficiencies is now widely recognised in the industry. Oil and Gas UK has set out the need for 20% to 40% efficiency improvements,¹¹ and the Oil and Gas Authority has announced that it will require companies to prepare asset improvement plans and encourage a 30% to 40% efficiency improvement by the end of 2017.¹² Achieving such efficiencies will both increase the number of viable developments and help to extend the life of existing projects

The longer term outlook for investment depends largely on the success of such efficiency measures, and any accompanying reforms to the fiscal and regulatory regimes. However, to provide an illustration of the scale of future activity, it is estimated that even with only 8 billion boe of cumulative production over the period to 2040-41, it will still require around £96 billion of capital investment, £54 billion of decommissioning expenditure and over £150 billion of operating expenditure.¹³

Such investment will make a significant contribution to the wider oil and gas supply chain, in turn supporting employment and the tax revenue generated by the industry's wider economic footprint. For example, the capital expenditure on field investment, exploration and appraisal and decommissioning outlined above, is estimated to support on average around 80,000 jobs a year over the period to 2040.¹⁴

This highlights why the Scottish Government's oil and gas policy emphasises the importance of considering the Total Value Added (TVA) of the sector's activity, as recommended by Scotland's Expert Commission on Oil and Gas, rather than focusing exclusively on the direct

⁹ Oil and Gas Authority, Call to Action 2015 <https://www.gov.uk/government/publications/call-to-action-the-oil-and-gas-authority-commission-2015>

¹⁰ IHS CERA Upstream Operating Costs Index, <https://www.ih.com/info/cera/ihindexes/Index.html>

¹¹ <http://www.oilandgasuk.co.uk/publications/viewpub.cfm?frmPubID=869>

¹² <https://www.gov.uk/government/news/new-north-sea-regulator-issues-urgent-call-to-action>

¹³ OBR, Fiscal sustainability report, June 2015, figures in nominal terms as reported by the OBR.

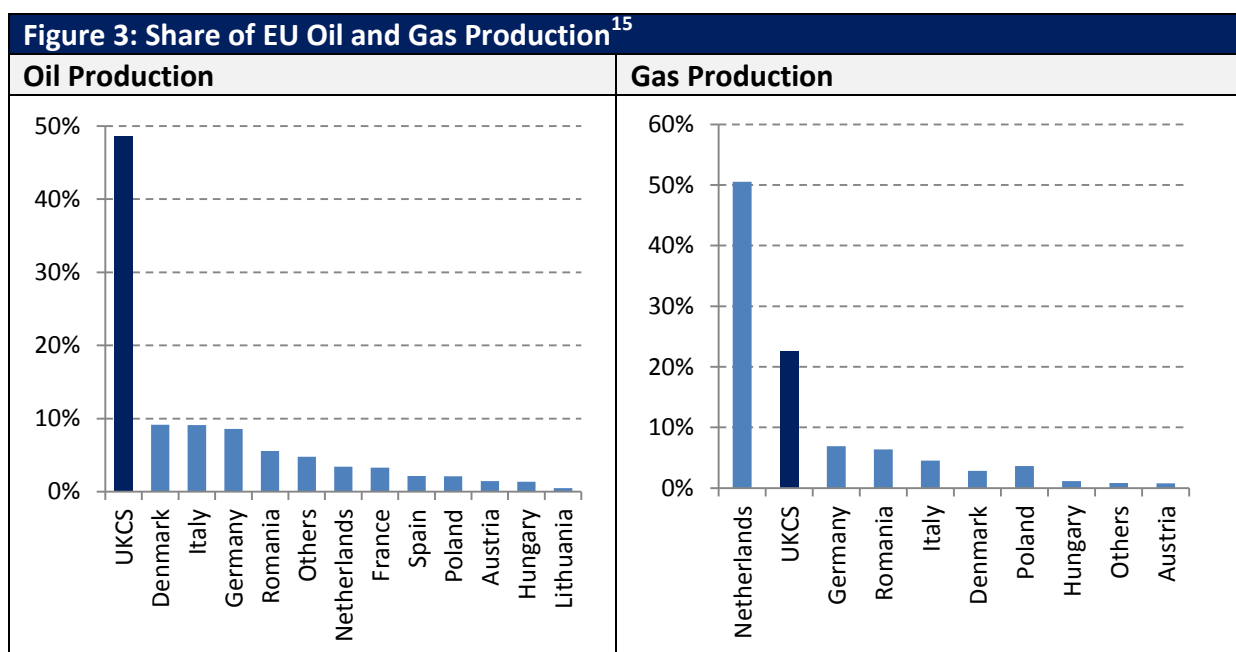
¹⁴ Scottish Government calculation, based on OBR expenditure assumptions (Supplementary Table 2.1, deflated to 2014-15 prices). Employment multipliers based on Oil & Gas UK capital expenditure multiplier from the Economic Report 2013 (p.58). Employment in individual years varies with the investment profile, it relates only to employment estimated to be supported by UKCS capital expenditure and excludes employment supported by operating expenditure and export activities.

contribution that the industry makes in terms of offshore activity and production taxes. The importance of TVA was also reflected in the Oil and Gas Authority Call to Action.

2. Production

Production in the UKCS is now entering its fifth decade. While production levels have declined from a peak in 1999, the UKCS remains a substantial producer with a combined production of oil and gas of 1.42 million barrels of oil equivalent (boe) per day in 2014.

Figure 3 below, shows that the UKCS remains the largest oil producer in the EU by a large margin and the second largest gas producer in the EU after the Netherlands.



The declines in production observed in recent years primarily reflect the maturing of the UKCS which has resulted in a number of large fields reaching the end of their productive lives. It also reflects a decline in production efficiency – the extent to which a field achieves its maximum production potential – as discussed in Box 1.

Box 1: Production Efficiency

Production Efficiency is defined as the ratio of actual production of a field to the maximum production potential, constrained only by technical and market limits. It is a useful metric to compare the efficiency of all UKCS production operations on a common basis.

¹⁵ EIA International Energy Statistics, Latest data for total oil supply (2014) and total gas supply (2013)

Depending on factors such as the complexity of a producing system, DECC state that production efficiency in the range of 80% to 95% represents “good” performance.¹⁶

Production efficiency across the UKCS has declined from 80% to around 60% over the last decade, with substantial declines due in part to unplanned stoppages and maintenance downtime. While production efficiency has increased slightly over the last two years, the reduction in efficiency is estimated to account for almost 0.5 million boe per day of lost production (approx. one third of actual production). This demonstrates the benefits that could accrue from improving production efficiency, and in particular, achieving the target of 80% by 2016, which was agreed between the UK Government and operators in 2013.¹⁷

UKCS production fell by only 1.1% between 2013 and 2014. This compares to production falls of 19%, 14% and 8% in the past three years. More recently, UKCS production in April 2015 was 9.8% higher than in the same month last year as a number of large fields came back on stream following the completion of maintenance work.¹⁸ This suggests that production activity may be approaching a turning point where it could level-off or improve over the medium term.

In the coming year, Wood Mackenzie expect 12 new fields to begin production, adding 326 million boe to UKCS reserves and 102,300 barrels of oil equivalent per day to 2015 production.¹⁹ This represents 6% of current base production from the UKCS. Partly as a result of this new production coming on-stream, Oil and Gas UK estimate that in the absence of any major project delays production levels could rise from 519 million boe in 2014 to 523 million boe in 2015.

There are a range of forecasts for future production (see Figure 4). Oil and Gas UK’s central forecast is for production to increase by approximately 17% between 2014 and 2019, reflecting the expected impact of new fields coming onstream and an improvement in production efficiency. Professor Alex Kemp also estimates that total hydrocarbon production will increase from current levels over the next few years.²⁰ By contrast, the OBR forecast for production to decrease by around 21% over the period 2014 to 2019. The OBR forecasts are taken from production projections produced by DECC which incorporate “very significant negative contingencies” to the underlying field level data to reflect past forecasting deviations.²¹

¹⁶ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/320222/edu_booklet_aug_13.pdf

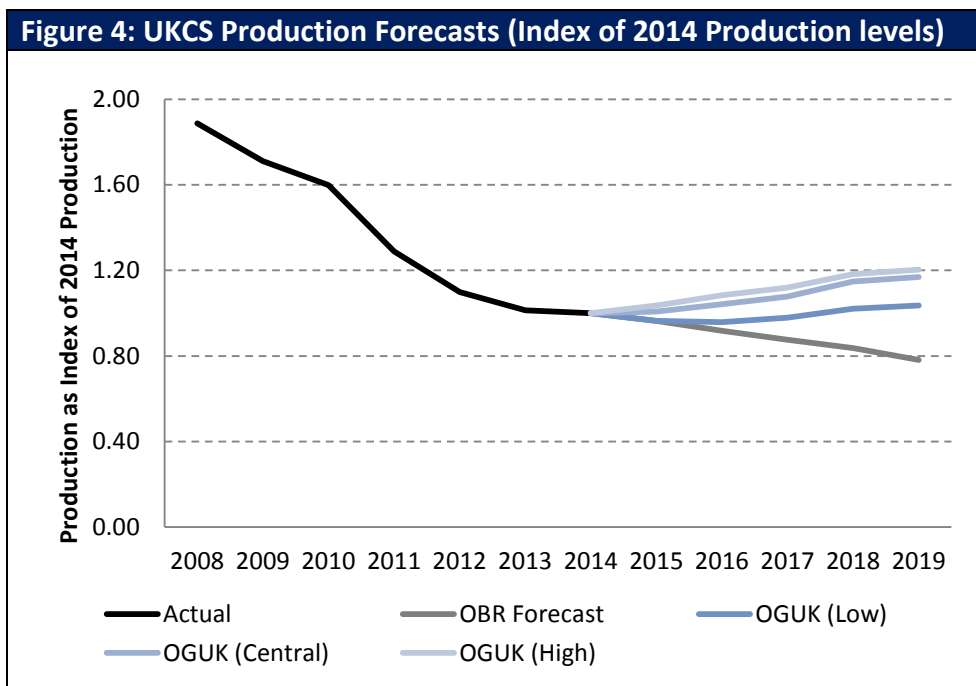
¹⁷ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/223846/pilot_minutes_2_may.pdf

¹⁸ <http://www.ons.gov.uk/ons/rel/iop/index-of-production/april-2015/stb-iop-april-2015.html>

¹⁹ Wood Mackenzie (2015), “UK Upstream – 2014 in review and what to look for in 2015”

²⁰ Kemp, A and Stephen, L (2015), “The Investment Allowance in the Wider Context of the UK Continental Shelf in 2015.” <http://www.abdn.ac.uk/research/acreef/working-papers/> (Paper 132)

²¹ DECC - UKCS Oil and Gas Production Projections (March 2015): https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/414172/Production_projections.pdf



With the pipeline of projects due to come onstream, the short term production outlook will largely be influenced by the industry’s ability to minimise start-up delays and to reduce production losses from maintenance and underperformance.

Over the long-term the production outlook will depend on a range of factors including oil and gas prices, the UKCS cost base, the regulatory and fiscal regime, the level of investment the UKCS can attract from global investors, and the success of new technologies in accessing harder to reach resources.

However, there remains considerable opportunities to extend production, with up to 23 billion recoverable barrels of oil equivalent remaining in the UKCS.²² If no further investment is sanctioned, the industry expect a further 6.3 billion boe will be produced.²³ In addition, there are up to 4 billion boe of further reserves currently in companies plans that could attract investment in the future. Further potential exists from up to 3.5 billion boe of discovered resources, which are not currently technically or economically producible but could become viable in the future. Finally there are estimated to be up to 9 billion boe of ‘yet-to-find’ resources.

While there remains opportunity to significantly extend the productive life of the UKCS, the impact of better stewardship of UKCS resources should not be understated. For example, it is estimated that the full and swift implementation of the Wood Review’s recommendations alone could lead to an additional 3-4 billion boe of the recoverable reserves being produced over the next 20 years.²⁴

²² <http://www.oilandgasuk.co.uk/economics.cfm>

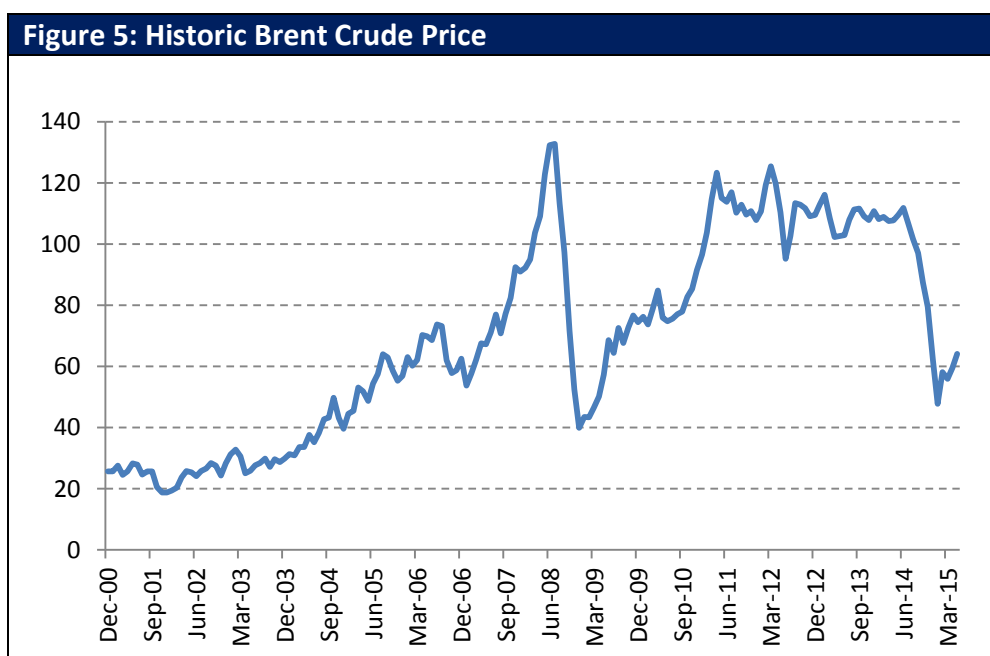
²³ Oil & Gas UK – Activity Survey 2015 – reserve estimates as at 1.1.2015.

²⁴ <http://www.woodreview.co.uk/>

3 Oil Price

As Figure 5 shows, the oil price increased from approximately \$24 a barrel in 2001 to reach a peak of over \$130 in July 2008. Prices subsequently fell by approximately 70% from this peak during the financial crises but recovered relatively quickly and remained above \$100 for most of the period from 2011 until the summer of 2014.

The fall in oil prices towards the end of 2014 was driven by a number of inter-related factors. Recent years have seen a substantial increase in global oil supply. Some OPEC members, including Libya and Iraq have boosted output by more than originally anticipated and the supply of 'unconventional' oil (e.g. US shale oil) has expanded. Other OPEC members have also chosen to maintain existing levels of supply despite this additional output coming on-stream to maintain market share. At the same time, demand-side factors have put downward pressure on prices. Global demand in 2014 from key importers was weaker than expected, in particular from China which experienced a slowdown in growth.

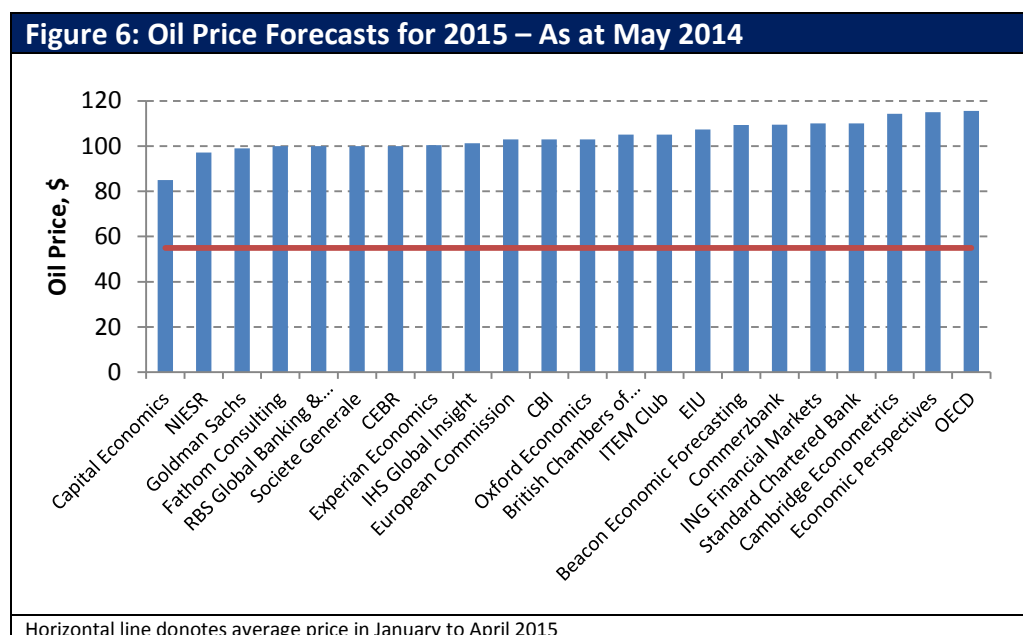


From June 2014 the price of oil fell by approximately 60%, to around \$48 in January 2015. While there has been a rebound in prices over the first quarter of 2015, they remain substantially lower than predicted by virtually all forecasters just 12 months ago. For example, in May 2014 the OECD expected oil prices would reach \$115.6 in 2015 and the DECC fossil fuel projection available at the time had a central forecast of around \$120 in 2015.²⁵

Indeed, Figure 6 shows that at this time last year, none of the independent forecasters included in the HM Treasury May 2014 “Forecasts for the UK economy” publication

²⁵ HMT Forecasts for the UK Economy (May 2014) and DECC Fossil Fuel Price Projections (July 2013). Figures converted to cash terms

expected prices to fall to current levels. The chart shows the published 2015 forecast from each institution compared to the average price for the first 4 months of 2015.



While the price remains below the levels observed in early 2014, there remains a number of upside factors that could see prices rebound. On the demand side, recent data suggests that global demand for crude oil is beginning to recover.²⁶ This is in part driven by developed markets responding to the period of lower prices, for example US Gasoline consumption is up on 2014 levels and is likely to continue growing as the US economy begins to benefit from lower prices. Likewise consumption of oil is expected to increase in China – on the back of continued growth in household consumption. These factors will boost the global demand for crude oil. The Organisation of Petroleum Exporting Countries (OPEC) forecast demand for oil to grow by 1.18 million barrels per day in 2015.²⁷

In terms of the supply-side factors, while the US is still producing record volumes of crude oil, the number of active oil rigs in the US has declined by around 60% since its peak in October 2014.²⁸ Some commentators, such as the International Energy Agency (IEA), have argued that this points towards a lower growth rate in US oil supply in comparison to previous years.²⁹

Over the long term there is a wide range of views for the specific trajectory of oil prices. However, market fundamentals such as rising population, economic growth and increasing prosperity are all expected to increase oil demand. For example, the EIA forecast that total oil consumption will increase by more than 30% over the period to 2040.³⁰ These market

²⁶ IEA, “Oil Market Report (OMR), June 2015”, <https://www.iea.org/oilmarketreport/omrpublic/> (Global oil demand averaged an estimated 93.3 mb/d over the first half of 2015, up roughly 1.6 mb/d on the year and 0.4 mb/d above the estimate in the IEA’s May OMR report.

²⁷ http://www.opec.org/opec_web/static_files_project/media/downloads/publications/MOMR_June_2015.pdf

²⁸ North America Rig Count, (June 2015), <http://www.bakerhughes.com/rig-count>

²⁹ IEA, “Oil Market Report June 2015”, <https://www.iea.org/oilmarketreport/omrpublic/>

³⁰ EIA Annual Energy Outlook 2015, [http://www.eia.gov/forecasts/aeo/pdf/0383\(2015\).pdf](http://www.eia.gov/forecasts/aeo/pdf/0383(2015).pdf) (Table A21)

fundamentals are likely to increase oil price over the longer term with the EIA forecasting that Brent Crude will reach \$141 by 2040 in 2013 prices (\$229 in nominal terms).³¹ Such an increase in oil price will result in more costly and technically challenging resources becoming economical.

4. Tax Revenue and Fiscal Reforms

The most recent outturn data for Scottish North Sea revenue is for 2013-14. In this year around £4 billion of revenue is estimated to have been generated from production in Scotland's geographical waters. UK North Sea revenue fell to £2.1 billion in 2014-15, and is expected to decline further in 2015-16 on the back of lower prices and the continued rise in costs observed in recent years.

The revenue figures above, and the remainder of this Analytical Bulletin focuses on the tax receipts paid directly by North Sea companies through taxes on the profits from oil and gas production. While this is an important revenue stream for government, it does not capture the full contribution that North Sea oil and gas activity makes to the Exchequer. In addition to the taxes paid on oil and gas production, North Sea operators also pay a range of other taxes, including business rates and employer national insurance contributions. On top of this, employment supported by the sector also generates tax receipts through income tax and employee national insurance contributions. To put this in context, it is estimated that the sector currently supports around 200,000 jobs across Scotland and international sales from the Scottish oil and gas supply chain reached a record £11.2 billion in 2013 – accounting for more than 50 per cent of total sales.³²

The challenging economic conditions faced by UKCS operators have prompted industry, and other stakeholders, including the Scottish Government, to put forward proposals to reform the fiscal regime.³³ This led to a number of policy announcements at Budget 2015 to help secure the long term viability of production on the UKCS. The measures announced at the Budget include:

- A 10 percentage point decrease in Supplementary Charge from 30% to 20%;
- A 15 percentage point decrease in Petroleum Revenue Tax from 50% to 35%;
- The introduction of a basin-wide Investment Allowance, allowing exemption of 62.5% of investment expenditure from the Supplementary Charge; and
- £20 million funding in 2015-16 for surveys of under-explored areas.

The Scottish Government also called for an exploration tax credit to provide additional support for exploration activity, which is currently at record low levels. This was not introduced at the Budget, but the UK Government has stated that it will explore options to

³¹ EIA Annual Energy Outlook 2015, [http://www.eia.gov/forecasts/aeo/pdf/0383\(2015\).pdf](http://www.eia.gov/forecasts/aeo/pdf/0383(2015).pdf) (Table A1)

³² Employment estimate - <http://www.oilandgasuk.co.uk/publications/viewpub.cfm?frmPubID=835>; International sales estimate - <http://www.scottish-enterprise.com/knowledge-hub/articles/insight/record-oil-and-gas-supply-chain-sales>

³³ <http://www.gov.scot/Resource/0046/00467339.pdf> (Jan 2015); <http://www.gov.scot/Resource/0046/00468834.pdf> (Jan 2015); and <http://news.scotland.gov.uk/imagelibrary/downloadmedia.ashx?MediaDetailsID=3330&Sizeld=-1> (Feb 2015)

incentivise exploration activity through the tax system. The Scottish Government has recently called on the UK Government to urgently consult on incentives to boost exploration in the North Sea.³⁴

Exploration activity is central to extending the longevity of the basin. For example, exploration rates in Norway substantially increased after the introduction of an exploration tax credit back in 2005. Since then a number of major fields have been discovered, including the Johan Sverdrup field which is estimated to contain 2.35 billion barrels. To put this in context, this is equivalent to around four and a half times the total production from the UKCS in 2014. Furthermore, by 2025, production from Johan Sverdrup could amount to a quarter of total Norwegian production,³⁵ with a considerable impact on both the Norwegian supply chain and the wider economy. Such discoveries highlight the potential benefits of a well-designed fiscal and regulatory regime, which specifically targets exploration in mature areas.

Impact of Fiscal Reforms

The complexity and perceived instability of the UK fiscal regime have been frequently cited as barriers to investment and activity.

Recent reforms will go some way to addressing these concerns. The shift to a basin-wide investment allowance will also make the tax system less distortionary in the way in which it influences investment decisions - encouraging investment in all assets, at all stages of the development cycle, as opposed to specific assets that qualify for field allowances. Overall, the OBR forecast that over the period 2014-2019, cumulative oil and gas production could be around 130 million boe higher as a result of the reforms announced at the Budget. This would mean that by 2019, oil production would be 14% higher than forecast and gas production would be 11% higher than forecast in the absence of these measures. Over the same period, the OBR expect cumulative investment to be £51.3 billion, compared to £48.3 billion in the absence of the new measures.

Whilst the measures are forecast to have an immediate positive impact on production and investment, they are estimated to incur a short term cost to the UK Exchequer as higher investment reduces companies' taxable income in the short-term, and the reforms reduce the effective tax rate that operators face. The OBR estimated in the March 2015 Budget that these measures will cost the UK Exchequer £1.3 billion over the period 2014-15 to 2019-20 as a whole. However, by incentivising the investment needed to develop new fields and extend the life of existing facilities, the reforms are expected to prolong the life of the UKCS and in turn boost future production and tax revenues. The full impact of these measures is not yet clear, in particular the behavioural component of this impact is difficult to quantify at this stage.

Research by Professor Alex Kemp (2014) has previously shown that fiscal reforms, such as the introduction of an investment allowance, will have a short term negative impact on

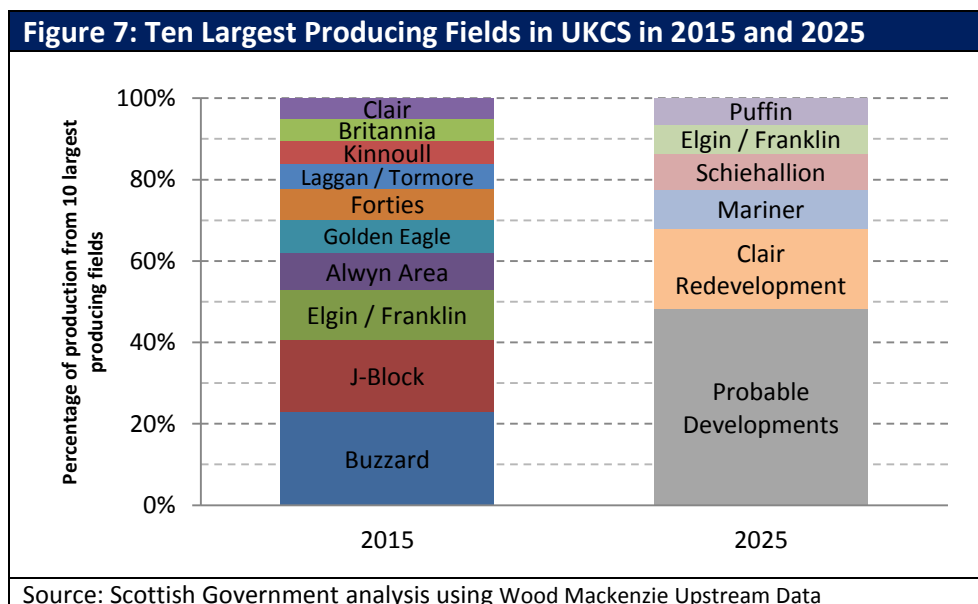
³⁴ <http://news.scotland.gov.uk/News/Action-needed-to-boost-oil-exploration-1a15.aspx>

³⁵ Wood Mackenzie, Upstream Service

government revenues, but that this will be in part offset by revenues born out of additional production in the longer term.³⁶ Professor Kemp has also estimated that the introduction of the investment allowance, alongside the headline rate reduction and cost efficiencies could increase cumulative production over the period to 2050 by 2.8 billion boe.³⁷

Over the medium term, fiscal reform will also improve the economics of probable developments. This refers to fields which have yet to begin the development process but are included in companies' long-term plans.³⁸

These developments will be fundamental to the longevity of the UKCS, and in the future will account for a growing share of UKCS production. As seen in Figure 7, by 2025, approximately half of production from the 10 largest producing fields on the UKCS is expected to come from probable developments that have not yet begun the development process. While these developments are expected to come onstream in the future, the current investment climate makes new development prospects commercially challenging at present.



Facilitating new field development is therefore key to the long term health of the UKCS and can be assessed through an analysis of economic hurdle rates. The hurdle rate is the required rate of return a project must achieve in order for a company to sanction the investment. Companies and investors often use the Net Present Value/Capital Investment (NPV/I) ratio when ranking prospective investment projects. In many studies a NPV/I ratio greater than 0.3 (the hurdle rate) is assumed to be required for a project to be sanctioned.³⁹

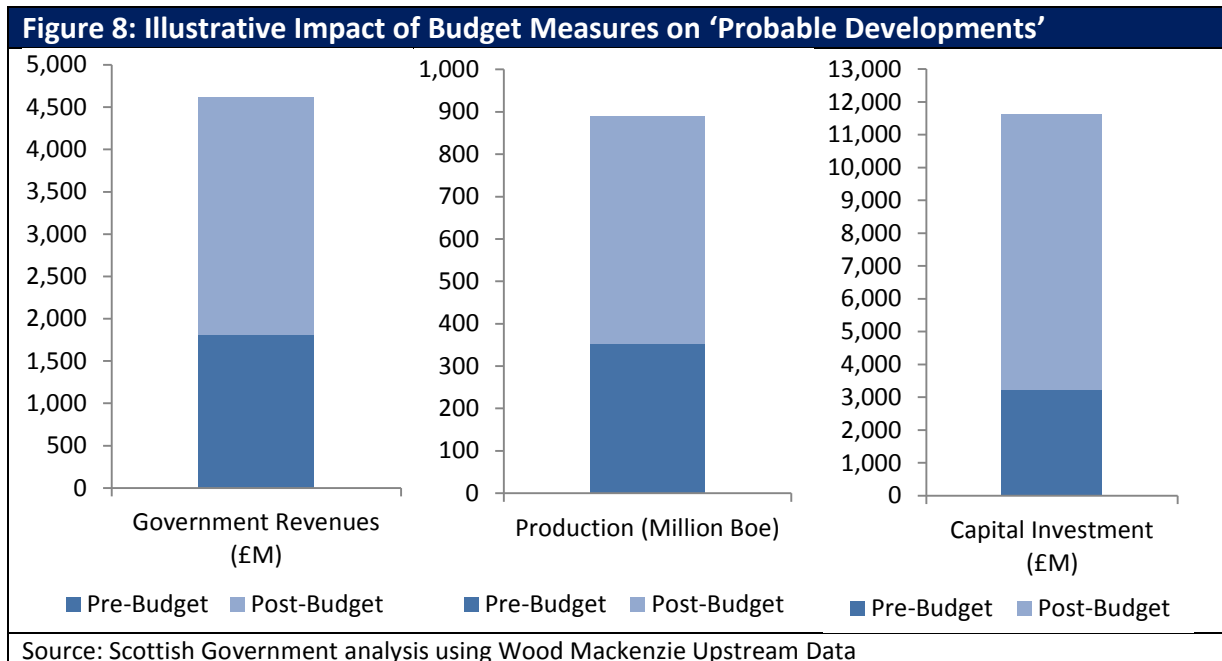
³⁶ Petroleum Taxation for the Maturing UK Continental Shelf (UKCS), A G Kemp, Linda Stephen and Sola Kasim (Oct 2014) <http://www.abdn.ac.uk/research/acreef/working-papers/> (Paper 128)

³⁷ Kemp, A and Stephen, L (2015), "The Investment Allowance in the Wider Context of the UK Continental Shelf in 2015." <http://www.abdn.ac.uk/research/acreef/working-papers/> (Paper 132)

³⁸ A field that has yet to start development, but is included in the companies' long-term plans, and is expect to be developed in the future.

³⁹ See for example, Kemp, A. & Stephen, L. (2014) "Price Sensitivity, Capital Rationing and Future Activity in the UK Continental Shelf after the Wood Review"

The potential impact of the Budget measures on probable developments is shown in Figure 8. The chart shows the level of production and associated tax revenue and capital expenditure on probable developments, which achieve the above hurdle rate both before and after the fiscal reforms announced in Budget 2015.⁴⁰ The analysis demonstrates that more than 500 million boe of additional reserves pass this economic hurdle rate, with associated capital investment of over £8 billion over their lifecycle, as a result of the recent fiscal reforms improving their economic viability.



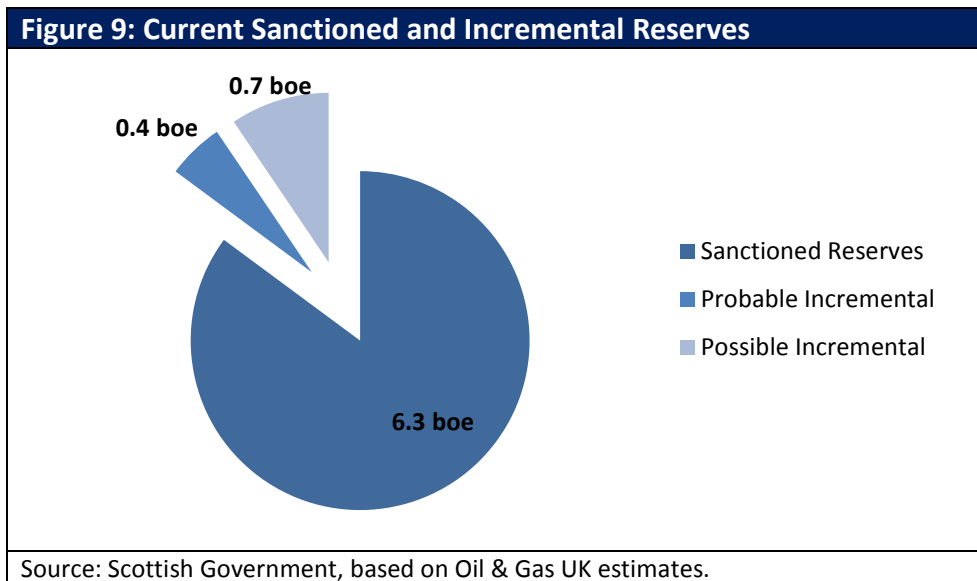
This analysis demonstrates that recent fiscal reforms could more than double the amount of production that currently passes the economic hurdle. However, it is important to note that probable developments are only a sub-set of current and prospective UKCS activity. In the longer term, the impact of the reforms announced in the Budget is expected to be greater.

In addition to the impact on new field development, the prospects for incremental investment in existing assets is also likely to improve as a result of an elimination of distortions in the existing fiscal regime which concentrated investment towards new developments. For example, the new investment allowance will encourage investment in assets already in production; whilst lower headline rates of tax will act to mitigate the risk of fields being decommissioned prematurely. Ultimately this will improve economic recovery from the UKCS. As illustrated in Figure 9, prior to the March 2015 Budget there are more than 1 billion boe of probable and possible incremental reserves in companies' plans.⁴¹ Nearly two thirds of these reserves were considered to have a significant, but less than 50% chance of being technically and economically producible prior to the Budget. However, the

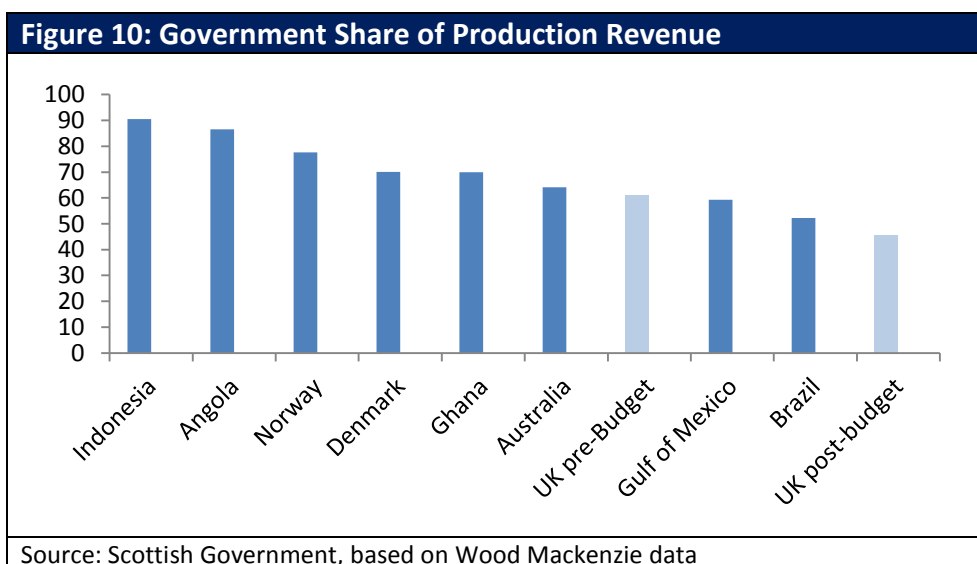
⁴⁰ Scottish Government analysis using Wood Mackenzie Upstream Service data and base price assumptions. This analysis is provided for illustrative purposes and does not represent a forecast of production volumes or revenue.

⁴¹ <http://www.oilandgasuk.co.uk/forecasts.cfm> **Probable reserves** are those reserves which are not yet proven but which are estimated to have a better than 50% chance of being technically and economically producible. **Possible reserves** are those reserves which at present cannot be regarded as 'probable' but are estimated to have a significant but less than 50% chance of being technically and economically producible.

reforms implemented will have increased the viability of these projects, which could help to prolong the life of a number of existing assets.



Companies’ decisions to invest in the North Sea, as opposed to other basins will be influenced in part by the competitiveness of the fiscal regime – in terms of both the headline tax rates, available reliefs and the certainty it offers investors. A competitive and predictable fiscal regime is therefore key to supporting future investment and in turn maximising recovery rates.



As Figure 10 illustrates, the budget measures introduced in March 2015 make the UK fiscal regime more attractive in a global context. The UKCS now has a lower government share of production revenue than many other countries competing for international investment. However, this comparison of respective fiscal regimes should be considered within the context of the maturity and cost environment of each of these regions. Unit costs in the UKCS are significantly higher than in many comparable investment locations and in many

cases prospectivity is lower. Whilst the recent fiscal reforms go some way to offsetting the higher cost base in the UKCS, they will not eliminate it entirely.

In summary, the fiscal reforms announced at Budget 2015 have been broadly welcomed by the industry and its stakeholders. However, the challenges highlighted in this document demonstrate the importance of both the industry delivering cost efficiency programmes and the need for the swift implementation of regulatory reforms that were proposed by the Wood Review and are being taken forward by the newly established Oil and Gas Authority. This will ensure that production is maximised and in turn increase the sectors contribution to the Exchequer.

5. Outlook for Scottish North Sea Receipts

UK tax receipts from North Sea oil and gas production were £2.1 billion in 2014-15. This represents a fall from previous years, driven by the increases in expenditure and fall in prices discussed in the previous sections. Receipts are projected to generate approximately £0.7 billion in 2015-16.

The analysis below sets out a range of projections for Scottish North Sea revenues from 2016-17 onwards, using a number of different assumptions about prices, production, and expenditure. These different expectations are assumed to impact on North Sea revenues from 2016-17 onwards.

The different assumptions about price, production and investment detailed in this bulletin are not mutually exclusive. Any combination could conceivably materialise. Table 1 presents a number of potential scenarios for Scottish North Sea receipts. These illustrate the potential impact that measures to improve future production and increase efficiencies could have on tax receipts over the coming years.

Potential Scenarios

- **Scenario 1** is based on the OBR forecast. This assumes an oil price of around \$70 a barrel between 2016-17 and 2019-20, and that production will decline by around 5% a year from 2014-15. The OBR forecast cumulative UK tax receipts from oil and gas to be £2.8 billion between 2016-17 and 2019-20. Over the past three years, approximately 85% of UK North Sea revenues are estimated to have come from the Scottish portion of the UK continental shelf.⁴² Assuming this trend continues, approximately £2.4 billion would be generated in the Scottish portion of the North Sea between 2016-17 and 2019-20.
- As set out in Figure 4, the industry's central forecast is that production will now begin to increase from 2014 levels – the impact of such an outcome on tax revenue

⁴² See GERS 2013-14 for details of the definition of the Scottish portion of the UK continental shelf, how the estimates are produced, and the latest figures. <http://www.gov.scot/gers>

is considered in **Scenario 2**. Were production to follow the industry’s central projection, tax receipts from the Scottish portion of the North Sea between 2016-17 and 2019-20 could be £4.4 billion. All other assumptions are consistent with Scenario 1.

- **Scenario 3** considers the impact of improved operating efficiency on tax receipts. Both Oil and Gas UK and the new Oil and Gas Authority have highlighted the need to reduce operating costs in the North Sea. Oil and Gas UK has set out the need for 20% to 40% efficiency improvements,⁴³ and the Oil and Gas Authority has announced that it will require companies to prepare asset improvement plans and encourage a 30% to 40% efficiency improvement.⁴⁴ This scenario considers the impact of a 30% reduction in operating costs on tax receipts. This reduction is assumed to occur gradually over the years to 2019-20. With such an improvement in efficiency, tax receipts from the Scottish portion of the North Sea could be £3.4 billion over the period 2016-17 to 2019-20. All other assumptions are consistent with Scenario 1.
- **Scenario 4** combines the production and efficiency improvements in Scenarios 2 and 3. The combined effect of an increase in production and reduction in operating costs could lead to tax receipts from the Scottish portion of the North Sea between 2016-17 and 2019-20 reaching £5.8 billion.
- The future path of oil and gas prices are a key determinant of North Sea tax revenues. **Scenario 5** provides an illustrative example of the impact of a higher oil price. Although many forecasters expect prices to increase from current levels, there is no consensus about the rate or size of this increase. As an illustrative example, in their March 2015 Economic and Fiscal Outlook, the OBR consider a scenario where the oil price could return to \$100 per barrel in 2015-16. In this case, when combined with the production and operating cost improvements in Scenario 4, tax receipts from the Scottish portion of the North Sea between 2016-17 and 2019-20 could be £10.8 billion.

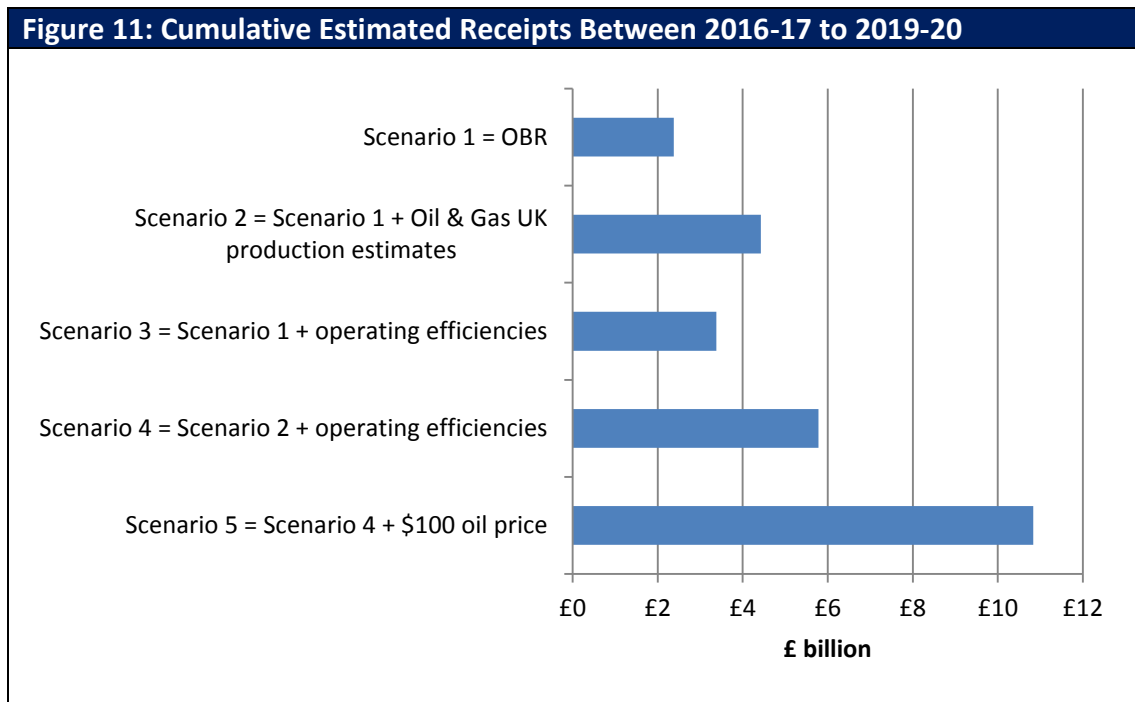
The table below summarises the results of these different scenarios.

Table 1 – Illustrative Projections for Scottish North Sea Tax Receipts (£ Billions)					
	2016-17	2017-18	2018-19	2019-20	Total 2016-17 to 2019-20
Scenario 1	£0.5	£0.6	£0.7	£0.6	£2.4
Scenario 2	£0.9	£1.0	£1.2	£1.2	£4.4
Scenario 3	£0.7	£0.8	£1.0	£0.9	£3.4
Scenario 4	£1.1	£1.3	£1.7	£1.7	£5.8
Scenario 5	£2.8	£2.3	£2.8	£2.8	£10.8

⁴³ <http://www.oilandgasuk.co.uk/publications/viewpub.cfm?frmPubID=869>

⁴⁴ <https://www.gov.uk/government/news/new-north-sea-regulator-issues-urgent-call-to-action>

Figure 11 shows the cumulative estimated receipts between 2016-17 to 2019-20 from the Scottish portion of the North Sea for each of the scenarios.



Summary

The combination of high levels of capital investment and high operating costs has resulted in total UKCS expenditure reaching record levels for four successive years. While investment is expected to have peaked in 2014, the impact of lower oil prices and high costs means that the outlook for company cash flows and government revenues are lower than previously forecast by many organisations. This highlights the importance of sustainable cost efficiency programmes, efforts to improve production efficiency and the need to explore options to extend field life and delay decommissioning.

The challenging economic conditions faced by UKCS operators have prompted industry, and other stakeholders, including the Scottish Government, to put forward proposals to reform the fiscal regime. This led to a number of policy announcements at Budget 2015. The tax measures announced at Budget 2015 are likely to have a positive impact across the basin. While the measures will depress government tax revenues in the short-term, in the longer-term they are expected to boost production and investment, and in turn future revenues.

Over the long-term, there remain considerable opportunities to extend UKCS production, with up to 23 billion recoverable barrels of oil equivalent estimated to remain.

**Scottish Government
June 2015**

This annex sets out the assumptions underpinning the calculation of tax revenue in Section 5.

Tax revenue is assumed to be proportional to profit. Profit is estimated as revenue minus cost. Revenue includes sales revenue (estimated as unit price times production) and other income. Cost includes capital expenditure, decommissioning expenditure, exploration and appraisal expenditure, and operating expenditure. In the baseline (Scenario 1), these variables are taken from the OBR's March 2015 Economic and Fiscal Outlook, with the exception of other income, which is from DECC's publication *Income from and expenditure on UKCS exploration, development, and operating activities: annually 1970-2013*.⁴⁵

Within each scenario, these variables are adjusted in line with assumptions as set out in the table below. No additional types of revenue or cost are included.

Table A1: Summary of source for assumptions made in each scenario	
Variable	Description
Scenario 2	
Price	As OBR, approximately \$70 per barrel
Production	17% increase between 2014 and 2019, as in Oil & Gas UK's 2015 Activity Survey
Operating costs	Adjusted for change in production (see below)
Other costs	As OBR
Scenario 3	
Price	As OBR, approximately \$70 per barrel
Production	As OBR, approximately 20% fall between 2014 and 2019
Operating costs	Phased 30% improvement in efficiency (see below)
Other costs	As OBR
Scenario 4	
Price	As OBR, approximately \$70 per barrel
Production	17% increase between 2014 and 2019, as in Oil and Gas UK's 2015 Activity Survey
Operating costs	Phased 30% improvement in efficiency, then adjusted in line with production (see below)
Other costs	As OBR
Scenario 5	
Price	\$100 per barrel, as in OBR oil price sensitivity
Production	17% increase between 2014 and 2019, as in Oil and Gas UK's 2015 Activity Survey
Operating cost	Phased 30% improvement in efficiency, then adjusted in line with production (see below)
Other costs	As OBR, but adjusted for change in price (see below)

⁴⁵ <https://www.gov.uk/oil-and-gas-uk-field-data#ukcs-income-and-expenditure>

Cost assumptions

Costs are affected by several assumptions in the model.

Firstly, costs are driven in part by the oil price. Although this is generally recognised to be the case⁴⁶ there is no consensus as to the nature of the relationship. This analysis assumes that 50% of the change in price is translated into a change in costs (i.e., if prices increase by 100%, costs increase by 50%). This attenuates the impact of price on profit, so that changes in price result in smaller changes in profit than if costs were left unchanged.

Secondly, operating costs are assumed to be directly related to production. That is, if production increases by 10%, then operating costs also increase by 10%. Capital costs, decommissioning costs, and exploration and appraisal costs are all assumed to be unaffected by changes in production.

When both production and price are varied, the production effect on operating costs is applied first, with the price effect then applied to the new total cost estimate.

In the lower operating cost scenario, operating costs are assumed to be 7.5% lower in 2016-17, 15% lower in 2017-18, 22.5% lower in 2018-19, and 30% lower by 2019-20.

Gas price assumptions

Gas prices are assumed to move directly in line with oil prices.

⁴⁶ See, for example, the OBR's 2013 Fiscal Sustainability Report:
<http://budgetresponsibility.org.uk/fiscal-sustainability-report-july-2013/>