

National Grid

Future Supply to St Fergus

September 2009

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Table of Contents

1. Introduction	3
2. Volumes by Supply Source	3
3. Volumes by Offshore Pipeline	4
4. Probability of Delivery for Major Fields	5
5. Key Sensitivities: Potential Upside in Flows to St Fergus	6
Appendix A: Supply Methodology	8
Illustrations	9

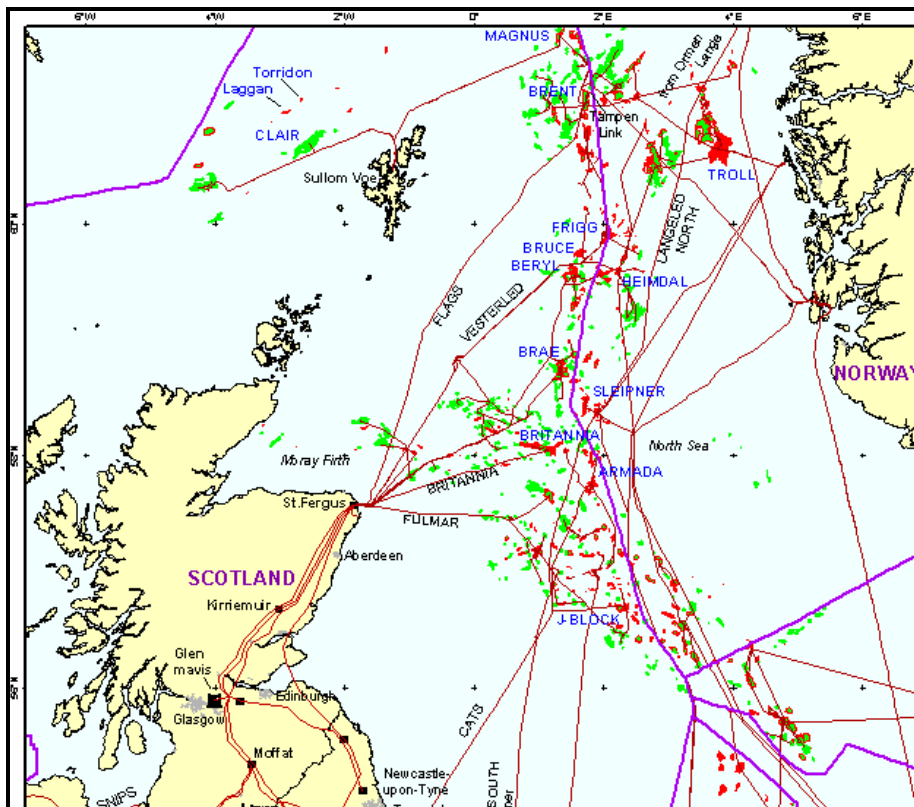
1 Introduction

National Grid requires an independent report to assess the future gas imports to St Fergus to support the decision by the regulatory Authority (GEMA) on release of assets for CCS (Carbon, Capture & Storage). Moreover this independent study would meet the industry requests for external independent verification of National Grid's supply forecast at St Fergus.

Wood Mackenzie has been appointed as gas market consultant to develop this independent Report for National Grid. The Report is intended to provide sufficient information to assess the future potential gas flows to St Fergus for the period 2013/2014 to 2017/2018¹ as well as to consider potential flows upsides.

This document a summary of the report.

2. Volumes by Supply Source



Gas flows to St Fergus comprise a mixture of indigenous UK gas and Norwegian imports². The UK Northern North Sea and Central North Sea is well known to be a mature gas production area with declining production volumes, although there is still thought to be significant potential in extracting remaining reserves.

Wood Mackenzie has forecast the contribution to future UK gas production from the remaining reserves. In addition to the already discovered reserves, further gas will be discovered through future exploration drilling. Gas exploration continues in the UK, albeit at reduced levels compared to 10 years ago. Indeed, it is anticipated that further commercial

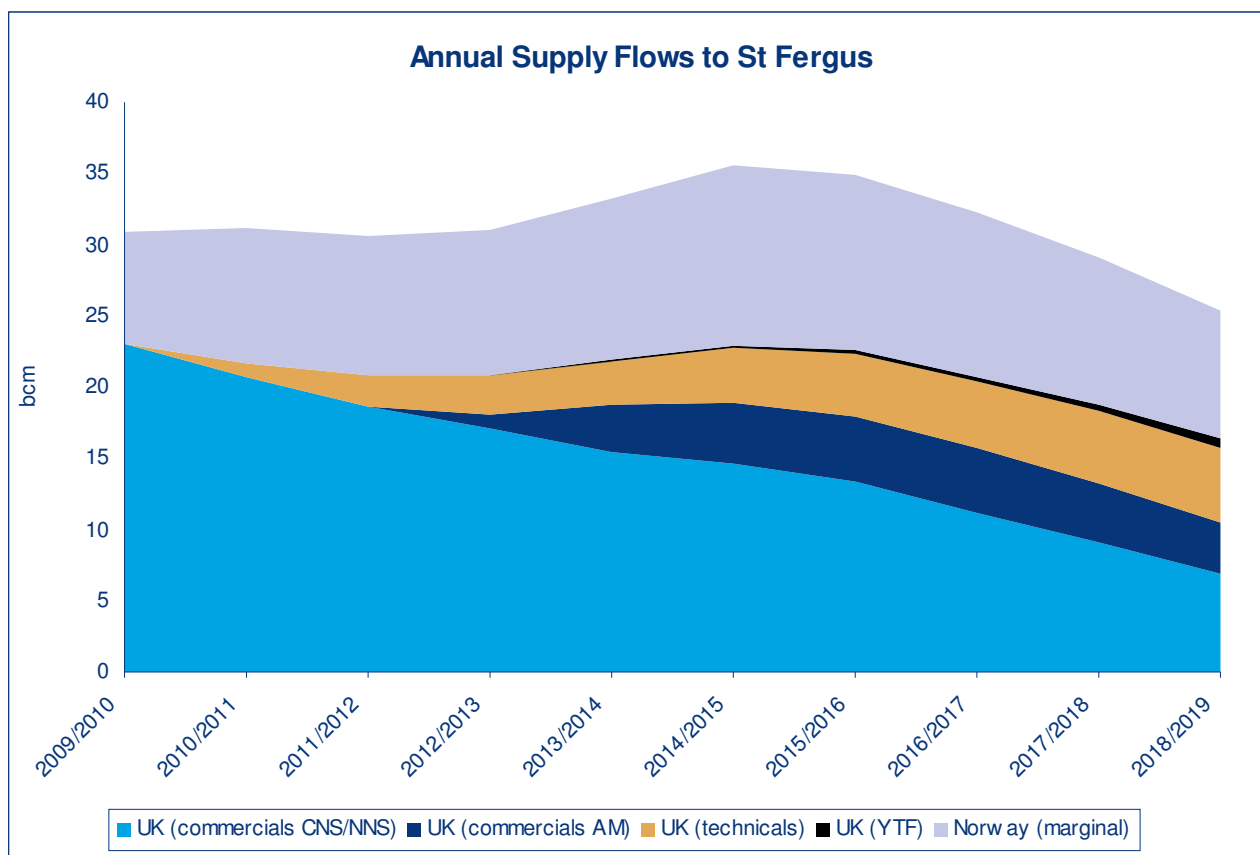
¹ All data in this document is reported in gas year (i.e. from October to September), unless otherwise specified.

² A description of the major production areas is contained in Appendix B of this Report.

discoveries will be made, and significant gas fields are still being discovered; Wood Mackenzie has accounted for this yet-to-find (YTF) reserves in the YTF production profile.

West of Shetlands is also expected to start contributing to the overall UK gas marketed production in the analysed timeframe. Nearly 90 bcm of gas reserves have been discovered in the West of Shetland sector to date. Norwegian gas production capacity has been increasing over the last years and is expected to keep doing so in the analysed timeframe. The traditional Northern North Sea Norwegian production is not set to decline in the next decade and is expected to contribute to the forecasted flows to St Fergus. However it should be noted that this production area is not exclusively linked to the UK offshore pipeline system but has the flexibility to be directed to Continental Europe as well and flows will ultimately depend upon Norwegian portfolio export optimization.

Chart 2.1: UK and Norwegian forecasted annual flows to St Fergus - by supply source



Source: Wood Mackenzie

Wood Mackenzie estimates overall gas flows to St Fergus to be flat around the current level for the next 3 to 4 years, where NNS/CNS UK production decline is expected to be overcome by additional production coming from technical (remaining) reserves and, to a lesser extent, from Norway³. Flows are then expected to peak in the year 2014/2015 as the new production from West of Shetlands is available, Flows are expected to decrease from then. Chart 2.2 (see “Illustrations”) shows the UK and Norwegian forecasted monthly flows to St Fergus by supply source

3. Volumes by Offshore Pipeline

Gas flows to St Fergus via three terminals which are operated by **SAGE**, **Shell** and **Total**.

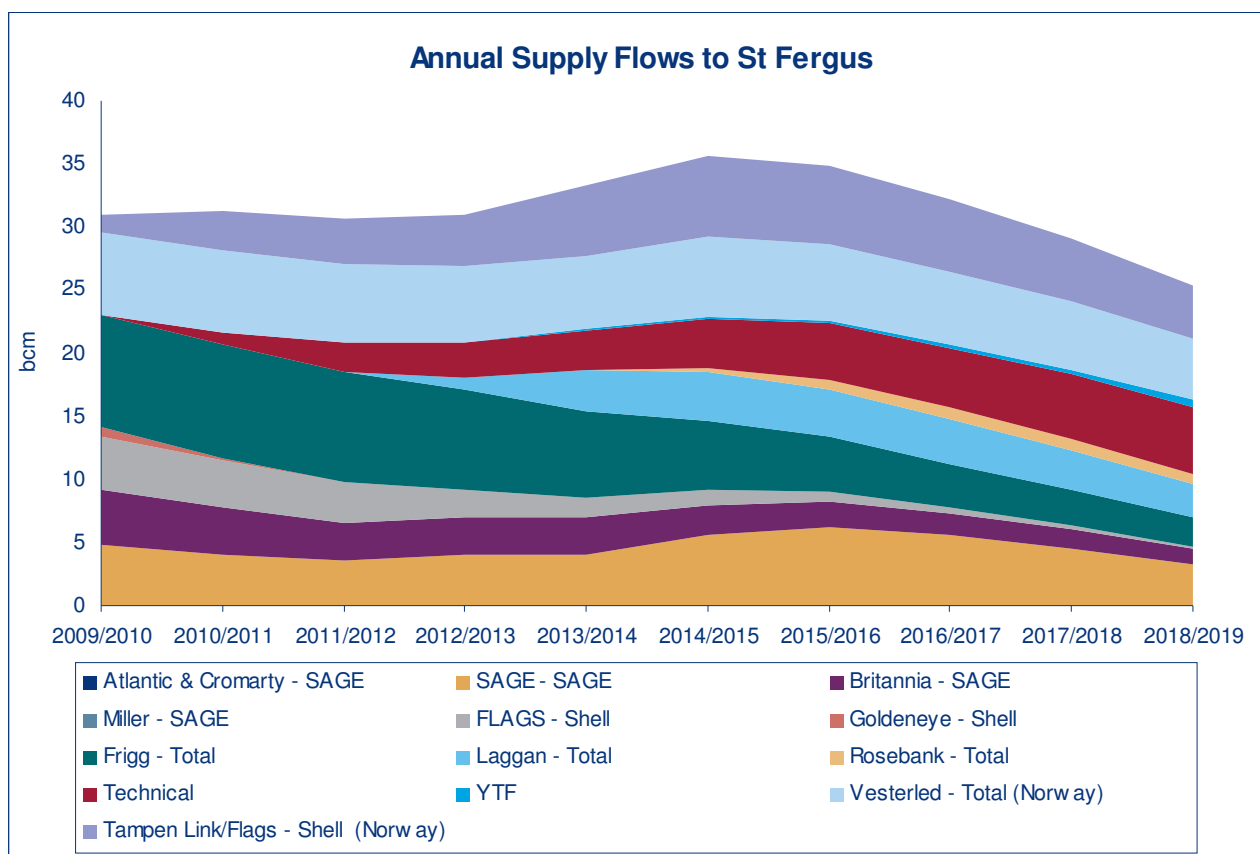
³ Existing contract long term exporting contracts from Norway are assumed to be rolled over throughout the forecasted period.

The **SAGE** terminal has historically been supplied by the **SAGE, Britannia, Atlantic & Cromarty** and **Miller** pipelines. We assume Miller is no longer in operation, and that volumes through Atlantic & Cromarty have now ceased. The SAGE infrastructure is owned and operated by partners in the Brae and Beryl Area fields, which account for around 85% of current throughput (around 10 bcm per year). Both of these areas are in decline, The Britannia pipeline transports gas from the giant Britannia field, as well as the Brodgar and Callanish fields

Shell St Fergus is supplied by the FLAGS, Fulmar and Goldeneye pipelines. Current UK supply into the FLAGS line is approximately 2.5 bcm per year, with the mature Brent field the single largest contributor. Supply through the Fulmar pipeline is currently around 1.5 bcm per year, and is made up of production from mature Central North Sea fields.

The Frigg UK and Norway (Vesterled) systems provide supply into **Total** St Fergus. Production through the UK pipeline is currently around 9 bcm per year, underpinned by the Alwyn Area, Bruce and Rhum.

Chart 3.1: UK and Norwegian forecasted annual flows to St Fergus – by offshore pipeline



Source: Wood Mackenzie

The **Tampen Link** was commissioned in October 2007 as part of the Statfjord Late Life (SLL), and allows gas from the giant Statfjord field, and a number of other fields, to be exported through Shell's Far-north Liquids and Associated Gas System (FLAGS) to Shell St Fergus (gas had previously been exported to the continent).

Vesterled throughput is largely made up of production from the Oseberg and Heimdal areas. The Gjoa field is scheduled to come onstream in the second half of 2010, and is estimated to hold over one trillion cubic feet of gas in recoverable reserves.

Given the high level nature of UK **technical** and **YTF** production profiles, Wood Mackenzie has not made specific assumptions on importing terminal at St Fergus.

Chart 3.1 illustrates the UK and Norwegian forecasted annual flows to St Fergus – by offshore pipeline

4. Probability of Delivery for Major Fields

The UK profile is reasonably low risk, due to the mature nature of the province and many of the commercial fields currently utilising the pipelines for export. It should also be noted that our individual pipeline profiles do not include any technical volumes (which are included in the full profile), as these have not been split into potential export systems (only screened for the likelihood of export to St Fergus).

The range of possible forecast flows and cessation dates for the SAGE, Shell & Total terminals are not expected to vary greatly from the Base Case due to the maturity and understanding of these fields. There is less certainty with Norwegian flows, however, although actual supply volumes will be determined by a number of factors which include Norway production optimization within UK and continental Europe, UK demand and ultimately available pipeline capacity to export additional volumes to the UK. Actual flows however are assumed to be sufficient over the period to meet pipeline capacity if required,

5. Key Sensitivities: Potential Upside in Flows to St Fergus

The analysis provided above represents Wood Mackenzie Base Case view on an annual and monthly level of the forecasted flows to St Fergus from UK indigenous production and potential Norwegian exports. While we have not identified particular upside risk as far as commercial NNS and CNS UK production is concerned (due to the mature nature of these areas), the potential upside flows to St Fergus is considered below:

Upside in technical and YTF production

A limited number of technical fields currently exist in the NNS, although some upside does exist for the **SAGE** fields. Potential upside could exist in the Brae Complex fields should the operator revisit drilling plans.

The position of the pipeline between the Brae and Beryl fields mean it is likely to be considered as an export route for any reserves discovered in the area. **Britannia** poses less upside potential. **FLAGS** could see some upside from near field exploration and development, but few current technicals are positioned sufficiently close to allow export. A number of technical fields currently exist within reasonably close proximity to the **Fulmar** infrastructure, offering some upside over our base profile.

In terms of the **Frigg** systems, technical reserves and further exploration in the prolific Alwyn Area offer some potential, although the significant upside exists West of Shetland (see below).

Upside in West of Shetlands

Significant upside over our base profile is thought to exist West of Shetland. This includes Tobermory (with new Laggan infrastructure), Lochnagar reserves not currently modelled, recent Glenlivet discovery and Clair Phase II gas reserves.

Chart 5.1 (see "Illustrations") shows the West of Shetland production upside

Upside in Norwegian flows

Norway can export gas directly into the UK via St Fergus (Versteled and Flaggs/Tampen Link pipelines) and via Easington (Langed pipeline). The Norwegian offshore pipeline system is a complex system where different sources of supply can potentially supply gas to alternative entry points both into Continental Europe and into the UK. Therefore, should the market conditions require so, Norwegian flows into St Fergus could potentially be higher. While overall UK indigenous supply declines over time, demand will be met by increasing Norwegian and LNG imports. Wood Mackenzie estimates that the maximum Norwegian export potential will not be reached in the next years – nor in the analysed timeframe – due to competition from LNG in North West Europe.

However, while higher Norwegian export could potentially be available to flow to St Fergus, there are a number of capacity constraints that are likely to limit the potential flows. According to our analysis we have identified the overall Norwegian production that could flow to St Fergus and have divided it according to the appropriate offshore pipelines.

According to our analysis, there could be a potential upside flow in the range of 5-7 bcm per annum over the analysed timeframe⁴. Such potential upside could eventually materialize should the UK market require additional gas or should the market conditions in Continental Europe be less attractive for Norway compared to the ones of exporting gas into the UK.

For the Statford are, the potential upside is represented by the volumes being exported exclusively into the UK, which would account for less than 1bcm per annum in the analysed timeframe, compared to our Base Case.

Upside on a daily peak basis

All the above analysis has been carried out assuming annual and monthly gas flows to St Fergus. Chart 5.5 (see "Illustrations") provides the forecasted flows to St Fergus in terms of mcm/d., i.e. the average annual flows on a daily basis. While these flows represent average daily flows, actual flows to St Fergus could potentially materialize⁵ according to (i) the swing UK indigenous production capability and (ii) incremental Norwegian spot flows.

We have conducted a peak day analysis and defined the upside potential flows to St Fergus. The UK appears to have sufficient production, import and storage capacity to meet average daily, peak and 1 in 20 peak demand. Any supply risk (where requirement of surplus gas is above the contracted and assumed volumes, e.g. 2013/14 & 2017/18) is offset by the availability of greater spot supplies and the location of import capacity and the increase in gas storage capacity.

In terms of potential additional flows to St Fergus we have estimated the possible swing capability from UK indigenous supply that flows into St Fergus to be around 7 mcm/d in 2013/2014 which is expected to decline to around 4 mcm/d as production declines⁶.

In line with the analysis on potential upside from Norwegian exports, we have also estimated the maximum potential daily upside from spot Norwegian imports into St Fergus. These are estimated to be in the range of 20 mcm/d in the analysed timeframe.

⁴ This estimate does not take into account any potential bottleneck due to incremental flows into the Total terminal at St Fergus for the technical and YTF production forecasts.

⁵ There are a number of reasons for above daily average flows which include: (i) peak winter demand, (ii) lack of storage availability, (iii) supply shortfall from other sources and (iv) economic incentives (i.e. opportunity cost).

⁶ The production swing is calculated assuming the monthly swing over the year period, discounted by a 10% as not all supplies will be available at the same time.

Appendix A: Supply Methodology

Our supply volumes are made up of a combination of Wood Mackenzie's commercial models, technical field profiles and yet to find profiles.

Commercial

The basis of our supply curve is an aggregation of Wood Mackenzie's modelled commercial gas fields (UK or Norway) which either export or are expected to export **directly** to one of the three St Fergus terminals. This does not include Norwegian flexible supplies. Commercial fields are defined as those in production, under development or likely to be developed in the near future.

Technical

Technical reserves are defined as reserves that have been discovered but are currently not considered commercial. Wood Mackenzie splits technical reserves into two categories as follows:

- **Potential reserves:** These are fields that we expect to be developed at some point and could be economic under current costs / price projections, but significant uncertainty remains over the nature and timing of their development.
- **Resources:** These are fields that we do not expect to be developed under current costs / price projections. To be commercial these fields require a breakthrough in technology, a step change in price, new fiscal terms or infrastructure that is not currently expected to be built.

Yet To Find

Our yet to find profile represents gas volumes likely to be discovered (in the UK), and tied back to St Fergus, in the future. This is based on previous exploration success (by region), discovery vs start-up data (across UKCS), average profiles and exploration forecasts.

Illustrations

Chart 2.2: UK and Norwegian forecasted monthly flows to St Fergus – by supply source

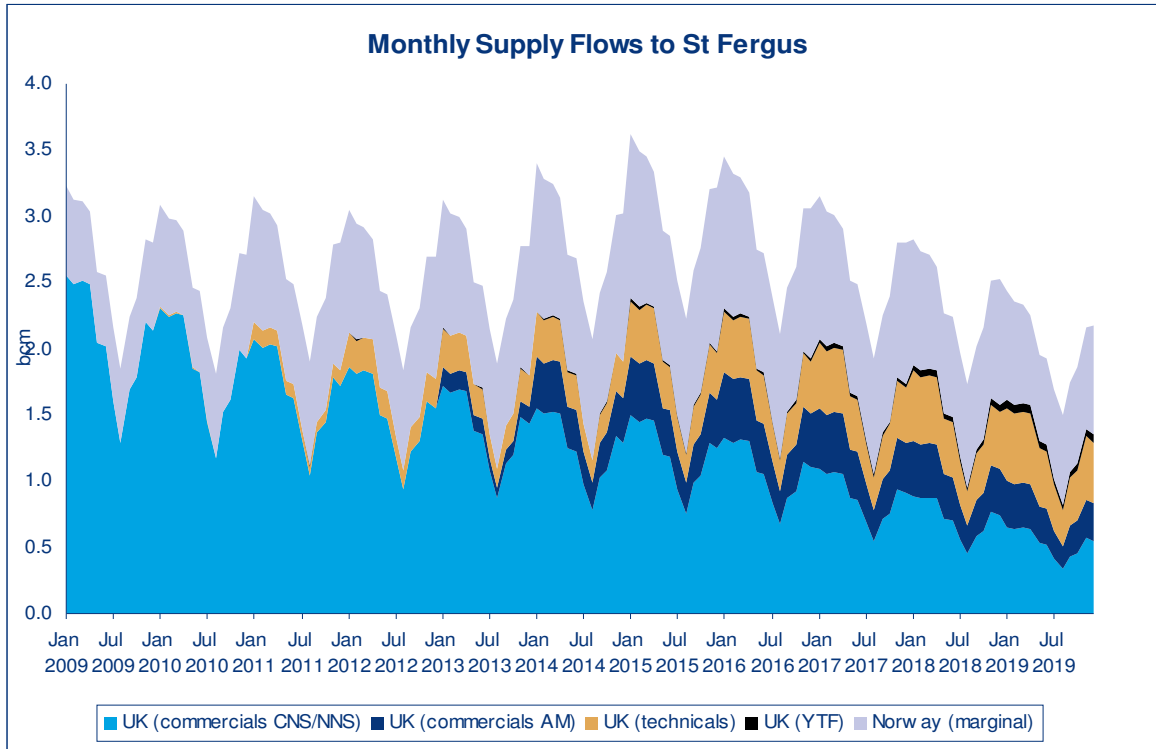


Chart 3.1: UK and Norwegian forecasted annual flows to St Fergus – by offshore pipeline

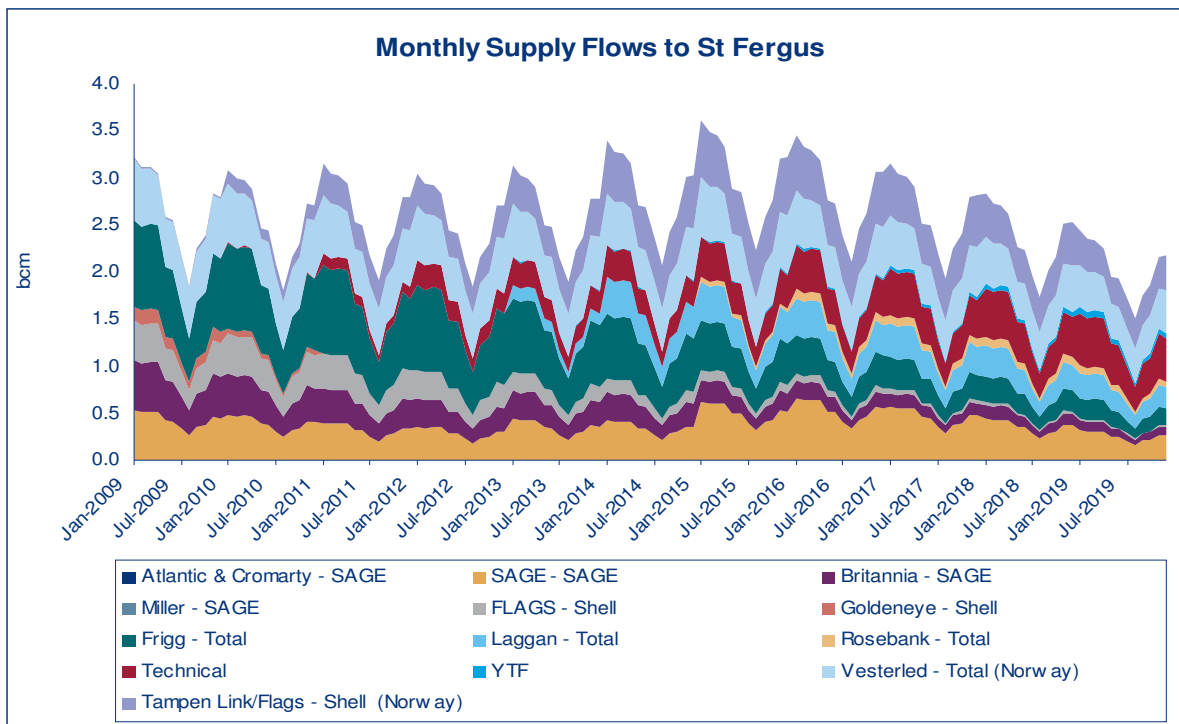
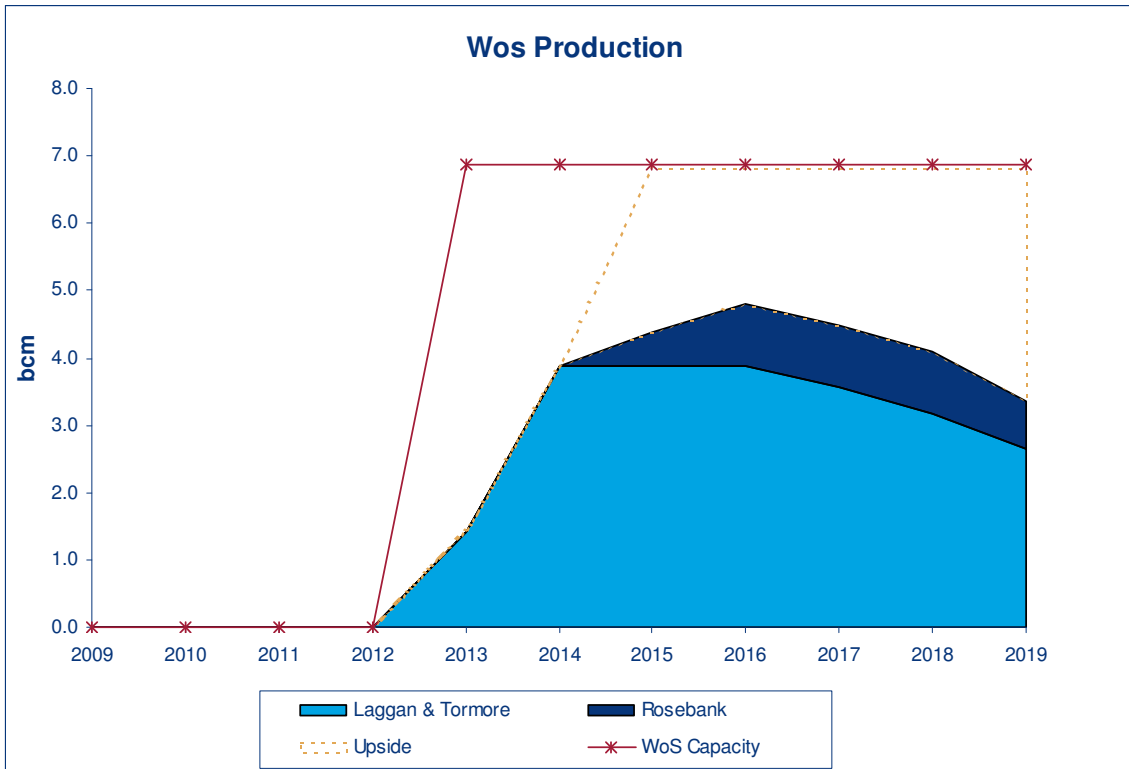
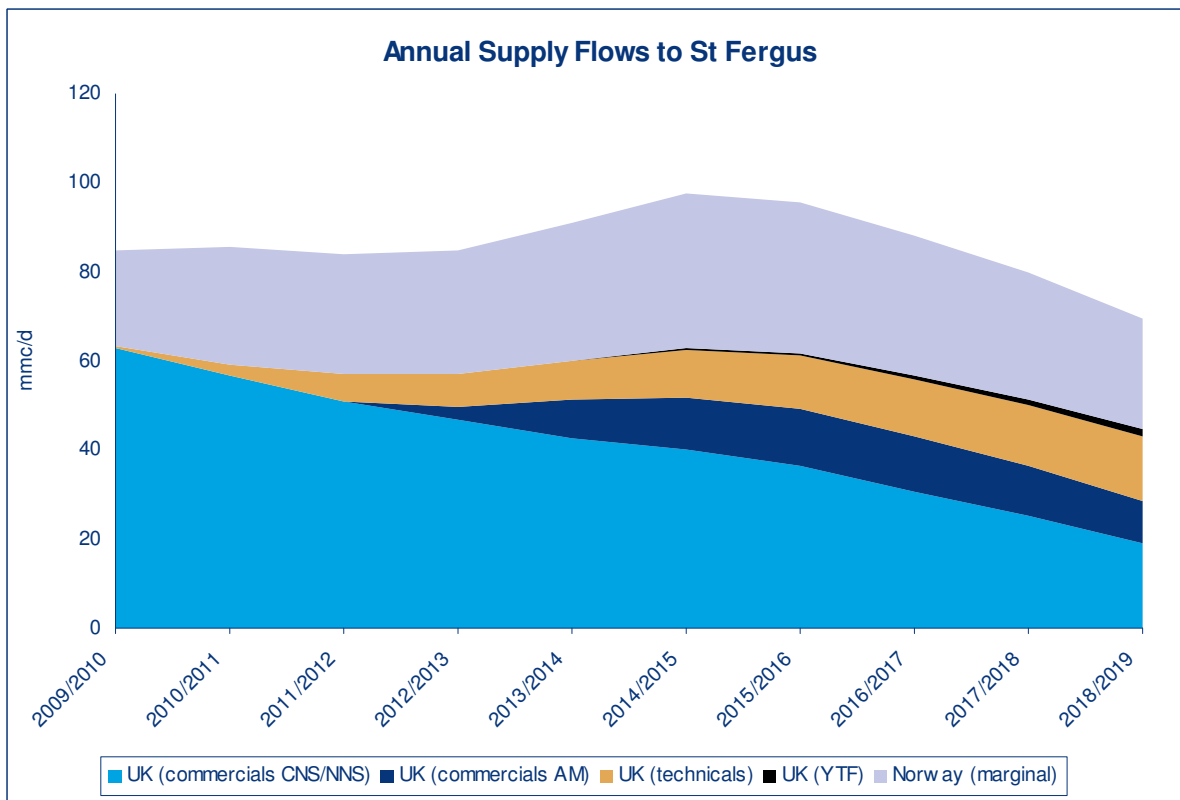


Chart 5.1: West of Shetland production upside



Source: Wood Mackenzie

Chart 5.5 – UK and Norwegian forecasted annual flows to St Fergus - by supply source (mcm/d)



Source: Wood Mackenzi