

Pathway G

A better path to a low cost, low carbon, secure energy future for the UK

Executive summary

Statoil is one of the largest importers of natural gas into the UK as well as a wind and CCS developer. As such we are concerned that the 2050 Pathways eliminates natural gas by 2050. The UK is one of the cleanest, lowest-cost and secure energy systems in Europe thanks to the development of its natural gas potential in the 1990s. Natural gas can improve the delivery of the current commitments to GHG emissions reduction, as well as renewables penetration, by reducing the cost and risk of the transition to a low carbon economy. Moreover, the increase of renewable power generation will require higher flexibility, which gas could provide. As a result Statoil have, with Lambert Energy Advisory developed an additional scenario, called Pathway G.

Pathway G, whose main assumption is that natural gas will play a critical role in the UK's primary energy mix, contributing with renewables, CCS (post 2030) and nuclear to a clean, low-cost and secure UK energy system.

In differentiating between gas and coal we highlight the benefit of the fuel switch from coal to gas. In addition we assume large policy-driven efficiency gains on the demand side, both delivering an early reduction in carbon emissions.

Starting from these assumptions, Pathway G would:

- achieve and surpass the desired reductions in GHG emissions, 55% by 2030 and 82% by 2050, and bring early CO₂ reductions, with cumulative emissions at the lower end of the range compared to the other pathways;
- Investments cost are only a fraction of all the other scenarios proposed, in 2030 £58bn versus a range of £65- £230bn, in 2050 £205bn versus a range of £265- £580bn, and provide a more convenient timing to the necessary technological development of a significant number of low carbon technologies, by foreseeing approximately 75% of all the capital spending to take place only after 2030.
- Annualised costs are lower as well at £36bn in 2030 against a range of £52- £72bn and £75bn in 2050 against £100- £142bn across the scenarios.

Pathway G

The main assumption in this new pathway is that natural gas will play a critical role in UK's primary energy mix. Having been developed through the Pathway Calculator, as the other scenarios proposed by DECC, Pathway G too will drive the UK to reach the ambitious target of an 80% reduction in Greenhouse Gas (GHG) emissions by 2050.

The main difference, however, is that Pathway G represents a highly cost efficient generation scenario while achieving cumulative CO₂ emissions

reductions by 2050 that are similar to the other scenarios. In adopting a greater emphasis on Natural Gas the pathway enables a steady transition to the UK's low carbon ambition in 2050.

An additional benefit of this new scenario is that it provides a greater time window for what are undoubtedly some of the most difficult technological challenges in the energy sphere, the parallel development of a significant number of low carbon technologies. It is important to recognise that throughout the early part of this period, considerable effort will be required to develop and commercialise CCS ready for wider implementation after 2030. At the same time, Pathway G fully endorses the need for energy efficiency measures and the development of renewable and nuclear options.

Statoil is not attempting to predict the explicit development of the energy systems in the UK. The purpose of Pathway G is to highlight that the primary objective of an 80% reduction in emissions can be achieved by 2050 using natural gas. Changing the proportion of other generation technology such as a greater degree of nuclear or offshore wind energy can be explored but these will reduce the cost benefits delivered by Pathway G. Statoil recognises, as DECC does in the call for evidence, that all the scenario's utilised would benefit from further work on the total energy system costs.

Technological uncertainty and the development of the energy mix

By allowing gas to be part of the UK's energy future there can be greater flexibility in the pace of development of many new technologies. This would significantly reduce the economic burden of such developments. Pathway G achieves a 55% and an 82% reduction in greenhouse gas emissions by 2030 and 2050 respectively, successfully meeting the key emissions objectives. Due to the early switch from coal to gas in the power sector under this scenario, cumulative emissions are at the lower end of the range compared to the other pathways. Furthermore, the reduction level in 2020 would be 43% and the cumulative emissions reductions under Pathway G, compared to those needed to achieve the 20% binding target, create a differential of about 750mn tCO₂, i.e. the equivalent of £10.1bn savings, assuming a carbon price similar to current levels (£13/tCO₂).

The current direction of UK energy policy appears to be significantly underplaying the critical role that natural gas can play in ensuring optimisation of the key objectives of energy security, carbon reduction and economic competitiveness. Statoil is fully supportive of the commitment to comply with the EU's 2020 Package and the aim to reduce emissions by 80% by 2050. However, we believe that the current vision of a revolution in the energy mix going forward, mainly at the expense of the historical role of natural gas, poses significant risks to the UK's energy security and economy in the near to medium term. The UK is one of the cleanest, lowest-cost and secure energy systems in Europe due to the development of its natural gas potential in the

1990s. To seek to phase gas out in search of an entirely new energy equilibrium both in terms of sources and infrastructure system, appears to carry significant risks and incur higher costs (ca. £550 billion by 2020, according to Green Investment Bank Commission). Most importantly, this is unnecessary as all of the targets above can be effectively achieved, with lower costs and risks, by acknowledging an appropriate role of natural gas in the energy mix.

Statoil sees the UK as one its most important gas markets both due to its proximity and the effectiveness of liberalisation. If the right signals are sent via UK policy to the Norwegian, UK and global gas developers, we feel that security of gas supply to the UK (in terms of volume and price stability) is likely to remain highly favourable. Significant gas reserves remain to be developed in UK and Norwegian waters with infrastructure already in place. However, if UK energy policy remains negative towards gas as the key fuel in the UK energy mix (e.g. an effective phasing out of gas from UK), this potentially crucial market relationship could founder, releasing significant volumes of gas for other core markets.

A back-up option is essential for renewables development

As renewable intermittent energy sources increase in the UK generation mix there will be a greater need for flexibility in conventional electricity generation sources to provide the necessary back up capacity. Power plants based on natural gas are the ideal solution for this intermittency. To ensure that sufficient back-up capacity is developed and peak supplies are secured and contracted for, measures needs to be taken. This may include promotion of further increase in gas storage capacity in the UK and necessary adjustments of the electricity market arrangements, such as for example capacity payments. It is important that this is addressed in the upcoming Electricity Market Review. Neglecting this aspect would mean to reduce the security of Britain's overall energy supply, and hindering the possibility to create a favourable environment for investment in renewables.

Without the above considerations, renewable intermittency may leave Britain exposed to the short-term global spot gas markets. For the countries which have long-term contracts in place for base load gas supplies and sufficient storage exposure to volatility would be reduced.

Pathway G in more detail

The scenario Statoil has created provides a diversified energy supply portfolio, in which natural gas, renewables, CCS (post 2030) and nuclear contribute to a clean, low-cost and secure UK energy system. Pathway G would meet the UK government's target in an economically feasible manner by providing the right incentives for the use and development of the most low-carbon and cost-effective energy sources by 2020. Beyond 2020, the market share of natural

gas in generation continues to grow until 2050, and from 2030 onwards carbon is sequestered by gradually replacing CCGT plants reaching end of life cycle with new Gas CCS plants, or by CCS retrofitting to relatively new gas fired power plants. This would allow enough time for CCS technology to mature.

Further key assumptions of the scenario are:

- Maintain nuclear power output at 2010 level
- Renewable energy, predominantly from offshore wind power generation, accounts for 17% of total power fuel mix by 2020 and 20% by 2050
- Offshore wind power generation accounts for 11% of total power fuel mix by 2020 and 16% by 2050
- Contribution of renewable energy to total primary energy consumption exceeds 15% by 2020, hence fulfilling the EU's binding target for the UK
- Fuel switch from coal to gas brings an early reduction in carbon emissions, surpassing 2020 limit.
- Large efficiency gains on demand side, with a strong focus on technological advances such as new industrial processes (almost similar to Scenario E, although less strong electrification)

In order to create Pathway G, we have manually adjusted the output of the 2050 Pathways Calculator.

As in Pathway Epsilon, it is assumed that current trends and drivers in domestic agricultural production continue, such that 5% of land in the UK is used for bio-crops. It assumes that the UK can access half of its projected market share of global bio-energy by 2050. On the demand side, in order to reduce UK's total energy need, high levels of electrification of heating and transport are assumed.

Although it is assumed that new nuclear power generation will be built under our scenario to replace plants that are being phased out in future, its role in the future is limited. In our view nuclear generation costs are not transparent, and the current Finnish and French new builds give us no confidence on timing and deliverability.

Looking at the results, Pathway G would get the UK more than halfway towards its 2050 GHG reduction targets in 2030, delivering an effective and affordable solution by accepting gas as a critical element in the roadmap for decarbonising the UK. It would reduce GHG emissions by 55% by 2030 while capital expenditures (capex) for construction of new power plants would be much lower compared to other scenarios. According to our calculations, cumulative capex for Pathway G in 2030 stands at ca. £58 bn while for the other scenarios the capex ranges between £65 bn and £230 bn.

Comparing the 2050 results, the cost gap widens further. While all scenarios meet the 80% GHG reduction target, capex for Pathway G (CCS applied) is only a fraction of that of the other scenarios. In our model, total capital spending on power generation by 2050 is ca. £205 bn compared to a range of £265 bn to £580 bn for the other pathways (except Pathway Delta). Only Pathway Delta has comparable cost estimates. However, Pathway Delta carries additional risks as it heavily depends on two energy sources, nuclear and coal with CCS, where CCS technology would have to be applied at an early stage while it remains an unproven technology at large scale. Furthermore, approximately 75% of all the capital spending under the Pathway G scenario occurs after 2030, reducing the need for immediate large scale spending requirements for UK economy.

Under current pathway scenarios the generation sources that will have the lion's share in 2030 and 2050 (renewables, nuclear, coal with CCS) all currently have estimated cost levels of ca. 3 to 4 times that of gas-fired power generation. If the rate of change is too quick and unilateral, we believe unnecessary costs will be inflicted upon the UK, with no additional carbon reduction or energy security benefits. Natural gas allows for a smooth transition and recognises the time required for additional technology development.

Conclusion

Statoil believe that embracing a gas led evolution of the UK's energy system allows the UK to achieve the next phase of its energy policy objectives. It can be achieve significant carbon reduction and maintain economic competitiveness without the risk of interruption to its energy supplies. Statoil would therefore recommend that DECC seek to include this approach within its pathways for 2050.