

23rd February 2015

Dear Joan,

Thank you for your letter dated 4th February seeking the Committee's views on the Infrastructure Bill and its assessment of the risks to carbon budgets presented by prospective shale gas production in the UK.

Since your letter was sent to us, the Infrastructure Act 2015 has received Royal Assent. Under the new Act, section 49 sets out a formal statutory role for the Committee. We will work with the Department of Energy and Climate Change and others to agree a suitable approach to meet the new statutory role. Providing our advice under the Act will require considerable additional work and nothing in this letter or the annex should be interpreted as prejudicing future analysis or conclusions from the Committee.

In particular, much of the debate about the role of shale gas and whether it is consistent with carbon budgets is about the period between 2030 and 2050. To-date the Committee has only undertaken detailed analysis to support recommendations about carbon budgets that apply to 2027. The new duty under the Infrastructure Act will require further detailed analysis covering the 2030s and 2040s that we have yet to do.

We have considered the role of shale gas in previous reports about carbon budgets to 2027. To-date we have concluded that UK shale gas production can be consistent with meeting UK carbon budgets but only if:

- production is regulated sufficiently to ensure that fugitive methane emissions are low
- it is accompanied by a strong commitment to reduce all greenhouse gas emissions (and therefore gas consumption), for example by setting a power sector decarbonisation target.

Taking all factors into consideration, the Committee concluded (in its Fourth Carbon Budget Review, volume 2, page 81): *"...there is a potentially complementary role for investment in low carbon technologies and shale gas in improving security of supply."*

The annex to this letter provides more detail about our analysis to-date. Our new responsibilities under the Infrastructure Act mean that we will give more detailed consideration to the above matters. That analysis will have to take a number of factors into account, including:

- The proportion of UK shale gas reserves likely to be economically recoverable in a manner consistent with domestic legislation and international agreements, and the possible timing of its development.
- The impact UK decisions on shale gas production would have on domestic gas demand.
- Whether any shale gas that is exploited is used for energy or feedstocks.
- The extent to which lifecycle emissions of shale gas and alternatives will be captured in the UK's net carbon account.
- Scientific and engineering evidence on fugitive (e.g. methane) emissions.
- What consideration will be necessary to ensure that the infrastructure used in the shale industry does not create a barrier to gas replacement in the 2030s and 2040s?

The Act sets out a timetable to provide the Secretary of State with advice. We are currently examining how to undertake the required analysis in these and other areas in line with that timetable.

We would be happy to discuss any issues raised in this letter, or indeed other related matters, with you.

Yours sincerely



Matthew Bell, Chief Executive, Committee on Climate Change

Annex

This annex provides facts and figures from the Committee's existing work about shale gas and its impact on carbon budgets. As noted in the main letter, the focus of the current discussion is the use of shale gas in the 2030s and 2040s and to-date our analysis stops at 2030. We are considering what further analysis is required to meet our new duties under the Act.

The analysis presented here is for information and does not pre-empt any future analysis or conclusions that the Committee might draw. This is a new and evolving area. The Committee will incorporate new evidence, as it emerges, into its thinking.

You rightly note in your letter that the time period over which any shale gas is exploited could be important. We note the following from our previous analysis:

- **Future demand for gas:** Under our central scenario and from the Review of the 4th Carbon Budget, gas consumption in 2030 is 42% lower than 2010 levels. Figure 1 (below) shows that while the reduction in gas demand is relatively steep in the power sector (57% in our scenarios with gas CCS, 75% without), it is less so in other sectors such as buildings and industry (31% and 45% reductions respectively). In particular, in 2030 there continues to be about 600 TWh of demand for gas. Gas demand will decrease beyond 2030 to meet the 2050 emissions target. We will analyse in more detail the least cost path through the 2030s and 2040s.
- **Future supply of gas:** We can expect that North Sea gas production will continue to decline. Taking into account the various sources of gas that can readily be identified, including existing sources of imports, Figure 2 (below) – based on National Grid's "Future Energy Scenarios" – suggests that there remains a gap of about 180 TWh/year in 2030 that could either be filled by additional imports or by domestic production. While the magnitude of possible UK shale gas production is uncertain, it appears unlikely to exceed this level (e.g. shale production in National Grid's 'Gone Green' scenario reaches 150 TWh/year in 2030).

Our scenario analysis on fuel demand only runs to 2030 at this level of detail, although gas consumption will clearly need to decline significantly between 2030 and 2050 in order to meet the 80% target. We have not yet identified the point at which gas consumption would fall to a level below that of domestic production (i.e. potentially implying the export of some UK-produced shale gas).

Our previous analysis has also considered the greenhouse gas emissions that result from the extraction of shale gas. Even if best practice is followed, the level of fugitive methane emissions that can be anticipated is uncertain. In our 2013 report on the UK's carbon footprint, we used a range of 0.5-2% for leakage rates from shale gas production, based on the assumption that best practice occurs to minimise them, driven by appropriate regulation. Figure 3 (below), from that report, shows that this gives well-regulated UK shale gas production a comparable or slightly smaller carbon footprint than imported LNG.

Although the emissions from extraction and transportation of shale gas may be comparable to those of imported gas, unlike imports they come under the scope of carbon budgets because production would occur in the UK. Based on shale gas production reaching 150 TWh/year in 2030, as in National Grid's 'Gone Green' scenario, we estimate that domestic shale gas might add 2 to 5 MtCO₂e/year in 2030 to emissions under the scope covered by carbon budgets, i.e. around 1% of allowed emissions.

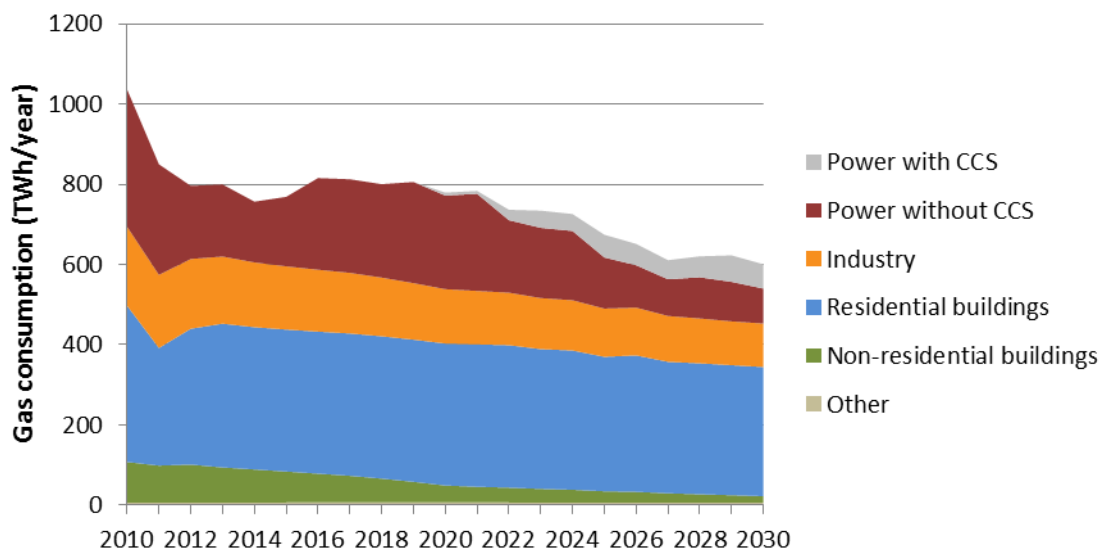
Figure 4 (below) describes the impact of a range of uncertainties examined under our previous work. We concluded that carbon budgets out to 2027 could be met within this range of uncertainty. Uncertainty over shale gas exploitation (under the conditions set out above) falls within this range. There is potential, therefore, that these additional emissions could be manageable within carbon budgets. However, this is subject to two considerations:

- First, if methane leakage rates were higher, then accommodating the additional emissions would be much more difficult. This emphasises the need to minimise methane leakage rates.
- Second, if a push for shale gas production is accompanied by a weakening of action to reduce total gas consumption, and therefore greenhouse gas emissions, particularly post-2030. It will be

important for any shale gas production to be accompanied by strong commitment to reduce emissions (e.g. through a power sector decarbonisation target and ongoing commitment to carbon budgets in line with the 2050 target).

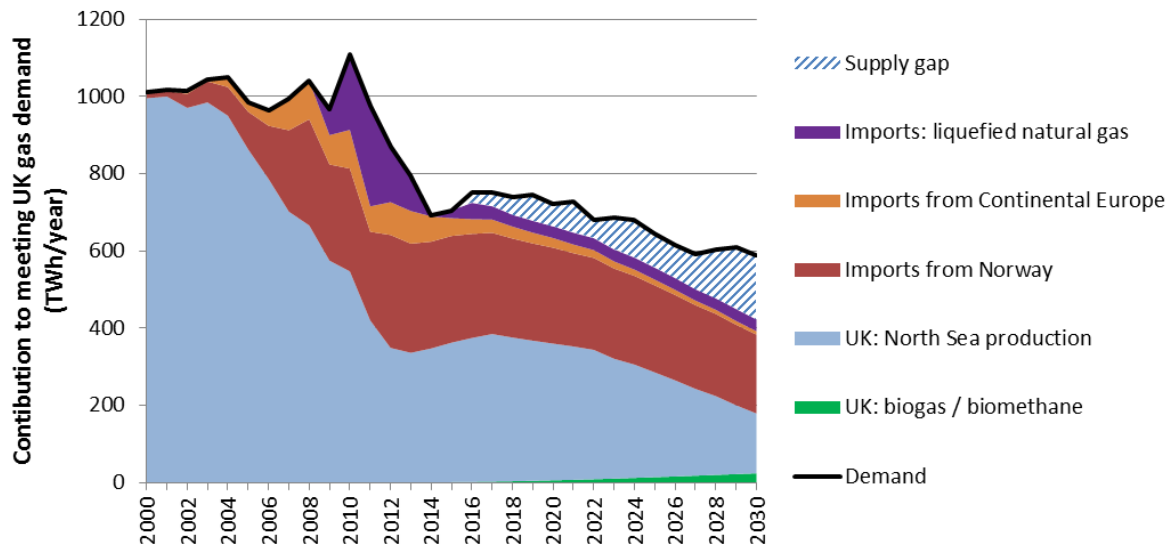
Figures referred to in the Annex

Figure 1 CCC Fourth Carbon Budget Review scenario – gas consumption by sector



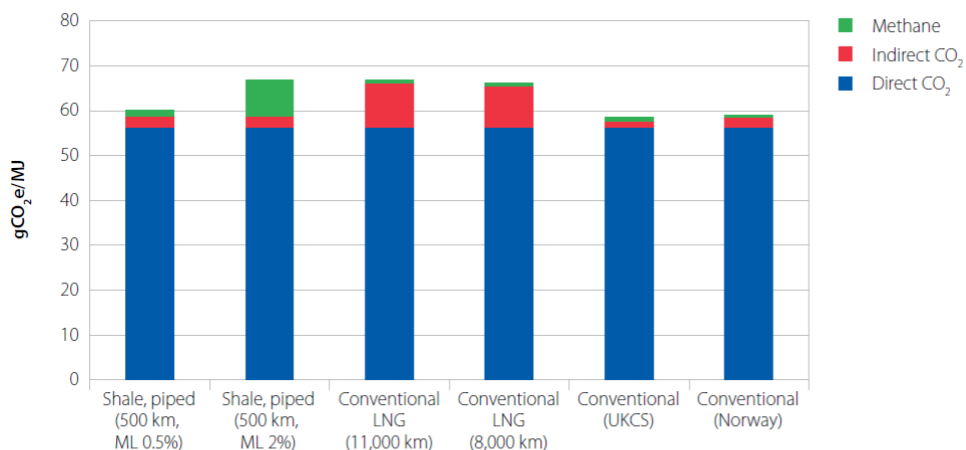
Notes: Data presented are out-turn until 2013, and modelled from 2014 onwards. The power sector scenario included reaches a carbon intensity of 50g/kWh in 2030, and includes 3.7 GW of gas with carbon capture and storage by that time. All gas accounted for on a higher heating value basis.

Figure 2 Meeting UK gas demand – domestic supply and required imports



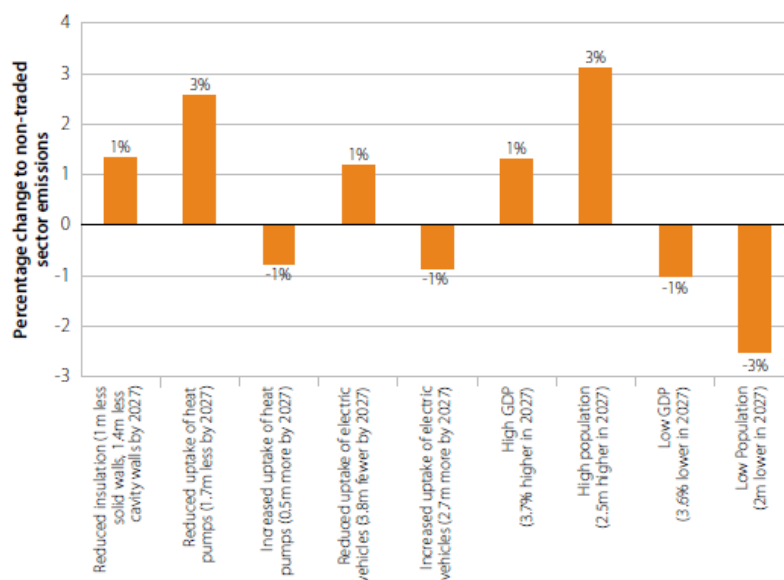
Notes: Overall gas demand consistent with that in Figure 1. Sources of UK production and imports are based on National Grid’s *Gone Green* scenario in their 2014 Future Energy Scenarios. The supply gap is calculated as the difference between identified National Grid sources and CCC demand in each year. If CCC demand is less than identified National Grid sources, LNG imports have been revised down accordingly. All gas accounted for on a higher heating value basis.

Figure 3 CCC Carbon footprint report: Illustrative lifecycle emissions of natural gas



Source: CCC analysis based on estimates developed by Ricardo-AEA.
Notes: Emissions per unit energy of gas delivered. Includes transmission but excludes UK distribution. ML = methane leakage from well completion.

Figure 4 CCC Fourth carbon budget review: Uncertainties in non-traded sector emissions



Source: CCC modelling, DECC (2013) Energy and emissions projections, ONS (2011) 2010-based population projections.

References

Committee on Climate Change (2013), Fourth Carbon Budget Review. Available at <http://www.theccc.org.uk/publication/fourth-carbon-budget-review/>

Committee on Climate Change (2013), Reducing the UK's carbon footprint. Available at <http://www.theccc.org.uk/publication/carbon-footprint-and-competitiveness/>

National Grid (2014), Future Energy Scenarios. Available at <http://www2.nationalgrid.com/uk/industry-information/future-of-energy/future-energy-scenarios/>