Title of Report: DECC Oil Price Projections-Note for Peer Review

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Overview

The objective of the report is to update DECC's long-term projections for the oil price to the year 2035. In doing so, the report uses a list of methods:

- Reviewing external forecasts
- Studying the historical evolution and volatility of the oil price
- Predictions from a supply-demand model
- Reviewing evidence on the long-run marginal cost of oil production

The oil price projections are presented in Table: DECC 2014 Oil Projections (2014 dollars) and Figure DECC 2014 Oil Price Projections, both in page 3.

For the central scenario, the oil price is projected at $105.0 in 2014, declines to $92.6 in 2018 and starts rising again reaching $135.0 in 2035. It is important to note that the figures in the central scenario are not derived from one single method, but rather a combination of methods.

For the low price scenario, the oil price is projected at $90.0 in 2014 and declines gradually (and at a constant rate) to reach $75.0 in 2035.

For the high price scenario, the oil price is projected at $120.0 in 2014 and increases gradually (and at a constant rate) to reach $195 in 2035.

The rest of the report describes the various methodologies and assumptions used in the oil price projections.

In my review, I will focus on and assess the methodologies/methods used in the report. The objective of this review is not to recommend or discuss alternative methods for projecting the oil price and/or to make a judgment on the numbers reached in the different scenarios.

General Comments

The report is fairly comprehensive and discusses the various scenarios in some details. Also many of the assumptions for instance about income elasticity and price elasticity seem reasonable and in line with existing empirical studies. However, there are some general weaknesses in the report, which should be addressed:

- *The different scenarios:* It is not clear what distinguishes the three different scenarios from each other, which adds confusion to the interpretation of the

projections. For instance it is standard to differentiate between different scenario on the basis of economic growth (high growth/low growth scenario); or efficiency (high efficiency/low efficiency); or supply growth (high oil supply growth/low oil supply growth). In this report, this differentiation cannot be made and what distinguishes the low price scenario is that it produces the lowest price trajectory among all the other scenarios.

- *Consistency*: It is important to show consistency in the method, especially when applied to a specific scenario. Some of the projections lack this consistency (please see below my specific comments).
- *Linear Interpolation*: Although the report presents many methods, most of the projections are based on a simple linear interpolation. This is fine, but it raises a more general question: Why introduce the different methods in the first place?
- *Literature Review*: The authors of the report should have made reference to some of the recent literature on oil price forecasting as this may have informed their decision of the appropriate methods.[1]

Specific Comments

Page 2, paragraphs 2 & 3:

It is useful to make clearly the distinction between forecasts and projections. A projection indicates what would happen if the assumptions which underpin the projection actually occurs. This is why it is important to study carefully and present very clearly the underlying assumptions.

Page 2, paragraph 4:
'No probabilities are attached to any of the scenarios'. There is no need to mention this, as the report is not forecasting the oil price.

Page 3: Tables and Figures

Table: DECC 2014 Oil Price Projections (2014$).
Figure: DECC 2014 Oil Price Projections

It is very useful at this early stage to put some notes under this table indicating how the different numbers have been derived. This is quite important as the low, central and high scenarios are derived from multiple methods. Even within the same scenario, the figures are derived from various methods. It is important to include a note of caution at the start of the report. It is also useful to have a brief discussion on what basis the various projections are being differentiated. The low/central/and high projections should not be differentiated on the outcome of the projection.

Page 4: paragraph 7

[1] For a recent and comprehensive review, see for instance, Alquist, R., L. Killian and R. Viffusson (2011), 'Forecasting the Price of Oil', Bank of Canada Working Paper 2011-15, June.

This paragraph mentions three methodologies: external forecasts; historical evolution and volatility of the oil price; predictions from a supply and demand model; and for the low case scenario, reviewing evidence on the long-run marginal cost. It is important to emphasize that while you consider all of these methods, some in fact don't affect directly or are used for projecting the oil price.

Page 4: paragraph 8
This is not clear. You should be more specific. Is this the Brent front month price?

Page 5: paragraph 13
For 2020 and 2019, the table shows two forecasts: EIA and Woodmac. So for these years, are these nominal price projections? Taking the average over these two observations, you will get a slightly different figure from the one presented in the table. Why? Is this to do with nominal versus real?

Page 5: paragraph 14
'The futures curve (as of 13/01/2014) is also plotted for comparison'. I think here it is worth mentioning at least in a footnote that the recent statistical evidence suggests that oil futures prices for long horizons are less accurate than no-change forecast. In a recent and very comprehensive literature review, Alquist et al (2011) show that there is "no evidence in support of the common practice at central banks of appealing to the price of long-horizon oil futures contracts as an indication of future spot prices. In particular, at a horizon of six years, which figures prominently in policy statements and speeches, central bankers would have been much better off relying on the no-change forecast than on oil futures prices'.

Page 6, paragraph 16
Since supply of light tight oil (LTO) is key for the decline in the oil price in the next few years, is it possible to have a view about what is referred in the report to the 'consensus expectation' and the range of uncertainty between the various LTO supply projections?

Page 6: paragraphs 20-22
For the central scenario, the price projections between 2020 and 2035 are based on interpolating the series from the IEA/EIA projection. It is not clear whether it is IEA or EIA figures are being used? Footnote 3 tends to suggest that it is the EIA. In any case, the figure $135 in the table needs further clarification.

Over all, it is important to insert a note in the table on page 2 indicating that under the central scenario:

1. Observations 2014-2020 are based on simple average of consensus forecasts.
2. For observations 2019 and 2020, the pool of consensus forecasts drops to two observations. Does this create a bias in the projections?
3. Observations 2021-2035 are based on a linear interpolation from a single point, under specific assumption that the oil price will trend upward as emerging economies increase their oil demand and the industry finds it difficult to keep pace with supply (paragraph 22, page 6).

4. The gradual decline in the oil price from 2014 to 2018 is due to averaging over a large number of forecasts, the increase in 2019 and 2020 is due to averaging over small number of forecasts, and the increase from 2020 onwards is due to linear interpolation. There is no consistency in the method used.

Page 6: A supply-demand model

The model is quite straightforward. Oil demand is modeled as a function of GDP, price, and exogenous changes (perhaps to reflect efficiency measures) while supply is modeled as a function of price and exogenous factors (perhaps to reflect technological innovation). Equation (3) describes the main drivers of the oil price: shifts in the demand curve due to rises in income and exogenous shifts.

It is important to be clear that none of the measures of elasticity is estimated from empirical models based on historical data, but they are plugged in the model based on the findings of existing studies.

The values for price elasticity and income elasticity seem reasonable. The exogenous shifts in supply and demand are less clear. Are these based on historical trend? If yes, over which period? Furthermore, are these shifts expected to continue throughout the projection period? It is important to make this clear. For instance, currently, there is the view that tight oil production growth will decelerate post 2020, especially in the US, due to the high decline rates. Are such considerations taken into account in the estimates of the exogenous shift?

Low Scenario (Page 8 para 36-38

This should not be called the low scenario. It is basically projections based on some measure of the long run marginal cost. The concept of marginal cost has been used in previous studies, though there is always the issue of who should be considered the marginal supplier in this long-term horizon: a high cost producer such as Canada or a low cost producer such as Iraq? Here the assumption is that price will equal marginal cost and be trending down at a constant rate. Some further discussion of why this might be the case is needed.

Whether this constitutes a low price scenario or not is a different issue altogether. It is simply based on a different methodology i.e. on estimating the long-term marginal cost based on a certain view of the supply curve. The fact that it produces a lower price trajectory does not make it a low growth price scenario.