DEPARTMENT OF ENERGY & CLIMATE CHANGE

DECC Fossil Fuel Price Projections

October 2012

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Introduction

1. This note presents an update to DECC's long-term price projections for oil, gas and coal. Last year an extensive review of the fossil fuel price projection methodologies used by DECC was conducted. This year's update to the projections uses the methodologies established last year with only minor changes.

2. More detail on the method used for the 2011 projections is published on DECC's website, along with peer review comments[1]. This publication focuses on the updates made in order to produce the 2012 projections.

3. This year the projections for each fuel have been updated to give a separate starting price (year 2012) for each of the low, central and high scenarios. This reflects the fact that these projections are estimated by DECC in the spring to allow their use in other DECC analysis to be ready before publication.

4. To create a set of price projections for the current year, an average is taken of the prices observed for the year to date and futures prices for the rest of the year. Low and high projections for the current year are based on observed historical deviations from the forward prices for each fuel.

[1] http://www.decc.gov.uk/en/content/cms/about/ec_social_res/analytic_projs/ff_prices/ff_prices.aspx

DECC 2012 Oil Price Projections

Prices are in 2012 US dollars per barrel.							
	Low	Central	High		Low	Central	High
2011	115.0	115.0	115.0	**2021**	91.7	124.6	154.1
2012	**105.0**	**115.0**	**125.0**	**2022**	90.3	125.7	157.7
2013	103.4	116.0	127.9	**2023**	88.9	126.8	161.5
2014	101.9	117.1	131.0	**2024**	87.6	128.0	165.3
2015	100.4	118.1	134.0	**2025**	86.3	129.1	169.1
2016	98.8	119.2	137.2	**2026**	85.0	130.3	173.1
2017	97.4	120.2	140.4	**2027**	83.7	131.4	177.2
2018	95.9	121.3	143.7	**2028**	82.5	132.6	181.4
2019	94.5	122.4	147.1	**2029**	81.2	133.8	185.6
2020	93.1	123.5	150.6	**2030**	**80.0**	**135.0**	**190.0**

Methodology

5. The methodologies used to create DECC's oil price projections remain unchanged from those used last year. A supply and demand model is used to estimate our central and high oil price projections. The results of the model are then sense-checked against external forecasts. For the low scenario, an assumption is made about the minimum cost of extracting oil and this is used as an indication of minimum price, then this is sense-checked against the supply and demand model.

6. For the central and high scenarios a supply and demand model, as reviewed last year, is used to create a growth rate and this is then applied to the 2012 starting prices, calculated using year-to-date and futures data. The model continues to use International Energy Agency (IEA) projections for supply and global GDP projections from the International Monetary Fund (IMF) as exogenous inputs. The price elasticity and income elasticity of demand assumptions are the same as those made last year.

Central Scenario

7. The supply and demand model has been updated to reflect new IMF projections for global GDP growth and 2012 data on spot and futures prices. The projections yielded by the

model are then sense-checked against external forecasts such as those made by the IEA and the Energy Information Administration (EIA).

High Scenario

8. The high scenario now starts from a price $10 above the central price estimated for 2012, using the methodology described in the introduction.

9. In the high scenario the model is adjusted to incorporate zero global supply growth in oil and a 0.1ppt increase in GDP growth in each year compared to the central scenario. The results are then sense-checked against external high oil price scenario estimates.

Low Scenario

10. The low scenario now starts from a price $10 below the central price estimated for 2012, using the methodology described in the introduction.

11. The low scenario is based on an assessment of the long-run marginal cost curve for oil, which is largely unchanged from last year. To sense check this projection, the assumptions of the supply and demand model are altered to see what would be required to produce a similar price trend.

Comparison with external and previous DECC projections

All prices are in 2012 $ per barrel.

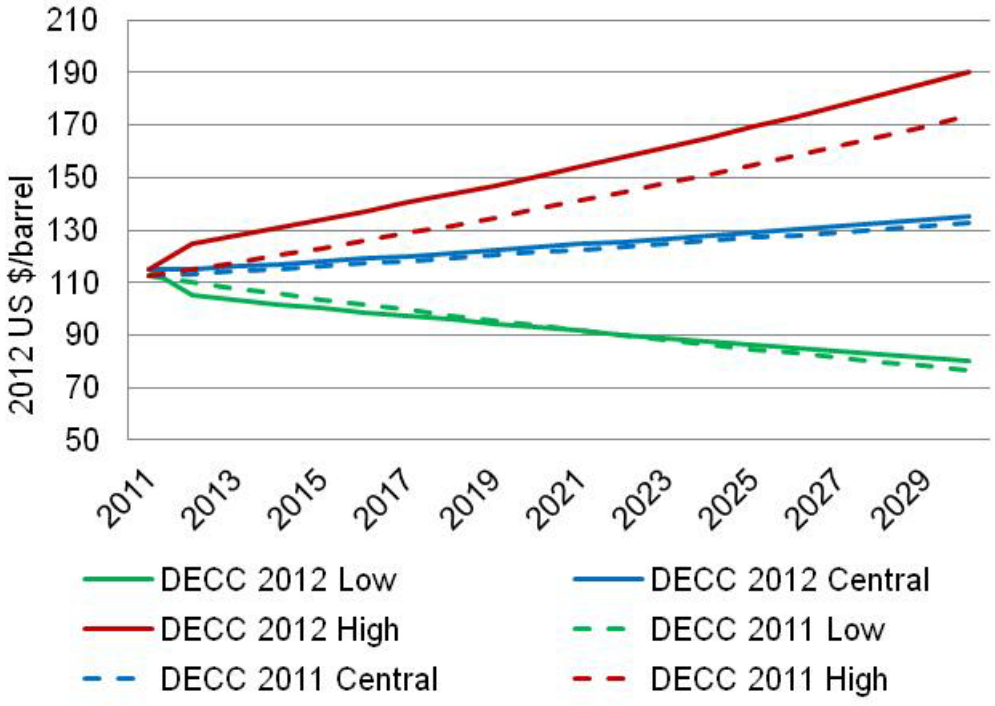

Figure 1: Comparison of 2012 DECC oil projections with those from 2011.

All prices are in 2012 $ per barrel.

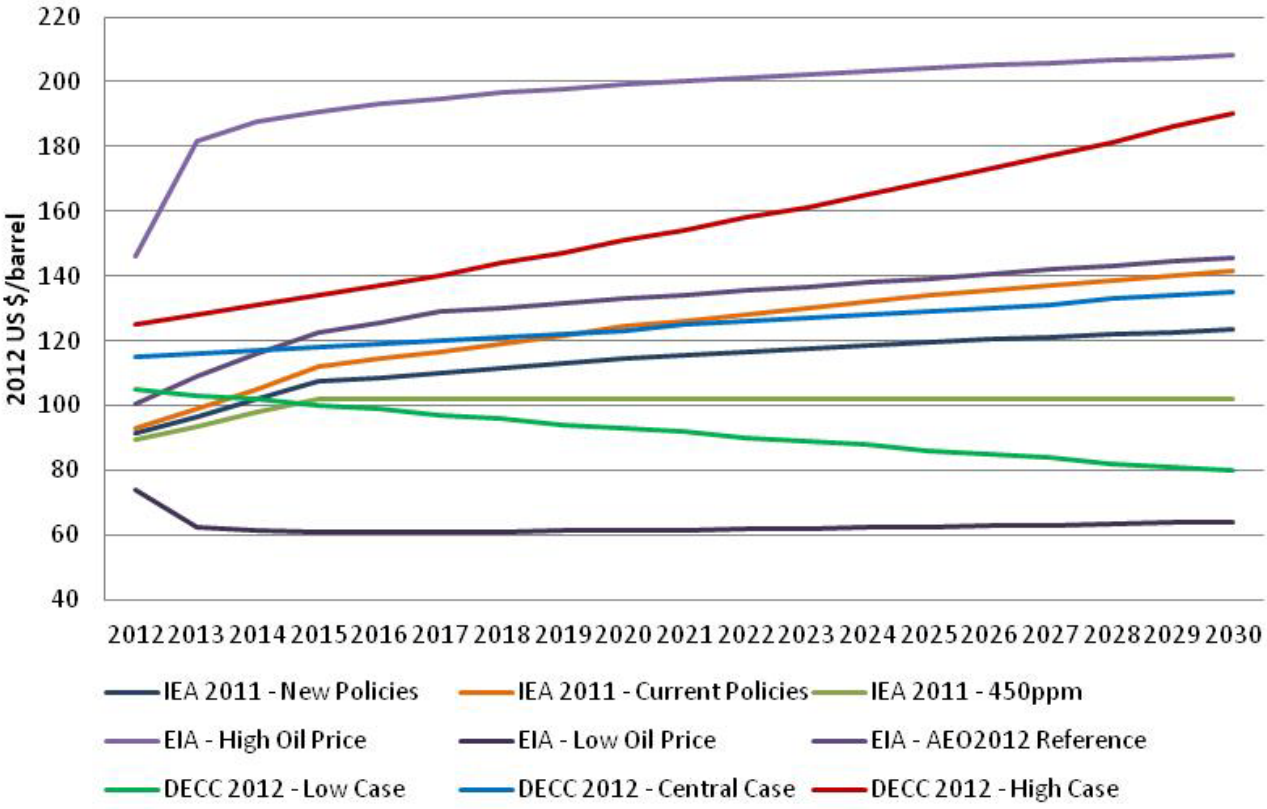

Figure 2: Comparison of external and DECC 2012 oil projections.

DECC 2012 Gas Price Projections

Prices are in 2012 pence per therm (p/th.). 2011 is the actual average NBP day-ahead price for that year (in 2012 prices, using the Consumer Price Index). All other years are projected prices.							
	Low	Central	High		Low	Central	High
2011	57.8	57.8	57.8	**2021**	41.1	71.9	102.7
2012	**52.0**	**61.2**	**70.4**	**2022**	41.1	71.9	102.7
2013	50.2	68.7	86.4	**2023**	41.1	71.9	102.7
2014	48.4	76.1	89.0	**2024**	41.1	71.9	10.7
2015	46.6	76.8	91.1	**2025**	41.1	71.9	102.7
2016	44.7	77.5	93.2	**2026**	41.1	71.9	102.7
2017	42.9	74.7	95.4	**2027**	41.1	71.9	102.7
2018	41.1	71.9	97.7	**2028**	41.1	71.9	102.7
2019	41.1	71.9	100.0	**2029**	41.1	71.9	102.7
2020	41.1	71.9	102.3	**2030**	**41.1**	**71.9**	**102.7**

Methodology

12. DECC's gas price scenarios project the annual average UK spot price for wholesale gas in pence per therm out to 2030. This relates to the price of gas for delivery 'today'[2] at the National Balancing Point (NBP), the UK's gas trading hub. The projections are in 2012 prices.

13. The methodology for the 2012 projections is similar to that for the 2011 projections, though a change in approach has been adopted for the low price projection. Broadly, the projections reflect varying outlooks for gas market fundamentals, the degree of market liberalisation and contracting/pricing arrangements between buyers and sellers of gas. They assume UK hub prices are linked or de-linked from oil-indexed gas prices at various times, depending on European gas market supply and demand fundamentals.

[2] The NBP spot price commonly quoted is the 'day-ahead' price, which is gas contracted for delivery one day forward.

Central

14. The 2012 central price projection follows a similar approach to the 2011 projection with some minor adjustments made.

15. Beyond 2012, the projection assumes the 'gas glut' observed in Europe at the end of the last decade continues to erode in the short to medium term. Although European demand growth is expected to be moderate at best, supply is expected to tighten as a result of less LNG availability. The main reason is continued growth in Asian LNG demand and limited increases in global LNG supply capacity until the second half of this decade.

16. As a result of tightening gas market conditions, UK and European hub prices are projected to partly re-link with gas-to-oil prices in 2013 and fully re-link over 2014-2016 (as previously). The re-linked price assumes an '11% rule' for gas-to-oil pricing[3] based upon DECC's central oil price projection. In this year's projection a discount of 5 per cent has been applied to the re-link period to reflect the fact that continental European gas buyers have, in recent years, re-negotiated contract terms with suppliers whilst maintaining gas-to-oil pricing[4]. At the same time, the proportion of natural gas sales in contracts linked to oil prices has fallen in recent years.

17. Efforts to liberalise European gas markets (EU 'Third Package' measures) and growth in global LNG supply capacity are assumed to undermine gas-to-oil pricing and loosen gas market fundamentals in the second half of the decade. As a result, hub prices decouple from oil-linked gas prices over 2017-2018 (as previously)[5].

18. From 2018 onwards, prices are assumed to be 72p/therm in real terms[6], based upon the range of long-run marginal costs of supplying gas to the UK[7]. 72p/therm is toward the upper end of this range implying there remains some tightness in European and global gas markets.

High

19. The high scenario now starts from a price 15% above the central price estimated for 2012, using the methodology described in the introduction.

20. Otherwise the 2012 high projection assumes a re-linking with gas-to-oil pricing with full re-linking in 2013. This again uses an '11% rule' though based upon DECC's high oil price projection, which has been revised upwards this year. No discount has been assumed from contract re-negotiations, which could reflect a scenario in which recent renegotiations are reversed as a result of tighter conditions in hub-traded gas markets.

21. Gas remains linked to oil-prices until the early 2020s i.e. there is no easing of gas market fundamentals, unlike the central projection. This could reflect a scenario in which Asian

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[3] The '11% rule' is a rule of thumb for gas-to-oil pricing based on empirics – the price of gas in $/mmbtu is approximately 11% of the lagged price of Brent crude oil in $/bbl. The typical lag used is 6-9 months.
[4] Wood Mackenzie estimate 2012 contract renegotiations between Russia and European buyers have resulted in discounts of 7 per cent, assuming $100/bbl. 'Those Russian Gas Contract Changes', April 2012.
[5] For example, Australia plans to increase its LNG supply by three to fourfold by the end of this decade.
[6] This is a re-flation of the long-run price of 70p/therm assumed in the 2011 central projection.
[7] See figures 4 and 5 in 2935-decc-gas-price-projections.pdf;
http://www.decc.gov.uk/en/content/cms/about/ec_social_res/analytic_projs/ff_prices/ff_prices.aspx

demand for LNG remains high whilst planned increases in LNG supply capacity for the second half of this decade are delayed. It could also reflect delays in the transition to liberalised markets in Europe.

22. Beyond this point, gas is assumed to be de-linked from (high) oil prices and plateaus at 103p/therm in 2012 prices[8]. This level is some way above the range of estimates of long-run marginal costs for gas to Europe so would need to reflect limited gas availability, for example as a result of rising production costs or very strong competing demand from Asia.

Low

23. The approach to DECC's low price projection has been revised in a more material way than the central and high scenarios. Previously, the US EIA projections for US gas prices was used for the low projection using the rationale that US prices would set a theoretical floor for UK gas prices. This was felt to represent an 'absolute floor' rather than a low price scenario and so has been revised to reflect a long-run price based upon the range of LRMCs to the UK. The transition to the low long-run price has also been made more gradual.

24. The low price projection assumes gas prices gradually fall from 58p/therm in 2011 to 41p/therm in 2018. This could reflect a scenario in which global LNG supplies are plentiful (as capacity projects come on-stream and Asian demand growth is subdued), European economic growth remains weak and European gas markets quickly become much more competitive. A long-run price of ~40p/therm represents the lower end of estimates of the long-run marginal cost of gas supplies to Europe.

[8] A re-flation of the long-run figure of 100p/therm assumed under the 2011 projections.

Comparison with external and previous DECC projections

All prices are in 2012 pence per therm

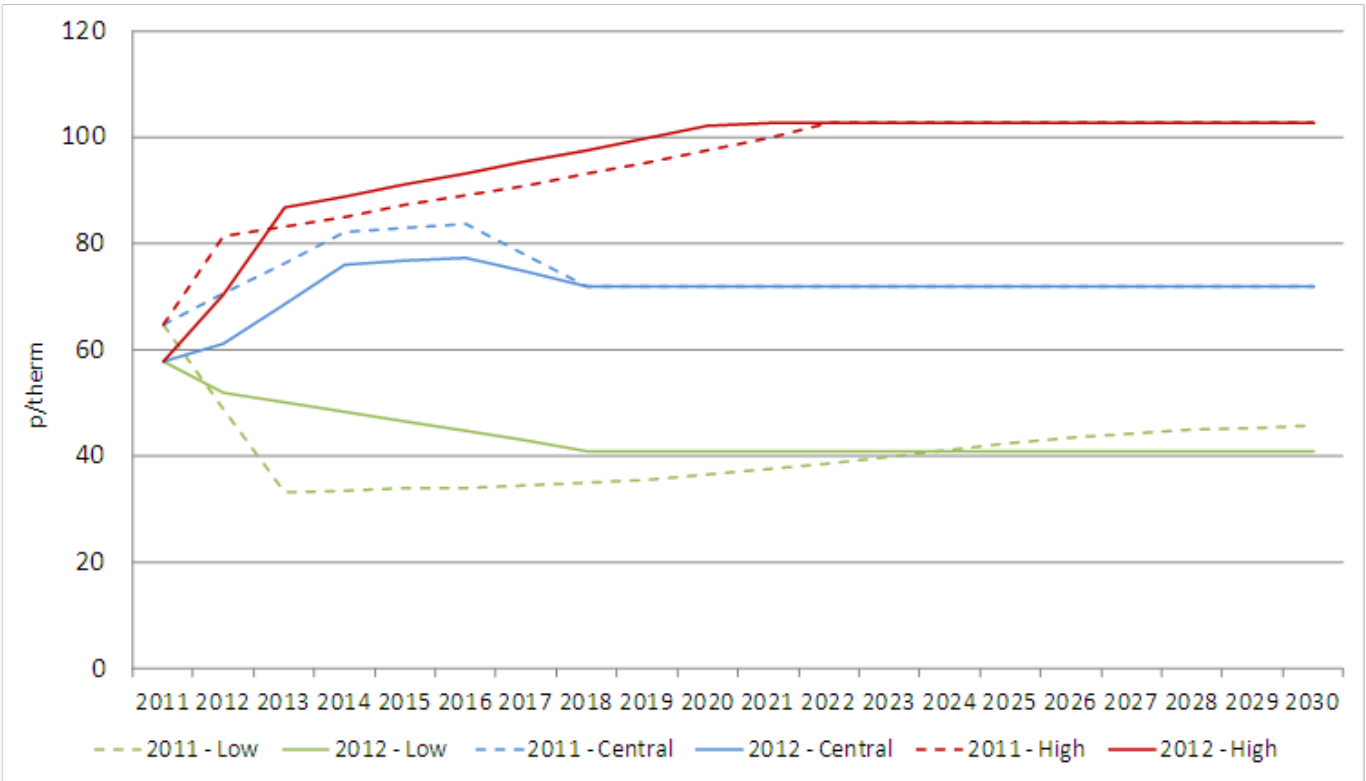
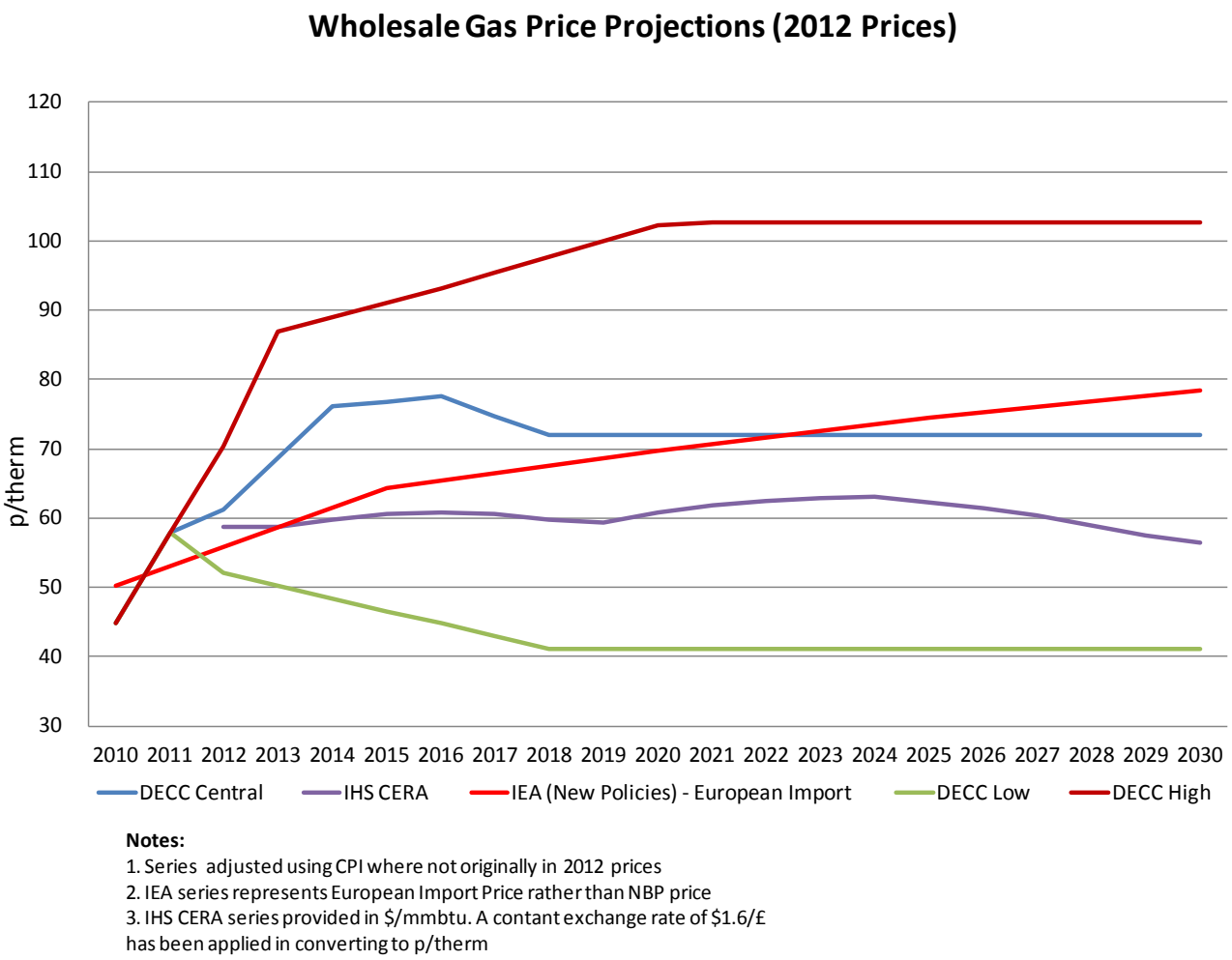


Figure 3: Comparison of 2012 DECC gas projections with those from 2011.

All prices are in 2012 pence per therm



Notes:
1. Series adjusted using CPI where not originally in 2012 prices
2. IEA series represents European Import Price rather than NBP price
3. IHS CERA series provided in $/mmbtu. A contant exchange rate of $1.6/£ has been applied in converting to p/therm

Figure 4: Comparison of external and DECC 2012 gas projections.

DECC 2012 Coal Price Projections

All Prices are in 2012 US dollars per tonne							
	Low	Central	High		Low	Central	High
2011	123.5	123.5	123.5	**2021**	76.0	120.0	167.2
2012	**96.9**	**101.6**	**107.1**	**2022**	76.0	120.0	170.6
2013	94.3	110.0	121.5	**2023**	76.0	120.0	174.0
2014	91.7	116.1	133.5	**2024**	76.0	120.0	177.3
2015	89.0	116.7	138.5	**2025**	76.0	120.0	180.7
2016	86.4	117.4	143.6	**2026**	76.0	120.0	182.3
2017	83.8	118.0	148.7	**2027**	76.0	120.0	183.9
2018	81.2	118.7	155.3	**2028**	76.0	120.0	185.5
2019	78.6	119.3	158.8	**2029**	76.0	120.0	187.1
2020	76.0	120.0	163.8	**2030**	**76.0**	**120.0**	**188.6**

Methodology

25. The methodologies used in formulating DECC's 2012 coal price projections in the central and high scenarios are unchanged from those used last year. In general, projections are based on forwards prices, analysis of market fundamentals, analysis of long-run and short-run marginal costs and regression analysis. Projections have also been sense-checked against those carried out by external organisations.

26. Forwards prices are used up to 2014 (2012 in the low scenario). We then interpolate from 2014 (2012 in the low scenario) to the projected 2020 value for each scenario. In the central scenario, price projections from 2020 are calculated using regression analysis and informed by long-term price forecasts. Prices in the high scenario are formulated using long-term export prices and freight cost estimates.

27. The methodology used in the low scenario has been revised from the previous year. In 2011, the approach taken in the low scenario was to attempt to establish a "price floor" for the coal price, using an estimate of long-run marginal cost. However, we now believe a more suitable assumption for a floor price is the short-run marginal cost of extraction and transportation.

Central Scenario

28. Prices to 2014 are based on forward prices, and then linear interpolation is used to 2020. From 2020, prices are formulated using regression analysis of the relationship between coal and gas prices and informed by EIA long-term export price projections and cost estimates.

29. Price projections have been revised to account for updated historical data on the relationship between coal and gas prices and this year's central scenario gas projections. The projections have also been informed by EIA 2011 "reference case" long-term export price forecasts and updated freight costs. This results in a projected CIF[9] ARA[10] price of $120/tonne in 2030.

High Scenario

30. In the period 2012-2014, projections are based on forward prices, adjusted upwards by 5%,10% and 15% respectively. This is a reflection that uncertainty increases further out along the forward curve. For the period 2015-2020 linear interpolation is used. From 2020 the coal price is based on long-term cost estimates.

31. In 2012, projections have been revised to reflect higher EIA 2011 long-term export price forecasts, as well as updated freight costs. In a supply constrained world with high demand for coal, European imports may come from high-cost, less productive mines elsewhere in the world (for example, the USA). Hence we use the EIA "high coal cost" scenario, which is based on lower productivity growth rates, higher mining wages, higher transportation costs and higher mine equipment costs, to derive a reasonable high case for European import prices.

32. Taking the EIA "high coal cost" projections, and adding freight costs, results in an ARA price of $189/tonne in 2030. These projections, reflecting the already comparably high EIA "high coal cost" USA export price forecasts, are higher than predicted by other external forecasts. However, in a world of low investment, high economic growth, and low productivity, we believe that they represent a reasonable high case for coal prices.

Low Scenario

33. The projection for 2012 is based on forward prices, with a downwards adjustment of 5% to reflect uncertainty. For the period 2013-2020 smooth linear interpolation is used.

34. In 2011, the approach taken in the low scenario was to attempt to establish a price floor for the coal price. While in 2011 an estimate of long-run marginal cost (LRMC, i.e. including capital costs) was used to derive this price floor, it now seems a more suitable assumption for a floor price is the short-run marginal cost (SRMC) of extraction and transportation (i.e. excluding capital costs), and the methodology has been updated accordingly.

35. Historically, coal markets have tended to be international in nature and prices determined by the cost of supplying the marginal unit of coal. In the low scenario, projections from 2020

[9] Cost, Insurance and Freight: A trade term requiring the seller to arrange for the carriage of goods by sea to a port of destination, and provide the buyer with the documents necessary to obtain the goods from the carrier.

[10] I.e. as delivered to the Amsterdam, Rotterdam and Antwerp region.

have been formulated based on an assumption about future SRMC that has been informed by lower-end IEA WEO 2011 short run production costs, and updated freight costs.

36. In a scenario with low growth in demand and/or excess supply, it is possible that prices may fall to SRMC after 2020. This results in a coal price in the period 2020-2030 of $76/tonne. This projection is below the majority of other forecasters but similar to the IEA 450 scenario by 2030.

Comparison with external and previous DECC projections

All prices are in 2012 Dollars per tonne

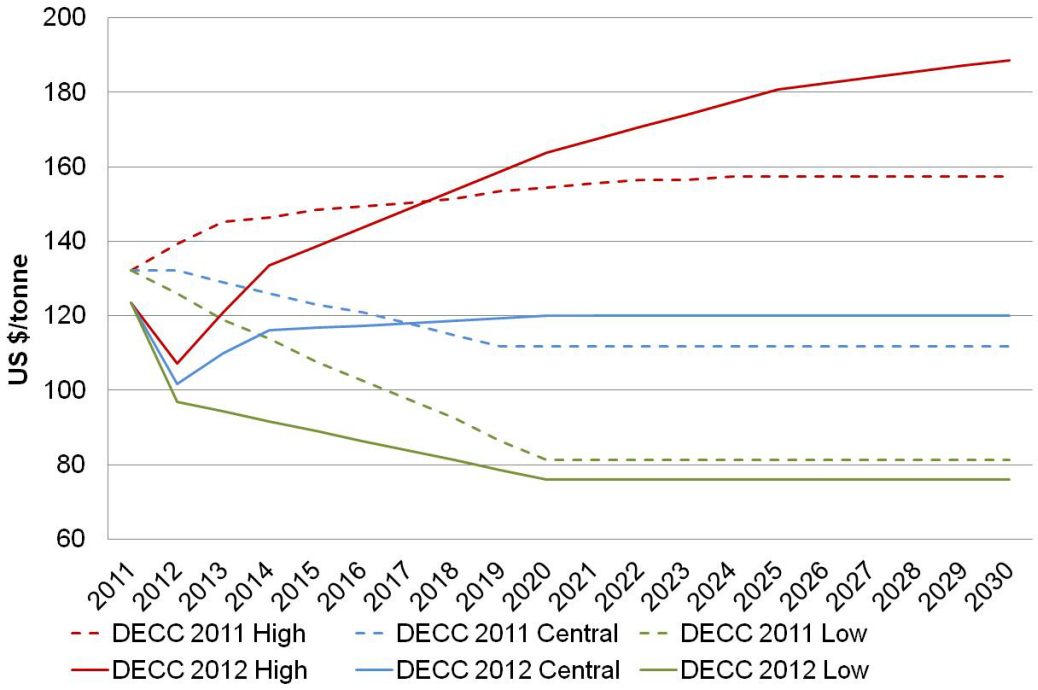


Figure 5: Comparison of 2012 DECC coal projections with those from 2011.

All prices are in 2012 Dollars per tonne

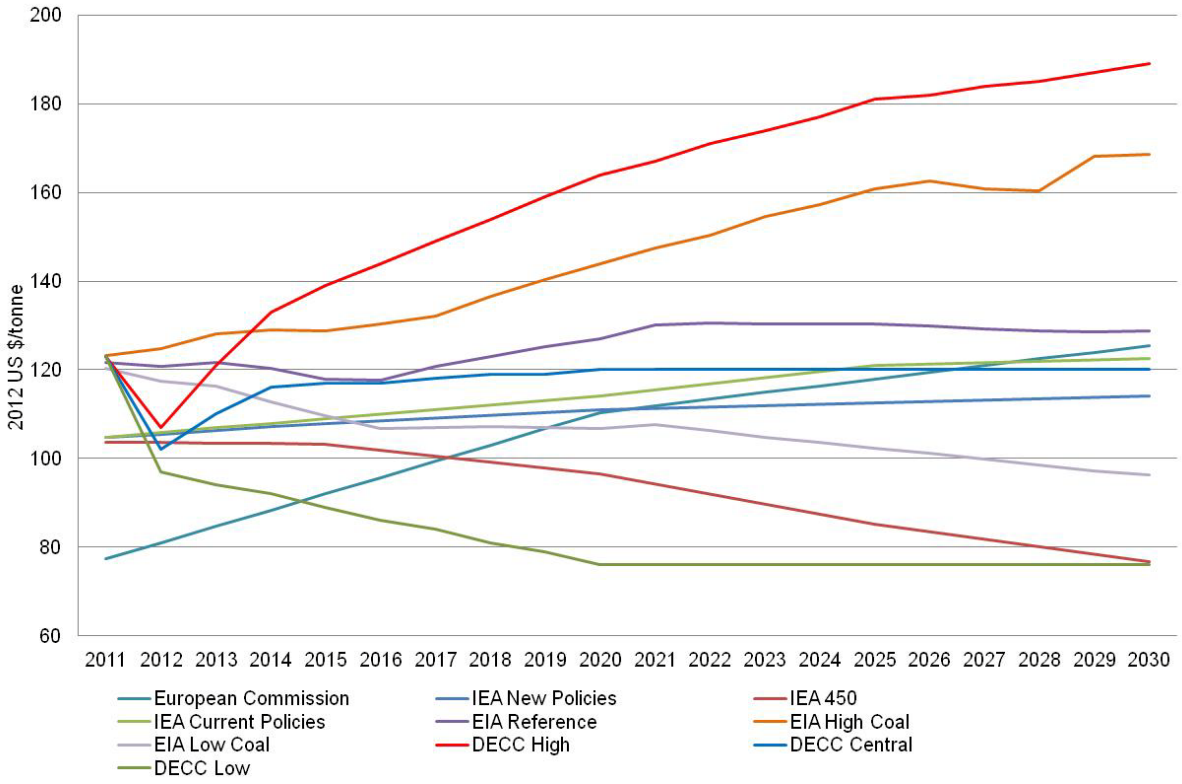


Figure 6: Comparison of external and DECC 2012 coal projections .

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