

# Summary of Updated Energy and Carbon Emissions Projections

## Headline carbon emissions projections to 2020

1 This annex provides a summary of the results of the latest UK energy and carbon emissions projections<sup>1</sup>. The following baseline projections reflect low, central and high assumptions of future fossil fuel prices; and the estimated impact of the Energy White Paper measures under central fuel prices. In addition, these projections explore the impact of a carbon price<sup>2</sup> for the UK sectors covered by the EU Emissions Trading Scheme (EU ETS).

### Baseline projections

2 Depending on the price of fossil fuels, and without the impact of the EU ETS and the measures in this White Paper, UK domestic carbon emissions are projected to be 149 -151 million tonnes of carbon (MtC) in 2020<sup>3</sup> (Table B1 below). This is 3-5 MtC higher than previous central baseline projections published in the Energy Review Report in July 2006. Part of the reason for this is that our projections now include a higher level of coal-fired electricity generation in 2020 than we projected last July, due to revised assumptions about the future level of fossil fuel prices<sup>4</sup>.

**TABLE B1. BASELINE PROJECTIONS UNDER LOW CENTRAL AND HIGH FOSSIL FUEL PRICES**

	2010	2015	2020
Low fuel prices	146.9	150.7	149.2
Central fuel prices	146.5	149.4	151.2
High fuel prices	145.8	149.1	150.5

1 A more detailed paper on the updated energy and carbon emissions projections is being published alongside this White Paper DTI: *Updated Energy and Carbon Emissions Projections*, May 2007. [www.dti.gov.uk/energy/whitepaper](http://www.dti.gov.uk/energy/whitepaper)

2 Except in the baseline projection, a carbon price of €20/tCO<sub>2</sub> in 2010 and €25/tCO<sub>2</sub> in 2015-2020 is assumed for the EU ETS sectors in the UK.

3 This baseline includes savings in 2020 of around 25MtC from existing measures.

4 The revised fossil fuel price assumptions used in these projections were put out to consultation in October 2006. The revisions to our fossil fuel price assumptions show an increase in expected future fuel prices, consistent with other major organisations (IEA and EIA) and reflecting market tightness and higher costs of production. The revision has also meant that the assumed relative price of fossil fuels has changed. In the baseline scenario, and without a carbon price, the price of coal is now more favourable compared with that in the July 2006 projections. This contributes to an increase in coal capacity in the new baseline of up to 8GW by 2020.



## Projections of the impact of EU ETS carbon price in the UK and the impact of the 2007 Energy White Paper measures

3 The projections published in this White Paper (and in contrast to the projections published with the Energy Review Report) incorporate an EU ETS carbon price for UK sectors of €20/tCO<sub>2</sub> in 2010 and €25/tCO<sub>2</sub> in 2015-2020.

4 The exact level of savings from the EU ETS beyond Phase II (2008-2012) will be decided in line with future national allocation plans. However, in this White Paper we present an illustrative projection of savings from the EU ETS in 2020 under central fuel prices of 13.7MtC<sup>5</sup>. Our projections show that in order to meet this level of effort, the EU ETS sectors in the UK will be required to purchase emissions allowances from abroad.

5 Table B2 below details the headline aggregate 2007 Energy White Paper projections. These are based on central fossil fuel price assumptions<sup>6</sup>. The range reflects the low, central and high carbon savings estimated to be achieved through the White Paper measures<sup>7</sup> (as described in Table 10.1 in chapter 10). These estimates also include the estimated full impact of the EU ETS carbon price and the additional effort from purchasing emissions allowances from abroad.

<b>TABLE B2. HEADLINE 2007 ENERGY WHITE PAPER PROJECTIONS (CENTRAL FUEL PRICES)</b>				
<b>Projections (MtC)</b>	<b>1990</b>	<b>2005</b>	<b>2010</b>	<b>2020</b>
Baseline	161.5	151.1	146.5	151.2
Emissions projection including full impact of EU ETS and assuming low impact of White Paper measures	161.5	151.1	136.1	128.9
Emissions projection including full impact EU ETS and assuming central impact of White Paper measures	161.5	151.1	135.7	126.5
Emissions projection including full impact of EU ETS and assuming high impact of White Paper measures	161.5	151.1	135.2	119.2

6 Table B2 shows that, along with the impact of the EU ETS and depending on the level of savings from the White Paper measures, UK carbon emissions are projected to be 119.2-128.9 MtC in 2020; equating to a 20-26% reduction on 1990 levels (See Figure 10.1 in chapter 10 of this White Paper)<sup>8</sup>. Table B3 below provides more detail on sectoral projections compared to the baseline projections, under central fuel prices. The range reflects the low, central and high estimated carbon savings from the White Paper measures. The table also separates domestic carbon emissions, and emissions savings achieved through the purchase of allowances from abroad.

5 This estimate reflects the assumption that the cap for Phase II of the scheme is unchanged in future phases. On the basis of our latest baseline projections, this would require 13.7MtC of savings in 2020. The actual level of savings to be achieved through EU ETS beyond Phase II (2008-2012) will be decided in line with future national allocation plans.

6 Emissions projections under high and low fossil fuel and central policy saving assumptions are reported in the detailed paper on the projections. [www.dti.gov.uk/energy/whitepaper](http://www.dti.gov.uk/energy/whitepaper).

7 This range reflects uncertainty about the timing and impact of the measures.

8 In the draft Climate Change Bill, the UK target is a 26-32% reduction in emissions on 1990 levels by 2020.

**TABLE B3. BASELINE EMISSIONS AND LOW, CENTRAL AND HIGH EMISSIONS BY SECTOR (CENTRAL FUEL PRICES)**

	2005	Baseline		Low carbon saving		Central carbon saving		High carbon saving	
		2010	2020	2010	2020	2010	2020	2010	2020
Power stations	47.0	45.3	49.0	44.2	38.8	43.5	36.4	42.8	32.9
Refineries	5.0	5.8	6.1	5.8	6.1	5.8	6.1	5.8	6.1
Residential	23.1	19.7	18.3	19.7	15.6	19.7	15.0	19.6	14.4
Services	6.5	6.2	6.6	6.1	6.0	6.1	5.8	6.1	5.6
Industry	30.8	30.8	29.9	30.8	29.7	30.8	29.6	30.8	29.6
Road transport <sup>1</sup>	32.7	32.5	33.9	32.4	32.2	32.4	32.2	32.1	27.2
Off-road	3.5	3.3	3.2	3.3	3.2	3.3	3.2	3.3	3.2
Other transport	3.1	3.4	3.7	3.4	3.5	3.4	3.4	3.4	3.3
LUC	-0.6	-0.5	0.5	-0.5	0.5	-0.5	0.5	-0.5	0.5
<b>Total<sup>2</sup></b>	<b>151.1</b>	<b>146.5</b>	<b>151.2</b>	<b>145.2</b>	<b>135.6</b>	<b>144.4</b>	<b>132.2</b>	<b>143.4</b>	<b>122.9</b>
<b>Emissions allowances purchased from abroad<sup>3</sup></b>	-	-	-	9.1	6.8	8.7	5.7	8.3	3.7
<b>Total including full impact of EU ETS</b>	<b>151.1</b>	<b>146.5</b>	<b>151.2</b>	<b>136.1</b>	<b>128.9</b>	<b>135.7</b>	<b>126.5</b>	<b>135.2</b>	<b>119.2</b>

1 DTI forecasts of road transport emissions are consistent with, but at the top end of DfT emissions forecasts because of the different modelling approaches used.

2 Estimated carbon emissions inclusive of the impact of the 2007 White Paper measures and a carbon price – but excluding emissions savings achieved through the purchase of allowances from abroad.

3 Estimated allowances purchased by EU ETS sectors in the UK from abroad (either EU allowances from other Member States in the EU ETS; or through Kyoto flexible mechanisms such as the Clean Development Mechanism).

## Greenhouse gas emissions projections

7 Under the Kyoto Protocol, the UK has a target to reduce greenhouse gas (GHG) emissions by 12.5% on 1990 levels by 2008-2012. The Kyoto target is based on a basket of greenhouse gases, of which carbon dioxide (CO<sub>2</sub>) represents the largest share. The latest projections show that the UK remains on track to exceed its Kyoto commitment<sup>9</sup>. The EU has committed to cut total greenhouse gas emissions by 20% on 1990 levels by 2020, or by 30% if in conjunction with other countries.

8 Based on the carbon emissions projections shown in this annex, together with an estimate of non-CO<sub>2</sub> GHG emissions projections<sup>10</sup> suggest that total UK GHG emissions will be between 147-159 million tonnes of carbon equivalent (MtCe) in 2020, i.e. 25-31% lower than 1990 levels. (Figure B1, below). This projection of UK GHG emissions is inclusive of savings of carbon

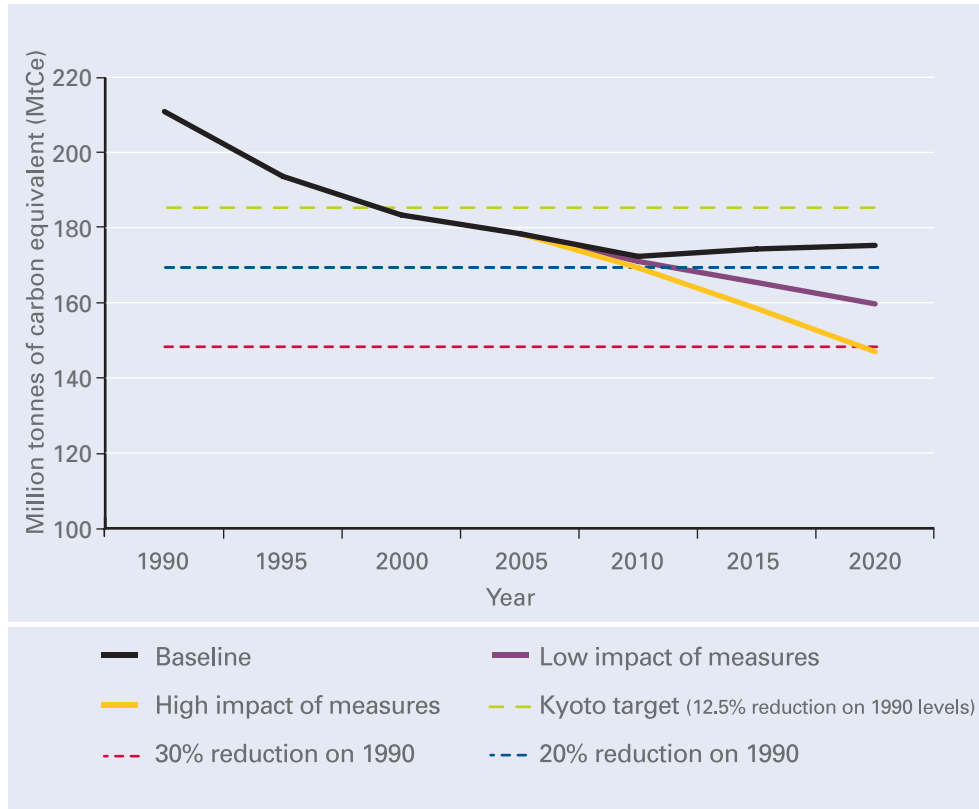
9 Defra, Provisional 2006 UK Climate Change Sustainable Development Indicator. <http://www.defra.gov.uk/news/2007/070329a.htm>

10 Provisional central estimates of non-CO<sub>2</sub> greenhouse gas emissions provided by Defra to the EU in March 2007. These estimates are under review to take account of the CO<sub>2</sub> projections provided in this White Paper, and other information that has become available since the 2006 Climate Change Programme was published. Fully updated estimates should be available in the second half of 2007.



achieved domestically through a carbon price of €20/t CO<sub>2</sub> in 2010 and €25/t CO<sub>2</sub> in 2015-2020<sup>11</sup>, and is based on central fossil fuel prices.

**FIGURE B1. PROJECTED GREENHOUSE GAS EMISSIONS (1990-2020)**



Source: DTI Updated Energy and Carbon Emissions Projections May 2007

<sup>11</sup> These GHG projections do not take into account the estimated additional allowances purchased by EU ETS sectors in the UK from abroad.

## Electricity generation mix

9 Table B4 sets out the fuel mix in electricity generation under central fuel prices in the baseline projection, and in the scenarios including the impact of a carbon price and the White Paper measures. The impact of the carbon price on the generation fuel mix is more significant by 2020, through its impact on the relative costs of generation and demand, favouring gas and nuclear generation at the expense of coal. The Government is consulting on the proposal of allowing the private sector the option of investing in new nuclear power stations. Because this issue is subject to consultation, we have only allowed the model to build new nuclear power stations in the high case, to show the potential impact of the proposal, for purely illustrative purposes.

TABLE B4. ELECTRICITY GENERATION MIX BY FUEL (CENTRAL FOSSIL FUEL PRICES)									
TWh	Baseline projections			Low policy estimates		Central policy estimates		High policy estimates	
	2005	2010	2020	2010	2020	2010	2020	2010	2020
Coal <sup>1</sup>	125	121	119	113	67	113	71	113	77
Oil	2	2	1	2	1	2	1	2	1
Gas	135	129	202	136	223	129	195	123	156
Nuclear	75	68	25	68	25	68	25	68	33
Renewables <sup>2</sup>	17	31	48	29	46	33	57	36	67
Imports	11	11	16	11	16	11	16	11	16
Storage	3	3	3	3	3	3	3	3	3
<b>Total</b>	<b>368</b>	<b>365</b>	<b>415</b>	<b>362</b>	<b>381</b>	<b>359</b>	<b>367</b>	<b>357</b>	<b>352</b>

1 In the three policy cases, in line with our measures, some of the coal generation in 2020 is from CCS demonstration power stations – ranging between 3TWh in the low policy case to 13TWh in the high policy case.  
2 Including renewables and waste.

## Fossil-fuel price assumptions

10 Our emissions projections are based on a range of fossil fuel price assumptions. Fuel price assumptions are intended to be illustrative scenarios to reflect uncertainty over the outturn of future prices in the modelling – they are not detailed forecasts or predictions of future prices.

11 Table B5 compares the assumptions in the central fuel price scenario for the 2007 Energy White Paper projections, to those used in the projections in the Energy Review Report in July 2006.

TABLE B5. CENTRAL FOSSIL FUEL PRICE ASSUMPTIONS						
2006 real prices	Crude oil \$/bbl		Natural gas NBP p/therm		ARA coal £/tonne	
	Energy White Paper	Energy Review Report	Energy White Paper	Energy Review Report	Energy White Paper	Energy Review Report
2010	57	41	42	34	30	28
2015	50	43	38	36	31	27
2020	53	46	40	37	32	26



12 In the central fossil fuel price scenario, the oil price assumptions are higher than those for the Energy Review Report. The upward revisions are consistent with changes made by the International Energy Agency (IEA) and the US Energy Information Administration (EIA), and reflect the continuing market tightness and higher costs of production. It is assumed that oil prices ease post 2006 as new production capacity comes on-stream and demand growth moderates, leading to an increase in spare production capacity. However, as oil production will be increasingly produced from more expensive sources, and spare capacity remains relatively limited, prices are assumed to remain higher than their historic average. Under our new projections, oil prices are assumed to be 57\$/bbl in 2010 and 53\$/bbl in 2020 (2006 prices).

13 The gas price in Europe is assumed to remain linked to oil prices, and UK gas prices are assumed to be similar to continental prices plus the transport cost differential. Gas prices are assumed to be 42p/therm in 2010, and 40p/therm in 2020.

14 Coal prices are assumed to fall in the short-term due to additional investment in coal production and transport capacity, as a result of recent high prices. However, post 2010 coal prices are assumed to grow in line with oil and gas prices due to the opportunities for substituting between the different fossil fuels. Coal prices are assumed to be £30/tonne in 2010 and £32/tonne in 2020.