Energy prices and bills - supplementary tables

Contents:

1. Energy prices and bills

a. Households

i. Energy prices (by components): electricity and gas; (2004, 2013, 2020, 2030)

Table 1. Residential retail electricity price by components (2004, 2013, and projected in 2020, 2030)

p/kWh nominal prices in 2004 (real 2013 prices in 2013, 2020, 2030)	**2004**	**2013**	**2020**	**2030**
Wholesale energy + supplier costs and margin	4.7	8.4	6.9	8.3
Transmission, distribution, metering	2.2	3.7	4.0	4.0
Warm Home Discount	-	0.2	-	-
Carbon price	0.0	0.4	0.8	2.7
Support for renewables, CCS and nuclear (RO, FiTs, CfDs)	0.1	1.1	2.4	2.9
Energy efficiency schemes	0.1	0.6	0.6	0.6
Smart meters	-	0.02	0.03	-0.1
VAT	0.4	0.7	0.8	1.0
Total	**7.2**	**15.1**	**15.6**	**19.4**

Source: CCC calculations. Overall UK price based on QEP Table 2.2.1. 2004 - 2013 based on Ofgem *Household energy bills explained,* and Ofgem *Supply Market Indicators.*
Note: Figures are presented rounded to one decimal place, so may not sum precisely to totals (which are based on unrounded figures). Transmission, distribution and metering includes balancing.

Table 2. Residential retail gas price by components (2004, 2013, and projected in 2020, 2030)

p/kWh nominal prices in 2004 (real 2013 prices in 2013, 2020, 2030)	**2004**	**2013**	**2020**	**2030**
Wholesale energy + supplier costs and margin	1.1	3.4	3.0	3.7
Transmission, distribution, metering	0.6	1.0	1.0	1.0
Warm Home Discount	-	0.02	-	-
Energy efficiency schemes	0.02	0.2	0.2	0.2
Smart meters	-	0.02	0.04	-0.1
VAT	0.1	0.2	0.2	0.3
Total	**1.9**	**4.9**	**4.5**	**5.1**

Source: CCC calculations. Overall UK price based on QEP Table 2.3.1. 2004 - 2013 based on Ofgem *Household energy bills explained,* and Ofgem *Supply Market Indicators.*

ii. Energy consumption: electricity and gas (2004, 2013, 2020, 2030)

Table 3. Consumption per household, gas and electricity, for typical dual-fuel household (2004, 2013, 2020, and 2030)

TWh per year	**2004**	**2013**	**2020**	**2030***	**2030 – with efficiency savings[#]**
Electricity: annual average consumption (kWh/yr)	3,566	2,988	2,988	2,988	2,207
Gas: annual average consumption (kWh/yr)	18,757	14,094	14,094	14,094	12,892

Source: DUKES Table 1.1, CCC calculations. **Note:** Calendar years. *2013 consumption assumed to be constant to 2020 and 2030; 2013 gas consumption is adjusted for temperature. [#]Including savings from continued roll-out of efficient boilers and other energy efficiency measures"

iii. Annual bill: electricity and gas (2004, 2013, 2020, 2030)

Table 4. Annual electricity bill by components, for typical dual-fuel household (2004, 2013, and projected in 2020, 2030)

£/yr nominal prices in 2004 (real 2013 prices in 2013, 2020, 2030)	**2004**	**2013**	**2020**	**2030**	**2030 – with efficiency savings**
Wholesale energy + supplier costs and margin	168	250	207	248	183
Transmission, distribution, metering	77	110	119	120	89
Warm Home Discount	-	6	-	-	-
Carbon price	-	11	25	80	59
Support for renewables, CCS and nuclear (RO, FiTs, CfDs)	5	34	71	86	63
Energy efficiency schemes	3	19	19	19	14
Smart meters	-	0.5	1	-2	-1
VAT	13	21	23	27	20
Total	**267**	**452**	**465**	**579**	**428**

Source: CCC calculations.

Table 5. Annual gas bill by components, for typical dual-fuel household (2004, 2013, and projected in 2020, 2030)

£/yr nominal prices in 2004 (real 2013 prices in 2013, 2020, 2030)	**2004**	**2013**	**2020**	**2030**	**2030 – with efficiency savings**
Wholesale energy + supplier costs and margin	237	480	422	524	483
Transmission, distribution, metering	125	135	144	144	133
Warm Home Discount	-	6	-	-	-
Energy efficiency schemes	4	31	31	31	29
Smart meters	-	3	5	-11	-10
VAT	18	33	30	35	32
Total	**384**	**687**	**632**	**724**	**666**

Source: CCC calculations.

b. Commercial prices: electricity and gas (2004, 2013, 2020, 2030)

Table 6. Commercial electricity price by components (2004, 2013, and projected in 2020, 2030), 'medium' sized consumer, paying the full rate of Climate Change Levy (CCL) and covered by the CRC Energy Efficiency Scheme (formerly known as the Carbon Reduction Commitment)

p/kWh nominal prices in 2004 (real 2013 prices in 2013, 2020, 2030)	**2004**	**2013**	**2020**	**2030**
Base electricity price (including wholesale energy, supplier costs and margin, transmission, distribution, metering)	3.3	7.4	6.3	7.2
Carbon price	-	0.4	0.8	2.7
Support for renewables, CCS and nuclear (RO, FiTs, CfDs)	0.1	1.1	2.4	2.9
Climate Change Levy (full rate)	0.4	0.5	0.5	0.5
CRC*	-	0.6	0.4	0.1
Total	**3.9**	**10.1**	**10.5**	**13.4**

Source: CCC calculations.

Note: Base price + carbon price and support for low-carbon generation based on QEP Table 3.4.1. Prices are for a medium sized consumer (2,000-19,999 MWh p.a. CRC only applies if annual electricity demand is over 6,000 MWh p.a. *Not actually

a charge on the price (allowances are purchased separately), but for transparency we include the cost as part of the retail price.

Table 7. Commercial retail gas price by components (2004, 2013, and projected in 2020, 2030), 'medium' sized consumer, paying the full rate of Climate Change Levy (CCL) and covered by the Carbon Reduction Commitment (CRC) scheme

p/kWh nominal prices in 2004 (real 2013 prices in 2013, 2020, 2030)	**2004**	**2013**	**2020**	**2030**
Base gas price (including wholesale energy, supplier costs and margin, transmission, distribution, metering)	1.2	2.9	2.4	2.9
Climate Change Levy (full rate)	0.15	0.18	0.19	0.19
CRC*	-	0.22	0.29	0.29
Total	**1.3**	**3.3**	**2.9**	**3.4**

Source: CCC calculations, generation based on QEP Table 3.4.1.
Note: Prices are for a medium sized consumer (2,778-27,777 MWh p.a. CRC only applies if annual electricity demand is over 6,000 MWh p.a. *Not a charge on the price (allowances are purchased separately) but for transparency we include the cost as part of the retail price.

c. Industry prices (by components): electricity and gas (2004, 2013, 2020, 2030)

Table 8. Industrial grid retail electricity price by components (2004, 2013, and projected in 2020, 2030).

p/kWh nominal prices in 2004 (real 2013 prices in 2013, 2020, 2030)	**2004**	**2013**	**2020**	**2030**
Base electricity price (including wholesale energy, supplier costs and margin, transmission, distribution, metering)	3.0	6.3	5.3	6.0
Carbon price	0.0	0.4	0.8	2.7
Support for renewables, CCS and nuclear (RO, FiTs, CfDs)	0.1	1.1	2.4	2.9
Climate Change Levy (average amount paid)*	0.2	0.27	0.27	0.27
CRC (average amount paid)		0.09	0.06	0.01
Total	**3.3**	**8.1**	**8.9**	**11.9**
Equivalent compensation and exemption **	-	*-0.1*	*-2.6*	*-4.4*
Total (with compensation and exemption)	***3.3***	***8.0***	***6.2***	***7.4***

Source: CCC calculations, based on QEP Table 3.1.4.
Note: Prices based on average price across all customer size bands, electricity purchased from a supplier (i.e. not autogeneration). *See notes to QEP tables 3.1.1-3.1.4. Rate paid allowing for discounts e.g. through Climate Change Agreements. **For eligible consumption, assuming 65% compensation on EU ETS cost within the Carbon Price in 2013, 75% compensation on Carbon Price from 2020 and 85% compensation/exemption on support for renewables, CCS and nuclear from 2020.

Table 9. Industrial retail gas price by components (2004, 2013, and projected in 2020, 2030).

p/kWh nominal prices in 2004 (real 2013 prices in 2013, 2020, 2030)	**2004**	**2013**	**2020**	**2030**
Base gas price (including wholesale energy, supplier costs and margin, transmission, distribution, metering)	1.0	2.5	2.1	2.5
Climate Change Levy (average amount paid)*	0.06	0.1	0.1	0.1

Carbon Reduction Commitment (average amount paid)		0.01	0.01	0.01
Total	**1.0**	**2.7**	**2.2**	**2.6**
Full EU ETS allowance purchase **				*1.4*
Total (with full EU ETS allowance purchase)				***4.0***

Source: CCC calculations, generation based on QEP Table 3.1.4.

Note: Prices based on average price across all customer size bands. *See notes to QEP tables 3.1.1-3.1.4. Rate paid allowing for discounts e.g. through Climate Change Agreements. ** Assumes EU ETS allowance purchases required for gas consumption.

2. Assumptions

a. Fossil fuel prices (2013-2030)

Table 10. Projected wholesale gas prices (p/therm) 2013-2030

p/therm (real, 2013 prices)	Low	Central	High
2013		**51**	
2014	46	55	63
2015	46	61	79
2016	45	62	81
2017	44	60	83
2018	44	57	84
2019	43	57	86
2020	42	59	88
2030	42	75	105

Source: DECC (October 2014) *Fossil Fuel Price Projections.* National Grid (31/11/2014) *Data Explorer.* 2014 is year to date.
Note: Adjusted to 2013 prices. Excludes transportation costs to station gate. Prices and bill estimates in section 1 are based on central scenario.

b. Carbon prices (2013-2030)

Table 11. Projected carbon prices 2013-2030 (£/tCO_2, 2013 prices), including Carbon Price Floor (CPF)

2013 prices	£/tCO_2 including CPF
2013	7.2
2014	10.5
2015	16.1
2016	22.6
2017	22.8
2018	22.9
2019	23.1
2020	23.3
2030	75.9

Source: DECC (October 2014) *Updated short-term traded carbon values used for modelling purposes.*
Note: Adjusted to 2013 prices. 2013 Carbon Price is actual.

c. Tax rates (2004-2030): CCL rate; CRC rate and percentage coverage in commercial sector; CCA discount and coverage

Table 12. Taxes on electricity (2004, 2013, 2020, 2030): Climate Change Levy (CCL) and CRC scheme

p/kWh nominal prices in 2004 (real 2013 prices in 2013, 2020, 2030)	**2004**	**2013**	**2020**	**2030**

Climate Change Levy (full rate paid by all commercial users)	0.43	0.52	0.54	0.54
Climate Change Levy (average amount paid by an industrial user)*	0.22	0.27	0.27	0.27
CRC – full rate paid**		0.65	0.44	0.08
CRC – average rate paid by industrial users***		0.09	0.06	0.01

Source: Quarterly Energy Prices (QEP), CRC guidance.
Note: *See notes to QEP tables 3.1.1-3.1.4. Rate paid allowing for discounts (e.g. through Climate Change Agreements) – around 60% of manufacturing industry is subject to a discount through a Climate Change Agreement (CCA). **Around 70% of commercial electricity demand is covered by the CRC (see Figure 3.1 in the Report). ***Around 13% of industrial electricity demand is covered by the CRC.

Table 13. Taxes on gas (2004-2030): Climate Change Levy (CCL) and CRC scheme

p/kWh nominal prices in 2004 (real 2013 prices in 2013, 2020, 2030)	**2004**	**2013**	**2020**	**2030**
Climate Change Levy (full rate paid by all non domestic users)	0.15	0.18	0.19	0.19
Climate Change Levy (average amount paid by an industrial user)*	0.06	0.10	0.10	0.10
CRC – full rate paid**		0.22	0.29	0.29
CRC – average rate paid by industrial users***		0.01	0.01	0.01

Source: Quarterly Energy Prices, CRC guidance.
Note: *See notes to QEP tables 3.1.1-3.1.4. Rate paid allowing for discounts (e.g. through Climate Change Agreements) – around 60% of manufacturing industry is subject to a discount through a Climate Change Agreement (CCA). **Around 85% of commercial gas demand is covered by the CRC (see Figure 3.1 in the Report). ***Around 5% of industrial electricity demand is covered by the CRC.

d. Cost of supporting low-carbon investments

Cost of the RO, FiTs, CfDs and wholesale electricity price

The Renewables Obligation (RO) is set to continue out to 2016/17, when it will be replaced through Electricity Market Reform (EMR) with Contracts for Differences (CfDs), which will be introduced from 2014, with a period of 'overlap' (where developers can choose between support mechanisms). Up to 2015, we assume the cost of deploying renewables is equal to our estimates of the cost of the RO. Total cost of renewables support in 2015 is therefore assumed to be £3.953 billion (in real terms, 2013 prices)[1].

We assume the cost of small-scale generation under FiTs is in line with DECC's Annual Energy Statement 2014[2]) and in the table below. After 2020/21, costs are held flat in real terms until 2030.

[1] We assume support remains flat at this level to 2020, and decreases as RO projects come to the end of their project lifetimes towards 2030.

[2] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/371387/43586_Cm_8945_accessible.pdf

Table 14. Cost of FiT support

£m nominal prices in 2004 (real 2013 prices in 2013, 2020, 2030)	2004	2013	2020	2030
Total	0	680	1183	1183

In addition to these costs, we assume that from 2016 onwards, new renewable, CCS and nuclear generation is supported under the EMR through CfDs. The cost of the CfD is calculated as the difference between the strike price (assumed to be set at the levelised cost) and the Long Run Marginal Cost of gas CCGT.

The cost of nuclear is based on modelling by Pöyry for our 2013 EMR Report, which we revised to be in line with the strike price for Hinkley Point C. For CCS, we assume that two demonstration projects (around 300 MW each) are added by 2020. We assume they run for the majority of the year at baseload (i.e. about 2.5 TWh each per year) at a generation cost of 15-18 p/kWh.

Wider network costs associated with low-carbon generation

We also include additional costs to the network associated with connecting renewable generation. This includes investment in transmission infrastructure[3], and options to help manage intermittent output from wind in particular (e.g. back-up capacity, demand-side response, and interconnection).

Based on detailed modelling for the CCC Renewable Energy Review, we assume that the costs associated with intermittency add around 1 p/kWh to system balancing costs for each additional unit of intermittent renewable generation[4]. For transmission costs associated with intermittency in future years we assume a cost of managing intermittency in line with our estimates for 2013 (1p/kWh at 10% intermittent generation), and that any additional cost is included as 'basis risk' in the strike price, under CfDs.

3. Scenarios to 2030

a. Electricity capacity in modelled scenario by technology (2013 - 2030)

Table 155. Capacity of key low-carbon technologies 2013, 2020, 2030

GW capacity	2013	2020	2030
Onshore wind	7.3	13	23.7
Offshore wind	3.7	11	24.4
Biomass	3.0	3.6	3.6
Marine	0	0.5	3.5
New nuclear	0	0	16.2
CCS	0	0.6	5.5

Source: CCC calculations.
Note: Renewable capacity includes existing capacity; nuclear and CCS are new capacity added by that year . We assume no new nuclear plant before 2020 . We assume two CCS demonstrations are added over the period 2018-2020.

[3] For example, the £9.0 billion of transmission investment identified by the Electricity Network Strategy Group as required to support renewable and other power generation investment. We estimate that this could equate to annualised payments of around £600 million (assuming a 6% discount rate and a 40-year annuity period).
[4] See Pöyry (2011) *Analysing Technical Constraints on Renewable Generation to 2050*, and CCC (2011) *Costs of low-carbon generation technologies, 2011 Renewable Energy Review Technical Appendix*, section 5.

The impact on bills is consistent with a range of scenarios that meet a decarbonisation target of 50-100 gCO_2/kWh in the power sector, as outlined in our 2014 Progress Report[5] (e.g. 13-25 GW onshore; 25-40 GW offshore ; 12.6-16.5 GW new nuclear ; 5-10 GW CCS).

b. Final energy demand: residential, commercial and industrial sectors (2004, 2013)

Table 166. Aggregate sector final energy demand (gas and electricity), residential, commercial and industrial sectors (2004, 2013)

TWh		2004	2013
Residential	Electricity	123	113
	Gas	396	344
Commercial	Electricity (grid)	71	79
	Gas	38	60
	Total	**109**	**139**
Industry	Electricity (grid)	93	89
	Electricity (autogeneration)	18	9
	Gas	164	103
	Solid fuels (coal, coke)	24	23
	Oil products	80	51
	Bioenergy	**3**	**6**
	Total	**400**	**291**

Source: DUKES Table 1.1, 1.9, 7.8, 7.9.

4. Reconciliation between CCC and DECC policy costs

Table 17. Reconciliation between CCC and DECC policy costs in 2020

Policy	**Impact on bill in 2020 (£ per household)**	
	Gas	Electricity
CCC low-carbon policies (£2013, including VAT)	**39**	**122**
DECC energy and climate change policy costs (£2013, incl. VAT). Bracketed values are figures reported in DECC (2014, excl. VAT)	**42** (41)	**151** (147)
Differences	***-3***	***-29***
Differences between CCC and DEC policy costs		
Rebase to CCC consumption. In 2020, CCC assumes household electricity consumption = 3,000 kWh; gas consumption = 14,100 kWh. DECC assumes electricity consumption of 3,192 kWh and gas consumption of 14,306 kWh in 2020.	-1	-10
ECO. CCC assumes a constant bill impact of the Energy Company Obligation based on 2013 whereas DECC's estimates take in to account projected changes in consumption to 2020 in calculating the bill impact.	1	-2

[5] CCC (2014) *Progress Report to Parliament*. Available at: www.theccc.gov.uk

Smart meters. CCC does not include savings due to energy efficiency benefits and a different balance of costs on gas and electricity.	4	0
Lower cost of FITS, RO, CfDs. In 2020, DECC LCF is around £8.0bn in 2020 in £2013 (reported in DECC (2014) as £7.6 bn in 2019/20 in 2011/12 prices, which is around £8.0 bn in 2020 calendar year, in £2013 prices), CCC assume around £7.2 bn.	0	-22
Lower carbon price impact on bill. Difference reflects different assumed marginal emissions factors, for example CCC assumes 350g/kWh in 2020 based on new gas, DECC assumes 430gCO2/kWh.	0	-10
Other wholesale market impacts. CCC uses the levelised cost of energy for new gas as a proxy for the cost of electricity delivered, whereas DECC includes the gross auction costs of the capacity market and the reduction in the wholesale electricity price due to low carbon policies. This difference in approach leads to a small difference in 2030.	0	0
Warm Home Discount. CCC assumes no cost on bills for the Warm Home Discount (WHD) beyond 2013 and does not average the rebate over all consumers, but discusses this in reference to particular consumers. DECC assumes cost of WHD continues and averages rebate over all consumers.	-7	7
Cost of managing intermittency. CCC assumes costs of managing intermittent generation in line with Pöyry's work for our 2011 Renewable Energy Review. This is applied to each unit of intermittent generation on the system. Added to this is transmission investment related to renewable investment annuatized over its lifetime ENSG, 2012).	0	8
Total adjustments	***-3***	***-29***

5. Energy efficiency

a. Residential energy efficiency

Table 18. Residential energy efficiency assumptions – insulation measures (2013 – 2030)

Measure	Energy saving (kWh)	2008-2013 Uptake (million)	2013-2030 Policy-driven uptake (million)	Cost (£ per installation, 2013)
Cavity wall insulation hard to treat	2,090	2.9	4.6	1,800
Cavity wall insulation easy to treat	1,865			660
Solid wall insulation internal	3,410	0.17	3.3	6,160
Solid wall insulation external	3,075			11,950
Loft insulation 50-125mm	420	3.9	5.4	275-325
Loft insulation 125-200mm	170			
Turning down the thermostat by 1 degree	580		9.7	0
Suspended timber floor insulation	695	Data not available	1.2	£9/m2
Solid floor insulation	725		2.9	£30/m_2
Glazing - single to double	2,000		0.1	£1,684
Glazing - pre-2002 double to double glazing	905		0.8	£1,684
Insulated doors	170		0.0	£505/door
Reduced infiltration	355		0.1	-
Heating controls – full (timer, TRV & thermostat)	585		0.9	£450

Source: Energy savings (includes electricity savings) and costs from Element Energy (2013) Review-of-potential-for-carbon-savings-from-residential-energy-efficiency-Final-report-A-160114.pdf 2008-2013 installation figures from Ofgem 2013-2030 uptake numbers from CCC (2013) *Fourth Carbon Budget Review* *http://www.theccc.org.uk/wp-content/uploads/2013/12/1785a-CCC_AdviceRep_Singles_1.pdf*
Note: Glazing costs shown are for fixed costs, but costs also include variable costs of £109/m2.

b. Commercial energy efficiency

Potential for energy saving and costs of measures to deliver this are sourced from analysis for CCC (2008) *Building a low-carbon economy* and updated in CCC (2013) *Fourth Carbon Budget Review.* This indicated a cost-effective potential (i.e. potential measures that would reduce emissions at a cost below a carbon price of £40 per tonne) of 36TWh (15TWh or 16% on gas and 21 TWh or 18% on electricity consumption), at a cost of around £1.5bn in 2020.

DECC's Energy Efficiency Strategy (2012) assumes broadly similar potential of around 31 TWh of cost-effective potential by 2020 (including products policy).

There is considerable uncertainty around the costs and savings of energy efficiency in the commercial sector.

c. Industrial energy efficiency

Potential energy savings and costs of delivering this are sourced from modelling for CCC (2013) *Fourth Carbon Budget Review,* using the ENUSIM modelling framework and updated Ricardo-AEA review[6] of further efficiencies from energy-intensive sectors. This analysis indicated cost-effective potential of reducing industrial energy consumption through efficiency improvement of 17TWh (5%) by 2020, and a 9% reduction for energy-intensive firms by 2030.

DECC's recent Energy Efficiency Strategy (2012) assumes of cost-effective potential of reducing industrial energy consumption through efficiency improvement of 20-63TWh (6%-20%) by 2020.

[6] http://www.theccc.org.uk/wp-content/uploads/2013/12/Ricardo-AEA-2013-Updating-and-extending-carbon-budget-trajectories-A-review-of-the-evidence.pdf