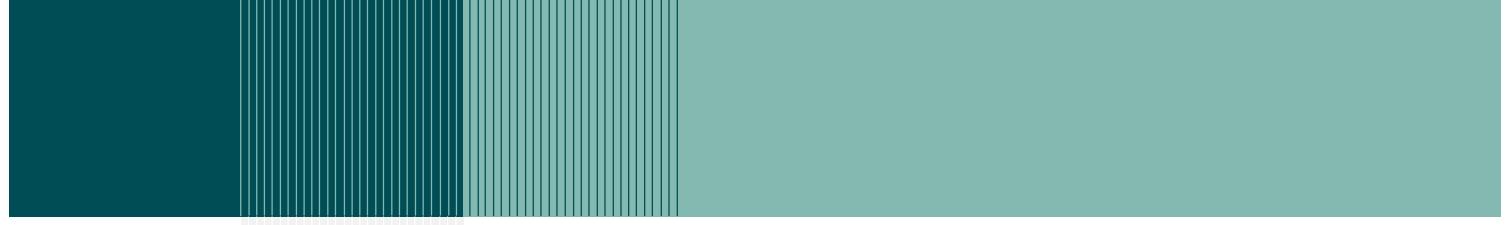


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Energy Supply Margins At Current Prices For Energy UK



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1. Summary

Even though wholesale energy prices have fallen recently, gas and electricity suppliers are earning very little margin on their sales to domestic customers, according to analysis by NERA Economic Consulting (NERA). The analysis takes the energy regulator's own research, and builds on it using data extracted from public sources or supplied by the energy companies.

The energy regulator, Ofgem, has previously estimated a “gross” margin between the domestic customer bill and some of the costs of a notional energy supply business. At the request of Energy UK, NERA has updated Ofgem’s method to current conditions and has extended it to include a more complete set of costs.

Based on current tariffs, Ofgem’s method would show an annual gross margin of £204 per dual fuel customer. NERA’s analysis shows that additional costs reported in public sources (including Ofgem itself) absorb £133 of this gross margin. Accounting for more realistic customer characteristics (e.g. average consumption and tariff discounts given to customers who shop around) absorbs another £39. NERA also estimates that the cost of specialised energy trading, needed to match energy purchases to customers’ demand, costs another £34 for a dual fuel customer. As a result, suppliers are not quite breaking even on dual fuel customers. (The annual overall margin is actually minus £1 per customer.) For customers who take electricity and gas from different suppliers, NERA finds that suppliers make on average a small positive overall margin – £9 and £10 per customer per year, respectively.

1.1. Background

Ofgem has previously estimated a “gross” margin per customer for a notional energy supplier. Ofgem intended to use this margin to analyse the relationship between wholesale and retail energy prices, and omitted a number of costs.

Suppliers have to incur many costs not included in Ofgem’s comparison of prices. These additional costs include the costs of operating a retail business and of a growing number of social and environmental obligations placed upon them by law. They offer various discounts to standard tariffs and they incur costs to meet short-term variations in consumers’ demand. These costs were not included in Ofgem’s analysis of relative prices, but account for a substantial part of a customer’s bill.

The costs of buying energy only make up around half of a customer’s bill, meaning that passing on a 10% rise or fall in energy prices would change a customer’s bill by about 5%. In practice, energy suppliers hold their tariffs stable, rather than passing on temporary gyrations in wholesale energy prices.

1.2. Additional Costs Based on Public Data Sources

In its energy supply probe, Ofgem listed various non-energy costs, accounting for over £50 pounds per electricity or gas customer, and over £100 per dual fuel customer, which Ofgem does not include in its calculation of suppliers’ “gross” margins. Further information is available from public sources on the cost of meter reading, additional environmental obligations and various social obligations. Taken altogether, these costs reduce the margin

from serving an electricity customer by £74, a gas customer by £80, and a dual fuel customer by £133. After allowing for these costs, the “net margins available to suppliers are £28 per electricity customer, £41 per gas customer and £71 per dual fuel customer. However, these figures overstate the profitability of serving real customers.

1.3. More Realistic Customer Characteristics

NERA collected industry information on average consumption, bad debt and tariff discounts, as well as some types of cost not reported elsewhere (e.g. the cost of working capital). Accounting for these more realistic conditions reduces the margin for dual fuel customers to £32. The margin for electricity-only and gas-only customers is lower, at £27 and £26, respectively.

1.4. Allowing for Matching Energy Purchases to Varying Customer Demand

Ofgem assumes that energy suppliers buy electricity in six-monthly blocks and gas in quarterly blocks. The pattern of a domestic customer’s demand is more variable. NERA estimates that the cost of buying and selling the energy needed to match the actual pattern of a domestic customer’s demand is £16 for an electricity customer, £3 for a gas customer, and £20 for a dual fuel customer. NERA also estimates that suppliers can expect to be charged for “imbalances”(when they incorrectly predict customers’ demand) at a rate of about £2 per electricity customer, £12 per gas customer, and £14 per dual fuel customer.

1.5. Overall Margins

The overall annual margins earned by suppliers after the adjustments listed above are: £9 per electricity customer; £10 per gas customer; and minus £1 per dual fuel customer.

2. Average Customer Bill

2.1. Contribution to Gross Margin

Our calculation of margins started from the customer bills used in Ofgem's December 2009 *Quarterly Wholesale/Retail Price Report*: £505 for electricity-only customers, £700 for gas-only customers and £1,185 for dual fuel customers. Using these figures ensures that our calculation of margins is as consistent as possible with Ofgem's gross margins.¹

We had previously calculated average tariffs on the basis of information provided by the six major suppliers. Our estimates using that data were somewhat lower than Ofgem's: £501 for electricity-only customers, £662 for gas-only customers and £1,139 for dual fuel customers. These differences are not very large, given the difficulty of estimating an "average" or "typical" customer bill from the wide variety of tariffs quoted by energy suppliers. However, the absolute differences feed directly into the calculation of the margin, where they seem proportionately larger. We would not be able to reconcile or explain the differences without sharing information that the six major suppliers provided to us on a confidential basis. We therefore adopted the figures provided by Ofgem. Below, however, we explain the basis of our own estimates.

2.2. Basis of NERA Estimate

Ofgem's August 2009 *Quarterly Wholesale/Retail Price Report* focused on standard tariffs prevailing at the time, and a notional annual consumption of 4MWh for electricity and 18.2MWh for gas.² On the basis of those assumptions, Ofgem constructed a national average customer bill, calculated as a weighted average across the six main suppliers, across payment method and across regions.

To replicate Ofgem's calculation of the average customer bill we asked the six main suppliers for their average per-customer revenue (based on current tariffs) by payment type, and then computed a weighted average. We asked for, and received, average annual revenue per customer for the average consumption expected in 2010, rather than for the notional annual consumption used by Ofgem. We therefore adjusted those average revenues per customer to ensure comparability with Ofgem's analysis. For this adjustment we took into account the 2-tier pricing system that suppliers generally use to charge for energy: the first units command a higher tariff per kWh than the last units, and accordingly a given change in consumption does not lead to a proportionate change in the bill. We estimated that at consumption levels close to Ofgem's notional figures of 4MWh for electricity and 18.2MWh for gas the tariff for an additional kWh of energy was around 85% of the average price per kWh. We therefore used 85% to adjust the customer bill to correspond to Ofgem's notional consumption levels.³

¹ See below for a discussion of wholesale energy costs.

² Ofgem (111/09), *Quarterly Wholesale/Retail Price Report*, August 2009, page 6, notes to Table 2.4. In addition to these consumption figures Ofgem also considered high use customers (with demand of 5.5MWh for electricity and 25MWh for gas) and low use customers (with demand of 2MWh for electricity and 9MWh).

³ To provide an illustrative worked example: if the difference between the estimated consumption and Ofgem's notional consumption had been 10%, we would have adjusted the customer bill by 8.5% (i.e. 85% of 10%).

3. Wholesale Energy Costs

Ofgem based the principal wholesale cost estimate in its *Quarterly Wholesale/Retail Price Report* series on a hedging strategy where firms “start purchasing energy 18 months ahead of time t, and have bought all their energy requirements for the year ahead at time t.”⁴ We used the same assumption. However, Ofgem’s description of its method is not entirely complete and we benefited immensely from previous work undertaken by one of the main suppliers, which had managed to replicate (more or less) the results in Ofgem’s previous reports. (The supplier had shared the results of this work with Ofgem and had not been informed that its method was fundamentally incorrect.) However, even the method replicated by the supplier, which we adopted, requires the use of some assumptions over the choice of contract for the hedging portfolio and other input data.

In the end, our estimates differed slightly from Ofgem’s, which indicates the difficulty we had in interpreting Ofgem’s method, and possible differences in input data. However, our estimate was so close to Ofgem’s that we left it in the calculation of margins. The differences might be taken as an index of the benefits that greater transparency in Ofgem’s explanation might bring.

Below, we explain our understanding of Ofgem’s method and how we estimated the wholesale energy costs.

3.1. Cost of Purchasing Seasonal Electricity Contracts

We calculated the wholesale cost C_{power} related to purchasing seasonal peak and baseload power contracts using the following formula

$$C_{\text{power}} = P_{\text{wp}} * V_{\text{wp}} + P_{\text{sp}} * V_{\text{sp}} + P_{\text{wb}} * V_{\text{wb}} + P_{\text{sb}} * V_{\text{sb}}$$

Where

V_{wp} is the volume of winter peak contracts

V_{sp} is the volume of summer peak contracts

V_{wb} is the volume of winter baseload contracts

V_{sb} is the volume of summer baseload contracts

We calculated the seasonal peak and baseload contract volumes using the demand weighting illustrated in Table 3.1.

⁴ Ofgem (111/09), *Quarterly Wholesale/Retail Price Report*, August 2009, page 11-12, para 6.11

Table 3.1
Seasonal Electricity Demand and Contract Weightings
as a Percentage of Annual Demand

Season	Demand weighting	Peak contract weighting	Baseload contract weighting
Summer	41.49%	3.32%	38.17%
Winter	58.51%	4.68%	53.83%

Source: NERA estimates based on industry data

We calculated P_{wp} and P_{wb} as the 12 months average of forward prices (quoted in the period from April 2009 to March 2010) of electricity contracts with delivery in winter 2010 for peak and baseload respectively, and P_{sp} and P_{sb} as the 18-month average of forward prices (quoted in the period from October 2008 to March 2010) of electricity contracts with delivery in summer 2010 for peak and baseload respectively. For each of these calculations we assumed that forward prices quoted in the period of November 2009 to March 2010 would be the same as those on 14 October 2009. We also used our estimate of the wholesale electricity cost (which is relevant for electricity and dual fuel customers) to calculate the cost of purchasing extra electricity to cover losses of 6% in the electricity networks.⁵

3.2. Cost of Purchasing Quarterly Gas Contracts

We calculated the wholesale cost C_{gas} related to purchasing quarterly gas contracts using the following formula

$$C_{gas} = P_1 * V_1 + P_2 * V_2 + P_3 * V_3 + P_4 * V_4$$

Where

V_1 to V_4 are the volumes of the quarterly gas contracts in year 2010, which we calculated using the quarterly demand weighting illustrated in Table 3.2.

Table 3.2
Quarterly Gas Demand Weightings

Quarter	Demand weighting
Q1	40.40%
Q2	16.86%
Q3	8.60%
Q4	34.14%

Source: NERA estimates based on industry data

P_1 to P_4 are the average prices of the corresponding quarterly gas contracts for the year 2010, based on forward price quotes as of 14 October 2009.

⁵ Our assumption of 6% losses is consistent with 1% losses on the transmission network and 5.41% in distribution over DPCR4 set out in Ofgem (47/09), *Electricity Distribution Price Control Review: Methodology and Initial Results Paper*, 08-May-09, p81, Table 5.5.

We calculated P_1 as the 18-month average of forward prices for delivery in Q1 2010 quoted in the period from July 2008 to December 2009, P_2 as the 15-month average of forward prices for delivery in Q2 2010 quoted in the period from October 2008 to December 2009, P_3 as the 12-month average of forward prices for delivery in Q3 2010 quoted in the period from January 2009 to December 2009, and P_4 as the 9-month average of forward prices for delivery in Q4 2010 quoted in the period from April 2009 to December 2009.

3.3. Information Date

For each of these calculations we used forward prices up to 14 October 2009. (In effect, we assume that forward prices quoted in November 2009 and later would be the same as those on 14 October 2009.) Ofgem may have used forward prices up to a different date. This difference in assumptions probably explains the bulk of the difference between our wholesale energy cost estimates and Ofgem's.

4. Further Cost Items

4.1. VAT and Other Costs

In the August 2009 *Quarterly Wholesale/Retail Price Report*, Ofgem grouped VAT and other costs together stating:

“The components of other costs are network charges (transmission and distribution), balancing, environmental costs (Energy Efficiency Commitment – EEC, Carbon Emissions Reduction Target – CERT, and Renewable Obligation Certificates – ROCs), some cost to serve and some meter costs and VAT.”⁶

In our analysis we broke this category down into further cost items, which we estimated as follows:

- § VAT – we used the applicable VAT rate of 5% to derive the total VAT implied by our estimated average customer bill.
- § Meter Asset and Maintenance Costs – We used separate estimates for electricity and gas meters from Cornwall Energy.⁷ We inflated these from 2006 nominal terms and divided by the number of electricity and gas accounts reported by Ofgem.⁸ We assumed that there are no synergies for dual fuel customers, for whom suppliers must pay the cost of meters for both electricity and gas.
- § CERT – Suppliers have an obligation to spend £3.36bn over three years to March 2011 on reducing carbon emissions by *inter alia* providing energy efficiency incentives to households.⁹ We allocated these costs to customer accounts by assuming that they are spread evenly across the three year life of the programme and divided equally between the number of accounts reported by Ofgem.¹⁰
- § ROC Costs – Suppliers must surrender a given number of Renewable Obligation Certificates (ROCs) for each MWh of electricity sold, or pay a buyout price, which is inflated over time with changes in the Retail Price Index (RPI).¹¹ Ofgem has not yet published the number of ROCs required from April 2010 onwards, and we assumed that the ROC obligation would rise in accordance with the schedule set out in 2008.¹² To

⁶ Ofgem (111/09), *Quarterly Wholesale/Retail Price Report*, August 2009, page 12, para 6.14

⁷ Cornwall Energy Associates, Gas and Electricity Costs to Consumers, Jan 2008, pages 15, 21

⁸ We used the monthly series RPI CHAW available from the ONS for inflating the Cornwall Energy estimates and the number of electricity and gas accounts available in Ofgem (169/07), *Market Report 2007*, Page 3

⁹ See No 10 press release, Home Energy Saving Programme: Helping Households To Save Money, Save Energy, July 2008

¹⁰ We used the monthly series RPI CHAW available from the ONS for inflating the Cornwall Energy estimates and the number of electricity and gas accounts available in Ofgem (169/07), *Market Report 2007*, Page 3

¹¹ See description of Renewables Obligation and current buyout price in: Ofgem Press Release, The Renewables Obligation Buy-Out Price And Mutualisation Ceiling 2009-10, 9 February 2009, page 1

¹² See Ofgem (282/07), Renewables Obligation: Guidance for licensed electricity suppliers (GB), April 2008, Appendix 4, page 41

obtain the cost of the Renewable Obligation for calendar year 2010 we took a weighted average¹³ of the cost implied by the current buyout price and ROC obligation, and the cost implied by our assumption about the price and obligation prevailing after 2010. We multiplied this per MWh estimate by Ofgem's notional 4MWh annual consumption for an electricity customer.

- § Distribution Charges – We derived electricity and gas distribution charges for customers with Ofgem's notional consumption levels for the financial year ending March 2010 using the current tariffs published on network operators' websites. We adjusted the electricity and gas distribution tariffs to reflect expected changes in tariffs resulting from regulatory proceedings for the financial year ending March 2011.¹⁴ We weighted the tariffs for each company by the number of domestic customers in each distribution area¹⁵ and averaged the charges for the financial years to produce an average tariff for calendar year 2010.¹⁶
- § Other Costs (Including Transmission Charges, Balancing, other environmental Costs) – To calculate residual costs, we subtracted our estimates for VAT, meter asset and maintenance cost, CERT, ROC and distribution charges for Q4 2009 to Q4 2010 from the VAT and Other Costs item in the August 2009 *Quarterly Wholesale/Retail Price Report* to obtain a residual cost. We inflated this residual cost by the RPI since September 2009 when the August 2009 *Quarterly Wholesale/Retail Price Report* was published into real January 2010 pounds.

4.2. Additional Costs – Public Data Sources

We used public data sources to obtain the first set of costs that we subtracted from the gross margin as per Ofgem. Those sources included Ofgem's own energy supply probe.¹⁷

To obtain our Cost to Serve estimate we used the following information:

- § Industry total for costs to serve for 2007 provided by Ofgem in the energy supply probe.¹⁸

¹³ We used ($\frac{1}{4}, \frac{3}{4}$) weights to reflect the fact that the current buyout price and ROC obligation will run from January until March (3 months) and the future buyout price and ROC obligation will run from April to December (9 months).

¹⁴ For electricity, the outcome of the current price control which will take effect from April 2010 is not yet clear, so we used the information available from Ofgem's Financial Model to the Initial Proposals, September 2009, Sheet "Results" – 5.3% (assuming X=0)

For gas, we used the revenue adjustments published for each year in the current price control in Ofgem, GDPC, Final Proposals, December 2007, Supplementary appendices pages 112-119 – see revenue adjustments for each company for each year.

¹⁵ Electricity distribution customer numbers: *Electricity Industry Review 13*, 2009, page 69. Gas distribution customer numbers: Ofgem, *GDPCR, Initial Consultation*, December 2005, page 69-72. Where no domestic number was available, we assumed that the distribution network had the same percentage of domestic customers as the average of the other distribution networks.

¹⁶ We used ($\frac{1}{4}, \frac{3}{4}$) weights to reflect the fact that the current buyout price and ROC obligation will run from January until March (3 months) and the future buyout price and ROC obligation will run from April to December (9 months).

¹⁷ Ofgem (140/08), Energy Supply Probe

¹⁸ Ofgem (140/08), Energy Supply Probe, page 96, Figure 7.11

- § A cost to serve premium of supplying gas of around £6 more than the cost to serve electricity, provided by Ofgem.¹⁹
- § Ofgem's report of the number of domestic accounts.²⁰
- § The relative proportions of electricity-only, gas-only and dual fuel customers from the data response by the six main suppliers.

In addition, we assumed some synergies in the cost to serve a dual fuel customer, such that the cost to serve for dual fuel customers was three quarters of the combined cost to serve an electricity and a gas customer. We allocated the total industry costs to serve between electricity, gas and dual fuel customer given these assumptions and inflated our estimate from its 2007 base year to real January 2009 pounds.

We obtained our Cost of Competition and Overheads estimates from the energy supply probe. Ofgem expressed this information as an industry total, which we allocated between domestic customer accounts using Ofgem's report of the number of domestic customer accounts.²¹

To obtain a meter reading cost, we used separate estimates for reading cost for electricity and gas meters from Cornwall Energy.²² We inflated these from 2006 nominal terms and divided by the number of electricity and gas accounts reported by Ofgem respectively.²³ We assumed that there are no synergies for dual fuel customers, for whom suppliers must pay the cost of reading both meters. In a private communication, an Ofgem official suggested that Ofgem's Cost to Serve already includes an allowance for the cost of meter reading, but we were unable to confirm this statement from any of Ofgem's documents and the official was unable to provide a figure for this allowance. This element of our calculation can be updated, if Ofgem provides more information.

Our estimate of the cost of the Community Efficiency Savings Programme (CESP) came from an Ofgem publication, which states that CESP will cost £3 per customer per year.²⁴ We divided this sum into an amount per account, in the relative proportions of electricity and gas accounts reported by Ofgem.²⁵

The government requires suppliers to undertake some social spending in support of disadvantaged consumers. Currently, Ofgem expects the industry to spend £125m in 2009/10 and £150m in 2010/11. To obtain an amount for calendar year 2010 we took a quarter of the 2009/10 figure and three quarters of the 2010/11 figure, leading to £143.75m. Given that

¹⁹ Ofgem (140/08), Energy Supply Probe, page 84, para 7.43

²⁰ See Ofgem 169/07, Market Report 2007, Page 3

²¹ For Cost of Competition and Overheads totals: Ofgem (140/08), Energy Supply Probe, page 96, Figure 7.11

²² Cornwall Energy Associates, Gas and Electricity Costs to Consumers, Jan 2008, pages 23, 15

²³ We used the monthly series RPI CHAW available from the ONS for inflating the Cornwall Energy estimates and the number of electricity and gas accounts available in Ofgem (169/07), *Market Report 2007*, Page 3

²⁴ Ofgem fact sheet 'Updated Household energy bills explained' 06/08/09 page 4

²⁵ Available in Ofgem (169/07), *Market Report 2007*, Page 3

10% of the social spending obligation may be offset against bad debt,²⁶ we spread 90% of £143.75m (i.e. £129.375m) across the number of accounts reported by Ofgem.²⁷

4.3. More Realistic Customer Characteristics

Ofgem estimates the gross margin earned on sales to a “typical” customer. Ofgem makes no claim that this customer represents an average consumer. However, to obtain a more accurate measure of supplier profitability (as opposed to a standardised margin), it is necessary to recognise the actual characteristics of the customers that retailers serve. Using data provided by the six main suppliers, we therefore adjusted Ofgem’s estimates to bring them closer in line with the characteristics of real customers.

4.3.1. Adjustment to More Realistic Consumption

Ofgem assumed that domestic electricity customers use 4MWh/yr and gas customers use 18.2MWh/yr. Our analysis of the industry’s own estimates gave average consumption levels of 4.2MWh for electricity and 16.1 MWh for gas – implying a small increase for electricity and a large reduction for gas. Accordingly, we made various adjustments to suppliers’ margins to reflect these more realistic consumption levels.

The lower volume of gas (compared to Ofgem’s notional consumption level) implies that suppliers will charge a lower average bill and pay a lower wholesale cost, VAT, ROC cost and distribution charge; together these changes narrow the margin available to suppliers. The higher volume of electricity (compared to Ofgem’s notional consumption level) implies that suppliers will charge higher bills and face higher costs; together these changes raise the margin available to suppliers.

Note that we treated distribution charges as a cost that is proportional to customer demand. This assumption is simple and transparent, but inaccurate. Distribution charges include fixed elements (similar to standing charges), which do not change if customers consume more electricity or less gas. However, any change in consumption has complex long-term effects on distribution charges. For instance, a fall in total consumption might cause distribution companies to raise their tariffs, in order to recover the same revenue. It is therefore difficult to model the effect of changing consumption on distribution charges with any accuracy. A transparent method would have to make a simple assumption: (1) distribution charges are proportional to consumption; (2) distribution charges per customer are fixed irrespective of consumption; or (3) some fixed percentage of distribution charges are proportional to consumption. For this report, we adopted assumption (1). The result is probably to overstate the margins for gas and dual fuel customers by a small amount. For electricity customers, the effect is reversed.

4.3.2. Reductions in Revenue

Ofgem used standard tariffs in its methodology, which excluded the discounts that various suppliers offer to online customers. We therefore asked the six main suppliers for the number

²⁶ Ofgem, Monitoring suppliers’ social initiatives, 25 July 2008, page4, para 1.8

²⁷ Ofgem (169/07), *Market Report 2007*, Page 3

of their online customers and for their average online discount. We then calculated the resulting total reduction in revenue and spread it across all customers.

We also requested the six main suppliers to provide data on the level of bad debt, as a percentage of total revenue from domestic customers. We applied an average of their bad debt, reported as a percentage of their revenue, to our bills for the average customer in each customer class, less an amount of £7 per customer (for all types of customer).²⁸ We deducted £7 because Ofgem's definition of the Cost to Serve includes a reference to bad debt; our assumption about the amount included here corresponds to the figure provided to us by an Ofgem official in a private communication. It would be possible to update this figure if we had better information.

4.3.3. Costs of the Retail Business

Ofgem did not include the cost of working capital in its calculations. In order to construct our own estimate of the cost of working capital, we assumed that cash/cheque customers pay with an average three-month lag and that suppliers face a cost of debt of 6.8% (equal to the average estimate of the cost of debt faced by water suppliers in the most recent OFWAT determination in November 2009).²⁹ From the data response by the six main suppliers we obtained estimates of the average bills that customers pay for electricity, gas and dual fuel, and we used our interest rate to calculate the cost of the three month delay in payment for electricity, gas and dual fuel customers who pay by cash/cheque. We then spread these costs over all customers.

In our data request we also asked the six main suppliers to estimate the one-off and recurring annual costs associated with implementing the market remedies put in place following Ofgem's energy supply probe. We estimated these costs as the industry average and applied them on a per-customer basis.

4.4. Additional Trading Costs to Match Demand Profiles

Ofgem assumed that energy suppliers buy all of their electricity and gas ahead of time in seasonal and quarterly blocks respectively. In reality, suppliers face further costs as demand varies within seasons and quarters, which require them to buy and sell electricity and gas to take account of the varying time pattern of demand. We estimated the contracts that suppliers must purchase to meet customer demand and the prices that suppliers must pay for these contracts. Our calculations took account of information from public data sources, our own estimates, and the response to our data request.

4.4.1. Cost of Shape

We calculated a cost of shape for our more realistic annual volumes of consumption (rather than Ofgem's notional consumption levels), based on seasonal prices and our estimates of required contract volumes and prices as outlined in sections 4.4.2 to 4.4.4.

²⁸ We used the adjusted bills, after taking into account the higher volume of electricity and lower volume of gas estimated by the six main suppliers in response to our data request.

²⁹ This is the nominal cost of debt, sourced from the real cost of debt assessed by OFWAT of 4.3-4.5% plus 2.5% inflation. See OFWAT, *Future water and sewerage charges 2010-15:Final Determination*, November 2009 page 120

Ofgem did not publish the details of its assumed seasonal energy volumes which are necessary for a calculation of the cost of shape. We therefore attempted to replicate the Ofgem calculations and the implied seasonal baseload and peak volumes for electricity and quarterly volumes for gas. We used these estimates together with our estimates of the contract volumes that suppliers then need to purchase or sell to build shape, and the prices they pay or receive for those volumes.

We derived the cost of monthly shape as the difference between the seasonal contract volume (as per Ofgem's approach) and our shaped monthly volume, multiplied by our monthly shaped contract prices. Our half hourly cost for electricity and our daily cost for gas reflected the difference between our shaped monthly volumes and our shaped daily/half hourly volume, multiplied by half hourly/daily shaped contract prices. We then computed the final cost of shape as the sum of the cost of monthly and half hourly shape and monthly and daily shape for electricity and gas respectively.

4.4.2. Contracts to Build Shape

Our estimate of the shape of monthly and half hourly electricity demand and monthly and daily gas demand stemmed from the historic pattern of demand across the year:

- § We obtained the expected half hourly profile of electricity demand in 2010 from Elexon³⁰.
- § We obtained the expected daily profile of gas demand in 2010 from one of the six main suppliers.

We used the half-hourly profile for electricity and the daily profile for gas to shape the annual demand levels for electricity and gas.

Based on the half-hourly and daily profiles, we constructed contracts that suppliers need to purchase and sell to meet the month-by-month demand variation.

For electricity, we derived the monthly profile of contracts by taking the monthly totals of the half-hourly shaped electricity demand. We broke the monthly electricity demand down into peak and baseload contracts in such a way that for each month, the baseload contract capacity was equal to the average off-peak demand capacity for that month. We then assumed that the remaining energy would be purchased under a peak contract. This method of splitting the monthly purchases into baseload and peak contracts implied that on average about 95% of energy should be contracted as baseload.

For gas, we derived a monthly demand profile by taking the monthly totals of the daily shaped gas demand.

4.4.3. Monthly Shaping

We created shaped monthly prices by imposing the relevant historical monthly price shape onto the contract prices for the season (electricity) or quarter (gas) that we used to replicate Ofgem's notional hedging strategy.

³⁰ for customer category 1 (domestic consumers)

We estimated the monthly shaped electricity and gas contract prices using the following public data sources:

- § Our profile of historical monthly electricity contract prices came from monthly averages of UKPX Reference Prices, downloaded from Bloomberg for the calendar years 2002 to 2008.
- § Our profile of historical monthly gas contract prices came from monthly averages of NBP day-ahead and weekend prices sourced from Heren for the calendar years 2003 to 2008.

We first computed the monthly shape for each sample year, separately for baseload and peak electricity prices, and for gas prices. We then constructed monthly shape indices by taking the averages of monthly shapes over all sample years. Finally, we calculated the within-season (for electricity), and within-quarter (for gas) monthly shape factors by dividing the monthly shape indices by the respective seasonal/quarterly averages.

4.4.4. Daily Shaping

We calculated the daily/half-hourly shaped prices by imposing the corresponding within-month shape factors onto the monthly shaped prices.

We used calendar year 2008 as the sample year for the half-hourly shape of electricity prices and the daily shape of gas prices. We first mapped the 2008 prices to individual days of the year 2010. In assigning the 2008 days to the year 2010 shape we took into account the similarity of the days, i.e. we mapped the n^{th} Monday of January 2008 to the n^{th} Monday of January of 2010, etc.³¹ To obtain within-month daily shape factors we divided the mapped prices by the monthly averages of mapped prices. For electricity prices we calculated separate shape factors for peak and off-peak periods.

We also adjusted the shaped electricity and gas price (increased for purchases and decreased for sales) by proportionate transaction costs derived from market data.³²

4.5. Imbalance Charges

Our review of Ofgem's reports suggested that Ofgem included Balancing Use of System Charges, but excluded imbalance penalties from its calculation of the costs paid by suppliers. We therefore asked the six main suppliers for their estimates of imbalance penalties per unit of electricity and gas delivered to customers, and computed the industry average. We then applied this cost to the more realistic electricity and gas consumption levels, to generate a cost per electricity, gas and dual fuel customer.

³¹ In those cases where, for instance, the n^{th} Monday of January is not available in 2008, but is present in 2010, we took the 1st Monday of January of 2008. This way we preserved the within-month volatility of 2008.

³² Electricity, Monthly: 3.0% and Half Hourly: 4.3%; Gas: Monthly, 0.5% and Daily 0.2%. Transaction costs percentages come from the bid-ask spread on UKPX baseload month ahead and 4 hour EFA block contracts and NGP Month ahead and Day ahead contracts for calendar year 2008. Data downloaded from Bloomberg.

5. Conclusion

We used various methods to estimate the costs and other adjustments that were not included in Ofgem's calculations of gross margins. As far as possible, we used data provided by Ofgem and other public sources. In some cases, we used estimates provided by the six major suppliers. We constructed our own simple model of short-term trading, in order to estimate the costs of matching energy purchases to the variations in consumer demand. We believe that Ofgem would be able to apply these methods to calculate margins on the same basis.

We are aware that some of our estimates differ from Ofgem's. There remains the possibility that we did not correctly allow for double counting (although we made every effort to do so). Our adjustment of distribution charges for actual levels of consumption tends to overstate the resulting margins for gas and dual fuel customers (and to understate them slightly for electricity customers). It would be possible to adopt a different approach, under which (some share of) the cost per customer of distribution is a fixed amount.

However, these differences and uncertainties reflect only a lack of detail in Ofgem's previous documents (which were not intended to be used in the way that we used them). Ofgem can easily remedy this problem by providing a more detailed breakdown of costs. Changing our calculations for these factors is unlikely to affect the overall conclusion, namely that energy suppliers are making little or no margin on sales to domestic customers.

Appendix A. Detailed Calculation of Margins in Energy Supply

Revenues, Costs and Margins (in prices of January 2010)	£ Per Customer per Annum			Line No.	Methods and Sources
	Electricity	Gas	Dual Fuel		
Customer Bill - as per Ofgem	505	700	1,185	(1)	Ofgem
Costs - as per Ofgem	-403	-579	-981	(2)	= (3) + (6)
of which:					
Wholesale Energy Costs (Hedging Portfolio)	-209	-350	-558	(3)	= (4) + (5)
of which:					
Hedging Portfolio (Costs of Contracts)	-196	-350	-546	(4)	Methodology of Ofgem QWRPR
Cost of Network Losses (at 6%)	-13	0	-13	(5)	Average network losses (distribution and transmission) based on Ofgem price control data
VAT and Other Costs	-194	-229	-423	(6)	= (7) + (8) + (9) + (10) + (11) + (12)
of which:					
VAT	-24	-33	-56	(7)	Calculated as 5/105 of total customer bill
Meter Asset and Maintenance Costs	-14	-14	-29	(8)	Sourced from Cornwall Energy
CERT	-24	-24	-47	(9)	NERA Estimate using No.10 Press Release and Ofgem Customer Numbers
ROC Costs	-16	0	-16	(10)	NERA Estimate using Ofgem data
Distribution Charges	-76	-126	-202	(11)	NERA Estimate using distribution companies' and Electricity Industry Review data
Other Costs (incl Transmission Charges, Balancing, Other Environmental Costs)	-41	-32	-73	(12)	NERA Estimate - figure from Ofgem QWRPR plus inflation
Gross Margin - as per Ofgem	102	121	204	(13)	= (1) + (2)
Additional Costs - Public Data Sources	-74	-80	-133	(14)	= (15) + (16) + (17) + (18) + (19) + (20)
of which:					
Cost to Serve	-40	-46	-64	(15)	Sourced from Ofgem probe, and updated for inflation
Cost of Competition	-16	-16	-32	(16)	Sourced from Ofgem probe, and updated for inflation
Meter Reading	-9	-9	-18	(17)	Sourced from Cornwall Energy
Overheads	-5	-5	-11	(18)	Sourced from Ofgem probe, and updated for inflation
CESP	-2	-1	-3	(19)	Sourced from DECC
Revenue Reduction from Social Spend Obligation	-3	-3	-5	(20)	Social Spend obligations for 2009/10 and 2010/11, excl 10% allowance for bad debt
Net Margin (After Adjustment for Additional Costs Based on Public Data Sources)	28	41	71	(21)	= (13) + (14)
More Realistic Customer Characteristics - Industry and NERA Estimates	-0	-16	-39	(22)	= (23) + (26) + (29)
Adjustment to More Realistic Consumption, of which:	8	-4	-6	(23)	= (24) + (25)
Change in Customer Bill	17	-63	-56	(24)	NERA analysis, based on industry sources
Change in Wholesale Energy and Other Costs Related to Consumption	-9	59	49	(25)	NERA analysis, based on industry sources
Reductions In Revenue, of which:	-4	-6	-27	(26)	= (27) + (28)
Discounts on Online Tariffs	-1	-1	-12	(27)	NERA analysis, based on industry sources
Bad Debt	-3	-5	-14	(28)	NERA analysis, based on industry sources
Costs of Retail Business, of which:	-5	-6	-6	(29)	= (30) + (31)
Working Capital	-4	-5	-5	(30)	NERA analysis, based on industry sources
Cost of Implementing Remedies from Ofgem Probe	-1	-1	-1	(31)	NERA analysis, based on industry sources
Adjusted Margin (Adjusted to More Realistic Customer Characteristics)	27	26	32	(32)	= (21) + (22)
Additional Trading Costs to Match Demand Profiles - NERA Estimates	-18	-15	-34	(33)	= (34) + (35)
of which:					
Cost of Shape	-16	-3	-20	(34)	NERA analysis, based on industry sources
Imbalance Penalties	-2	-12	-14	(35)	NERA analysis, based on industry sources
Overall Margin	9	10	-1	(36)	= (32) + (33)

Appendix B. Energy Supply Glossary

Bad Debt	Although the electricity industry goes to great lengths to prevent customers defaulting on their bills, every supplier has to write off a percentage of its revenue as debts that will never be paid. The rate of bad debt means that suppliers do not collect the full amount of revenue implied by their tariffs.
Balancing	Energy suppliers purchase energy in longer-term block contracts. The stable supply of energy over these periods needs to be matched to the varying consumer demand for energy. Balancing refers to eliminating excess demand or excess supply by trading energy in the energy markets.
Baseload/Peak Contracts	Ofgem assumes that suppliers purchase a variety of different energy contracts, differentiated by date (quarterly, seasonal) and, in the electricity sector, by time of day. Electricity contracts are described as “baseload” if they deliver the same amount all day and every day of the contract period. Some contracts only deliver energy between the hours of 7am and 7pm on weekdays; demand is generally higher during such periods, so these contracts are known as “peak” contracts. Traders and brokers quote prices for a variety of “baseload” and “peak” contracts.
CERT	The Carbon Emissions Reduction Target (CERT) obliges all domestic energy suppliers with a customer base above 50,000 customers to make savings in the amount of CO2 emitted by householders.
CESP	The Community Energy Saving Programme (CESP) requires gas and electricity suppliers and electricity generators to deliver energy saving measures to domestic consumers in specific low income areas of Great Britain. The CESP obligation runs from 1 October 2009 to 31 December 2012 and applies to all licensed gas and electricity suppliers with more than 50,000 domestic customers and to all licensed electricity generators that have generated 10 TWh/yr or more (on average over a three year period). These suppliers and generators are obliged to meet a carbon reduction target of 19.25 million tonnes of carbon dioxide (MtCO2) in total.”
Competition Costs	Suppliers incur costs to compete for customers, i.e. when they approach customers by telephone or in person, arrange a new contract, register a new customer and transfer details from the previous supplier. When they lose the customer to another

supplier, they also incur costs to terminate the contract and to transfer the customer to the new supplier.

Cost of Shape

Energy contracts offer electricity or gas at a constant rate over a defined period. Customer's demand varies by half-hour (for electricity) or day (for gas). In order to match their purchases to their sales, suppliers need to buy "shape" as well as arranging a portfolio of long-term energy contracts. To buy "shape", suppliers must buy and sell energy in shorter term blocks - first monthly blocks to match the monthly pattern of demand and later weekly, daily or half-hourly blocks to match actual demand. This process has a net cost to suppliers, because usually they have to buy energy in periods when demand - and price - is high, and to sell back energy in periods when demand - and price - is low.

Cost to Serve

Energy suppliers incur costs in managing customer accounts. In particular, this item includes the costs of sending out bills, managing payments by customers, handling customer contacts, and dealing with queries.

Distribution Charges

Suppliers pay a charge for using the local distribution network, which delivers energy from the transmission network to domestic (and other) customers.

Distribution Network

In both the electricity and gas sectors, local distribution networks take energy from the transmission network and deliver it to domestic (and other) customers. There are fourteen electricity distribution networks and eight gas distribution networks in Great Britain. These networks run at lower voltages and pressures than the transmission networks (down to the levels at which energy is delivered to households, e.g. 220 volts).

Dual Fuel Customers

Dual fuel customers are those that purchase both electricity and gas from the same supplier.

EEC

The Energy Efficiency Commitment (EEC) set targets on energy suppliers to improve energy efficiency in households across Great Britain. The scheme has now been replaced by the CERT.

Energy Trading

Energy producers, importers and suppliers all need to buy and sell energy. They trade energy primarily via wholesale markets. In those markets, participants - as well as specialised energy traders and brokers - arrange contracts to supply energy in multiples of a megawatt-hour. Much of this trade

involves standard contract designs - e.g. a contract for the sale of a constant volume of gas on every day in a particular quarter (e.g. the first three months of 2010). Various bodies report the prices at which these standard contracts are currently changing hands.

Environmental Obligations	Suppliers face obligations under the law and their supply licence to pursue environmental objectives (as well as serving their customers). For every unit of electricity they deliver to a customer, they must buy a certain proportion (currently about 10%) from renewable energy sources. To show that they have met this obligation, they must buy "Renewables Obligation Certificates" (ROCs) from renewable generators (or face a penalty for any shortfall). Suppliers also have to spend money on meeting the obligations imposed by the "EEC", "CERT" and, from 2010, "CESP".
Gigawatt-hour (GWh)	= 1,000 MWh. Used to measure the output of a large power station, for instance.
Gross margin (as per Ofgem)	The margin in pounds per year between (1) a standard customer's bill (calculated using standard tariffs) and (2) a narrow range of costs that Ofgem attributes to the standard customer. Ofgem publishes data on this "gross margin" at quarterly intervals, to monitor how wholesale and retail prices are moving over time. See "Net Margin".
Imbalances	Suppliers arrange in advance to purchase the electricity and gas that they think a customer will need. However, usually the customer's demand is higher or lower than the suppliers' forecast, because of unpredictable variation in the weather and other factors. The difference between (1) the energy that the customer consumes and (2) the energy that the supplier has bought is called an "imbalance". Both the electricity and gas wholesale markets have centralised systems for putting a price on imbalances - usually a high price on any deficit and a low price on any surplus. Suppliers therefore buy at a loss when demand rises and sell at a loss when demand falls. Imbalances impose a cost on each market, which is fed back to suppliers (and ultimately to customers).
Kilowatt-hour (kWh)	A basic unit of energy, equivalent to the consumption of an old 100 watt bulb over 10 hours, or a new energy efficient 10 watt bulb over 100 hours.

Market Remedy Costs	Ofgem has recently told the suppliers that they must take additional measures to remedy potential problems in the retail market. In particular, suppliers must now report more information to Ofgem and must monitor their own tariffs more closely, to ensure that price differences reflect cost differences. These new obligations cost a certain amount to administer - the “market remedy costs”.
Megawatt-hour (MWh)	= 1,000 kWh. The basic unit for wholesale energy trading. Over a year, a typical domestic customer uses 3 to 4 MWh of electricity and 15 to 20 MWh of gas, according to industry data.
Meter Asset and Maintenance Costs	Suppliers pay the capital cost of buying and installing meters (“asset cost”) and the cost of ensuring that the meter operates properly (“maintenance cost”). They pay separately for the meter to be read from time to time.
Meter Reading Cost	Energy suppliers pay the cost of meter readings from time to time, to establish how much electricity or gas their customers have consumed.
Net Margin	The margin in pounds per year between (1) a customer’s actual bill and (2) a wide (but incomplete) set of the costs associated with serving that customer. Some costs are associated with serving customers in general (e.g. overheads), but can only be allocated to a specific customer using an accounting rule (e.g. equal cost per customer). Ofgem’s definition of “net margin” explicitly leaves out some costs. See also “Gross Margin”.
Network Losses	Some of the energy that suppliers buy in wholesale markets does not reach the final customers due to electrical resistance and heat losses within the transmission and distribution system. Suppliers therefore have to buy more energy than their customers actually consume.
Operating Costs	The costs of operating a retail business are the costs associated with maintaining current customers and winning over new customers. This includes for example the cost of publishing tariffs and advertising special deals.
Overheads	Overheads are costs of activities that do not directly generate profits but that are necessary for the operation of a company. An example of an overhead is the cost of managing the staff payroll.

Portfolio Hedging	Suppliers hold consumer energy tariffs stable for months at a time, rather than changing them every time wholesale energy prices change. Suppliers therefore buy a portfolio of energy contracts in advance, to fix the prices they will have to pay. This strategy protects them against major losses (or profits) when energy prices change. A strategy which reduces the risk to profits is called “hedging”. (A strategy which increases the risk to profits is called “speculation”.)
Renewables Obligation	Every time a generator using renewable energy sources generates any electricity, it collects Renewables Obligation Certificates (ROCs) from a central agency. (Formerly, renewable generators received one “ROC” per megawatt-hour of output; the ratio of ROCs to output now varies between different technologies.) The generator can sell its ROCs to a supplier, who has an obligation to buy a certain quantity. By these means, suppliers pay a premium for output from renewable energy sources.
Retail Energy Market	Sales of energy from suppliers to final customers.
Shape	Ofgem models energy procurement as buying energy contracts for a block of energy delivered at the same rate throughout a quarter (for gas) or through a six-month season (summer or winter) for electricity. In practice, the demand of domestic customers has a more variable “shape”, rising in peak days or hours and falling in off-peak days or hours. Some of this variation in the “shape” of demand is unpredictable until the last minute, e.g. because it depends on the weather.
Social Obligations	Social obligations are the obligations imposed on energy suppliers by the regulator to help vulnerable customers, e.g. low income customers who have trouble paying their bills and who run into arrears. The suppliers have set aside large sums to fulfil these obligations: £125 million in 2009/10, £150 million in 2010/11 and £175 million in 2011/12.
Suppliers	Energy companies are only allowed to sell electricity or gas to a final customer if they have a supply licence. Holders of such a licence are known as “suppliers”. There are six major suppliers in the gas and electricity markets, and a number of smaller ones.
Terawatt-hour (TWh)	= 1,000 GWh. Used for measuring quantities of energy at the level of a national market, e.g. total consumption, total production, energy saving targets, etc.

Transaction Costs	In order to transform contracts that deliver energy at a constant rate into the right “shape” to meet domestic customers’ demand, suppliers must buy some energy when demand is higher than average and sell some energy when demand is lower than average. Each time they either buy or sell, suppliers must pay the costs of the transaction, e.g. brokers’ fees.
Transmission Charges	Suppliers pay a charge for using the national transmission network (the “national grid” for electricity and the “national transmission system” for gas). In each sector, the transmission network delivers energy from the wholesale market to the distribution networks (which pass the energy on to final customers). Energy producers and importers pay a separate transmission charge for using the transmission network to send their output to the wholesale energy market.
Transmission Network	In both the electricity and gas sectors, there is a national transmission network (the “national grid” for electricity and the “national transmission system” for gas). The transmission network takes the output of producers (generators in electricity, gas wells) and importers and delivers it to the wholesale market. It then takes the energy from the wholesale market to the distribution networks (which pass the energy on to final customers). Electricity transmission networks operate at high voltage (132,000-400,000 volts). Gas transmission networks operate at high pressures (40-70 bar, i.e. 40-70 times atmospheric pressure).
Wholesale Energy Market	Marketplace in which energy is traded between energy companies and others in bulk quantities. i.e. multiples of a megawatt-hour.
Wholesale Energy Costs	As defined by Ofgem, wholesale energy costs means the cost of purchasing the energy (electricity and gas) needed to serve a standard customer’s annual consumption. Ofgem’s term estimates the cost of acquiring electricity in six-monthly blocks and gas in quarterly blocks. In practice, suppliers must engage in further trading, in order to convert these flat blocks of energy into the shape that fits the demand of domestic customers, which varies half-hour by half-hour (in electricity) and day-by-day (in gas).

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