Securing the UK's energy future – meeting the financing challenge

An update to the Ernst & Young *'Costing the earth? The impact of climate change mitigation on UK domestic customer energy bills'* study

February 2009

Executive summary

The UK's energy sector faces significant challenges over the next 10-15 years, both to maintain secure energy supplies and meet climate change and renewables targets.

Meeting these challenges will require substantial investment over the coming years. Our '*Costing the earth*?' study, published in June 2008, concluded that this investment would amount to £165 billion by 2020.

Since publication of the study, some notable developments have taken place in the UK energy supply sector:

- The impact of the financial crisis has fundamentally altered the landscape in which the energy supply industry raises capital.
- Development costs for new energy projects have increased, resulting from commodity, supply chain and labour constraints, although these have been partially offset by recent commodity price decreases.
- Concerns for Western Europe's energy security have been heightened by the most recent gas dispute between Russia and Ukraine.
- New announcements have furthered the process of converting energy policy aspirations into tangible project proposals, including new gas storage, nuclear power plants and carbon dioxide transport infrastructure.

Centrica plc has commissioned Ernst & Young to review these developments and produce this update study. The study assesses the changes to forecast capital investment and explores some of the issues in financing this new investment.

This update study has extended the time horizon to 2025 to capture the new investment and concludes that £234 billion of new investment is now required to meet the UK's energy goals, compared with our original estimate of £165 billion. This additional investment will double the value of the UK's total energy supply asset base (after taking into account depreciation) by 2025.

The energy supply industry will be responsible for funding this investment, through borrowing, direct shareholder investment and retained earnings. However, securing this investment is not guaranteed and will rely upon energy companies' ability to access debt and equity finance. This in turn will require the same companies to persuade their lenders and shareholders that income on new assets will be enough to service and repay the debt and provide adequate returns to shareholders, whilst sustaining long-term profitability.

In summary, the UK energy supply industry has earned an average annual net income of c.£4 billion from 2005-2007. The additional annual net income that would be required to fund the equity share of the new £234 billion of investment is c.£7 billion (calculated as the average across the three years post construction, from 2026-2028). This equates to an average Return on Capital Employed (ROCE) of c.12% which is in line with returns made by the industry in recent years, which averaged c.12% from 2005-2007 (pre-tax).

Our main conclusion is that without sufficient confidence that future returns on new investment will be adequate to cover financing costs, in addition to sustainable shareholder return, there is a risk that the UK's energy investment needs will not be met and that investment capital is redeployed to other sectors of the economy and possibly other countries. If it does go ahead, the energy supply industry will need to play its role in funding the new investment in the most efficient way, for example through optimising financing costs, operating expenditure, tax liabilities and capital expenditure programmes.

Alongside this fundamental financing challenge lies the dilemma of deploying this substantial level of investment in the most cost effective manner, which reinforces the need for a continuing focus from industry and government on demand reduction and energy efficiency. What's clear is that the right balance needs to be struck between the most cost-effective means of reaching the UK's energy sector goals, whilst ensuring the energy supply industry can deliver these goals through being able to adequately finance the significant levels of investment required to meet them.

1. Introduction

'Costing the earth? The impact of climate change mitigation on UK domestic customer energy bills' (CTE) was published by Ernst & Young in June 2008. In it we explored the impacts on domestic customers of the investment associated with delivering the measures to mitigate climate change out to 2020.

Since the publication of CTE, the energy and financial landscape has changed significantly. The recent dispute over gas supply between Russia and the Ukraine has once again highlighted European vulnerabilities with respect to energy supply. The financial crisis and resulting global recession has severely restricted access to debt and continues to force companies in all industries to reassess their future capital investment expectations. For instance, the cost of debt in financing new energy infrastructure has risen by 1-2% over the past 12 months (see Figure 1 below), which has already increased the costs of financing renewable energy projects. For those companies with weak balance sheets, the availability and cost of debt is having a particularly marked impact. Significant commodity price fluctuations, supply chain pinch points and development costs have also increased risks in developing new energy projects, although this has been partly mitigated by falling commodity prices.

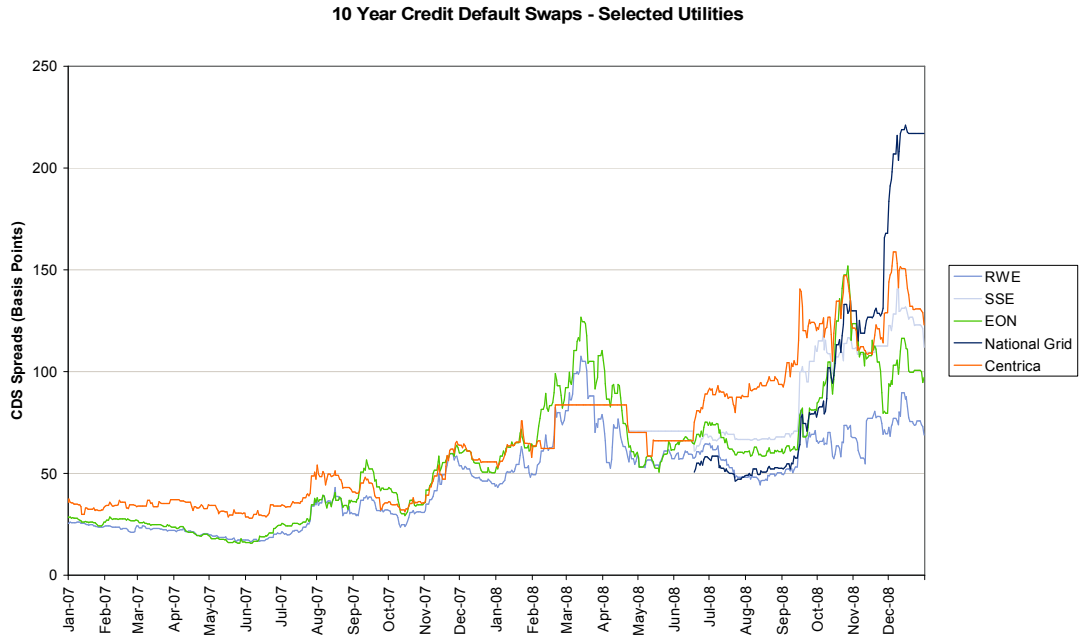

Figure 1 - 10 year credit default swaps for selected utilities (Source: Bloomberg)

Meanwhile, plans for nuclear new-build in the UK have progressed considerably and other energy supply investments have been announced, including proposed expansions to the UK's gas storage capacity and the planned build-out of the UK's first CO_2 transportation infrastructure to support development of carbon capture and storage (CCS) power plants.

To take account of these developments, Centrica plc has commissioned Ernst & Young to update the CTE study and to reappraise the scale of new investments likely to be needed from the UK's energy supply industry from 2009 to 2025 (the original CTE work covered the period to 2020). Furthermore we calculate the levels of return that the UK energy industry will need to make in order to finance this investment, to inform the debate on whether this level of investment can be made, and to address the challenge of financing it.

We have built on our CTE work by extending the period under analysis to 2025, in order to take account of further retirements of baseload generation capacity and capture new infrastructure investments.

Our estimates are based upon publicly available information, coupled with Ernst & Young judgements about what investment may be necessary in the years out to 2025, together with possible phasing.

2. Investment required by the UK energy sector by 2025

We have estimated the total capital investment required to meet the UK's energy goals, using base assumptions which are consistent with our previous CTE study, including:

- 26% cut in carbon emissions by 2020 from a 1990 base level[1] and measures to meet this target. These include the proposed Supplier Obligation, the roll-out of smart metering to all domestic households and support for low carbon power generation such as renewables, new nuclear build and carbon capture and storage (CCS). We continue to assume that a significant portion of plant which has opted out of the LCPD will retire several years prior to the 2015 deadline.

- We have assumed that over 40% of electricity will need to be generated from renewable sources from 2020. This is driven by the requirements of the EU Renewable Energy Directive, which means that 15% of energy will need to come from renewables by that date. Whilst recognising that these targets may be challenging to meet in practice, our analysis assumes that they will be met.

- We have excluded 'business as usual' spend on networks from our calculations and focused on the incremental spend that will be necessary to safeguard supply security and meet the government's low carbon agenda.

However, there are two principal changes from the approach used for CTE, both driven by our desire to focus more sharply on the need to ensure security of supply.

Firstly, we have extended the period under consideration to 2025. This enables us to take into account two significant factors that will impact baseload generation capacity:

1. The expected closure of all the UK's existing nuclear plant, except for Sizewell B, by 2023.

2. The probable retirement of a large tranche of coal-fired capacity, all of which has complied with the Large Combustion Plant Directive but is likely to reach the end of its working life in the period 2021-2025. We anticipate as much as 8GW of capacity falling into this category.

Secondly, we have included future spend on import infrastructure that we believe will be necessary to provide continued access to gas, in the face of a predicted rapid decline of indigenous production from the UKCS over the next ten years. This means taking account of future spend on LNG regasification facilities and the possible addition of additional gas pipeline links to Continental Europe.

We estimate that the capital expenditure on new projects and committed spend required across the energy supply industry to 2025 is at least £234 billion. The breakdown of this figure is shown in Table 1 overleaf.

[1] The Climate Change Bill has now brought a target of a 26-32% reduction in emissions from 1990 levels by 2020 into statute.

Table 1 – Updated incremental capital investment estimates to be made by the UK energy supply industry

Investment Type	Incremental spend from 2009 to 2025 in real terms *(£ bn)*	Description, including key assumptions
Nuclear power plant	38.4	*12.8GW online by 2023*
Gas-fired power plant	6.4	*13.1GW online by 2021*
Coal-fired power plant with CCS	7.3	*3.2GW online by 2025*
Renewable generation capacity	112.5	*To reach total capacity in 2025 as follows: Onshore: 9GW; Offshore: 33GW; Tidal: 8.6GW; Hydro: 1.5GW; Other Renewables: 5GW*
Transmission – offshore network	12.0	*Costs associated with Rounds 1, 2 & 3*
Transmission – onshore grid reinforcement	12.0	*Costs to accommodate new-build generation capacity*
Distribution – network enhancement	4.2	*30% uplift on current levels to cope with embedded generation*
Smart metering roll-out	13.4	*Roll-out from 2010 over 7 years*
Carbon Emissions Reduction Target (CERT)/ Supplier Obligation (SO)	15.7	*SO for 2017-2020 taken to cost 2x CERT*
Gas storage	8.4	*c.75 days storage capacity*
LNG import terminals	1.0	*Expected project pipeline*
New pipeline infrastructure	0.2	*Expected project pipeline*
CO_2 transport infrastructure for CCS	2.0	*Expected transport and storage network*
TOTAL	**233.5**	

Source: Ernst & Young analysis

In terms of phasing:

- Renewables investment is assumed to last until 2020, in order to meet the UK Government's 2020 penetration target.
- The costs of smart metering are spread relatively evenly over the period 2010-2017.
- The nuclear build spans 2014 – 2022, based on an expectation that the first plant will be commissioned in 2017, with costs being spread over the construction period.
- Early investment (2009-10) relates mainly to new gas-fired build, gas storage and renewable power generation.

The total £233.5 billion estimate represents an increase of £68.2 billion on the assumed level of incremental spend that underpinned CTE, at £165.3 billion. This is due to additional projects being included in the scope of the analysis, as well as our reappraisal of costings.

Table 2 below shows the additional investments that have been added to the CTE investment estimates, as well as subtractions to take account of investments we believe have now been made.

Table 2 - Summary of investment additional to previous CTE paper

Investment	Change from CTE assumption (£bn)	Description, including key assumptions
Nuclear power plant	30.3	*Additional 8GW by 2025; costs re-evaluated*
Gas-fired power plant	0.5	*Additional 1GW of Open Cycle Gas Turbines by 2025*
Coal-fired power plant with CCS	3.6	*Additional 1.6GW by 2025*
Renewable generation capacity	27.0	*Costs re-evaluated*
Transmission – offshore network	3.8	*Costs re-evaluated*
Gas storage	7.1	*Revised cost estimate; extension of project pipeline*
LNG	1.0	*New = expected project pipeline*
Pipeline infrastructure	0.2	*New = expected project pipeline*
CO_2 transport infrastructure for CCS	2.0	*New = expected project pipeline*
Total	**75.5**	
LESS: spend assumed to have been made in 2008	(7.3)	
Total addition to CTE	**68.2**	

Source: Ernst & Young analysis

Based on table 2 above, it is worth noting the following highlights:

- Prospects for nuclear new-build have improved considerably in recent months. In particular, a programme which delivers a modest increase in capacity on today's level is increasingly likely to attract political support. However, we have noted a significant increase in the capital costs now being quoted publicly in respect of potential nuclear new-build in the UK, based in part on experience through construction of new nuclear plants in France (Flamanville) and Finland (Olkiluoto).

- We have also added further coal-fired plant with CCS and gas-fired plant, compared to our 2020 CTE scenario.

- The further retirement of coal plant in the period 2020-2025 provides opportunities for nuclear, coal with CCS and gas capacity to be added to the generation mix.

- Our cost estimates for the offshore transmission network and for the storage capacity needed to increase gas supply security and responsiveness have also been revised. The increased gas storage investment estimates will make a significant difference to the UK's gas storage capacity, increasing it to c.75 days of average demand, from the current 16 days.

Implications for the Generation Mix

The resulting generation capacity mix in 2025 will change significantly compared to the current generation mix, as shown in Figure 1. In 2025, a higher proportion of generation will have to be supplied by gas-fired and nuclear capacity, coupled with a significant increase in renewable capacity to meet 2020 renewable targets. As newly installed renewable capacity will need to be used to its maximum, current baseload plant will not be required as frequently. Investment for baseload plant will therefore need to be recovered over a shorter period.

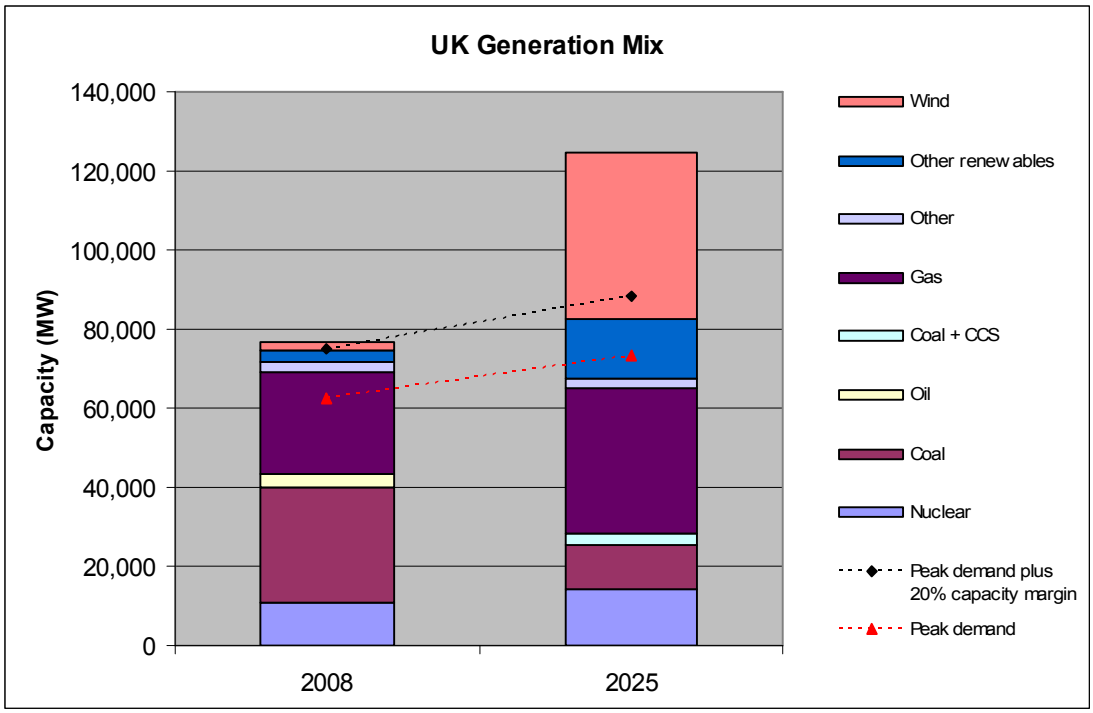

Figure 2 - Generation mix in 2008 and 2025 (Source: Ernst & Young analysis)

Implications for electricity demand

Despite the current economic recession in the UK, which will marginally reduce electricity demand growth, we do not believe this will have a material impact on longer-term investment. Moreover there are other longer term aspirations, such as the potential mass electrification of transport (including electric vehicles) over the coming decades, which we have not factored into this update study. If implemented these would increase electricity demand considerably. For our analysis in 2025, we have assumed that the levels of overall demand for electricity and gas in that year will remain the same as in our 2020 baseline scenario for CTE.

Implications for asset base growth

The reported asset base of the current energy supply industry is approximately £62 billion (fixed assets plus goodwill), which includes assets required to generate, transmit and distribute electricity and to import, transmit and distribute gas. Taking into account asset depreciation the additional £234 billion of new investment will represent a doubling of the asset value of the UK's energy supply infrastructure by 2025, in real terms to c.£127 billion.

3. Funding the investment and impact on energy supply companies

Without other forms of subsidy, the £234 billion of estimated capital investment to 2025 will need to be funded by existing or new companies operating in the UK's energy supply industry. In order to finance this investment, such companies will require the confidence of their investors, shareholders and lenders that they will be able to:

- Service debt interest and repay the loan capital borrowed from banks and other lenders.
- Offer shareholders and investors an adequate return on equity funding made available, either through new investment (eg. new shares issued) or using existing cash reserves held by the companies.

The companies will therefore need sufficient certainty that, over the life of the new assets, the associated income will enable them to meet the above expectations. If such certainty cannot be obtained, investments are unlikely to be made, and investment capital (for which the companies must compete) may be directed to projects in other sectors of the economy or indeed projects in other countries.

So how can the UK's energy supply companies meet this financing challenge? We have approached this question by:

1. Considering first, how much of the investment can be borrowed, through 'debt finance'.

2. Calculating the residual investment which must then be funded by shareholders, through 'equity finance'.

3. Estimating the consequent levels of net income and returns required from the new assets (which we then set in context alongside the net income and return levels for existing assets).

Calculating levels of debt and equity finance

We have created a series of notional industry sub-groups which make up the UK's energy supply industry, including for example, network infrastructure, nuclear new-build, renewable energy etc. Each of these sub-groups will be able to raise debt in differing proportions and at differing cost; costs which we have assumed through assessing historical and likely forecast 'costs of capital' and leverage for each sub-group. So for example, it will remain easier to attract debt finance for network infrastructure projects, which benefit from relatively stable regulated returns constituting lower risk, than for renewable energy projects which are perceived as being higher risk. Looking across all industry sub-groups we have estimated that the approximate weighted average cost of capital in relation to the £234 billion spend is 8.5% which is based on a cost of 6.6% for debt paid down over the life of the asset.

Based on the required investment mix we have estimated that overall c.48% of the £234 billion can be raised as debt. The residual 52% will therefore need to be funded through equity finance. The fact that over half of the future financing will need to come from equity is in part a reflection of significant tightening in the availability of debt finance.

Estimating levels of net income and return required to meet financing costs

We have then calculated the levels of net income and returns (expressed as return on capital employed, ROCE) needed to finance the total capital investment required, including both debt and equity.

In summary, the UK energy supply industry has earned an average annual net income of c.£4 billion, across the last three years, from 2005-2007. The additional annual net income that

would be required from the new £234 billion of investment is c.£7 billion (calculated as the average across the three years post construction, from 2026-2028).

This equates to an average ROCE of c.12% which is in line with the average ROCE of c.12% achieved by the UK energy supply industry over the last three years.

To provide further context, it is important to make clear that levels of net income and returns will vary over the lifetime of the new assets. In the early years of construction for instance, returns on capital will be lower as investments are made, but for which accompanying revenue has yet to be generated. Equally, in the later years of construction, returns will be higher as investment tails off, the flow of revenue increases, and asset values depreciate. Finally, returns will be highest as the assets reach the end of their useful lives. For this reason, and as an alternative measure, we have also calculated that the additional annual net income that would be required to fund the new £234 billion of investment would be c.£6 billion per year, on average across the total lifetime of the assets. This equates to an average ROCE across the total lifetime of the assets of c.15%.

Given that the assumed incremental tax rate across the energy supply industry (excluding revenues from upstream oil and gas assets) is c.28%, returns on investment need to be sufficient in order to cover the cost of tax as well as the financing cost of equity and debt.

Table 3 below summarises the main results from the study, as described above.

Table 3 - Summary of financial metrics (Source: Ernst & Young)

Annual Metric	Recent three year average for 2005-2007 (real terms)	Future three year average post construction, for 2026-2028 (real terms)
Earnings before Interest and Tax	c.£7bn	c.£14bn
Net income post Tax and Interest	c.£4bn	c.£7bn
Overall pre-tax return (ROCE)	c.12%	c.12%

Conclusions

The industry as a whole will therefore need to consider carefully how it will fund capital expenditure and committed spend on the scale outlined above, given the scale of the investment programme required and its necessity in safeguarding security of supply and delivering UK renewable and climate change targets.

Without sufficient confidence that future returns on new investment will be sufficient to cover financing costs including an adequate return, there is a risk that the UK's energy investment needs will not be met and that investment capital is redeployed to other sectors of the economy and possibly other countries, or other climate change and renewable goals are sacrificed in return for lower risk and lower cost investments in alternative UK energy infrastructure.

The UK's energy supply industry faces a number of challenges including:

- Can the current market structure still deliver this investment and sustain the necessary returns?

- What are the risks of energy companies re-directing investment to other countries, where returns could be superior?

- What contribution should industry and government expect from demand reduction and energy efficiency measures, bearing in mind the need to deploy new investment as cost effectively as possible?

What's clear is that the right balance needs to be struck between the most cost-effective means of reaching the UK's energy sector goals, and ensuring the energy supply industry can deliver these goals through being able to adequately finance the significant levels of investment required to meet them. Ultimately, the energy supply industry will need to play its role in funding the new investment in the most efficient way, for example through optimising financing costs, operating expenditure, tax liabilities and capital expenditure programmes.