Energy market investigation

Approach to financial and profitability analysis

8 December 2014

This is one of a series of consultative working papers which will be published during the course of the investigation. Parties wishing to comment on this paper should send their comments to energymarket@cma.gsi.gov.uk by 24 December 2014.

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Purpose of this paper

1. The purpose of this paper is to set out the Competition and Market Authority's (CMA) proposed approach to assessing the financial performance of the energy sector. We welcome views and comments on this paper. At the end of the paper (Appendix 6) there is a list of specific questions on which we would particularly welcome submissions, but we are also happy to receive comments on other aspects of our proposed approach, or on areas that have been omitted from this paper.

Introduction

2. In the context of our investigation, when reaching a view concerning the functioning of a market, we consider the outcomes of the competitive process in that market: including prices; product quality and range; and levels of innovation. While profitability analysis provides a framework for assessing the level of prices, broader financial analysis can provide insight into the various factors affecting the performance of firms in the market and hence the competitive dynamics of the sector.

3. We do not regard 'excess' profitability in itself to be a problematic feature of the market, but instead a market outcome that provides an indication that competition problems may exist. In other words, excess profitability is one of the possible symptoms of ineffective competition, rather than a cause of ineffective competition. Our profitability findings may be used in the context of determining the scale of the consumer harm or detriment that might arise in the form of higher prices.

4. In this paper we set out the role of financial and profitability analysis in a market investigation and describe our proposed approach. We see this analysis as having three main applications:

   (a) to contribute to an understanding of the various income and cost factors affecting financial performance and trends therein over the period, as well as investment incentives (particularly in generation);

   (b) to answer the question of whether prices have been above competitive levels over the recent past; and

   (c) to help identify which, if any, firms have market power and, if so, in which market segment(s).

5. The paper has four main sections:

(a) **Role of profitability analysis:** discussion of the purpose of profitability analysis in a competition investigation and the factors considered when interpreting the results of this analysis.

(b) **Scope of our analysis:** identification of the firms, business activities and time period of relevance to our assessment.

(c) **Proposed profitability measure and benchmarks:** discussion of the theoretical basis of the adjusted return on capital employed (ROCE) measure, how we will use margins in our analysis and the benchmarks against which we propose to assess profitability.

(d) **Approach to profitability analysis:** discussion of our proposed approach to measuring economic returns and capital employed for each segment of the value chain (generation, trading and supply).

Role of profitability analysis

6. In this section, we discuss the role of profitability analysis in a competition investigation and the factors that we take into account when interpreting the results.

Purpose of profitability analysis

7. Our Guidelines highlight that:

> Firms in a competitive market would generally earn no more than a 'normal' rate of profit—the minimum level of profits required to keep the factors of production in their current use in the long run, ie the rate of return on capital employed for a particular business activity would be equal to the opportunity cost of capital for that activity.[1]

8. The purpose of conducting profitability analysis, therefore, is to understand whether the levels of profitability (and therefore prices) achieved by the firms in the reference markets are consistent with levels we might expect in a competitive market. If excess profits have been sustained over a relatively long time period, this could indicate limitations in the competitive process.

[1] *Guidelines for market investigations: their role, procedures, assessment and remedies (CC3)*, April 2013, paragraph 116.

Interpretation of profitability analysis

9. In interpreting the results of our analysis, we take into account a number of factors. First, our Guidelines recognise that at particular points in time the profitability of some firms may exceed what might be termed the 'normal' level. There could be several reasons for this, including cyclical factors, transitory price or other marketing initiatives, and some firms earning higher profits as a result of past innovation, or superior efficiency.[2] We will consider how these factors affect our interpretation of any observed gap between returns and the cost of capital; and how they affect our interpretation of differences in profitability between firms.

10. On the other hand, our Guidelines highlight that a finding of low profitability does not necessarily signify that competition is working well, since low profitability may be concealing ineffective competition. For example, incumbent firms, despite being protected from new entry, may not earn high profits because they are inefficient and operate with higher costs than would be sustainable with stronger competition in the market.[3] Therefore, in addition to considering whether prices are too high based on out-turn industry costs, we also intend to compare costs across firms (particularly in the supply sector) to understand their relative efficiency.

11. We may be interested in the trend in profits over the period of review as an indicator of improvements or deteriorations in the competitive environment. For example, where profitability has increased over a number of years, this may indicate a worsening of the competitive situation or weakening of competitive pressures in the reference markets. We also propose to analyse the relative profitability of various different segments of the industry. For example, we plan to estimate the profitability of different technologies for energy generation. In particular in analysing the energy sector, we will take into account the effects on revenues and costs of certain policy changes, regulatory interventions (eg Ofgem's 2008 Probe), macroeconomic changes (eg wholesale market price shocks) or other events when evaluating any trends in profitability and the relative profitability of different activities. These changes will serve to provide the context of how we interpret the results of our profitability analysis.

12. A key consideration for our interpretation of profitability will be the extent to which material investment risks have been taken by operators and, where possible, how we expect profitability to evolve in the future as a result of such investments, eg the impact of the introduction of smart meters. In particular,

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[2] *CC3*, paragraph 117.
[3] *CC3*, paragraph 125.

we recognise that our assessment of profitability will be based on historical financial performance, and that there may be a number of market developments which could have an impact on the levels of future profitability. However, the impact of market developments on future levels of profitability in the reference markets will be relevant to our consideration of any interventions we may need to make should we find an adverse effect on competition arising from market features in the reference markets.

13. Finally, to put our profitability assessment into the wider context of our market investigation, in reaching a view about the functioning of the reference markets and identifying any market features that may have an adverse effect on competition, profitability will be only one of the outcomes of the competitive process we will be taking into account, and we will take into account evidence on other market outcomes, including product quality and range; and levels of innovation, as well as our analysis of the evidence on the different market features that might give rise to an adverse effect on competition. Therefore, in the context of our market investigation, we will be considering the evidence on market outcomes in the round, rather than individually on any particular area of analysis.

Scope of our analysis

14. In this section, we set out the scope of our profitability assessment and the relationship with our terms of reference, highlighting which business activities we consider to be relevant, which firms we intend to analyse and the time frame over which we will assess their profitability.

The reference markets and the business activities

15. Our terms of reference define the reference markets as the economic markets for the supply and acquisition of energy in Great Britain (GB), where for this purpose 'energy' means both electricity and gas, and both the wholesale and retail activities are included in the reference (with the exception of retail supply to larger businesses).[4]

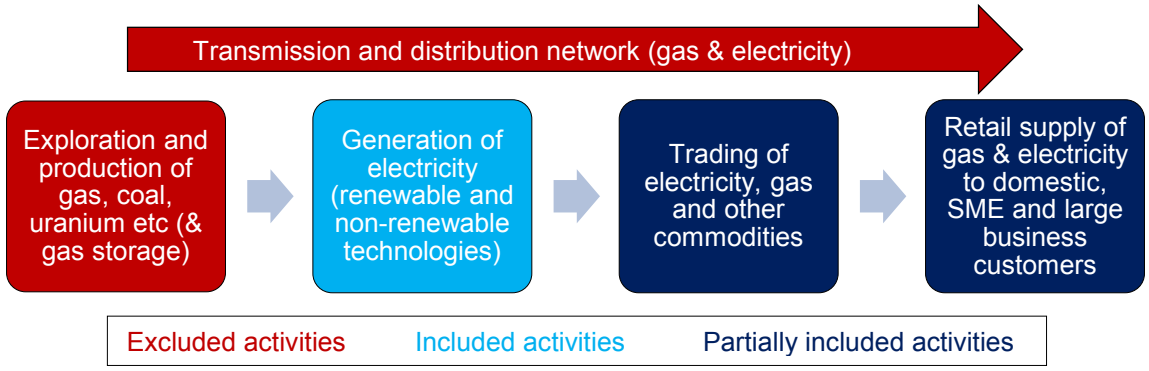
16. Figure 1 shows the various stages of the energy supply chain, from the exploration and production of gas, coal and other inputs, to the supply of gas and electricity to customers. Gas is used both as an input to the production of electricity and as a product which is supplied directly to customers for their use. Gas is supplied to customers via a network of distribution pipelines, while

[4] Ofgem's terms of reference for the CMA's investigation are set out on our webpages.

electricity is supplied via a network of transmission (high voltage) and distribution (lower voltage) lines.

FIGURE 1

Energy supply chain



Source: CMA analysis.

17. Our profitability assessment will focus principally on the business operations engaged in: *(a)* the generation of electricity; and *(b)* the retail supply of electricity and gas to domestic and small and medium-sized business (SME) customers. In the case of retail supply, we propose to focus on the profitability of domestic and SME customers as separate from larger business customers.[5]

18. With respect to trading, we observe that the vertically integrated operators adopt different business models in terms of how they delineate their generation and trading activities (see Appendix 1 for further details of firms' business models). The impact of these different models is that certain activities which are undertaken by 'generation' in one firm are undertaken by 'trading' in another firm. For the purposes of our analysis, it is important that the firms are analysed on a comparable basis where possible.[6] Regardless of the business model adopted, we consider that the optimisation of generation assets and choosing how and when to purchase inputs and sell outputs (both generation and supply), are relevant to our investigation and should be included in our analysis. These activities, as well as the operation of generation assets and

[5] This approach reflects the reference markets set out in paragraph 15. We do not believe that it would be useful to seek to separate electricity generation activities according to whether the output is used by domestic and SME customers or by large businesses as the same asset base is used to produce all output.
[6] Comparability ensures that measured differences in profitability reflect actual differences in performance rather than merely differences in how the information has been presented. We recognise that, in some cases, it will not be possible to collect information that is comparable across firms in all respects. As a result, we set out a number of benchmarks and cross-checks (eg, re-estimating the revenues of generation and the input costs of retail supply using wholesale spot prices) that we plan to undertake to create greater comparability across firms and come to a view on the scale of any differences.

the retail supply of gas and electricity together comprise the 'Relevant Operations' for the purposes of our analysis.

19. Our current view is that the other trading activities undertaken by the vertically integrated firms, such as the trading of various commodities on a proprietary basis, are unlikely to be relevant to our investigation and we are therefore not proposing to look at the profitability of these, either as undertaken by the vertically integrated energy firms or by other intermediary firms who engage in trading activities in the wholesale markets on behalf of other market participants, eg Morgan Stanley or Shell.

20. Where both the retail supply and generation activities are ultimately held under common ownership (ie for a vertically integrated firm), we may also seek to assess the profitability of all the Relevant Operations as a whole.

21. In our assessment of retail energy supply profitability, we may also consider the importance of the income generated from providing ancillary retail products and services, eg boiler repairs and maintenance.

22. We do not propose to conduct a profitability assessment of the following activities:

    (a) **Upstream gas production and storage:** where this activity is also carried out by a vertically integrated energy firm. In our statement of issues (the issues statement), we said that the evidence collected during the assessment leading up to this market reference, suggested that the wholesale gas market in GB did not share the potentially harmful features that were identified in wholesale electricity.[7] Based on this, we do not intend to conduct a profitability of the upstream gas operations. However, where a supplier is vertically integrated in relation to gas production, storage and supply, it is our intention to verify that the pricing of such inputs does not result in any transfer of profits from the Relevant Operations to these upstream activities.[8]

    (b) **Transmission and distribution networks:** where these are owned (or have been owned in the past) and operated by some of the major vertically integrated market participants, these operations are fully ring-fenced from the rest of their operations, and earn a regulated rate of return as determined by Ofgem. We said in our issues statement that we

[7] We also said that the wholesale gas market is connected to other markets through import pipelines and liquefied natural gas import terminals, making it part of a wider international market for gas. Source: issues statement, paragraph 62.
[8] In the first instance, we will seek to check this by comparing input prices for gas across the generation and retail supply businesses to understand whether there are systematic differences between the firms.

were not minded to investigate further the regulation of revenues from transmission and distribution activities, and we do not propose to assess the profitability of transmission and distribution network operations.[9] Instead, we have decided to focus our assessment on the returns generated by those activities where no such form of price regulation is in place.

Identifying the relevant firms

23. Our profitability assessment will focus on the six largest energy suppliers in GB, namely Centrica, E.ON, EDF, RWE, Scottish Power and SSE, each of which has operations that are engaged in the generation of electricity and the retail supply of electricity and gas. In GB, these firms have a combined market share of 90% of the retail supply market in terms of domestic customer account numbers, and around 70% of electricity generation capacity.

24. Of the six largest firms, Centrica and SSE are also engaged in the production and storage of gas, while Scottish Power and SSE also currently own and operate distribution and transmission assets.[10] Our proposed treatment of these two areas of activities is covered in paragraph 22 above.

25. We will compare the profitability of the largest firms' relevant operations with those of the following medium-tier independents:

    (a) Independent generators: Drax, ESB, GDF Suez and Intergen (together, the **'**Mid-tier Generators'); and

    (b) Independent retail energy suppliers: Co-op Energy, First Utility, Ovo Energy and Utility Warehouse (together, the 'Mid-tier Suppliers').

26. Collectively, the Mid-tier Generators account for around 15% of GB electricity generation capacity, while the Mid-tier Suppliers account for just under 10% of the retail electricity and gas supply market in terms of domestic customer account numbers.

The time period under consideration

27. We aim for a time period over which we can examine trends in profitability over a full business cycle, in order to provide a representative picture of profitability which is not unduly distorted by unusual macroeconomic conditions or one-off events.

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[9] Issues statement, paragraph 60.
[10] See Centrica website; SSE website; SP Energy Networks website.

28. In our draft financial information request, we consulted the six largest firms on a ten-year time period over which to conduct our profitability assessment, from 1 January 2004 to 31 December 2013, or their corresponding (or closest matching) financial years (FY), ie FY04 to FY13.

29. However, in determining and agreeing the time period over which to request financial information and ultimately to conduct our profitability assessment, we took into account the ability of, and constraints faced by the energy firms in providing the information to us in the form required for the purpose of our analysis, and:

    (a) for the six largest firms, we decided to request annual financial information covering the seven-year period beginning 1 January 2007 and ending 31 December 2013, or FY07 to FY13 (the 'Relevant Period'); and

    (b) for the Mid-tier Suppliers and Generators, we decided on a shorter five-year time period beginning 1 January 2009 to 31 December 2013, or FY09 to FY13.

30. It is our intention to request from all these firms, their profit and loss (P&L) account and balance sheet information for their Relevant Operations for a further year, ie FY14, as soon as they become available.

31. In addition, in order to obtain an understanding of the performance of the firms and the wider sector over a full economic cycle, we will review other financial, operational and market information relating to the early to mid-2000s where available. We consider that this may be important context for our financial analysis, given that the financial crisis and consequent recession is likely to have affected firms' performance during the Relevant Period.

Proposed profitability measures and benchmarks

Profitability measures

32. There are a number of different ways of measuring profitability. Our Guidelines primarily refer to the rate of return on capital, which can be based on cash flows (truncated internal rate of return (TIRR) or profits (ROCE). However, the Guidelines also highlight that, in situations where capital employed cannot be reliably valued, we may consider alternative measures, such as the return on sales or other relevant financial ratios.[11] When selecting an appropriate measure of profitability, we take into account the nature of the industry and the pattern of investment, as well as the availability of data. For

[11] *CC3*, Annex A, paragraphs 9 & 15.

example, in the case of energy generation, we observe that the capital-intensive nature of the industry means that the most relevant profitability benchmark is likely to be return on capital. In contrast, we recognise that for the retail supply of gas and electricity, there is likely to be some uncertainty over the recognition and measurement of elements of the capital base. As a result, we consider that it is appropriate to take into account a range of profitability measures – not only ROCE – in coming to a view on the financial performance of the relevant firms.

33. When estimating returns on capital, our approach is generally to start with accounting profits and then to make adjustments to arrive at an economically meaningful measure of profitability. Economic profits can differ in important respects from accounting profits, with adjustments most commonly required to the value of capital employed in the business to *(a)* ensure that all assets required for the operation of the business, including intangible assets, are recognised on the balance sheet, and *(b)* the value at which these assets are included in the capital base reflects the current opportunity cost of owning the asset.[12] We observe that, provided that these and a small number of other adjustments are applied to accounting profits to estimate 'economic profits', the TIRR and ROCE approaches to measuring profitability tend to converge.[13] In this investigation, we propose to use ROCE as our main measure of profitability. We set out the theoretical underpinnings of this approach in more detail in Appendix 2.

34. As we discuss in more detail in paragraphs 83 and 84, for the retail supply sector, we will seek to assess financial performance using a number of measures, including return on capital, return on sales and various profit margins (eg gross profit, EBITDA and EBIT margins).[14] An advantage of considering profit margins for retail profitability will be the availability of segment P&L account information, which will enable us to consider the relative profitability of different customer groups, eg by domestic, SME and industrial and commercial customers, as well as further segmental profitability, eg by region or tariff type.

Benchmarks

35. When measuring profitability on the basis of return on capital, we consider the weighted average cost of capital (WACC) to be the appropriate benchmark as this represents the opportunity cost of capital for the relevant activities. We

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[12] *CC3*, Annex A, paragraphs 10 & 11; and *CC3*, paragraph 115.
[13] *The Economic Analysis of Accounting Profitability,* Edwards, Kay & Mayer, 1987.
[14] Where gross profit equals revenues less direct costs; EBITDA means earnings before interest, tax, depreciation and amortisation; and EBIT means earnings before interest and tax.

plan to use the capital asset pricing model (CAPM) to estimate the cost of equity, as we consider that this model has the strongest theoretical under-pinnings, as well as a number of market benchmarks (corporate bond yields) and firm-specific information (actual debt costs) to estimate the cost of debt. We propose to estimate three different WACCs, one for a stand-alone generation business, one for a stand-alone retail supply business and one for a vertically integrated firm. In Appendix 3 we set out our proposed approach to measuring the cost of capital for both generation and retail supply in more detail.

36. While there is no single appropriate benchmark for profit margins, we are currently considering a number of potential comparators against which to assess the profits earned by the retail supply firms. We set out this range of comparators in paragraph 85.

Detailed approach to profitability analysis

37. In order to conduct a separate profitability assessment of each of generation and supply, it is necessary to identify the relevant activities for each segment of the value chain and ensure that the financial information used for the assessment *(a)* reflects these activities on a consistent basis across the firms, and *(b)* reflects the arm's length or market price for any goods or services traded between different segments of the value chain.

38. In this section, we first set out which activities we consider to be relevant for each of generation and supply, and how we propose to deal with potential transfer pricing issues, before explaining how we plan to analyse profitability in each of generation, trading and retail supply. In each case, we highlight the main adjustments to accounting information that we consider will be necessary to ensure that our analysis is economically meaningful.

Relevant activities and business models

39. As noted in paragraph 18 and explained in greater detail in Appendix 1, there are two basic business models adopted by the vertically integrated firms to delineate their generation and trading businesses. Under the 'full-function generator' model, the generation business manages commodity price risk in house and takes all hedging and operating decisions,[15] with the trading arm executing instructions on its behalf. In contrast, the 'toll-generator model', removes commodity price risk from the generation business and places these

[15] Ie, the generation business decides when and how to buy its inputs, sell its electricity output and when to produce. In addition, the full costs of these hedging and operational decisions should be reflected in the financial statements of the generation business.

risks with the trading function, with the trading function deciding when to run the plant.

40. The firms have chosen which business model to adopt based on their view of how best to organise their operations. We consider that there are strengths in each model and do not have a view on which may be optimal from the perspective of running an energy generation and trading business. For the purposes of profitability analysis, these two business models give rise to two potential approaches: one approach would be to categorise asset optimisation as an intrinsic part of the generation business; while the other approach would be to view it as an activity that is logically separate from the ownership and operation of generation assets. For the purposes of ensuring comparability we think it is useful to include asset optimisation within generation. Similarly, we consider that it is logical to analyse retail supply on a basis that captures the full value of operating the business, including the costs and risks of hedging.[16]

41. From the discussions that we have had with the vertically integrated businesses, we understand that it is not possible for all of them to present their financial information on this basis. As a result, we will need to carry out some further analysis in order to obtain a complete view of the profitability of their generation and supply businesses. In paragraphs 67 to 70 (trading profitability) and 71 to 78, we set out how we propose to address this issue.

Transfer pricing

42. In order to assess the financial performance of the separate business divisions of a vertically integrated firm, any inter-company transactions between the various divisions need to be priced on an arm's length basis. If transactions were reflected in the financial statements of the firms on a basis other than arm's length, the results of our analysis would not be meaningful as profits would be transferred from one business division to another.

43. In the energy sector, Ofgem has requested that the vertically integrated firms report their financial results separately for generation and supply for the consolidated segmental statements (CSS). As a result, the firms have told us that they have well established procedures in place to ensure that transactions are priced on an arm's length basis. These procedures have been reviewed by BDO. See Appendix 4 for a summary of the Ofgem-commissioned review of the transfer prices used by the six large vertically

[16] We note that this approach implies that some of the capital that is currently employed by the firms in their trading businesses may need to be reallocated to their generation and supply businesses respectively, such that the capital bases of these businesses reflect all the assets that are required to operate effectively on a stand-alone basis. Our current view is that collateral for trading and risk capital are particularly relevant in this context.

integrated firms. We will consider the scope for transfer pricing to distort the profits reported in generation, trading and supply as we carry out our analysis. In particular, we consider that the scenario analysis that we are proposing to undertake using wholesale spot prices to restate revenues and costs (see paragraphs 100 to 102) should provide an interesting comparison in this respect.

Generation profitability

44. As set out in paragraph 32, we propose to analyse the profitability of the firms' generation activities using ROCE. We consider that the main issue that arises in implementing this approach is obtaining an economically meaningful valuation of the generation assets employed by the firms. In this section, we focus on our proposed approach to valuing these assets. We note that a generation business operating on a stand-alone basis may also need collateral to support its trading activities (assuming that it did not sell all its output on the spot market) and may require a certain level of risk capital. We explain our approach to collateral in paragraphs 72 to 77 and our approach to risk capital in paragraphs 77 to 81.

45. In addition to measuring the profitability of the firms' generation businesses overall, we will also seek to understand the profitability of each type of generation technology (ie nuclear, coal, combined cycle gas turbine (CCGT), wind). We observe that a variety of factors are likely to have affected profitability over the relevant period, including the imposition of a carbon tax, changes in the (relative and absolute) prices levels of coal and gas and a reduction in demand, and that these factors are likely to have had a different impact on the profitability of each generation technology. For example, where CCGT is the marginal plant, the imposition of a carbon tax is likely to increase the profitability of nuclear plants and reduce the profitability of coal plants.

46. We will supplement our assessment of the six vertically integrated firms by comparing their profitability with those of the Mid-tier Generators. In interpreting the results of our analysis, we will take into account a number of factors, including the long lives of generation assets. This means that *(a)* our period of review will only provide a view of the returns made on the assets over a part of their lifetimes; and *(b)* at any given time, a proportion of the assets employed in the industry may represent obsolete technology.

Valuation of generation assets

47. One of the aims of our assessment of profitability is to determine whether prices have been above competitive levels over the recent past. One way to approach this is to consider whether a hypothetical new entrant could have

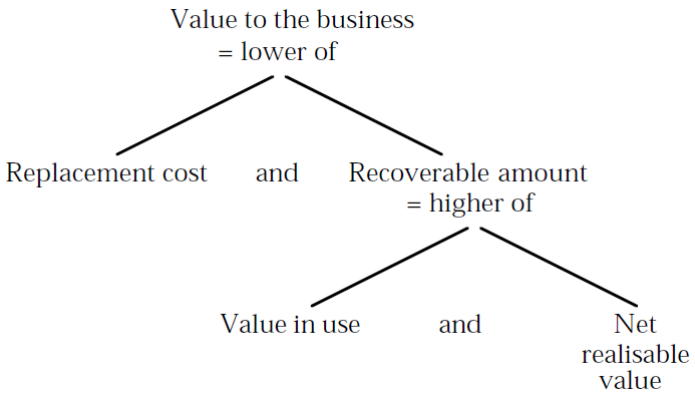
priced below incumbent suppliers (assuming no barriers to entry). Hence we are interested in a measure of current value of capital employed, as a proxy for the cost facing a new entrant.

48. This current value may be similar to accounting book values for newly constructed assets but wide gaps may emerge over time due to inflation and technological change.

49. The current value of an asset can often be seen as the cost to replace it with an asset of similar capacity and condition (variously known as 'replacement cost' or 'modern equivalent asset (MEA) value'). However, where replacing the asset would not be economically viable the current value will be lower, reflecting the net realisable value or the value in use (whichever is the higher of the two).These valuation options are set out in the diagram below.

FIGURE 2

Establishing which valuation basis for an asset gives its value to the business



Source: UK Accounting Standards Board, Statement of Principles, 1999.

50. In recent years, the value of various generation assets has varied significantly for a number of reasons, including: *(a)* the financial crisis and drop in demand; *(b)* changing relative input prices of coal and gas; and *(c)* the imposition of stricter environmental standards. These changes have resulted in *(a)* plants moving up and down the merit order, with a consequent impact on profitability; and *(b)* firms being forced to choose between upgrading and closing or moth-balling plants depending on the relative economics of each option. In some cases we understand that generators have recorded significant impairment losses against the original value of some of their generation assets.

51. As a starting point, we consider that the most appropriate valuation approach is to estimate the depreciated replacement cost of the MEA for each plant in operation over the Relevant Period. Although we recognise that certain plants may have had a lower value to their owners, and should therefore (according

to the approach set out above) be valued at their value in use, we do not believe that these lower values provide an appropriate measure of capital employed for a competition investigation. This is because the value in use of an asset is estimated by forecasting the future cash flows the firm expects to generate from operating that asset and discounting them at the firm's cost of capital. As a result, if the firm's expectations are fulfilled, the asset will by definition earn a return equal to its cost of capital.[17] This result is circular.

52. Where assets have been impaired over the period due to physical wear and tear, we propose to reflect these losses of value against the replacement cost in both the P&L and balance sheets of the firms. However, where assets have been impaired due, for example, to decreased utilisation as the result of falling demand or a change in the merit order, we will consider these losses separately from the overall operational returns on the assets.

53. In the following paragraphs we set out our proposed approach for each of the main technologies employed in generating electricity in greater detail.

CCGTs

54. We propose to estimate the MEA value of the CCGTs that were used to generate electricity over the Relevant Period using *(a)* information on the build cost of recently constructed CCGTs (from firms' financial information) and *(b)* DECC/Parsons Brinckerhoff data on typical build costs. We expect to use a reasonably narrow range of cost estimates, representing the typical costs of constructing a plant. We will apply depreciation to these replacement values to reflect the age of the assets at the start of the period, based on their expected useful economic lives.[18]

55. We recognise that there will be differences in efficiency between the most recently constructed CCGTs and those that were built in the 1990s and early 2000s. In the first instance, we propose to examine the extent of differences in levels of efficiency to assess whether making adjustments to the asset values to reflect these differences will have a material impact on our results.

Wind (onshore & offshore)

56. As for CCGTs, we propose to estimate the MEA value of the onshore and offshore wind farms owned and operated by the six largest energy firms using *(a)* information on the build cost of recently constructed wind farms (from

[17] If the firm manages to earn a higher return than it expected when it estimated the value in use, it is not clear whether this indicates a competition problem or whether the value in use was just too low. Therefore we consider that the replacement cost offers a more reliable valuation benchmark.
[18] We have requested this information from the six largest energy firms.

firms' financial information); and *(b)* DECC/Parsons Brinckerhoff data on typical build costs. We will apply depreciation to these replacement values to reflect the age of the assets at the start of the period, based on their expected useful economic lives.

57. We note that several of the larger offshore wind farms have been recently constructed and therefore may only show returns for a year or two of the Relevant Period. This is likely to limit the extent to which we can draw conclusions regarding their financial performance.

Coal

58. The GB fleet of coal-fired power stations was largely constructed in the 1960s and 1970s. Our current understanding of the industry suggests that an entrant to the generation sector during the Relevant Period would not have sought to build a coal station due to the relative capital costs of doing so (compared with the costs of building a CCGT) and the various environmental regulations and taxes that have been imposed in recent years with the aim of reducing the carbon intensity of energy generation. Indeed, a number of these assets were either closed during the period, or are expected to close by 2015 due to various environmental regulations. A few plants are expected to remain in use until the early 2020s. There are several implications of this situation for our profitability analysis, including:

    (a) The profitability of (old) coal assets is unlikely to provide a reliable indication as to the returns generation businesses can expect to make in the future.

    (b) A new entrant would have used a different technology which may have had significantly different returns.

    (c) As the coal assets are very close to the end of their useful economic lives, their capital value will be heavily depreciated and therefore relatively low, regardless of the valuation approach adopted.

59. Our current view is that the most appropriate approach to valuing the coal-fired power stations is to assume that all coal assets would have been replaced with CCGTs over the period and hence value the coal plants on the basis of the replacement cost of CCGTs. We will then apply a suitable level of depreciation to reflect the age of the assets.

60. In conducting this analysis, we are aware that CCGTs and coal-fired stations have different operating costs, in particular due to the price of coal relative to gas and the efficiency with which fuel is converted into electricity. For the majority of the Relevant Period, the costs of operating a coal-fired power

station were lower than the costs of operating a CCGT plant. As a result, a firm entering the industry with a CCGT plant at the beginning of the period would have made lower profits than the firms operating the existing coal fleet did in fact make over that period. As we discuss in paragraph 51, for the purposes of a competition assessment, we consider the level of return earned on the MEA to be the appropriate benchmark. Therefore, we will seek to adjust either operating profits or the capital values of the replacement asset to reflect the differential operating costs of CCGTs and coal. We believe that one approach to making this adjustment would be to use the output of our economic model of plant-specific marginal costs. We invite interested parties to make submissions on this approach and/or suggest alternate means of making these adjustments.[19]

61. In addition to the MEA value approach, we consider that it would also be useful to calculate ROCE based on actual profits and the carrying value of the coal-fired power stations in the firms' accounts. We observe that coal assets have been impaired over the Relevant Period due to the introduction of various environmental regulations, such as the Large Combustion Plant Directive (LCPD) and the Industrial Emissions Directive. On impairment, firms are required to write assets down to their recoverable amount, which will generally reflect their value in use (or fair value, if higher than value in use). Therefore, this approach should indicate the returns made by the generators on the deprival value of the assets. (Although, as explained in paragraph 51, we consider this measure of capital to be less relevant for a competition assessment).

Nuclear

62. The GB fleet of nuclear power stations was largely built in the 1970s and 1980s, with the large majority of this fleet (eight out of nine stations) expected to close by 2023.[20] Our current view is that a new entrant wishing to provide base load electricity over the Relevant Period would have chosen between constructing a new nuclear power station (using significantly different technology to the existing fleet) or building a CCGT. As in the case of coal, therefore, this implies that:

[19] When estimating the MEA value of assets, it is usually the case that the modern equivalent asset is more efficient than the asset being valued, ie has lower running costs per unit of output, such that the MEA value is reduced to reflect the lower efficiency of the existing asset. However, in the electricity generation market over a reasonable proportion of the Relevant Period, coal assets have been cheaper to operate than CCGT, putting them higher up the merit order. Logically, this would imply that the MEA value of coal plants should be somewhat inflated vis-à-vis a similarly aged CCGT.
[20] See EDF website.

(a) the profitability of the nuclear assets is unlikely to provide insight into the returns generation businesses can expect to make in the future, particularly since the planned new nuclear plant(s) will operate with the benefit of a contract for difference (CFD) which guarantees the price received; and

(b) a new entrant may have used a very different technology with significantly different returns.

We will take these issues into account when interpreting the results of our profitability analysis.

63. We propose to analyse the profitability of nuclear assets on three different bases. The first is to use a variety of benchmarks to estimate the cost of constructing a new nuclear power station (as the MEA) and apply depreciation according to the age and expected useful economic life of the existing assets. Our current view is that potential sources of information on the costs of building a new nuclear power station include the DECC/Parsons Brinckerhoff dataset, the forecast build-cost of Hinkley Point C and any available information on the costs of recently built nuclear power stations elsewhere in the world. We invite interested parties to provide information on any additional/ alternative sources of nuclear build costs and/or to provide views on the sources set out here.

64. The second is to value the nuclear power stations on the basis of the cost of building CCGTs with the same level of productive capacity, applying a suitable level of depreciation. We would then seek to adjust these asset values to reflect the fact that the marginal cost of producing power with CCGTs would be substantially higher than for the existing nuclear fleet (see paragraph 60).

65. The third approach is to use the carrying value of the existing assets.[21] EDF told us that, on acquisition of the assets from British Energy, it valued them on a DCF basis for the purposes of its accounts. We consider, therefore, that this carrying value represents a reasonable approximation of their value in use. Although this approach suffers from the potential circularity issue highlighted in paragraph 51, we consider that it would be a useful supplement to the other two approaches.

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[21] Our current view is that, in conducting this analysis, we should use two scenarios: *(a)* estimating returns based on the value of the assets in the financial statements of the subsidiary which is controlled by EDF; and *(b)* estimating returns based on the value of the assets controlled by EDF plus the estimated costs of decommissioning the power stations. These latter costs remain with the Nuclear Decommissioning Authority but are relevant to the overall returns earned on nuclear assets (effectively a government subsidy).

Other generation assets

66. Our approach for other generation assets, such as open-cycle gas turbines (OCGTs), will reflect the principles that we have set out in this section. We do not propose to estimate MEA values for relatively minor categories of assets such as pumped storage or hydroelectric plants.

Trading profitability

67. Each of the large vertically integrated firms operates a centralised Trading function. We have categorised the activities which may be undertaken by this function as:

    (a) providing wholesale market access for other group businesses;

    (b) market-making with third parties; and

    (c) trading for value.

    Our understanding of each of these activities and of trading operations more generally can be found in Appendix 5.

68. Our preliminary view of the relevance of the above activities to our analysis of trading profits is as follows:

    (a) We believe that the profits/losses generated by Trading from providing wholesale market access services to group businesses, namely Supply and Generation, are relevant. These profits/losses are generated mainly through fees (including premiums added to market prices) that are paid by Supply and Generation for providing this market access.

    (b) As explained in paragraph 40, for the purposes of our profitability analysis, we consider that generation optimisation (often called an 'internal toll') is in substance a Generation (rather than Trading) activity. This activity is a trading for value strategy, which involves an internal transaction between Generation and Trading. We aim to include the results of this activity within our Generation profitability analysis and exclude the results from any analysis of trading profits.

    (c) Profits/losses from the following activities are not likely to be relevant to our analysis because they do not form part of the energy value chain:

        (i) trading for value (with the exception of Generation asset optimisation discussed in *(b)* above); and

        (ii) market-making with third parties.

However, we are interested in understanding the scale of profits relative to other trading activity.

69. In order to complete our analysis we will want to understand the extent to which trading profits or losses are generated by the different activities which we describe above.

70. The large vertically integrated firms use a number of metrics such as ROCE, return on risk capital and margins to measure the performance of their Trading functions. Our preliminary view is not to conduct a full profitability analysis on Trading as it contains elements that we think are outside our area of interest.

71. Instead, we aim to understand the key drivers of performance and Trading's scale relative to Generation and Supply for each of the large vertically integrated firms. In addition, for those firms which operate an internal tolling model, part of Generation profitability will sit within Trading (see paragraph 40). As part of our analysis we will seek to understand how large this is and allocate it to Generation. Overall our analysis will allow us to form a view on the scale of profits from different trading activities and their materiality relative to Generation and Supply. This will be done separately for each of the large vertically integrated firms.

Collateral and contingent capital

72. A business trading in wholesale energy markets may be required to post collateral with its counterparty in a trade. This offers the counterparty protection against the risk that the business defaults on a contract.[22]

73. Collateral is comprised of two parts: initial margin and variation margin. Initial margin is posted when entering a trade. Its size depends on various factors such as the creditworthiness of the counterparty entering the trade and the expected duration of the contract. Variation margin is additional margin that may be required due to subsequent price (mark-to-market) changes to the commodity being traded. For example, if, due to price movements, a supplier has agreed to pay a price above the current market price of a commodity, a counterparty is likely to demand additional collateral protection (variation margin) on that trade.

[22] Collateral takes various forms: cash, a letter of credit or a parent company guarantee (PCG) or other liquid securities. Cash is the most 'expensive' form of collateral because it requires a cash payment into an escrow account; PCG is least expensive since it requires no payment (although the existence of PCGs may reduce a firm's ability to borrow). Therefore, liquidity is one of the most desired features of collateral. Additionally, the creditworthiness of the counterparty, the length of the trade and the expected volatility of the commodity are important determinants of the amount of collateral.

74. An independent generator or supplier is likely to need to post some collateral in order to participate in traded wholesale markets. However, a firm with a good credit rating and trading history is likely to be able to post significantly less expensive forms of collateral, for example a PCG rather than cash or liquid securities.

75. The variation margin requirement of contracts will vary according to future commodity prices. In a benign commodity price environment there may be little change in variation margin. However, in a volatile commodity price environment variation margin requirements could increase materially. An independent supplier or generator may therefore want to have access to a buffer so that it can meet possible increases in variation margin caused by certain commodity price changes (for example, a step change in electricity or gas prices). This buffer is termed contingent capital.

76. Contingent capital might take the form of committed lending facilities from a bank, or a PCG, both of which would be relatively inexpensive to fund. The availability of such facilities will be driven by the creditworthiness of the independent supplier or generator. An alternative, but more expensive form of contingent capital would be holding cash or liquid securities.

77. In our profitability assessment we will want, in the first instance, to understand the level of collateral that the vertically integrated firms currently hold against the trading activities of their generation and supply businesses.[23] We will also seek to understand the amount of collateral held by the Mid-Tier Suppliers or, where relevant, the alternative arrangements they make in order to avoid posting collateral. Second, based on this information on actual collateral balances and taking into account the views and submissions of various firms active in energy trading, we propose to consider the level of collateral and/or contingent capital that an independent generator or supplier with operations of a similar scale to the six largest firms would need to post. To the extent that this is required we will need to recognise this within the capital employed of generation and supply. We invite submissions on the extent of the collateral and contingent capital needs of independent generators and suppliers. In particular, we invite parties to make submissions on how collateral and contingent capital requirements could be expected to change as an independent supplier increased in size from the level of existing Mid-Tier Suppliers towards the size of the six largest retail suppliers.

[23] This should exclude any collateral held for trading activities that are outside the scope of our investigation, such as proprietary trading that is not linked to the energy supply chain.

Risk capital

78. A supply business, which has agreed to supply customers at a fixed retail price (or at a variable retail price which it cannot change quickly) is exposed to volumetric risk. That is, the risk that it has contracted to buy in advance an amount of energy which subsequently proves to be either too much or too little.

79. This might occur due to inaccurate forecasting of future customer numbers, for example due to higher customer losses than expected. It might also occur if climatic conditions are different from those forecast. For example, a particularly cold winter may mean that a supplier has not contracted sufficient gas volumes for its customer base and it will be required to purchase these additional volumes, often at a high price.

80. A supply business may wish to hold risk capital to cover such an eventuality. This may take the same form as the capital described above in paragraph 76. We will want to assess the extent to which risk capital might be required for an independent supply (or generation) business. As part of our analysis we will want to understand the amount, types and quality of risk capital required by both independents and large vertically integrated firms. This will also enable us to better understand the appropriate level of risk capital that a large stand-alone supplier might need. As part of this analysis we may want to establish upper and lower bounds for risk capital.

81. We observe that, in theory, a stand-alone generation business may also require risk capital to provide protection against a situation in which it was not able to deliver the level of power it had contracted to sell; for example due to a plant failure. We invite parties to comment on whether these risks can be addressed via the purchase of insurance or whether additional risk capital is, in fact, required for a generation business.

Retail profitability

82. As for generation, we will seek to assess profitability of retail supply on the basis that the supplier operates in a stand-alone manner, assuming the full costs and risks associated with purchasing its gas and electricity inputs according to the hedging strategy chosen by the firm over the Relevant Period. We will also consider any ancillary retail activities, where we consider these to be relevant to our consideration of retail supply profitability. In addition, we will seek to understand the profitability of different customer groups within the Supply Business, eg domestic and SME customers, as well as domestic customers by region or tariff type (where information is available).

83. As discussed above we are planning to measure profitability using both ROCE and profit margins for the supply business. Several firms have highlighted to us that, in the retail supply business, the level of capital recorded on the firms' balance sheets may not reflect the actual level of capital that a firm would need to employ in order to operate in this sector. Therefore, it will be necessary for us to conduct a careful evaluation of the actual capital required by retail suppliers to operate effectively. We will seek evidence on this from both the large, vertically integrated firms and the Mid-tier Suppliers.

Margin analysis

84. Profit margins will be expressed as a ratio, specifically profit or earnings as a percentage of sales or revenue. Margin analysis will allow us to judge, over time, the management's ability to manage costs and expenses and to generate profits. We propose to analyse the following margins:

(a) gross margins ((revenues – direct costs) / revenues);

(b) earnings before interest and tax (EBIT) margins ((revenues – direct costs – selling, general & administrative (SG&A) costs) / revenues); and

(c) earnings before interest, tax, depreciation and amortisation (EBITDA) margins ((EBIT + depreciation and amortisation (D&A) costs) / revenues).

85. We propose to assess the competitive benchmark for profit margins on a predominantly empirical basis, and we will consider a range of comparators including:

(a) precedent regulatory decisions concerning retail energy pricing both in GB before market liberalisation and other international jurisdictions (although we acknowledge the limitations of differences in other regulatory and tax regimes which may reduce their comparability with GB);

(b) returns generated in comparable retail or utility sectors, if appropriate, where we will take into account differences in the operational leverage, asset intensity, competitive environment, and commodity risks, in determining the extent to which the sector is comparable with retail energy supply; and

(c) return on sales generated by the Mid-tier Suppliers. At this stage, given the relatively higher growth in the customer base of the Mid-tier Suppliers over the Relevant Period compared with the six largest firms, a direct comparison of their EBITDA or EBIT margins with those of the six largest firms may be distorted by differences in the relative size of their customer acquisition costs (as a proportion of total indirect or operating costs). We

will therefore consider the gross margins (which exclude customer acquisition costs) of the Mid-tier Suppliers as one possible comparator for the gross margins of the six largest firms.

86. When analysing margins we will look to compare a supplier's level of profitability to its competitors and to industry benchmarks. We will look into margins by region (geographical regions across GB) and by segment (customer and tariff type) for the Supply Business of the six largest firms as well as the independent Mid-tier Suppliers. The purpose of the segmental analysis is to assess whether certain types of customers, due to their choice of tariff or their categorisation (eg domestic vs non-domestic), might be more profitable than others; and whether certain geographical regions are more competitive than others across GB.

87. As part of our review of the P&L account information of the retail supply business, we will be looking to make any appropriate adjustments to increase the comparability of our profit margin calculations across the different retail energy suppliers. For example, as we discuss in more detail later when discussing our proposed ROCE analysis in retail supply, one such adjustment to EBIT we are currently considering is the capitalisation of customer acquisition costs (see paragraph 93).

88. As part of our margin assessment, we will also be interested in the trend in profit margins as an indicator of changes in the competitive environment. For example, a situation where the profit margins of suppliers representing a significant part of the market have increased over a number of years may indicate a worsening of the competitive situation. If so, this could indicate barriers to entry, or other sources of incumbency advantage, which prevent smaller suppliers entering the market with competing offers.

Efficiency analysis

89. As part of our assessment of retail profitability, we will also take into account the impact on profitability of different levels of cost efficiency. For the purposes of our cost-efficiency assessment of the supply business, we will look at the levels of indirect costs reported to us by the six largest firms. These costs largely represent the supply business's costs of servicing customers, eg billing and customer service, and are the costs that are deducted from the gross profit to get to EBIT. Indirect costs are, to a large degree, controllable by the supply business, and therefore an appropriate area of focus for our efficiency assessment. We propose to look at these costs against a suitable metric such as per customer or per account to enable a comparison of their indirect costs, and relative levels of cost efficiency.

Recognition and valuation of capital employed in retail supply

90. From our initial review of the financial statements and discussions with the six largest retail suppliers, we understand that the balance sheets of these firms may not provide an economically meaningful measure of the capital they employ. In this section, we discuss the main categories of assets, both tangible and intangible, which we consider to be necessary and set out our initial views on how they should be valued. We invite interested parties to provide comments on both the extent to which these (and any other assets) should be recognised in the capital base of the firms and the approach that we should take to valuing those assets.

Treatment of intangible assets

91. Intangible assets are non-physical non-monetary assets that are typically not recorded on the balance sheet. They comprise items such as patents and know-how, and are often internally generated.[24]

92. Where a business has spent money in the past to create an intangible asset that will generate a stream of revenue in the future, it may be important to recognise that expenditure in evaluating profitability. We typically seek to recognise intangibles where the following criteria are met:[25]

(a) it must comprise a cost that has been incurred primarily to obtain earnings in the future;

(b) this cost must be additional to costs necessarily incurred at the time in running the business; and

(c) it must be identifiable as creating such an asset separate from any arising from the general running of the business.

93. In the energy supply sector, we consider that the customer base is likely to represent a relevant intangible asset. We invite submissions on any other categories of intangible assets that would meet these criteria.

94. The principle for valuing intangible assets is the same as for tangible assets: we measure them at replacement cost and amortise them on a straight line basis over their useful lives (unless the asset has an indefinite useful life, in which case it is not amortised). For customer base/customer lists, the useful life can be the average period that customers remain 'sticky' once they switch suppliers. In the retail supply of energy, we note that there may be two broad

[24] Purchased intangibles are more likely to be recognised on a company's balance sheet.
[25] *CC3,* Annex A,

types of customers to consider: ‘switchers’ and ‘sticky’ customers. We would expect it (as a point of fact) to be relatively straightforward to measure both the acquisition cost and the average ‘lifetime’ of the former. However, for sticky customers, we recognise that measurement of lifetime and acquisition cost is more problematic. In our analysis, we are concerned to avoid the capitalisation of the future profits that may be earned from customers that do not switch suppliers, as this would introduce circularity. Therefore, we propose, at least for one scenario, to value (and amortise) all customers as if they were ‘switchers’. We invite submissions on alternative means of valuing sticky customers, taking into account the need to avoid circularity in the analysis.

Recognition of collateral, contingent and risk capital

95. As explained in paragraphs 72 to 77, we propose to estimate the quantity of collateral and/or contingent capital that a stand-alone supply business would require in order to support its reasonable trading activities and include this in the capital base of the supply businesses. In addition, we will consider adjusting the capital employed upwards for the relevant amount of trading, network, balancing and metering collateral[26] that the firms need to hold in order to operate. Under this category we will consider on one hand the collateral that must be posted at a given time and the capital that companies need to hold in reserves to cover margins if wholesale prices drop unexpectedly.

96. Similarly, we will want to assess the extent to which risk capital might be required for an independent supply business. (See paragraphs 78 to 81 for a more detailed discussion of risk capital.)

Working capital: accounting for the effects of growth and seasonality

97. Calculating a capital employed figure based on a firm’s balance sheet information at its financial year end may not be reflective or representative of the capital that was employed to generate the associated returns during the year. This is particularly an issue where, for example, a firm faces significant swings in working capital during the year such that the net working capital position is not representative of the working capital employed by the business during the year (eg due to seasonality or large intra-month peaks and

[26] Trading collateral needs to be posted with trading counterparties to cover the losses to the counterparty if the supplier defaults on that trade. Network, balancing and metering collateral is required to cover indebtedness to network and metering companies when charges are paid after they are incurred and therefore collateral must be provided based on estimates, as well as in relation to trading on the balancing mechanism.

troughs), or if the firm has experienced significant growth or contraction during the year.

98. We will therefore take into account the average capital employed, measured at two (or more) different points throughout the year. Taking into account an average capital employed is crucial with growing businesses and it would make comparisons between the vertically integrated firms (mature businesses) and Mid-tier Suppliers (growing businesses) more relevant.

Profitability of the whole value chain

99. While we are principally interested in the profitability of each element of the energy value chain on a stand-alone basis, we may also seek to understand the profitability of the large, vertically integrated firms across the full value chain, ie generation, (relevant) trading activities, and supply. We will consider the extent to which the profitability of the generation and supply businesses within a vertically integrated firm move together or in opposite directions.

Scenario analysis

Generation

100. We observe that the profitability of firms' generation activities will depend on a number of factors, including the wholesale prices achieved for electricity, the operational efficiency of the plants and the prices paid for inputs. In addition, the profits recorded within the generation business P&Ls may depend on the business model operated by the firm and the extent to which the prices (both input and output) achieved by the trading business are transferred through into the generation business. Therefore, in order to understand the relative impacts of input prices, operational efficiency and output prices on the profitability of the firms, we propose to recalculate revenues based on the actual volumes generated in each half-hour period and spot market prices. In addition, we will compare average fuel input costs across operators in each year of the period to understand the impact of these on generation profitability.

101. By comparing actual profits with those adjusted for wholesale prices/input costs, we will also be able to identify the impact on generation of the trading activities undertaken by the firm over the period.

Supply

102. We observe that the profitability of retail suppliers is likely to vary as the result of, inter alia, different wholesale input costs (ie some firms will have

purchased gas and electricity more cheaply than others or adopted different hedging strategies), the relative efficiency of operations, the level of prices achieved from customers, and the customer mix. In order to understand the relative impacts of input prices and the operational efficiency of the retail suppliers, we propose to recalculate wholesale gas and electricity input costs for the six largest firms based on actual volumes used and spot market prices over the Relevant Period. By comparing actual profits with these adjusted profits, we will also be able to identify the impact on supply of the trading activities undertaken by these firms over the period.

Appendix 1: Business models (tolling)/hedging

1. The six vertically integrated firms adopt different business models to delineate generation and trading businesses, which can have a significant effect on the amount of risk faced by the generation business and the trading business.[1]

2. In essence, a 'toll-generator model' removes commodity price risk from the generator and places these risks with the trading function; and the trading function decides when to run the plant. A 'full function generator' manages commodity price risk in-house and takes all hedging and operating decisions, with the trading arm executing instructions on its behalf.

3. Table 1 below spells out the key aspects of the two models in further detail.

4. The revenues and costs of toll generation are not comparable to those of full service generators, since the fuel costs are typically not recorded on the toll generators P&L and the revenue line is significantly lower as a result.

[1] In practice the distinction between the full-service and toll-generator business models are not as sharp as portrayed in the table as some of the Big 6 do a combination of the two and/or specify the respective responsibilities between for generation and trading somewhere in between the two.

TABLE 1 **Key aspects of the full function generator and toll generator business models**

Aspect	*Business*	*Full-function generator*	*Toll generator*
Activities	Generation	• Constructs & maintains power plant • Decides when it is worthwhile to run plant • Buys fuel • Produces electricity • Sells electricity	• Constructs & maintains power plant • Sells an option • Produces electricity as instructed • Charges a usage fee for electricity produced
	Trading	• Executes the transaction of buying fuel and selling electricity as instructed	• Pays option fee • Decides when it is worthwhile to run plant • Buys fuel • Incurs usage fees • Sells electricity
Turnover represents	Generation	The sale of electricity	The sale of an option over the capacity of the power plant (a fixed fee) plus usage fees that vary with the volume of electricity produced
Margin represents	Trading	Brokerage fees for providing a dealing service ie acting as an agent for Generation	Gross margin is the revenue from the sale of electricity less the cost of fuel needed to produce it. Net margin is gross margin less option and usage fees.
Main operational risks	Generation	• commodity prices move unexpectedly (it might not be worthwhile to run your plant or not as worthwhile as you thought it would be) • plant breakdowns • (you cannot run your plant even if it is worthwhile to do so)	• plant breakdowns (you pay a penalty to the owner of the option)
	Trading	• none (trades on an execution-only basis in the market place)	• commodity prices move unexpectedly (it might not be as often worthwhile to instruct the plant to run as you envisaged when negotiating the option contract, or, when it is worthwhile running the plant, it is not as worthwhile as you envisaged)
Volatility of profitability (with economic cycle)	Generation	High	Low to medium
	Trading	Low	Medium to high
	Combined	Weighted average of above (same as for toll generator)	Weighted average of above (same as full function generator)

Source: CMA analysis.

Appendix 2: Financial information: basis of preparation principles

1. In the paragraphs below we set out the theoretical underpinning to the ROCE approach that we plan to adopt when analysing profitability.

Edwards, Kay and Mayer

2. The ROCE approach is grounded in the CMA's Guidelines which in turn refer to the analysis of Edwards, Kay and Mayer (1987) (EKM),[1] particularly Chapter 4, section 4.4 onwards. EKM discuss the application of their approach to the identification of monopoly power.[2] They demonstrate that a particular measure of the ex post accounting rate of return (ARR), which we call ROCE, is suitable for comparison with the cost of capital, for this purpose. However, they stress the importance of separating monopoly profits from the consequences of unfulfilled expectations (of which impairment losses are an example). They also acknowledge other measurement difficulties.

3. EKM's ARR is based upon two critical accounting conventions. First, all assets (and, where relevant, liabilities) are measured on a value to the owner basis (often referred to as deprival value or value to the business) in the balance sheet. Second, all gains and losses recorded in the balance sheet (other than transactions with owners, such as dividend payments) are included in the profit measure. Thus, the income measure is 'comprehensive income' and the income statement ties in with the balance sheet, the income in the former reconciling with the change in net assets in the latter.

4. The balance sheet comprising all assets deployed in the business less liabilities incurred should be complete. Assets are defined as rights or other access to future economic benefits controlled by an entity as a result of past transactions or events. Liabilities are obligations of an entity to transfer economic benefits as a result of past transactions or events.[3] From the perspective of a new entrant assets would also need to be able to be purchased separately from purchasing the business as a whole, ie only the separable assets are relevant here. The only possible exception to this approach would relate to the start-up costs[4] inevitably incurred by a new entrant. To the extent that these costs need to be recovered over future periods, they create an inseparable intangible asset, the cost of which would need to be recovered over future periods.

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[1] *The Economic Analysis of Accounting Profitability (1987)*, Jeremy Edwards, J A Kay, Colin P Mayer.
[2] See EKM, pp58 & 59.
[3] As defined in the *Statement of Principles for Financial Reporting (1999)*, UK Accounting Standards Board.
[4] Examples of these costs relate to assembling and training a workforce, devising working practices, and possibly a commissioning period when a plant is below full capacity.

Use of economic costs determined on basis of an asset's value to its owner

5. We are interested in economic (or continuing) costs. Economic costs[5] are the costs of resources used at a price they would be traded at in a highly competitive market, where entry to and exit from the market is easy. Here the value of resources consumed and assets utilised should reflect their current value to the business, not their historical cost or a restated amount reflecting an historical revaluation.

Measurement basis for valuation of assets[6]

6. The current value of an asset could be determined by reference to entry value (replacement cost), exit value (net realisable value) or value in use (discounted present value of the cash flows expected from continuing use and ultimate sale by the present owner). For some assets (for example, investments in actively traded securities), these three alternative measures of current value produce very similar amounts, with only small differences due to transaction costs. However, for other assets (for example, fixed assets specific to the business), differences between the alternative measures can be material.

7. Assets utilised should reflect their current value to the business, which is the loss the entity would suffer if it were deprived of the asset involved. That measure, which is also referred to as the deprival value, or value to the owner, will depend on the circumstances involved.

8. In most cases, as the entity will be putting the asset to profitable use within its current operations, the asset's value in its most profitable use (in other words, its recoverable amount) will exceed its replacement cost. In such circumstances, the entity will, if deprived of the asset, replace it, and the current value of the asset will be its current replacement cost.

9. An asset will not be replaced if the cost of replacing it exceeds its recoverable amount. In such circumstances, the asset's current value is that recoverable amount:

   (a) When the most profitable use of an asset is to sell it, the asset's recoverable amount will be the amount that can be obtained by selling it, net of selling expenses; in other words, its net realisable value (NRV).

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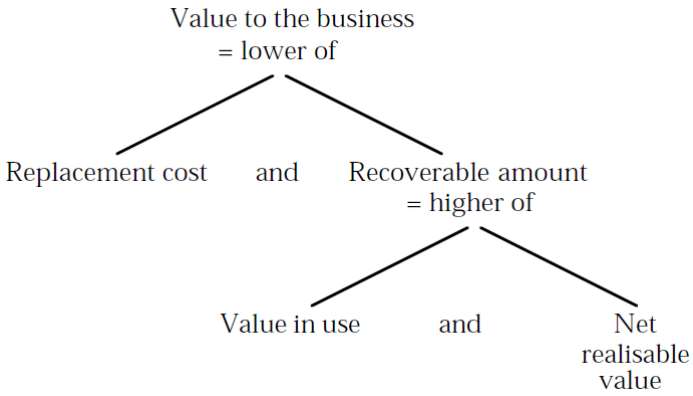
[5] The Byatt Report, volume 1, p5.
[6] The following paragraphs draw heavily on the 'Alternative Measures of Current Value' section within the *Statement of Principles for Financial Reporting (1999)*, UK Accounting Standards Board, paragraphs 6.6–6.9.

(b) When the most profitable use of an asset is to consume it – for example, by continuing to operate it – its recoverable amount will be the present value of the future cash flows obtainable and cash flows obviated as a result of the asset's continued use and ultimate disposal, net of any expenses that would need to be incurred; in other words, its value in use.

10. This can be portrayed diagrammatically as shown in Figure 1.

FIGURE 1

Establishing which valuation basis for an asset gives its value to the business



Source: UK Accounting Standards Board, Statement of Principles, 1999.

11. Application of these valuation principles consistently across all assets is also called current cost accounting (CCA).

12. An implication of valuing generation plant of a particular type consistently on the basis of their value to their owner from one period to the next is that should give rise to the same *expected* ROCE across the plants. Under this approach differences in profitability, other than that reflecting windfall profits or losses, should in principle reflect superior or inferior management etc, rather than the locked-in relative inefficiencies associated with, for example, an individual plant's technology. A further implication of this approach is that up until the point when the owner of the plant believes it is about to finally stop generating electricity for good the owner is expecting to recover not only its ongoing (cash) costs but also the remaining economic value of the plant (which might well be quite small compared to its original cost if it is marginal plant).

13. Such an approach to valuation also implies that the full cost of the original investment would be charged to the P&L over the plant's lifetime, primarily through depreciation charges. Depreciation reflects the expected loss in value of a plant. This can be contrasted with other sources of loss over time in economic value embodied in plant. The losses arising from these other

sources are normally described as impairment losses. Impairment can occur because something has happened to the economic environment in which the fixed assets are operated such that the carrying value (here the value of the business as determined on CCA principles) falls below the recoverable amount[7] for that asset.[8] One example of a change of economic circumstances would be an unexpected permanent slump in demand leading to excess capacity within the industry. Another example could be a sharp unexpected change in input costs relative to the input costs of competing plant which makes the plant not worthwhile to operate.

14. Thus either through depreciation (the expected loss in economic value in any period) or through impairment losses (the unexpected loss in economic value in any period) the full original cost is expensed in the profit and loss, consistent with the principle of determining profitability on the basis of financial capital maintenance (FCM).

Estimation of replacement cost

15. Where an asset is worth replacing, its value to the business will be its current replacement cost, or more precisely the replacement cost of an MEA determined in a fully competitive market and allowing for the asset's remaining useful life. The MEA value is the cost of replacing an old asset with a new one with the same service capability allowing for any differences both in the quality of output and in operating costs. The fact that markets are often not fully competitive does not alter the validity of the assumption of competition as a benchmark for measuring costs.

16. This approach is consistent with our Guidelines, which state[9] that the CMA considers MEA values to be the economically meaningful measure for the purpose of measuring profitability in most cases. The definition given in the Guidelines emphasises that this valuation should be based on the most efficient technology available at the time and assumes that assets are optimally configured.[10] This is the case even if the assets in question actually use legacy technology and are not ideally situated for current market conditions.

[7] The recoverable amount is the higher of net realisable value ('exit' value) and value in use.
[8] Definition of impairment as per FRS11, paragraph 2, p6.
[9] *CC3*, Annex A, Market characteristics and outcomes, Measuring profitability, paragraph 14.
[10] The MEA value is the current cost of acquiring assets which yield equivalent services to those currently used by the firm, based on the most efficient technology and optimal configuration.

Use of profits assessed on the basis of comprehensive income

17. When measuring the return being made on capital invested it is important to identify in the measure of profits all gains and losses recorded in the balance sheet (other than transactions with owners, such as dividend payments). This measure of profits is known as 'comprehensive income' as it includes not only profits from day-to-day operations but also any exceptional trading profits earned or losses incurred as well as any gains or losses resulting from movements in asset values during a period. Because comprehensive income will also reflect any unexpected, temporary or otherwise unusual items accounted for in a period, it can be helpful to separately identify these items to aid the interpretation of profitability over time.

18. This approach to measuring profitability therefore means that the costs incurred, or revenues earned, in any one period will not necessarily reflect the levels of costs expected to be incurred, or revenue expected to be earned, in future years (at current cost levels). For example, one would not necessarily expect the unexpected losses in the value to the business of some generation plant deployed over the period of review to be repeated in the near future.

19. However, no commercial competitors would come into an industry if they did not expect to be able over the longer term to recover all their costs, including any unexpected decline in value of their assets, as well as earn a normal profit (the opportunity cost of capital) on their continuing operations. They would measure their return on investment after recovery of funds sufficient to maintain the real value of the financial capital they had invested. Therefore when assessing whether capital invested at the beginning of the period has in fact been maintained by the end of the period, it is important that all changes in the value to the business of its fixed assets have been charged to the profit and loss account. This system of accounting is called FCM.[11]

[11] FCM is a system of accounting which regards the capital of the business as a fund attributable to the proprietors and profit as the surplus arising after that fund has been maintained. Assets are stated at their value to the business. This is the definition contained in The Byatt Report's glossary on p136. There it is defined in real terms, ie after allowing for changes in general purchasing power.

Appendix 3: Cost of capital: planned methodology

Introduction

1. In this section, we set out our proposed approach to calculating the cost of capital for electricity generation and the retail supply of electricity and gas in GB. Our Guidelines note that:

> Firms in a competitive market would generally earn no more than a 'normal' rate of profit—the minimum level of profits required to keep the factors of production in their current use in the long run, ie the rate of return on capital employed for a particular business activity would be equal to the opportunity cost of capital for that activity.[1]

2. In order to determine whether competitive conditions in the energy market allow operators to earn 'excessive' profits, therefore, we require a benchmark cost of capital. In many cases, we would seek to establish a single benchmark cost of capital for an industry. However, in this case, we note that the appropriate cost of capital may vary depending on the type of activities undertaken by the firms. For example, we consider it likely that an energy-generating business will have a different cost of capital from an energy supplier. Similarly, we will seek to understand whether vertically integrated businesses have a different cost of capital from businesses which operate at a single stage of the supply chain only.

3. We first set out the theoretical framework that we use to estimate the cost of capital, before discussing each of the key parameters in turn, highlighting the type of analysis that we will carry out in order to reach an estimate of the relevant cost of capital for each type of operator in the industry.

Framework for estimating the cost of capital

4. Our Guidelines highlight that we generally look to the CAPM when considering the cost of capital, since this is a widely understood technique with strong theoretical foundations.[2]

5. The CAPM can be used to calculate the cost of equity. It relates the cost of equity $E[R_i]$ to the risk-free rate (R_{rf}), the expected return on the market

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[1] *CC3*, paragraph 116.
[2] *CC3*, Annex A, paragraph 16. See Brealey & Myers, 'Principles of Corporate Finance', chapters 8 & 9 for a detailed exposition of the CAPM.

portfolio (R_m), and a firm-specific measure of investors' exposure to systematic risk (beta or β) as follows:

$$E[R_i] = R_{rf} + \beta(R_m - R_{rf})$$

6. If a business were entirely funded by equity, the expected return on equity could be considered to be its 'cost of capital'. However, most firms are funded by a combination of both debt and equity, such that the appropriate cost of capital to consider is the weighted average cost of debt and equity. The WACC is given by the following expression:

$$WACC = E[R_i] \times E/(D+E) + K_d \times D/(D+E)^3$$

7. Finally, the cost of capital must take into account the effects of tax on returns to capital providers. The returns to debt holders take the form of interest payments which are usually tax-deductible. The returns to equity holders (dividends), on the other hand, are taxed. Hence, where the cost of capital is expressed 'pre-tax', the cost of equity used must reflect the fact that the actual return to shareholders will be reduced by the rate of tax. We propose to estimate the cost of capital on a nominal pre-tax basis.[4]

$$\text{Pre-tax WACC} = [(1/(1-t)) \times E[R_i] \times E/(D+E)] + [K_d \times D/(D+E)]$$

Specification of the parameters of the WACC

8. There are a number of issues that we need to consider prior to undertaking the WACC calculation in order to ensure that it is an appropriate benchmark for the return on capital calculations. These include: the relevant geographic market;[5] the relevant activities; and the relevant time period.

9. A business's cost of capital is determined by the financial and economic conditions of the market(s) in which it operates. While several of the larger operators in the sector are part of multinational firms, the CMA will look to estimate the cost of capital of that is relevant for the GB operations of these businesses only, ie the cost of capital of a hypothetical stand-alone[6] GB operator.

10. As explained in paragraphs 17 to 21, we will seek to understand the profitability of each element of the supply chain for energy in the UK, including

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[3] Where D is debt, E is equity and K_d is the cost of debt.
[4] This avoids the need to adjust nominal financial information to remove the effects of inflation.
[5] Note that 'relevant market' as used in this paper does not refer to the economic relevant market for market definition purposes.
[6] This approach does not take into account any benefits or costs arising from the firm belonging to a larger group with operations in a number of countries.

both the generation of electricity and retail supply of both gas and electricity. Therefore, we will also estimate a cost of capital for each of these activities within the supply chain. In addition, we will seek to understand whether the cost of capital for a vertically integrated business differs significantly from the average for independent generation and supply businesses, ie whether vertical integration provide an efficiency benefit (or disadvantage) in terms of the cost of capital.

11. As set out in paragraphs 29 and 30, we plan to analyse the energy firms' profitability for the seven to eight years from FY07 to FY13/FY14. Hence, the WACC should also be estimated for this same period. Given this time frame for the analysis, we plan to estimate a single or average cost of capital for the whole period rather than a number of annual estimates. While we recognise that the decline in interest rates over the relevant period, largely as a result of the financial crisis and recession, will have had an impact on the cost of capital, we consider that this effect can be taken into account in our interpretation of the results rather than requiring separate annual estimates of the cost of capital for each year in the period.

Specification of the components of the WACC

Risk-free rate

12. The risk-free rate provides a measure of the return that can be expected by an investor without accepting any risk on an investment. It is usually proxied by the redemption yield on index-linked government bonds (government bonds are also referred to as gilts) as these are regarded as having both negligible default and negligible inflation risk. We propose to use the return on long-dated index-linked UK gilts as a measure of the real risk-free rate. In addition, as a cross-check, we may take into account the level of index-linked yield curves over the relevant period as an indication of the expected risk-free rate. In order to estimate the nominal risk-free rate, we will adjust these yields to reflect actual inflation over the relevant period, as measured by the retail prices index (RPI).[7]

Equity risk premium

13. The equity risk premium (ERP) is the difference between the return provided by the market as a whole and the risk-free rate. We propose to estimate the

[7] We consider that the RPI measure of inflation is the appropriate one to use in this case as UK index-linked gilts are indexed to RPI inflation (rather than CPI or any alternative measure).

market return and the ERP based on both historical and forward-looking approaches, including data collected by Dimson, Marsh and Staunton and the Barclays Equity Gilt Study.[8]

Beta values

14. The beta value used in calculating the cost of equity measures the riskiness of the returns on the stock being analysed relative to the rest of the market. For a listed entity, this is equal to the covariance between the stock's returns and the market's returns, divided by the variance of market returns. When a firm is not listed, however, its beta value cannot be measured directly but can be estimated based on the betas of comparable companies.

15. In estimating an appropriate beta value (or range of beta values) for the energy firms, we will have reference to:

    - the beta values of the UK-listed operators, including Centrica, SSE, Drax, Telecom Plus and Good Energy;
    - the beta values of the overseas listed parent companies of UK operators, including EDF, E.ON, Iberdrola, RWE, and GDF Suez; and
    - the beta values of overseas listed businesses with similar activities.

16. We invite parties to provide details of potential comparable companies that we may wish to take into account when forming a view on an appropriate beta value for each activity within the energy supply chain. We will review and refine this list in order to come to a view on an appropriate set of comparable companies.

Gearing

17. The choice of capital structure (ie the level of debt and equity) for a firm does not affect the overall returns it generates for its debt and equity holders but only the distribution of the returns to those parties. Overall returns are determined by the financial performance of the business, that is, by how successful the business is in using its assets to generate profits. On the other hand, the WACC may be affected by choices over the capital structure.[9] In this case, we observe that firms at different stages in the energy supply chain may have chosen very different capital structures for a number of reasons. Therefore, in the first instance, we will seek to understand any such systematic differences

[8] *Credit Suisse Global Investment Sourcebook*, 2014, and *Barclays Equity Gilt Study 2014*.
[9] See *Principles of Corporate Finance*, Brealey and Myers.

in the capital structures chosen. We would then expect to estimate a 'typical' capital structure for each type of business (generator, supplier and vertically integrated) on the basis of which to calculate the cost of capital.

18. We will estimate gearing levels for the listed businesses in the sector by using information on their market capitalisations and their net debt figures over the relevant period. For non-listed businesses, the market value of equity (and debt, although to a lesser extent) will generally be unknown. As a result, it is not possible to estimate a precise level of gearing. However, given the relatively large number of listed firms in the industry, we consider it likely that we will have sufficient information from the listed operators to reach a view on a 'typical' capital structure without requiring data on unlisted firms.

Cost of debt

19. We plan to estimate the cost of debt for the energy operators on the basis of:

- the interest rates paid by the operators on bank debt over the relevant period;
- yields on publicly traded corporate bonds issued by the energy firms; and
- yields on UK corporate bonds with a similar credit rating to the energy firms over the relevant period.

20. We will consider whether there are systematic differences in the cost of debt for generators, suppliers and vertically integrated businesses. In addition, we will take into account the need to ensure consistency between the 'typical' capital structure and the cost of debt used.

21. We invite parties to comment on whether they consider it necessary for the purposes of this analysis to reach a view on a debt beta for the firms in the industry.

Tax rate

22. We propose to use the statutory marginal rate of corporation tax in the UK over the relevant period.

Size premium

23. Following an initial review of some of the academic literature, our current view is that both the theoretical underpinnings and the empirical evidence for a size premium on smaller firms is inconclusive. We also observe that the six vertically integrated firms operating in the energy sector, on which our

analysis is focused, are all relatively large firms, even when their generation and supply activities are considered on a stand-alone basis. Therefore, we do not propose to include a size premium in our cost of capital calculations.

Appendix 4: Ofgem-commissioned review of transfer prices

1. Ofgem asked the vertically integrated firms to separate out their profits across their licensable generation and retail electricity and gas supply businesses (but not separately identify any profits reflected in their trading business). Ofgem commissioned BDO to review the transfer pricing to and from their trading business reflected in the internal sales and costs of these two businesses.

2. Ofgem asked BDO to focus on whether the given transactions were priced broadly in accordance with prices posted on trading screens. BDO confirmed this but noted that not all the transactions replicated observable market transactions and therefore in some instances firms had made adjustments to the posted prices to take account of differences in transaction structure, eg in risk.

3. Ofgem did not ask BDO to review whether the internal sales were the type of transaction that an independent business would enter into, nor consider whether the prices posted in the external market which were used to determine transfer prices would reflect the outcome of a competitive (eg liquid) market.

4. We recognise that the transactions undertaken by the vertically integrated firms between their generation and trading and retail arms may not be available to non-vertically-integrated players. For example, a vertically integrated generator may enter into a power purchase agreement with its trading arm or with the trading arm of another firm that is longer in duration than any available to an independent.

5. Given the work that has already been done in this area, we are not proposing to conduct further investigation of transfer pricing. We consider that our models of stand-alone supply and generation profitability (as described above) will provide insight on how the profits of the largest firms are affected by vertical integration.

Appendix 5: Trading

Introduction

1. This appendix comprises two sections:

   (a) Background – we explain why firms involved in the energy supply chain need to participate in the wholesale market and why large vertically integrated firms have all developed a centralised trading model.

   (b) Types of trading activities – we describe the main types of activities undertaken by the trading businesses of the large vertically integrated firms.

Background

2. In this section we set out some relevant background on trading. First, we explain why firms involved in the energy supply chain need to trade in various wholesale markets. Second, we explain why each of the large vertically integrated firms has centralised interactions with the wholesale market into a single trading business which acts as a route to market for all its businesses requiring wholesale market access.

The wholesale market

3. For firms involved in the energy supply chain, wholesale markets are the simplest way of selling or buying the product(s) which are central to their business. In addition, these firms often use wholesale markets to eliminate or reduce uncertainty in particular variables, such as commodity prices. Some examples of this are:

   (a) An **electricity generator** will sell its expected electricity output into the wholesale electricity market. How it chooses to sell its output will depend on several factors, including: the characteristics of its generating technology;[1] its attitudes to risk; its financial strength and its business model. As a result it could agree to fix now the price it will receive for some or all of its future output (eg up to two to three years into the future); or decide to sell some or all of its output much closer to the time when it is actually generated (eg in the day-ahead market or even in the balancing mechanism).

[1] For example, some technologies have very low marginal costs (wind, nuclear) while others can increase or reduce capacity very quickly (pumped storage) – each may be more valuable at different times. Plants of the same type will have different efficiencies and therefore be profitable to run at different times.

In addition, thermal generators will need to acquire significant volumes of commodities (coal, natural gas, carbon) in order to generate electricity. Usually they will want to make these commodity purchase decisions at the same time as their decision to sell their output. They will therefore need to participate in traded wholesale markets in order to procure sufficient volumes of these commodities to ensure they can produce electricity. They will need to make the same decisions about whether to fix some or all of the prices for these inputs in advance.

(b) A **gas producer** sells the output from its gas field, usually into the GB National Balancing Point (NBP) traded gas market (if it is a gas field located in GB). Each producer will have a different strategy with regard to selling its output. It may choose to sell mainly in the short-term market or alternatively it may choose to fix in advance the price it will receive for its future output (a forward sale).

(c) **Energy retailers** often want to have some certainty about the price which they will pay for the gas and electricity they expect to supply to their customers. As a result they often buy forward some or all of their customers' expected gas and electricity demand. How much and how far in advance they buy forward will depend on various factors, including commercial strategy, market prices and the actions of their retail competitors.

4. Each of the businesses described in (a) to (c) above is an important part of the energy supply chain and owns a business (a retailer; a gas field; a power station) which requires it to interact with the wholesale market. An important feature of all of these businesses is that they are exposed to volumetric uncertainty. That is, they cannot be certain of their exact future consumption or production, even at times very close to when the product will be physically delivered.

5. Volumetric uncertainty introduces an additional complication for these businesses. For example, a retailer will have to estimate in advance how much electricity and gas it will require for its customers in a given period. However, depending on changes in climatic conditions and customer retention, its forecast of its required amount will continually change. As a result, businesses exposed to volumetric uncertainty will often seek to continually refine their wholesale market positions as conditions change. In addition, they will also respond to changes in wholesale market prices and various other factors (for example, the actions of competitors). As a result of these actions, by the time wholesale energy is consumed or produced it may have been sold and re-purchased many times by a business.

6. As well as businesses involved directly in the energy supply chain there are various other participants in wholesale energy markets. These include financial intermediaries (eg investment banks), commodity trading houses (eg Vitol), oil & gas majors (eg Royal Dutch Shell) and investment funds (eg hedge funds). Each of these participants has expanded into the market, often from an adjacent sector, with the intention of profiting from its involvement. For example, investment banks have expertise in providing trading services in various different products so commodity trading represents a logical extension of their activities.

7. Trading in GB wholesale energy is mostly conducted either through bilateral trading, which is known as over-the-counter trading (OTC).[2] Trading also takes place on specialised exchanges (eg ICE[3]) which focus on particular types of markets.

Development of trading businesses

8. The large vertically integrated firms all own businesses in different parts of the energy value chain. They will therefore have multiple interactions with wholesale markets, often with different businesses trading the same products. For example, a firm that owns both an electricity generation and an electricity supply business is likely to be both buying and selling wholesale electricity for both businesses.

9. In this situation it could choose to self-supply. That is, to trade bilaterally between its generation and supply businesses, bypassing the wholesale market for matching volumes (although still having to trade if its supply did not match its demand). However, most firms told us that it was more efficient to operate through the market, because the timings of purchases by retailers will not match the desired timings of purchases by generators. So while they did trade internally to some extent this was far less than they could if they pursued a dedicated self-supply strategy.

10. In response to owning different businesses which are each having many interactions with wholesale markets the larger vertically integrated firms set up centralised trading divisions to act as a single route to market for all their businesses. This means that all wholesale trading activity for a large vertically integrated firm is routed through a single trading business rather than each

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[2] OTC markets are networks of trading relationships usually centered on a group of dealers. Dealers act as market-makers by quoting prices. Unlike exchange trading, dealers are not usually required to quote the same prices to other dealers as they post to customers, and they do not necessarily quote the same prices to all customers. Trades are struck and settled between the buyer and the seller without the use of centralised clearing.
[3] Intercontinental Exchange website.

business unit accessing the market directly itself (which it could do through a financial intermediary or an exchange).

11. This centralised trading model was often developed from a more decentralised structure whereby all trading was not routed through a single internal trading function. Nevertheless, this is the structure that each of large vertically integrated firms now employs.

12. Although each vertically integrated firm now uses a centralised trading arm as its route to market, the size and scope of these trading operations varies considerably. Three key drivers of this are:

    (a) **The number of countries in which a firm is active and the extent to which it has created a global trading business**. Some firms (for example, EON) have operations in many countries and have decided to operate using a global trading hub which serves as an internal market for all group businesses globally. Other firms have more country-focused operations (for example, serving mainly UK businesses).

    (b) **The extent to which a firm's businesses expose it to different markets**. For example, if a firm owns gas, coal or other commodity assets it will have extended its trading activities into these areas.

    (c) **The extent to which the trading division has expanded into adjacent (or new) markets**. Many commodity trading firms have expanded to become multi-commodity, multi-region businesses.[4] Some trading divisions within the vertically integrated firms have followed the same strategy. They have grown their trading businesses by expanding their scope into new or adjacent traded markets and regions in order to increase profitability.

13. As a result, some of the trading businesses within the vertically integrated firms are focused largely on trading with the GB wholesale energy market (including generation input commodities); others are multi-region, multi-commodity businesses where GB wholesale energy is a relatively small part of their overall operations.

Types of trading activities

14. We have described above how each firm uses its own trading business to interact with the wholesale market. We have also described how the size and scope of these trading businesses can vary significantly between firms. In this

[4] McKinsey & Co, *Next generation energy trading*, May 2013.

section we briefly describe the three main types of trading activities carried out by a trading business. We then explain which of these activities we believe are most relevant to our assessment of profitability.

Market access

15. Trading businesses provide a route to market for group businesses which need to interact with traded wholesale markets. Providing this service is known as providing market access. In essence the trading function is performing a sales and purchasing function on behalf of the supply and generation businesses.

16. The way a trading division is paid for providing this service to other group businesses varies between firms; one example is an agreed percentage mark-up on each trade.

Market-making

17. A trading business may also provide market access across a range of traded markets to third parties – acting as both a buyer and a seller in a given market, while managing the risk that this activity generates. This function is known as market-making. The main risk in market-making is adverse price movements in the (often very short) period that the market-maker holds an open position. For example, if a market-maker buys a position from a third party and the price of the position falls before it is possible to sell this position on or hedge the acquired position.[5]

18. A market-maker aims to generate profits from the difference between the buy price and the sell price of a product (the bid-offer spread)[6] and/or any fees[7] charged to customers for providing this service. Market-making is conceptually distinct from proprietary trading (which we discuss below) in that a market-maker aims to profit from the volume of traded activity rather than seeking to profit from anticipating the direction of the market. In reality it can be sometimes be difficult to distinguish between the two functions.

19. Market-making for third parties in the GB wholesale energy market is a logical extension for a trading business which is providing a route to market for other group businesses.

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[5] Or in an extreme scenario, liquidity drops and the market-maker is unable to exit a position for a period of time.
[6] The bid-offer spread is the difference between the price to buy a product and the price to sell. Larger liquid markets will tend to operate with very small bid-offer spreads (for example, the GBP/USD foreign exchange market) while less liquid markets will operate with larger bid-offer spreads.
[7] Any fees would normally be a fixed percentage of the transaction cost.

Trading for value

20. We use the term trading for value to describe a wide range of strategies used by firms with the aim of delivering profitable trading transactions. These strategies may be used in various forms by commodity trading firms in all regions as well as those participating in the GB wholesale energy market. Most of these trading for value activities can be classified into three broad areas: asset optimisation, arbitrage and proprietary trading. We summarise each in turn.

Asset optimisation

21. An important feature of virtually all agricultural, energy and industrial commodity markets is the existence of physical constraints, transformation processes and seasonality. These give rise to price differences which allow a trading firm which either owns or has acquired rights over an asset to structure profitable transactions. This is because asset ownership/rights allow a trading firm to exercise optionality, which might come from:

    (a) Location – the ability to send a commodity anywhere in the world and therefore exploit physical constraints, which give rise to different prices in different locations. For example, you may have acquired the right to buy natural gas at an agreed price and can then ship this as liquefied natural gas to wherever in the world it will be most profitable.

    (b) Time – the right to postpone or accelerate flow of a commodity. There are often significant seasonal variations in commodity prices, for example gas tends to be more expensive in winter than summer and electricity tends to be more expensive during mid-day peaks in demand. It may therefore be profitable to acquire and then store a commodity in order to sell it later when it will be more profitable to do so. Gas storage is an example of this.

    (c) Quality – you can change the physical specification of a commodity to benefit from differences in prices between specifications. Many commodities are not uniform but have numerous different grades and/or refined versions of the underlying product. For example, crude oil can be heavy or light, sticky or non-sticky and different qualities sell for different prices. In addition crude can be transformed into numerous products which each sell at different prices, for example gasoline, diesel, or lubricating oil. Acquiring and then refining oil from one grade to another in order to profit from the difference between the refined and unrefined price is an example of this.

22. These types of strategies are often referred to as asset optimisation or asset-backed trading. A trading business may participate in this strategy across a whole range of commodities. One example of this strategy that is of particular interest is the optimisation of power generation assets. This is a strategy followed by some firms which involves a transaction between the generation business and the trading business. In essence the generation business sells to the trading business the right to convert an input (eg gas) into output (power) and schedule when this activity is undertaken. In effect the trading business then controls when the power station generates.

23. This type of arrangement is known as tolling. The trading business has paid a fee and hopes to achieve a return in excess of the fee it has paid for scheduling rights by running the station when it is most profitable to do so. In deciding when to operate and for how long, a trading business will consider various factors, including the price it will be able obtain for its electricity output, estimated plant start-up costs and the cost of key inputs (coal, gas, carbon) required to generate electricity.

Arbitrage

24. This strategy involves a trading firm seeking to exploit inefficiencies in a market in order to make a riskless profit. These inefficiencies normally disappear, often very quickly, as a result of arbitrage opportunity. For example, it may be possible to arbitrage the spark spread market (which is a spread between power price and the required gas input) with the individual power market and gas market.

Proprietary trading

25. Proprietary (or speculative) trading is another type of trading for value. This involves a trading firm using its industry knowledge to take risk positions with the intention of profiting from subsequent market movements.

Appendix 6: Specific consultation questions

1. In this section, we set out a number of questions on which we would particularly welcome submissions. We note that this list is not intended in any way to restrict the scope of submissions on our proposed approach to analysing the financial performance of the sector: respondents are encouraged to make submissions on any of the issues raised in this document or, indeed, on areas that have not been explicitly discussed.

2. We note that we have already received a number of detailed submissions and responses to questionnaires from energy firms and other industry stakeholders. Where respondents have already made submissions on any of these areas, we encourage them to cross-refer to those submissions.

Area of analysis	*Questions for consultation*
Treatment of trading activities	• Do respondents agree that profits and losses from generation optimisation activities should be analysed as part of the generation segment in a vertically integrated firm? • Do respondents agree that trading for value, where unrelated to energy supply and generation activities, is not relevant to our investigation?
Valuation of generation assets	• Which technology should we assume is the modern equivalent asset for coal-fired and nuclear power stations? • Is CCGT a suitable replacement in both cases? • What benchmarks should we take into account for the replacement cost of a new nuclear power station?
Valuation of generation assets	• Are plant-specific marginal costs, as measured by the CMA's economic model, an appropriate basis for making adjustments to MEA values to reflect differential operating costs? • If not, can generators provide details of the marginal cost of production for each plant?
Valuation of generation assets	• Is it appropriate to assume that generation assets depreciate on a straight-line basis? • If you consider that an alternative depreciation profile is appropriate, please provide the reasons and, where appropriate, supporting evidence.
Transfer pricing	• To what extent can transfer pricing arrangements between reporting segments be relied on given *(a)* Ofgem and BDO's previous reviews, and *(b)* the extent to which transactions conducted by trading arms are arm's length?
Valuation of collateral	• How does the level, type and quality of collateral required by a stand-alone generation and/or retail supply business change as the business increases in size/scale? • Are there economies of scale for a vertically integrated business in terms of the level of collateral required?

Area of analysis	*Questions for consultation*
Valuation of contingent capital and risk capital	• What level, type and quality of contingent capital/risk capital would a large, independent generation business require? • What level, type and quality of contingent capital/risk capital would a large, independent retail supply business require? • Are there economies of scale for a vertically integrated business in terms of the level of contingent capital/risk capital required? • When providing responses to these questions, please explain the implications for customers if an energy business were to cease trading, providing supporting evidence where appropriate.
Profitability benchmarks for retail supply	• Which benchmarks should we consider when assessing the level of retail supply firms' profit margins? • Please explain why you consider these benchmarks to be appropriate.
Valuation of customer base for retail supply	• When valuing the retail suppliers' existing customer base, is it appropriate to use the same value for all customers (ie both those that switch frequently and those that do not)? • What assumptions should we make regarding the average life of a customer? • Which costs should we include in measuring the cost of acquiring a customer?
Scenario analysis	• We propose to re-estimate both generation revenues and retail supply input costs using (half-hourly) information on volumes and wholesale market prices. Please provide any views on this type of analysis.
Cost of capital: Comparable companies	• We invite parties to suggest comparable companies for the purposes of estimating beta values and gearing levels for both energy generation and supply businesses. • Where the businesses proposed are not directly involved in the energy sector, please explain why you consider them to be a useful comparable for the purposes of estimating the cost of capital.