Embedded generation: a UK perspective

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1. Introduction

As in many countries, heat generation in the United Kingdom is a vital part of domestic and commercial life. As at 2006, heat generation in the United Kingdom accounted for 41% of the country's energy consumption and 47% of its carbon dioxide emissions, with heat consumption accounting for 60% of the average domestic energy bill.[1] Most consumers in the United Kingdom do not purchase heat. Instead, they purchase the fuel to generate heat (eg, around 69% of consumers use gas to generate heat, with 14% using electricity, 11% using oil and 3% solid fuels).[2] As is shown in the table below,[3] only a small percentage of heat is generated by renewable means.[4]

	2004	2005	2006	2007	2008	2009
Percentage of heating from renewable sources	0.7	0.9	1.0	1.2	1.4	1.6

The government's heat strategy is focused on efficient heat production and consumption. This includes:

- heat generation from renewable fuel sources (eg, biomass);
- utilisation of heat that would otherwise be wasted;
- district heating schemes; and
- improved energy efficiency within buildings (eg, insulation).

Specific incentives to encourage investment include renewable obligation certificates (ROCs), feed-in tariffs, renewable heat incentives, bioenergy capital grant

1 *Heat and Energy Saving Strategy*, Department of Energy and Climate Change (2009), p12. Also see the Department of Energy and Climate Change's interactive UK Heat Map website (http://chp.decc.gov.uk/heatmap/).

2 *Renewable Heat Incentive: consultation on the proposed RHI financial support scheme*, Department of Energy and Climate Change (February 2010), p7.

3 *Energy Trends June 2010*, Department of Energy and Climate Change (published by National Statistics), p12

4 According to *Energy Trends June 2010*, the "three sources of renewable heat production in the United Kingdom are the direct combustion of biomass (93 per cent of the total), active solar heating, and geothermal aquifers" (p21).

schemes and enhanced capital allowances.[5] These focus on renewable projects. However, there are limited incentives in the United Kingdom for energy efficiency projects that do not have a renewables component.

In a world facing dramatic technological and commercial change and restructuring on an almost daily basis, the emergence of a 'perceived' novel or new energy solution in an established and traditional market is often viewed at best with scepticism and caution, at worst with cynicism and fear. The emergence of distributed heating systems, combined heat and power (CHP) systems and combined cooling, heat and power (CCHP) systems[6] in the UK energy market has been rapid (in traditional energy industry terms), and has been driven by both government policy and market forces.

Yet the technology itself and its application are not new. At the end of the 19th century, the United Kingdom's energy and hydraulic engineering expertise was second to none, and the country led the world in the development and deployment of embedded generation systems.

In 1883 an act of Parliament established the London Hydraulic Power Company, which went on to install a hydraulic power network of high-pressure cast-iron water pipes (two inches to 10 inches in diameter and up to one inch thick). The pipe network covered an area north of the Thames, from Hyde Park in the west to Docklands in the east. The utility provided reliable energy services and most users abandoned their own generators.

The system was a cleaner and more compact alternative to steam power – it powered machinery, lifts, cranes, theatre machinery and bridges. At its peak, it had five primary pumping stations plus accumulators (equivalent to today's energy storage) pumping more than 1.6 billion gallons of water annually through 180 miles of pipework. Following the demise of the London Hydraulic Power Company, the wheel turned full circle and users were forced to install their own plant or convert to electric motors.

The system was eventually closed in 1977 (replaced by electricity) and the entire company was acquired in 1981 by a group led by Rothschilds, which recognised the importance of the pipe network for the coming generation of communications systems. It subsequently sold the network of pipes, ducts and conduits to Mercury Communications in 1985, which used the underground pipe infrastructure (and the associated licences and wayleaves) to run fibre-optic cables across the City of London: evidence that the enduring value of the infrastructure lay in the underground assets rather than in the technology (engines) at the surface.

Further, back in 1947 the then British Electricity Authority had a statutory duty to "investigate methods by which heat obtained from or in connection with the generation of electricity may be used for the heating of buildings in neighbouring

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5 For further information on this please read the chapter entitled "Renewable energy support mechanisms: an overview".

6 In this chapter the commonly used phrase 'embedded generation system' encompasses all three of these systems. Other commonly used phrases include 'distributed energy/heating system' and 'district energy/heating system". In some jurisdictions, CHP systems are more commonly referred to as 'co-generation systems' and CCHP systems as 'tri-generation systems'.

localities, or for any other useful purpose, and the Authority may accordingly conduct, or assist others in conducting, research into any matters relating to such methods of using heat".[7] From 1974 to the late 1970s, the then Department of Energy was actively considering embedded generation system solutions across London. During this period a National Heat Board was established and considered nine main schemes, including sourcing heat from Barking Power station. The London Electricity Board and the Central Electricity Generation Board developed plans for a 100 megawatt (MW) district heating scheme linked to Bankside Power Station. However, by the late 1970s, the North Sea oil and gas field discoveries led to diminished interest in embedded generation systems. It is only in the last 10 years, as climate change and security of supply issues have garnered worldwide attention, that both public and private sector interest and investment in embedded generation systems in the United Kingdom have increased.

Most of us would define a 'renewable energy solution' as a building-mounted solar panel or a wind turbine; very few would define a 'renewable energy solution' as a district heating system and even fewer as an embedded generation system. Yet today, these systems are being acknowledged as one of the most efficient, cost-effective solutions to deliver low or even zero-carbon energy to large-scale, high-density and mixed-use living and working environments.

Embedded generation systems are capable of delivering reliable, low or zero-carbon energy solutions on both a micro and macro scale, utilising the waste heat from power generation to produce hot water which is distributed to multiple buildings via a network of buried, highly insulated pipes.

Embedded generation systems typically use fossil fuels as their primary fuel source and are therefore not the ultimate remedy for a zero-carbon energy objective. However, as they use the primary fuel source more efficiently to produce heat, power and possibly cooling, and are closer to the end user (thereby minimising distribution losses), they also reduce the resulting greenhouse gas emissions. This also helps to meet the government's other key energy objective of reducing fuel consumption, thereby helping to manage the United Kingdom's security of supply issues.

Given the above characteristics, embedded generation systems are particularly well suited to generating and delivering low-carbon energy to areas of high population density, such as the cities and towns where most of the country's population live and work. While many of these embedded generation systems are installed contemporaneously with the construction of new buildings and infrastructure, technological advancements mean that in most cases it is now both technically possible and commercially viable to retrofit this technology into existing buildings and infrastructure.

This chapter considers the key commercial issues in structuring an embedded generation system project in the United Kingdom. In doing so, it first provides an overview of the UK electricity, gas, heat and biomass markets, as well as a regulatory overview, to put into context the key commercial issues set out in section 5. It is intended to provide guidance for those considering participating in any way in a

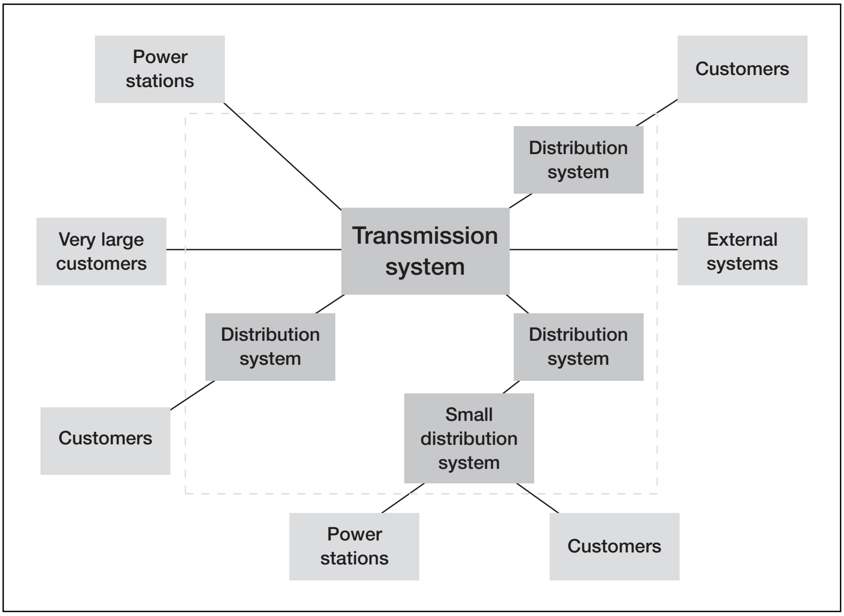
7 See Section 50(1) of the Electricity Act 1947.

embedded generation system project, whether it be located in the United Kingdom or in another jurisdiction that shares similar regulatory and market characteristics. This chapter should be read in conjunction with "Combined cooling, heat and power generation: technical, commercial and legal aspects".

2. UK market overview

2.1 Electricity market

Since the introduction of the Electricity Act 1989, the UK electricity market has evolved into a highly sophisticated and competitive market, with private sector participation in generation, transmission, distribution and supply. The diagram below[8] provides an overview of the complex physical interfaces in the UK electricity market.



(a) Generation

Generation is dominated by the major power producers[9] operating large power stations throughout the United Kingdom, with a total capacity of 78,255MW, which as at December 2009 accounted for 92% of the country's total generating capacity of

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8 Courtesy of Michael Rudd (partner, SNR Denton).

9 As at the end of 2009, the major power producers were AES Electric Ltd, Baglan Generation Ltd, Barking Power Ltd, British Energy plc, Centrica Energy, Coolkeeragh ESB Ltd, Corby Power Ltd, Coryton Energy Company Ltd, Derwent Cogeneration Ltd, Drax Power Ltd, EDF Energy plc, E.On UK plc, Energy Power Resources, Gaz De France, GDP, Suez Teesside Power Ltd, Immingham CHP, International Power Mitsui, Magnox North Ltd, Premier Power Ltd, RGS Energy Ltd, Rocksavage Power Company Ltd, RWE Npower plc, Scottish Power plc, Scottish and Southern Energy plc, Seabank Power Ltd, SELCHP Ltd, Spalding Energy Company Ltd and Western Power Generation Ltd – *Digest of United Kingdom Energy Statistics, 2010*, Department of Energy and Climate Change, paragraph 5.62, p127 (published by National Statistics).

85,337.[10] For statistical purposes, this now includes major renewable power producers,[11] including:

- hydro (4,139MW of total capacity as at December 2009);
- wind (1,211MW of total capacity as at December 2009); and
- major renewables other than hydro and wind, which burn fuels such as landfill gas, sewage sludge, biomass and waste (213MW of total capacity as at December 2009).[12]

Regarding CHP, as at the end of 2009:[13]

- there were 1,465 CHP schemes with a total installed electricity capacity of 5,569 megawatts electrical (MWe) and a total installed heat capacity of 10,755 thermal megawatts (MWth). Of these, there were almost 120 large-scale (ie, over 1MW) CHP plants with a total capacity of 2,268MW, of which 2,036MWe qualified as 'good-quality CHP';[14]
- these 1,465 schemes generated 27,777 gigawatt-hours (GWh) of electricity, representing 7% of the total electricity generated in the United Kingdom during 2009;
- although only 18.6% of these schemes had an electricity capacity of greater than 1MWe, they represented 96% of total installed CHP electricity capacity;
- 90% of the CHP electricity capacity was in the industrial sector, with less than 1% in residential, commercial, retail and government buildings;
- 71% of these schemes used natural gas as their fuel source, with 23% using non-conventional fuel sources such as by-products and waste products from industrial processes or renewable fuels;
- these schemes had an overall average efficiency (as a percentage of gross calorific value) of 67% (24% average electricity efficiency and 43% average heat efficiency);
- approximately 8% of the 'good-quality CHP' consumed in the United Kingdom was purchased from over 60 CHP systems located outside the United Kingdom (primarily Denmark, France, Germany and Ireland) wishing to derive an additional revenue stream through the sale of levy exemption certificates[15] issues against the electricity generated by those CHP stations;[16] and

10 *Digest of United Kingdom Energy Statistics, 2010*, paragraph 5.31 and Chart 5.7, pp121 and 140.

11 For example, as at the end of 2009, the major wind producers were Centrica Energy, E.On UK plc, Fred Olsen, HG Capital, Renewable Energy Systems, RWE Npower plc, Scottish Power plc, Scottish and Southern Energy plc and Vattenfall Wind Power.

12 *Digest of United Kingdom Energy Statistics*, 2010, paragraphs 5.58 to 5.64 (inclusive) and Chart 5.7, pp127, 128 and 140.

13 Statistics taken from the *Digest of United Kingdom Energy Statistics, 2010*, Chapter 6.

14 This relates to the United Kingdom's Combined Heat and Power Quality Assurance Programme, introduced in line with the requirements of highly efficient combined heat and power systems contained in the EU Cogeneration Directive (2004/08/EC). For more information see www.chpqa.com.

15 A levy exemption certificate is a certificate issued to a generator that generates renewable electricity. This certificate is purchased by the electricity supplier that purchases the electricity and ultimately by specific industrial and commercial customers that purchase that electricity. Its purpose is to exempt those specific industrial and commercial customers from paying a climate change levy (pursuant to the Finance Act 2000). Regarding its application to combined heat and power projects, please see www.ofgem.gov.uk/Sustainability/Environment/CCLCHPEx/Pages/CCLCHPEx.aspx.

16 *Digest of United Kingdom Energy Statistics, 2010*, Paragraph 6.9, page.

- these schemes saved 13.89 million tonnes of carbon in 2009 as against all fossil fuels.

Unlike in some other countries, no city in the United Kingdom has a citywide integrated heat distribution network.

(b) Transmission[17]

A single transmission system operator – National Grid Electricity (NGET) plc – operates the regional transmission networks owned by NGET (in England), Scottish Power Transmission Limited for southern Scotland and Scottish Hydro-Electric Transmission Limited for northern Scotland.

Most embedded generation systems in the United Kingdom do not connect directly to the transmission system, and therefore this chapter does not address the regulatory framework and the industry codes and agreements relevant to the UK transmission system.

(c) Distribution[18]

Fourteen distribution network operators are licensed, pursuant to Section 6 of the Electricity Act, to distribute electricity over distribution networks in a defined geographic area. In addition, four independent distribution network operators (IDNOs) distribute electricity over distribution networks located within the geographic boundary of a DNO's licensed area and are therefore connected to that DNO's distribution network. Any generator (including one that owns a small-scale generation system) that wishes to connect directly to, or licensed electricity supplier that wishes to use, a DNO or IDNO's distribution network must accede to the Distribution Connection and Use of System Agreement, a multi-party common terms agreement between distributors, generators and suppliers. The agreement was established in October 2006 to replace the numerous bilateral connection and use of system agreements that existed.[19]

The term 'private wire' is given to distribution networks, often connecting an embedded generation station to the consumer, which are exempt from the prohibition of carrying out the activity of distribution (usually because the distribution network is small enough to qualify for a general or specific exemption, as noted in section 3 below). Installation of the private wire system does not in itself remove the consumer's choice of electricity supplier. In the author's experience, there has been a move away from private wire systems connecting residential customers because of the *Citiworks* case.[20]

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17 See the Office of the Gas and Electricity Markets (Ofgem) website for more information – www.ofgem.gov.uk/Networks/Trans/Pages/trans.aspx.

18 See the Ofgem website for more information – www.ofgem.gov.uk/Networks/ElecDist/Pages/ElecDist.aspx.

19 For more information see the Distribution Connection and Use of System Agreement website – www.dcusa.co.uk.

20 *Citiworks AG v Sächsisches Staatsministerium für Wirtschaft und Arbeit als Landesregulierungsbehörde*, Case C-439/06, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:62006J0439:EN:HTML. In addition, please see the chapter entitled "Combined cooling, heat and power generation: technical, commercial and legal aspects".

(d) Supply

Distribution and supply are separate activities. This means that electricity supply becomes just like the sale of any other goods or services – customers are free to choose their supplier based on price.

To date, over 120 supply licences have been granted in the United Kingdom. The holders of these licences go beyond core utility companies and include others that have a specific reason for requiring a supply licence, including in relation to embedded generation system projects.

2.2 Gas market

As gas is the primary fuel source for the UK heat market, it is worth briefly considering the UK gas market.

As at December 31 2008, there were 22.327 million domestic and small business gas consumers in the United Kingdom, consuming 377,473GWh of gas per year; and over 324,000 large gas consumers, using 208,982GWh of gas.[21] Consumption is roughly split into thirds between domestic consumption, electricity generation and consumption by industry, services and energy industries.[22]

In 2004 the United Kingdom was a net importer of natural gas for the first time since 1996. By 2009, the net import figure had increased to 319 terawatt-hours (TWh).[23] This is one factor that has raised concerns about the country's energy security.[24]

2.3 Biomass market

The generally accepted definition of 'biomass' in the United Kingdom is any material, other than fossil fuel, which is or is derived directly or indirectly from plant matter, animal matter, fungi or algae.[25] As noted by the UK Biomass Taskforce, it is "literally, any biological mass derived from plant or animal matter. This includes material from forests, crop-derived biomass including timber crops, short rotation forestry, straw, chicken litter and waste material."[26]

Gas made from biomass may also play an important part in the renewable energy mix of the future. The term 'syngas' is used to refer to any gas made artificially/by synthesis. If synthesis gas is produced from biomass, it is called biosyngas. 'Biogas' is defined to mean gas produced by the anaerobic conversion of organic matter.[27] It is composed of approximately 60% methane, 40% carbon dioxide and other trace levels of contaminants. 'Bio-SNG' is a term used to refer to a combustible gas that has been created by the thermochemical process of gasification (see below) of organic material. It is composed predominantly of methane, hydrogen, carbon monoxide and carbon dioxide.[28]

21 *Digest of United Kingdom Energy Statistics, 2010* Table 4A, p 101.
22 *Digest of United Kingdom Energy Statistics, 2010*, paragraphs 4.10 and 4.11 and Chart 4.2, pp97 and 98.
23 *Digest of United Kingdom Energy Statistics, 2010*, paragraph 4.7, p95.
24 "Energy Security: A national challenge in a changing world", Malcolm Wicks MP, August 2009.
25 See Section 4 of the Renewables Obligation Order 2009 and Section 100(3) of the Energy Act 2008.
26 Report to Government (October 2005), Biomass Task Force, Paragraph 1.9, p9.
27 See Section 100(3) of the Energy Act 2008.
28 *Biomethane into the Gas Network: A Guide for Producers*, Department of Energy and Climate Change, December 2009.

In January 2009 the National Grid published a report that argued that in the longer term, with the right government policies in place, renewable gas could meet up to 50% of UK residential gas demand.[29] Interestingly, the report noted that as at the date of the report, 1.4 billion cubic metres of renewable gas are currently produced in the United Kingdom – which could meet around 1% of total UK gas demand. However, because of the commercial incentives (the Renewable Obligation Scheme), all of this gas is used to generate electricity at efficiency levels of around 30% in most cases. If the gas were injected into the gas grid, this could be used as the primary fuel source for embedded generation systems. However, it could also be delivered straight into consumers' homes and utilised for heating at efficiency rates in excess of 90%, meaning that it could challenge both the economics and climate change drivers behind the use of embedded generation system projects, particularly for consumers with existing connections which would otherwise require retrofitting in order to connect to an embedded generation system.

More broadly, in order to be entitled to receive renewables obligation certificates, a generator of any biomass generating facility must (among other things) provide the Office of the Gas and Electricity Markets (Ofgem) every year with information relating to the sustainability of the biomass which is used by the embedded generation system. This information includes:

- the material which the fuel will be composed of;
- the form it will take;
- whether it will be a by-product of another process;
- whether it will be waste;
- where it was derived from; and
- the proportion (if any) which will be derived from energy crop.[30]

2.4 Spark spread

Two major factors affect the economics of an embedded generation system project:

- the relative cost of fuel (principally, natural gas); and
- the value that can be realised for electricity.

The difference between the price of electricity and the price of the gas required to generate that electricity is known as the 'spark spread'.

During 2007, the market improved for embedded generation system projects due to an increase in the spark spread (ie, a fall in the price of gas relative to that of electricity). However, uncertainty regarding future movements in the gas and electricity markets has created perceptions of increased risk for embedded investors and schemes. This is one reason why fiscal incentives are considered so important by many in the industry.

3. Embedded generation systems – key regulatory points

Unlike certain other European countries, the United Kingdom has no legislation or regulations specifically dedicated to embedded generation systems. Instead, a variety

29 *The Potential for Renewable Gas in the UK: A Paper*, National Grid, January 2009.
30 See Article 54 of the Renewables Obligation Order 2009.

of legislation and regulations deal with various aspects of embedded generation system projects.

3.1 Electricity

Although the generation, distribution and supply of electricity are regulated activities, many embedded generation systems in the United Kingdom either fall within the general exemption regime (Electricity (Class Exemptions from the Requirement for a Licence) Order 2001) or qualify for a specific exemption (pursuant to Section 5 of the Electricity Act 1989) from the prohibition in Section 4 of the Electricity Act 1989 against carrying out generation, distribution or supply activities without the relevant licence. Licence exemptions are of benefit to vertically integrated embedded generation system projects for a number of reasons. First, under the Electricity Act 1989, it is not possible for one entity to hold licences for all three activities (generation, distribution and supply), and as such a licence exemption makes such a structure possible. Second, it frees small-scale industry players from the regulatory burdens of licence compliance.

3.2 Heat

The generation, distribution and supply of heat are not regulated activities in the same sense as electricity generation, distribution and supply.[31] However, two important statutory provisions apply to the operation of these systems:

- Section 50 of the New Roads and Street Works Act 1991 requires a person to apply for a street works licence (if it does not have a generation licence that extends to the distributed heating and cooling system as outlined in footnote 32). This is common to most projects of this type.
- Section 108 of the Housing Act 1985 deals with heating charges payable by secure tenants.[32] This may be relevant where the embedded generation system is supplying heat to affordable housing.

3.3 Consequences of limited regulation

From the author's experience, a 'light-touch' regulatory approach to embedded generation systems has both positive and negative outcomes. On the positive side, light-touch regulation affords greater flexibility to structure the commercial, technical and legal aspects of an embedded generation system project to suit the particular needs of the project. On the negative side, light-touch regulation means that more detailed contractual arrangements are required to address matters usually covered by regulation. This can increase the complexity of the legal, technical and commercial arrangements, with resultant time and cost consequences.

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31 An important qualification to this statement is that if a person holds a generation licence, then pursuant to Sections 10(3) and 10(3A) of the Electricity Act 1989, this licence enables the licence holder to rely on Schedule 4 of the Electricity Act 1989, which contains various powers that can apply to the distribution and supply of heat regarding street works, alteration of works, protection from interference, wayleaves, felling and lopping of trees and entry onto land for the purposes of exploration. In the author's experience, such powers (although not often exercised) can act as leverage when negotiating property and access rights.

32 In essence, a secure tenant is one or more tenants where at least one occupies a dwelling house as their only principal home and the landlord is a local authority, new town corporation, housing action trust or urban redevelopment corporation.

(a) Energy services companies and multi-utility services companies

Energy services companies: The European Joint Research Centre distinguishes energy services companies (ESCOs) from traditional energy service providers by referring to their delivery of the following:

1. ESCOs guarantee the energy savings and/or the provision of the same level of energy service at a lower cost by implementing an energy efficiency project. A performance guarantee can take several forms. It can revolve around the actual flow of energy savings from a project, can stipulate that the energy savings will be sufficient to repay monthly debt service costs for an efficiency project, or that the same level of energy service will be provided for less money;

2. The remuneration of ESCOs is directly tied to the energy savings achieved;

3. ESCOs typically finance, or assist in arranging financing for the installation of an energy project they implement by providing a savings guarantee;

4. ESCOs retain an on-going operational role in measuring and verifying the savings over the financing term.[33]

In the United Kingdom, the term 'ESCO' is also the name commonly used to refer to an incorporate or unincorporated project vehicle which has a central role in the design, construction, commissioning, operation and maintenance of an embedded energy system and the provision of heat and/or power supplies. This role is 'central' rather than 'primary role' for the reasons explained in section 5 below.

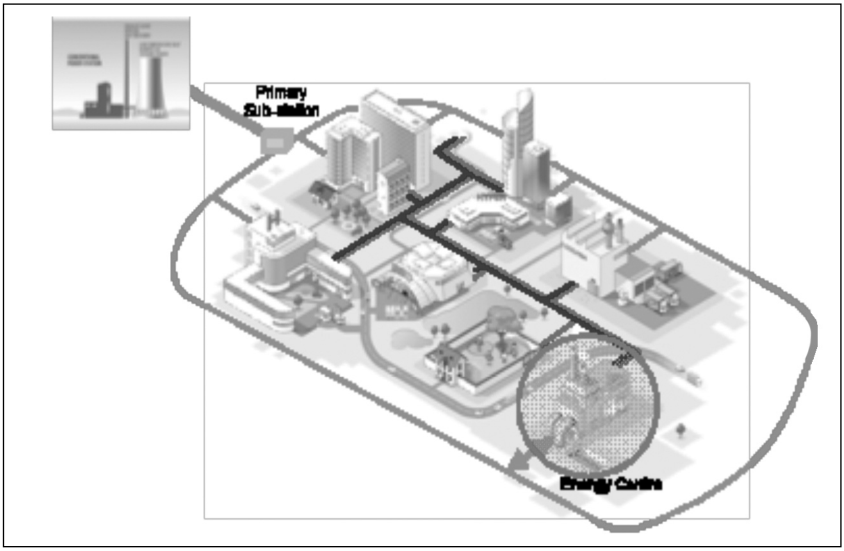
Multi-utility services companies: A 'multi-utility services company' (MUSCO) is an incorporate or unincorporated project vehicle which goes beyond energy services and incorporates a range of core utilities that can include electricity, gas, water, sewerage and telecommunications.[34] The term is now commonly used by mainstream utility companies that, through a variety of legal structures, establish a MUSCO (either themselves or in joint venture with other persons such as other utility companies) which assumes responsibility for the coordinated design, construction, commissioning, operation and maintenance of these core utilities. The arrangements can also extend to additional goods and services related to the core utilities, including embedded generation systems.

The diagram below illustrates the typical 'scope of services' that a MUSCo service organisation would present, with the MUSCO services running alongside the complementary existing utility services.

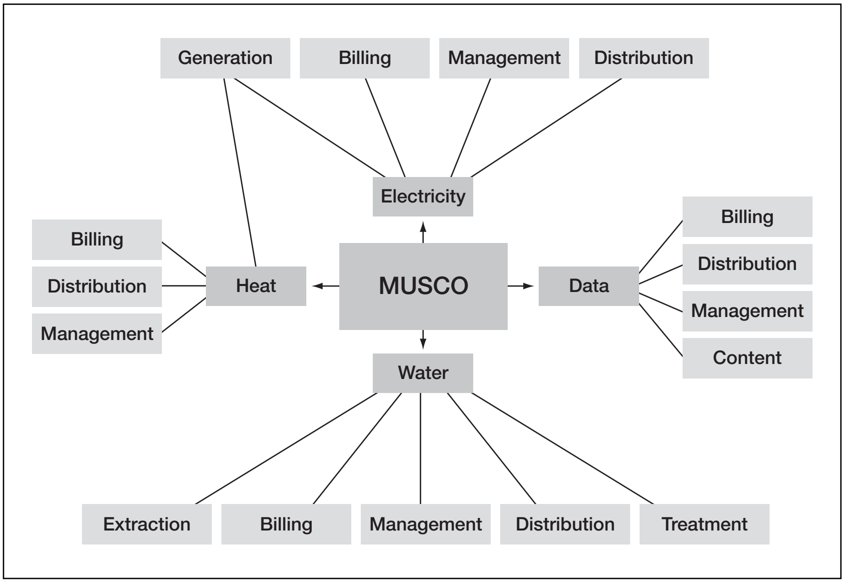
This example includes electricity, gas, water/sewerage, data (fibre-optic infrastructure), and could also encompass heat, cooling, borehole water extraction, building mounted, integrated renewables, waste sorting and collection and waste

33 *Energy Services Companies in Europe: Status Report 2005*, Paolo Bertoldi and Silvia Rezessy; European Commission Director General Joint Research Centre, Institute for Environment and Sustainability, Renewables Energy Unit; pp 17 and 18.

34 For example, see the Elephant and Castle regeneration project (www.elephantandcastle.org.uk/00,news,1608,185,00.htm) and the Allenby/Connaught Project (www.aspiredefence.co.uk/pages/mujv/).



The schematic below illustrates the high-level structure and function of a typical MUSCO.



Given the utility regulatory regime in the United Kingdom (as outlined briefly in sections 2 and 3 above), there are certain activities that only licensed entities (eg, an electricity distribution company) can perform. Further, the utility regulatory regime either prohibits a single entity from carrying out more than one regulated activity or makes it sufficiently complex (due to the different regulatory rules governing each utility market in the United Kingdom) to make it unviable for a single entity to do so. For these reasons, it is not uncommon for the MUSCO to be a separate entity with no utility licences, which enters into the primary contract with a developer to procure this infrastructure and then enters into contracts with each relevant utility, which may or may not be an affiliate of the MUSCO.[35] At present, few organisations can provide the full gamut of services required, resulting in many entering into joint venture arrangements with complementary organisations.

A perceived advantage of a MUSCO, compared with an ESCO, is the ability to assess and realise additional revenue streams beyond just one core business, such as an embedded generation system. This is particularly relevant when considering data services, where the margins for the sale of wholesale network access or even retail content are considerably higher than for the sale of energy or water supplies.

4. Key issues for an embedded generation system project

4.1 Introduction

This section considers key commercial issues for embedded generation system projects in the United Kingdom, and in doing so also touches on some key technical and legal issues. While the technical and legal matters can have a significant influence on the commercial aspects of the project, it is typically the commercial aspects of the project that ultimately determine whether it is viable and how it should be structured. Consequently, from the author's experience, the commercial issues are usually considered in detail first before the stakeholders delve into technical and legal matters.

Given the diversity and complexity of embedded generation system projects, this section is not intended to be an exhaustive or detailed analysis of the key issues for these projects. Instead, it is intended to be a checklist to assist you in understanding the key issues you need to consider for an embedded generation project.

'Core stakeholders' below refers to:

- the person procuring the embedded generation system project, which may include a property developer, landlord, local or statutory authority and/or anchor customer (referred to as the 'principal');
- the ESCO/MUSCO (although for convenience, references to 'ESCO' in the remainder of this section also mean a MUSCO which is involved in an embedded generation system project); and
- the consumers of heat, cooling and/or power supplies generated by the embedded generation system, which may include both non-domestic (eg, industrial, retail and commercial) and/or domestic (including social housing) customers.

As in any project, a raft of other stakeholders have a role to play in the project, including:

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35 For certain utilities, there are regulatory restrictions on a licensed utility's dealings with affiliates (eg, Condition F6.8 of the Water and Sewerage Licence and Standard Condition 41 of the Electricity Distribution Licence).

- public bodies which issue relevant licences, permits, permissions and other authorisations (eg, the local planning authority, Ofgem, the Environment Agency and the Competition Commission);
- insurers;
- debt and equity funders;[36]
- any persons with property interests who are not core stakeholders (eg, the owners of adjoining land owners or persons with interests, such as wayleaves, on the relevant land);
- utility companies which provide utility connections and/or supplies to the embedded generation system, the principal and customers;
- the fuel supplier(s); and
- the ESCO's contractors and suppliers.

Finally, while this section considers the key commercial issues, the principal must also consider the most appropriate process to select an ESCO and identify, agree and document (in contracts) the commercial, technical and legal arrangements concerning the embedded generation project. Some principals (eg, public authorities and licensed utilities) are caught by procurement regulations which, if applicable to an embedded generation system project, will require the principal to procure the embedded generation system project in accordance with the relevant procurement regulations.[37]

4.2 Key commercial issues

The key commercial issues are set out below.

(a) Financials

This is the most important commercial issue to be addressed for these embedded generation system projects, as it determines whether the project is viable. The key financials are typically as follows.

Capital and operational costs: The first issue to consider is the likely capital and operational costs associated with delivering the project and how these will be allocated between the core stakeholders. Key points to consider here are as follows:

- the technical aspects of the embedded generation system, including what it is, how and when it is to be designed, installed and commissioned, and its interface with existing infrastructure (including existing utility infrastructure);[38]

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36 Please read the chapters in Part 3 for more information on issues for debt and equity funders.

37 The Utilities Contracts Regulations 2006 and the Public Contracts Regulations 2006.

38 Related issues include:
- whether the embedded generation system is to be installed on a greenfield site or retrofitted to cater for existing customers;
- the legal obligations that the principal must meet which impact on the embedded generation system project (eg, planning obligations which set renewable, sustainability and carbon targets); and
- the input fuel for the embedded generation project.

The input fuel(s) in itself raises broader issues, particular for renewable fuel sources such as biomass, where the core stakeholders must consider the sustainability of the input fuel and the security of fuel supply.

- who will undertake the core activities of design, installation, commissioning, operation and maintenance;[39] and
- whether the party with primary responsibility for the costs of the core activities will receive a financial contribution to such costs from any of the other core stakeholders. For example, if the ESCO is primarily responsible for such costs, the principal may agree to contribute to such costs in return for a reduced cost for a lower heat, cooling and/or power price or a direct income stream from the project.[40] Alternatively, if the principal designs, installs and commissions the energy system, it may transfer ownership to the ESCO for valuable consideration.[41]

Income: The second issue to consider is the likely income generated from the project and how that income will be distributed between the core stakeholders. The main income streams for this project are as follows:

- ESCO – assuming that the ESCO is more than an operation and maintenance contractor receiving a fee for service, it will receive income from the sale of heat, cooling and/or power. Some key considerations here are:
  - to whom the ESCO is selling the heat, cooling and/or power, which could include a combination of on-site customers,[42] external customers[43] and, in the case of power, a licensed electricity supply company;[44]
  - the price it will sell it for. Typically, the electricity price is determined by

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39 Related to this is the insurance costs. In order to determine the most appropriate insurance regime for an embedded generation project, the core stakeholders need to consider what insurances are required and, for each required insurance, determine:
• the extent to which there are any existing insurance policies (eg, group insurances);
• the insureds, loss payees and persons noted on the policy;
• the level of insurance, premiums and deductibles;
• the person responsible for effecting and maintaining the insurance; and
• whether there are any gaps or overlaps with any other relevant insurance policy.

40 In addition, the ESCO may assert that the principal should contribute to such costs on the basis that an embedded generation system displaces certain utility infrastructure costs that the principal would have incurred in any event.

41 A principal may choose to transfer for nominal consideration or less than full valuable consideration if it receives a benefit elsewhere, such as a reduced heat, cooling and/or power price. If the principal is a public body, it may be required to transfer for full valuable consideration in order to meet its best value obligations.

42 If the principal is the landlord of such customers, the ESCO will typically seek to impose an obligation on the principal to procure that these customers connect to and take a supply from the embedded generation system. Before agreeing to this, a principal must consider what legal restrictions may exist which would hinder their ability to agree to such an obligation. Such restrictions may exist in statute (eg, pursuant to relevant landlord and tenant legislation) in the lease with the tenant or, more broadly, because of competition law issues.

43 When using the phrase 'external customers', the author is referring to customers who are outside a defined area within the principal's legal control (whether pursuant to statutory powers or as freeholder, tenant or perhaps manager pursuant to an estate management agreement). The extension of an embedded generation system to external customers is a matter that requires careful consideration, particularly if an external customer is identified after the core agreements are signed. If the principal is prepared to allow the embedded generation system to be extended to external customers, the parameters within which an ESCO can do this must be carefully defined in the core agreements between the ESCO and the principal.

44 If the ESCO is exempt from holding a generation licence, then in order to sell the electricity to a licensed electricity supplier, the ESCO must either register under the Balancing and Settlement Code or designate another Balancing and Settlement Code party to register (and enter into a power purchase agreement with that party).

reference to market prices. However, there is no 'market price' for the supply of heat and/or cooling. This means that the ESCO and each customer must agree a bespoke price which takes account of the ESCO's costs of supply, the volume of the supply and the term of the agreement.[45] If the supply of power, heat and/or cooling is for more than one year, there is usually a price review mechanism and, particularly in the case of power, the customer has the ability to switch supplier;[46]
- the fiscal incentives that the embedded generation project will be entitled to receive (see section 3 above), who is entitled to receive the benefit (which may depend on who owns the embedded generation system) and the extent to which the beneficiary will directly or indirectly share that benefit with the other core stakeholders; and
- whether the ESCO provides any other ancillary services and, if so, the price to provide such services.

The ESCO may derive further income from an energy and/or carbon savings regime, but may also have to pay moneys to the principal and/or other customers if those savings are not achieved.

- Landlord – the owner of the land on which the embedded generation system is located (which may be the principal) may receive lease rentals from the owner/operator of the embedded generation system.[47] As with any lease rental, the issues are how much and when can it be varied. However, from the author's experience, what is particularly challenging in the United Kingdom is that there is limited market information in order to determine an appropriate market rental for an embedded generation system.[48] Consequently, for many projects the rental is a 'calculated rental', which is calculated by reference to the other financials for the project, particularly the ESCO's income stream.
- Owner of embedded generation system – if the owner leases the equipment comprising the embedded generation system to another core stakeholder, it can receive an equipment lease rental. For example, the principal may design, install and commission the embedded generation system, but retain ownership and lease the equipment to the ESCO for an agreed period, so as to enable the ESCO to run its business.
- ESCO sponsors – each sponsor's income stream can take a variety of forms, but the most common is dividends.

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45 It is not uncommon that the price for heat and cooling includes a standing charge to cover fixed costs and a variable charge to cover operating costs.

46 If an ESCO's customer switches electricity supplier and the ESCO owns the distribution network connected to that customer, the ESCO can still generate revenue through use of system chargers payable by the customer's new electricity supplier.

47 From the author's experience, for many embedded generation system projects where the landlord is also the principal, there is simply a peppercorn rent on the basis that the principal will receive other financial benefits, such as lower power, heat and/or cooling prices. However, more principals are now seeking a rental stream.

48 The release of valuable space for development/rental is a primary benefit, although it will always be difficult to assign a valid monetary value to this benefit; there is also the opportunity to utilise undeveloped (distressed) land to accommodate energy centres which suit out-of-the-way, low-value sites.

Financial targets: The third issue to consider is the financial targets for the project, including:

- the internal rate of return that the ESCO is entitled to earn in delivering the project and running its embedded generation system business; and
- cost savings that the principal and/or other customers want to achieve from taking more energy-efficient heat, power and/or cooling supplies from the embedded generation system compared with procuring them via conventional means.

Setting the financials is often a time-consuming process which commences as one of the initial key issues for the project and continues to be developed and updated while other technical, commercial and legal matters are agreed. From the author's experience, the core stakeholders often have differing views on the financials, including both the methodology for, and figures used in, determining each key element.

The core stakeholders will also have to agree and document the circumstances which entitle any of the financials to be modified[49] and what happens if the financials move beyond certain tolerances (eg, if the project becomes financially unviable for a party or a party is making 'super-profits').

Related issues to all of the above are:

- the term of the project, which will need to be long enough for the parties that incurred the capital and operational expenditure to achieve the agreed return on their investment. Periods of between 15 and 25 years (and sometimes longer) are not unusual; and
- the tax and accounting treatment of the financials. This includes such things as value added tax, withholding tax and capital allowances (including enhanced capital allowances), all of which are beyond the scope of this chapter.

(b) Responsibility for core activities and ownership of embedded generation system

Another key issue is determining who is responsible for the core activities of designing, installing, commissioning, operating and maintaining each component of the embedded generation system and who owns the embedded generation system.

In the author's experience, there are a variety of ways of dividing the core activities. Two of the more typical divisions are as follows:

- The ESCO takes full responsibility for all core activities and owns the embedded generation system.
- The principal designs, installs and commissions all or a part of (eg, the distribution network) the embedded generation system and then:
  - either transfers ownership to the ESCO (for either nominal or valuable consideration) or leases the equipment comprising the embedded generation system to the ESCO for an agreed period so as to enable the

49 This includes determining a procedure which will accommodate changes to the scope and timing of the delivery of the embedded generation system and changes to the system post-commissioning.

ESCO to run its business. The ESCO is then responsible for operation and maintenance of the embedded generation system; or

- retains ownership and possession of the embedded generation system and simply engages the ESCO as the operation and maintenance contractor (which may also include metering, billing and other services).

Part of the process of dividing responsibility is to identify, allocate and determine how to manage the key risks for delivering the project.

(c) Ownership of ESCO

The third key consideration is the legal structure of the ESCO and who will be its sponsors. Two typical structures for the ESCO are as follows:

- The sponsors are persons other than the principal or the customers (eg, a utility company); or
- The sponsors are two or more of the core stakeholders (eg, the ESCO and the principal).

If the ESCO's sponsors do not include the principal and the ESCO is not in itself a entity of substance, the principal may require performance and/or payment support from the sponsor (eg, in the form of a parent company guarantee or independent security).

If two or more core stakeholders are likely to be sponsors, they will each need to consider the issues set out in the chapter entitled "Structuring the project vehicle".

5. Conclusion

While various government incentives aim to encourage investment in embedded generation system projects, ultimately it is whether agreement can be reached on the above key commercial issues (and then the other commercial issues, as well as technical and legal matters) which determines whether an embedded generation system project is viable and can proceed.

What is hopefully apparent from section 5 above is the large number of interrelated commercial decisions that need to be made in order to determine an optimal solution for a particular embedded generation system project. In practice, the growing maturity of the embedded generation system market has led to a wide variety of solutions. While there are benefits to this (eg, the solution is tailor-made for the project), this variety – coupled with the lack of specific regulation for embedded generation system projects and the lack of interconnected systems (eg, across a town or city) – has led to a fragmented and non-standardised embedded generation system market. This may create difficulties in the future if the government chooses to create standardisation, whether on a specific policy matter affecting embedded generation projects or on the whole embedded generation market generally.

As the embedded generation system market in the United Kingdom is likely to grow rapidly over the coming years, it is important that the government and all interested stakeholders carefully consider the above matters so as to ensure a smooth transition for those that have taken the risk to invest early in this market.

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