BUSINESS PLAN: ENERGY APPLICATIONS
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ENERGY APPLICATIONS™

Enabling Energy Services

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for the conferral of Master in Business Administration

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1. Foreword

This thesis is the product of five years (or approximately 7,000 out of a target 10,000[1] hours) of practical and theoretical exposure to world energy markets from London, Lisbon and New York. During this time the author has brokered energy insurance packages in Lloyd's of London for global renewable energy developers, worked with two utilities in Europe both in the field and designing high level energy efficiency strategy, and consulted a clean energy investment firm in New York that builds and funds start-ups in emerging markets. The culmination of these assignments is an appreciation for the scale and variety of the challenges that lie ahead for the energy industry, and a grasp of what it takes to be successful within such a competitive and ever-changing environment. This thesis intends to lay grounds for significantly impacting upon world energy markets, by understanding and consolidating a set of innovative modern sub-industries, known as 'Energy Services', and creating a business that will be able to capitalize on the opportunity to the full, unlike ever before.

[1] **The "10,000 hour rule" -** Malcolm Gladwell (Outliers, 2008) states that the key to succeeding in ` environments is largely a matter of practicing a specific task for a sustained period of time. He uses examples from the software industry including Bill Joy and Bill Gates, musicians like The Beatles, and the best litigation lawyers in New York City, all of which practiced their various disciplines for at least a total of 10,000 hours before getting a 'break' and becoming well-renowned leaders in their fields.

2. Abstract

The energy services industry is not only misunderstood due to its diversity of value propositions, it has also been largely ignored as a major short term means of tackling climate change, ensuring energy supply security, and mitigating against rising energy costs (the three typical national energy policy goals frequently quoted around the world).

Private sector business models have not been sufficiently identified, designed, incorporated, and evolved to meet the enormous opportunity that exists. The motivation for this thesis is therefore to design a highly effective business model that will make rapid inroads into the energy services industry, based on a deep understanding of its history, inherent market failures and institutional barriers, and critical success factors.

This study set out to establish the range of existing business models in the energy services sector, and to explain the current and likely future market trajectories of its component parts, being, the energy efficiency, renewable microgeneration, carbon management, and smart energy management sub-industries, by conducting a literature review of thirteen high profile studies and interviewing multiple participants across the industry. The thesis also undertakes a thorough data analysis of the UK energy services market, quantifying its investment potential up until 2020 by developing individual growth models for each sub-industry.

Five broad categories of energy services business models were identified including Utility Service Companies, Original Equipment Manufacturers, Energy Service Providers, Energy Service Companies, and Integrated Developers, which can be further broken down, proving that supply side fragmentation is severe. The data analysis concluded that an immediate total addressable market of £106.8 billion exists for a well constructed business which adequately combines the skills needed to operate across the four energy services sub-industries. The structure, resources, and value proposition of this business are set out in the enclosed business plan for a new company called Energy Applications™.

3. Executive Summary

The purpose of this thesis is to design the blueprints for a highly successful energy services firm, using business model innovation, and grounded on a deep understanding of the changing nature of the energy industry, the evolution of the energy services sector, its sub-sectors and technologies, and the current and future state of the UK opportunity.

The thesis introduces the energy services industry through suggesting that the conventional economic theory, in which rational economic agents will always seek to maximise their own utility by consuming more with disregard for others, cannot be sustained for much longer in the energy environment which is resource constrained, and that climate change economics and energy supply security will lead to a dramatic shift towards a service oriented energy market.

The energy services industry is rooted in the provision of supply side services (primarily procurement and hedging price risk), however a clear transition towards demand side management (energy efficiency), onsite generation (renewable microgeneration), smart energy management, and carbon management exists, hinging on innovative new technologies.

The energy services literature identifies five main categories of business model in existence in Europe and the US, namely, Utility Service Companies, Original Equipment Manufacturers, Energy Service Providers, Energy Service Companies, and Integrated Developers. These can be broken down into other variations as testament to the supply side fragmentation that exists. Such lateral widening of value propositions has detracted from the industry's ability to mobilize significant demand through a single game changing value creator.

While typical energy services projects have a low risk profile similar to that of US government bonds, and high return characteristics equivalent to small companies, growth has failed to materialize. This can be attributed to the failure of credible energy service businesses offering tangible, short term, low cost solutions that are able to transcend traditional market failures and institutional barriers to energy services including amongst others, split incentives between landlords and tenants, measurement and verification challenges, access to capital, complexity of carbon markets, and regulatory uncertainty.

The primary market for UK energy services is the building stock, which accounts for 45% of national energy consumption, and although energy intensity is falling well below the global average, significant potential for energy services still exists. This opportunity is calculated to

be worth **£106.8 billion** addressable immediately. £68.4 billion of this is in the energy efficiency retrofit market, achievable by 2050, of which approximately 30% is likely to be available by 2020. A £26.7 billion renewable microgeneration opportunity and £11.3 billion smart energy management opportunity exist through 2020 of which 50% and 75% respectively are seen to be achievable by then, as supply and demand drivers begin to reconcile. In addition, £180 million will be achievable by 2020 in the carbon trade market, arising from emission reductions that can be monetized. It is within this market that a new hybrid energy service business must build skills to ensure success.

The proposed start-up to capitalize on this opportunity will be named **Energy Applications™**. It represents the next major step in energy services business model innovation, combining the best of previous business models, and incorporating new components to rectify existing shortfalls. Energy Applications™ will be the first UK firm to enable energy services with impact, through coherently combining and leveraging the power of energy efficiency, renewable energy, carbon management, and smart energy management. Its mission will be ***to partner with its clients to deliver energy independence from innovative and integrated energy and carbon management solutions***, and it will go about this with ultimate professionalism, humility, ownership, vision, intensity, and diligence.

Energy Applications™ will consist of three revenue generating units – Analytics, Procurement, and Trade, which will offer a phased approach to achieving its clients' objectives, initially through monitoring, analysis and advisory, followed by project design and implementation under Energy Performance Contract or Energy Service Agreement, and finally monetization of excess energy supply and emission reductions. At the heart of Energy Applications™ will be a proprietary market making mechanism known as SYNERGYNET™, which will serve as the transaction mechanism, facilitating the channel between supply and demand at each stage of service provision from Analytics to Trade. SYNERGYNET™ is a virtual market place and intelligence gathering system, containing a series of data storage and analysis tools, client energy management applications, and procurement management mechanism. It ensures realisation of important synergies through leveraging both economies of scale and scope from its network of proven best-of-breed technology suppliers, whilst delivering competitively priced solutions through operation of a fully accountable sealed bid auction platform.

The first year of operation scheduled for 2013, will involve securing of office space, design, build, and testing of SYNERGYNET™, customization of operational contracts, fund structuring and capitalization, recruiting start-up team (including a Managing Director, Analytics, Procurement, and Trade Heads, Business Development Manager, Contract Solicitor, IT Manager and Operations/Accounting Manager), initiating a far-reaching marketing plan (including advertising, exhibitions, and trade shows), and initial client acquisition.

In 2013 Energy Applications™ expects total **operating expenses of £1.65 million**, 43% of which relate to payroll, and capital expenditure of £250,000 for the design and build of SYNERGYNET™. It also expects to secure 5 commercial, 5 industrial, and 10 residential clients of average size which will equate to a **combined project value for the year of £6.3 million** split £36,000 for Analytics, £6.3 million for Procurement, and £4,000 for Trade. After paying suppliers, Energy Applications™ will retain a **gross margin of £1.58 million**, which after interest results in a **net loss of £225,000**. 2014 will also show a **net loss of £105,000.**

By 2015 it is estimated that Energy Applications™ will achieve its **critical volume threshold of £13 million in turnover**, allowing it to reach **profitability of £322,000**. It is only at this level that the business model makes economic sense due to the significant investment in people and skills that is required (payroll accounts for 63% of operational expenses in 2015). To get to 2015, Energy Applications™ will need to secure a loan in the order of £2 million to cover the first year's operating expenses and investment capital required to build SYNERGYNET™. It is assumed that the firm's weighted average cost of capital will be 8% and that all debt will be repaid within five years.

Post 2015, the rate of growth in energy services markets is expected to accelerate, taking advantage of a conducive political environment in the UK, maturing technologies, and escalating power prices. Exceptional client retention rates will be guaranteed through high quality end-to-end service provision, and the securing of new long term projects will give Energy Applications™ a good chance of achieving profitability through 2020.

4. Introduction

a. Motivation

"One of the most urgent energy policy and energy economics challenges continues to be the search for suitable "tools" to execute energy conservation potentials. The level of success is far from satisfactory as the continuous increase in final energy consumption reveals."(International Energy Agency, 2009)

The energy industry as we know it is in the midst of a dramatic transition from mass commodity provision to being a service oriented marketplace. This evolution is being stimulated by an alteration in the supply and demand dynamics of traditional fossil fuel based power systems, in which natural resource constraints are impacting supply, and climate change economics are influencing demand, both of which are having negative price implications for energy consumers. The result is that a range of energy services are emerging to respond to new demand trends. These include energy efficiency contracts which guarantee savings through a series of hardware upgrades, maintenance services, and behavioural changes; renewable energy generation installations, both utility scale and distributed micro-generation; carbon management services to reduce building and vehicle emissions profile; and smart energy management services that utilise software and network creation to deliver flexible energy management capabilities. The scale of opportunities in each of these service lines is tremendous, albeit they are controlled largely by the international political agenda that emanates from the Kyoto Protocol. Continuing national regulatory uncertainty has hindered the coordinated private sector response to addressing the opportunity, and whilst many new companies have incorporated to offer some of these energy services, business models continue to prove less than compelling and all-round inadequate in harnessing the full power of energy services. This thesis will seek to understand the evolution of the energy services industry, the scale of the current opportunity that exists in the UK, identify the range of energy service business models deployed to date, evaluate the reasons for their inadequacy, and create the foundations for a new energy service business that is capable of delivering game-changing value to consumers in a persistent and defensible manner.

b. The Challenge

Energy Efficiency, Renewable Energy (Microgeneration), Smart Energy Management, and Carbon Management...these four themes have been at the centre of the energy conundrum since the beginning of the second millennium, as the climate change agenda has grown in

stature and realism. Each sub-industry in theory boasts strong fundamentals that are deemed to be able to alter the world's trajectory towards irrepressible global warming. So why are the best energy services companies yet to distinguish themselves to the extent that firms like Google, Apple, and IBM have stood above the rest in their respective fields?

Many organisations, both public and private, have emerged to combat society's greatest challenge, and capitalize on potentially the most lucrative business opportunity since the dotcom era. This has included firms from the conventional (fossil fuel based) energy industry, as well as start-ups, directing investment to innovative sub-industries including energy efficiency, renewable energy, carbon management, and smart energy management. Plenty have succeeded, but not to the extent that politicians have hoped or anticipated. Many, on the other hand, have failed. You need only look to the US for the latest in a string of failures that have engulfed firms from multiple sub-industries, namely electric vehicle manufacturer Aptera Motors with its infamous 2E, solar panel manufacturer Solyndra (which even received a US$535 million loan guarantee from the government), and Evergreen Solar Inc. The UK recently lost project developer Quinn Wind Energy and wind turbine manufacturer Proven Energy. Corporate failures are not characteristic of the energy industry alone. Other sectors have all faced their share of destruction as well, perhaps just not to the same extent. So what makes the energy industry unique in this respect?

The energy industry is not only the largest industry in the world, with the largest traded commodity, but it is effectively "a prerequisite for more or less all economic activity" (Vaekstfonden, 2006). It is a *system* comprised of many *interconnected elements*, namely overlapping sub-industries, technologies, products, services, international and national policy, and concurrent business models that all respond differently to a set of intertwined market drivers in order to achieve *a specific function*[2]. Implications of individual decision making may stretch way beyond first and second order effects, and business models are not always sufficiently resilient to survive the consequences. Many companies have succumbed to the competitive and inherently complex modern energy market place. Even well established organizations have failed to keep pace with the transition towards a highly diverse and innovative energy industry, as the supply side diverges from being commodity driven, to one constrained by resource availability, and therefore increasingly service oriented. So what can entrants do to hedge against such complex markets and mitigate against the high failure rate?

[2] Systems Dynamics is a concept born out of a group of MIT academics which is used to analyse and understand problems in new ways, taking a holistic approach and breaking complex systems into their component parts.

c. Research Purpose and Method of Analysis

To address this phenomenon, the research purpose shall use an explanation, prediction, and discovery framework. Specifically the paper will seek to **explain** (beyond the traditional factors quoted in most literature) why the energy services industry has failed to deliver, using quantitative and qualitative analyses of a selection of energy services business models and companies. It will then **predict** the future state of the energy services industry in terms of the persistence and defensibility of its components using industry life cycle analysis. Finally, it will **discover** the most suitable solution through design of a business model to deliver game-changing energy services solutions to energy consumers. In conceiving the business model, the author turns for inspiration to a term popularised by Johnson, Christensen, and Kagermann in their article "Reinventing Your Business Model" (Harvard Business Review, 2008), known as Business Model Innovation (BMI). According to Levy (Renewable Energy World, 2011) BMI offers a path to rapid deployment of existing technologies. In the current context, BMI provides new ways to "monetize the ancillary benefits of cutting emissions, and create business models that focus on features that people are willing to pay for" (Levy, 2011). Therein lies the ultimate purpose of this thesis – **to conceive a business model which utilises existing technologies in a game-changing manner, proving sufficiently compelling for energy consumers, that they will be willing to pay for the service**.

d. Thesis Structure

The thesis is comprised of four main components: Context, Literature Review, Market Analysis, and Business Plan. The ***Context*** will introduce the energy services industry, defining its history and scope to date, whilst seeking to understand the evolution of the general business model, and what drives the markets in question. The ***Literature Review*** will assess leading authors' and organizations' perspectives on existing energy service business models in order to identify the issues that must be solved in the second half of the thesis, culminating in the ***Issue Identification*** (which will consist of a reference framework). The paper will then be brought to a head in the second half with a ***Market Analysis*** that will represent the first attempt in the UK to size the energy services market according to investment potential across energy efficiency retrofits, renewable microgeneration, smart energy management, and carbon management. Finally, the thesis will propose a complete ***Business Plan*** (including financial analysis based on the market analysis section) for a new energy business, using business model innovation theory. The new business will be named **Energy Applications™.**

5. Context

a. "More is Better"

The global energy sector has undergone a vast evolution from its earliest stage provision of heat and light to support basic livelihood, using easily accessible natural resources. It has subsequently built countries and defined borders, created war and destruction, dominated world politics, sealed the fate of economies, and created some of the world's most powerful business tycoons. Its transition has been determined largely by technological innovation and a growth in scientific capability allowing individuals, companies, and governments to harness the world's natural resources for personal gain. The international struggle for economic superiority has largely come down to the availability of national energy resources on home territory, and the growth of consumerism and commerce has transformed the sector into one of mass commodity provision and wealth generation for those in control of the resources. One only need refer to the conventional economic theory, in which, as confirmed by McEachern (2006), economic agents (consumers) acting according to rational self-interest, will always attempt to maximise their own utility without consideration for the effects of one's actions on others – hence "more is better". Evidence of this theory clearly exists within the energy industry throughout its history, as final energy consumption continues to rise even today. Only during the oil crises of 1973 (caused by the Arab Oil Embargo) and 1979 (due to the Iranian Revolution) when major industrial economies faced petroleum shortages, did energy consumers begin to consider voluntarily reducing consumption. During this period, the world got its first taste of demand side management and started to consider "energy efficiency" to be worthwhile and a viable alternative to increasing supply. This was however short-lived when supply side pressures were alleviated during the late 1980's and 90's, increasing competition once again, reducing prices, and ramping up end-use consumption with disregard for efficient use of energy.

The effects of limitless energy consumption have been largely ignored up until recently due to seemingly endless supplies of fossil fuels and the euphoria of the resulting economic growth and prosperity. The next phenomenon however, which has threatened to alter the trajectory of the world's energy consumption indefinitely, is climate change as a result of greenhouse gas (GHG) emissions. Although having received much scepticism relating to evidence of its existence, most analysts finally accept that some form of cause and effect can be traced to fossil fuel combustion.

b. Climate Change Economics

The Intergovernmental Panel on Climate Change (IPCC), the most credible climate change research organization (established by the United Nations), has been instrumental in undertaking and presenting the most detailed research on the evidence for climate change, and has released four comprehensive assessment reports to date. In its *Fourth Assessment Report* (AR4, 2007) the IPCC concluded that "warming of the climate system is unequivocal". Furthermore, the report states that "most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations." On the basis of this evidence, the EU has established and committed to a Climate Protection Target of containing the global mean temperature increase to no more than 2°C relative to pre-industrial levels. The European Commission claims that "in order to have a 50% chance of keeping the global mean temperature rise below 2°C relative to preindustrial levels, atmospheric GHG concentrations must stabilise below 450 parts per million (ppm) CO_2 equivalence". According to the IPCC the amount of carbon dioxide in the atmosphere in 2005 was 379 ppm (versus the natural ppm range over the last 650,000 years of 180-300 ppm). More recent updates from the National Oceanic and Atmospheric Administration suggest that even following the positive impact on emissions of the 2008-09 economic slow-down, current atmospheric CO_2 concentration is 395ppm (March, 2012).

This Climate Protection Target has profound implications for the energy industry and all of its components. The IEA (2006) captures this resolutely in stating that "at the point of use, the largest contributor to CO_2 emissions is improved end-use efficiency, accounting for nearly two-thirds of total savings." The IEA also cites more efficient vehicles, improved supply-side efficiency, and increased use of renewables in power generation as important factors in achieving emission reductions. To reinforce the potential role of energy efficiency, McKinsey's infamous CO_2 abatement cost curves report negative abatement costs for a series of demand side energy conservation measures including replacing incandescent light bulbs to LED's in residential buildings, upgrading to efficient home electrical appliances, residential HVAC retrofits, and thermal insulation in commercial buildings. This implies that investment in such measures would create a net financial gain to society over the project lifecycle, taking into consideration investment cost, operational expenses, and overall savings. Hence, energy efficiency and renewable energy are immediately viable means of addressing the climate change downside.

c. Traditional Energy Services

Energy Services as a concept did not exist during the era of fully regulated energy markets in which all consumers had to accept fixed tariff rates charged by national energy companies. Deregulation of energy markets has led to the rise of energy services innovations aiming to capitalize on previous market inefficiencies relating to price and service. Early liberalisation in the UK took place in the 1980's, when large energy consumers began bidding for their energy tariffs twice yearly in tender rounds, hence the opportunity for energy procurement consultants emerged, calling themselves energy service companies. Regulatory reform progressed further to allow certain consumers access to wholesale energy markets where they could purchase 'blocks' of energy on the same basis as utility suppliers on the day ahead market. This again required the expertise of energy traders with an understanding of energy markets and pricing mechanisms. As a result the early energy service companies (or procurement consultants) found a niche, and currently service 70% of the UK market. This gradually evolved to a model in which energy service companies not only procured energy from the grid, but managed onsite generation, installing and maintaining Combined Heat and Power (CHP) units, and upgrading boilers. The experience was different in the US with more early emphasis of energy services focusing on demand side management to mitigate against rising fuel costs associated with the oil crises. The purpose of early energy services companies whether in the UK or US was narrow, with clear demand or supply side strategising, inhibited by some degree of continued regulation and lack of competitive incentivization.

d. Modern Energy Services

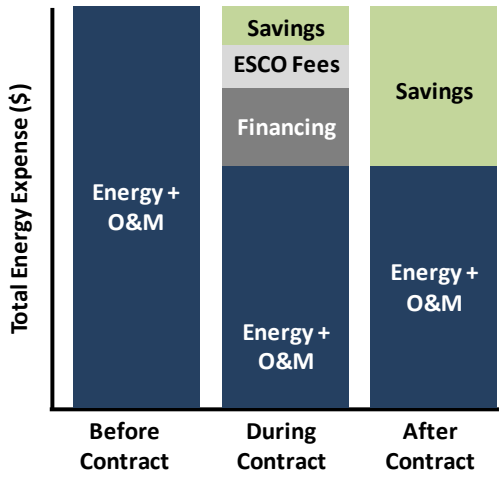
Energy Services, according to Bertoldi et al (2006) "encompass a range of activities, such as energy analysis and audits, energy management, project design and implementation, maintenance and operation, monitoring and evaluation of savings, property/facility management, energy and/or equipment supply, provision of service (space heating/cooling, lighting, etc.)." Immediately, energy services are now considered to be comprised of a multitude of new functions to optimise the energy environment. Broken into its component parts, Bertoldi's definition suggests that energy services can either address **energy demand** or **energy supply**. It also suggests that energy services can involve design and implementation of **capital upgrades** or simply ongoing **operation and maintenance** aggregation and improvement. Energy services can also be based on a range of applications that vary on a spectrum of non-interventionist analysis, monitoring,

and design (**intangible solutions**) or proactive audit, facility management, or equipment/service supply (**tangible solutions**). In addition, each of the aforementioned functions requires a unique contract form to administer the transaction which can vary in length from 1 day to 30 years.

Bertoldi's definition of energy services shows correlation with what Fawkes (2007) calls the "value drivers" within a company's energy operations, namely – energy prices, energy demand, O&M costs, and capital. The IEA also encapsulates both sides of the energy services equation claiming that "any energy supply should first of all focus on energy conservation by evaluating all possible demand reduction opportunities...only afterwards the remaining demand should be supplied as efficiently as possible – including renewable supply options" (IEA DSM, 2009). **These definitions imply that energy services can be comprised of a demand management function which is capable of analysing a customer facility, introducing consumption analytics techniques and optimisation, and a supply function which procures energy supply in the most economically viable and low carbon manner possible, either onsite or from the grid.**

The term energy service company (or ESCO), although considered widely ambiguous, has been defined by Goldman et al (2005) as "a company that provides energy-efficiency-related and other value-added services and for which performance contracting is a core part of its energy-efficiency services business." Fawkes (2007) also states that ESCO's "supply energy efficient equipment, heat, energy, Operations and Maintenance, or Facilities Management," but also guarantee savings, for which they are remunerated, usually facilitate project finance, retain an ongoing operational role, and are independent of an equipment vendor. This operating model is illustrated in Figure 1, whereby an ESCO creates savings at the outset, having signed a long term contract, which are fully realisable for the client once all financing and remuneration costs are recovered by the ESCO who is responsible for investment in capital upgrades to generate energy (and therefore cost) savings.

Figure 1: How ESCO's Operate



Source: Fawkes, 2007

6. Literature Review

Energy services as a concept has not been analysed and reported on as widely as other mainstream energy industry themes. Oil geopolitics and "peak oil" for example dominate tabloids on a weekly if not daily basis. The golden age of gas, nuclear power dilemma, and cleantech prospects have also received widespread attention from media, academics, research organizations, international policy groups, private companies, and heads of state alike. In building a literature review relating to energy services however, material is largely restricted to those highly resourced institutions with the foresight or political motive to try to stimulate interest and investment in the area. Entities like the EU Commission (EUC), International Energy Agency (IEA), UK Energy Research Centre (UKERC), Greater London Authority (GLA), and the US Environment Protection Agency (US EPA) are amongst the main sources of energy services insights and analyses. In addition, a handful of pioneering academics, writers, and business leaders including Paolo Bertoldi and Steven Fawkes have delivered some of the most comprehensive and advanced accounts of the energy services space.

Before embarking upon the specific energy services literature however, it is worth considering Johnson, Christensen, and Kagermann's paper (referred to in the introduction) which proposes the Business Model Innovation concept. It is highly relevant to the following business plan and in the context of the energy services literature to follow. Johnson et al in the December edition of the 2008 Harvard Business Review (Reinventing Your Business Model, 2008), came up with the telling assertion that "one secret to maintaining a thriving business is recognizing when it needs a fundamental change". Change in itself is not representative of the authors' key message, as it goes on to develop a concept named Business Model Innovation (BMI) whereby existing or new companies force industry change by deploying existing technologies in a unique and novel fashion, such that it can "define value in a new way and provide game-changing convenience to the consumer". The 2008 article describes how BMI has "reshaped entire industries and redistributed billions of dollars of value." For reference, the authors quote some of the world's most successful companies from the US retail sector (including Wal-Mart, and Target, which, based on innovative new business models accounted for 75% of the total valuation of the retail sector in 2008) and low cost airlines (which grew from nothing to capture 55% of the US airline industry). Perhaps, the greatest known example of BMI is Apple, which "built a groundbreaking business model that combined hardware, software, and service" and transformed the mobile device and music industries, whilst providing substantial convenience to the consumer. Levy (2011), writing for

RenewableEnergyWorld.com builds upon Johnson et al's work relating to BMI but within the clean energy sector. He confirms that "BMI provides ways to monetize the ancillary benefits of cutting emissions, and create business models that focus on features that people are willing to pay for" (RenewableEnergyWorld.com, 2011). Levy's paper is affirmation that we are entering an era of BMI, which can be just as effective (if not more) than developing new products and services. Moreover, Levy illustrates the appropriateness of BMI in the energy services sector drawing attention, for example, to the range of obstacles that currently exist to the uptake of energy efficiency. Levy states that "BMI can develop systemic solutions that overcome some of the many market failures and institutional barriers to energy efficiency and clean energy". Within the industry he refers to Better Place, who, with a new model for replaceable batteries for electric vehicles, is attempting to transform the way in which the industry will function. EnerNOC, the demand response firm that creates virtual power networks, is also referenced by Levy as a firm that innovatively combined existing IT network and energy management applications to solve a significant consumer need.

* * *

Turning to the energy services literature, significant disparity has emerged between authors arising out of variable motives and fragmented experiences. This has resulted in conflicting views as to what comprises an energy services business, with multiple definitions commonly used, and a maze of disconnected obstacles that have constrained collective industry growth. Unsurprisingly many different companies with diverse business models and solutions have appeared, all classing themselves to some extent as energy service providers, including **Utilities**, **Energy Service Companies** (Performance Contractors), **Energy Supply Companies** (Supply Contractors), **Energy Service Provider Companies**, **Integrated Energy Contractors**, **Original Equipment Manufacturers**, **Integrated Developers**, **Local Authorities**, **Building Energy Management System Providers**, **Sustainability Consultants**, and general **Contractors**. All of these appear in the literature. A game-changing energy services business model has still not emerged with conviction. More politicians and economists are acknowledging the scale of the challenge that the energy services industry currently bears, and the stage is set for appropriate BMI. The following literature review covers all of the business models referenced above, and is organised thematically as follows:

- The Brattle Group provides a high level account of the likely shift towards an energy services as opposed to the existing commodity-based energy industry, claiming that, **utilities** being the most viable form of investment vehicle, can only rebuild necessary

supply side infrastructure if they have an adequate stake in the energy services transition. Other authors reviewed do not see the role of utilities being significant in the short term, but rather as exit strategies (potential buyers) for successful pioneers.

- Bertoldi, Hinnels, and Rezessey (2006) argue that **ESCO's**, having had some success in the facilities management arena in the UK, could use community projects as a stepping stone to address the household energy services/retrofit opportunity. Saxena and Hinnels follow this up with a later study suggesting that ESCO's may also be the most appropriate way to address the UK's need for 10 million near zero-carbon new build houses by 2050. This is confirmed by the Greater London Authority which is firmly in support of the ESCO model for public sector retrofits (RE:FIT) and the commercial Better Buildings Partnership programme currently under way in London.

- Deutsche Bank (DB), in contrast to UK commentators, focus their attention on establishing the next generation of financing models to support the energy services sector, thereby implying an operational business model somewhat different from the ESCO's which have become common place in the US public sector. In supporting a novel "Energy Services Agreement" structure, Deutsche Bank infers that the **Integrated Developer** is likely to outlive the ESCO model by providing more diverse, honest, and all encompassing engineering, finance, and advisory solutions.

- The IEA also disagrees to some extent with the UK's sole focus on the ESCO model (also known as the EPC model), suggesting that the **Energy Supply Contracting** model has made far more of an impact in the energy contracting sector. With the advent of distributed (renewable) generation, this is the basis for future energy services, when combined with EPC, forming what is known as **Integrated Energy Contracting** (IEC). The EU Commission, US EPA, and Danish Enterprise and Construction Authority's arguments reinforce that of the IEA, suggesting that an integrated approach of product service systems will be the most effective strategy.

- Steven Fawkes presents a compelling case for an energy services transition in the UK, using evidence from the US in particular, and advancing the concept of outsourcing energy management as a fundamental tool for reducing energy consumption and carbon emissions using a systems approach. Taking the most holistic approach, he presents a number of energy services business models that have been used in the UK,

but which tend to consider only a single aspect of energy management; contending rather that the future is likely to entail the integration of supply and demand services within an integrated package that uses monitoring and targeting methods combined with automatic meter reading (AMR) technology, distributed generation, and enterprise energy information systems. This bears similarities to the IEA view.

* * *

Thomas Edison always envisioned that the energy sector would sell services in the form of useful power such as heat, light and appliance hours, rather than merely kilowatts as a commodity. Peter Fox-Penner (Principal/Chairman of the Brattle Group, a leading US advisor in the field of electricity and gas markets), recently published the paper entitled ***"Return of the Energy Services Model: How Energy Efficiency, Climate Change, and Smart Grid Will Transform American Utilities"***. The paper considers a major transition from a "commodity utility business" that currently exists, to an "energy services model". In support of this, the author focuses on the current role of the utility industry in the US, which, since the industrial revolution, has enjoyed rising commodity sales. Having since gained enormous financial credibility, the article continues, utilities are seen as attractive investment vehicles for investors seeking strong and safe asset backed positions. Utilities have thus been able to raise cheap debt and fund the new infrastructure requirements of the power generation and transmission business. Fox-Penner notes that with an imminent flattening and likely decline in commodity sales due to climate change policy (particularly carbon markets), energy prices will have to rise resulting in further declining retail sales as consumers cut consumption. Regulators will then act to moderate price increases, further constraining utility margins and causing a reduction in investor returns. Subsequently escalating utility borrowing costs, will leave "the traditional utility industry...with the non-viable proposition of rebuilding its supply system financed solely by declining commodity sales". The solution, Fox Penner says, is to facilitate a utility industry that "financially hedges its declining commodity sales with increasing energy services revenues". This will supposedly be enabled by the smart grid whereby utilities become a "unique hybrid between network providers and regulated public works". This suggests a return to Thomas Edison's vision that utilities will begin selling delivered energy (heat, light, etc) instead of raw commodity which most energy consumers do not understand. This implies a shift towards delivering a function rather than a product. The author supports his perspective by stating that other innovation attempts such as ESCO's, have failed outside of the public sector, making the **utility service model** more compelling.

Despite the paper's convincing rational for a major transition to the energy services model, few energy regulators or utilities across the world would agree with Fox-Penner's vision, at least not within the next decade. The prospect of such a major transition, which hinges on the commercial viability of smart grid, is surely unacceptably obtrusive to an industry entrenched in its ways. Regulatory reform to oversee such an energy services industry would also be nigh on impossible to achieve for today's governing bodies bearing in mind the bureaucratic decision making process that would need to be satisfied. Therefore, despite The Brattle Group's prominent position in the energy services sector, and their strong underlying rationale, the paper lacks objective evidence for such a transition, and seems far from near-term reality. There may still however be room for business model innovation around utilities.

In contrast to the Brattle Group's view that the energy services evolution will favour utilities, three leading studies produced by the EU Commission (2008), US EPA (2009), and Danish Enterprise and Construction Authority (2010) respectively, suggest that integrated ESCO's may be a more suitable approach. In particular, the three papers have concurrently focused on the concept of **product service systems (PSS)** as being at the core of new business model innovation. According to the US EPA, "the PSS concept describes the economic space in which products and services are combined in value propositions to meet customer needs". The articles make it clear that PSS is to be distinguished from conventional product or service related customer value propositions, wherein, a system of products and services are offered to the market in a mutually reinforcing manner, providing environmental benefit and changing the dynamic of an industry and how it generates return. The US EPA reinforces the potential of service based innovation by stating that what is particularly required are "sustainable service-led business models" in order to "address the challenge of the 'services transition' and to exploit the promise of the **'functional economy'**" (US EPA, 2009). This is broadly in line with The Brattle Group's position, but offering a different solution. The EU Commission also validates the need for business model innovation that focuses on resource preservation. All three studies, produced by top industry participants and academics, reference ESCO's as one of the successful business model innovations that will alter the business-as-usual trajectory towards more sustainable growth through the adoption of product service systems. The Danish Enterprise and Construction Authority state that the shift aims to deliver "function as opposed to products". ESCO's certainly aim to deliver energy savings and emission reductions, not through sale of a specific product or service, but through a well-designed and implemented combination of reinforcing measures that span products, services, and

behavioural changes. One specific form of energy services business model to be noted (as referred to by the EU Commission) in addition to the typical EPC, is what is known as the "Design, Build, Finance, Operate" model which usually involves a public owner and a private operator and is used in the event of long term contracts up to 35 years in which the public stakeholder needs to ensure a certain performance through private sector incentives. All three research papers are authored by very credible sources in their own rights, and with consistent content and supportive evidence coming from the three studies, the product service system concept is internationally sound. Furthermore, and what is important for the purposes of this paper, the potential for ESCO's to fulfil this business model innovation seems to exist.

Steven Fawkes, in his book ***"Outsourcing Energy Management"***, shows support for the ESCO model in general, emphasising the indefinite importance of services in the future of the energy world. His arguments hinge on the concept of outsourcing, which correlates to some extent to the IT industry of twenty years ago in which outsourcing became a widespread means of obtaining necessary expertise, increasing flexibility, improving performance, and converting fixed costs into variable costs. His arguments also elaborate on specific energy service business models that have prevailed in the UK, which can be split into the two broad categories of **Energy Service Provider Companies** (ESPC's) and **Energy Service Companies** (ESCOs), the key difference being that ESCO's guarantee savings where ESPC's do not, and are remunerated based on performance on an ongoing basis.

Fawkes identifies three types of ESPC's, namely **Energy Procurement Consultants** (which traditionally focused on risk management related to energy procurement and offsetting price risk), **Technical/Management Consultants** (which perform strategic reviews, energy audits and energy management design and implementation), and **Monitoring and Targeting Bureaux** (which undertake data entry, invoice validation, finance reporting, and energy procurement based on building software and enterprise energy information systems). In addition, Fawkes describes the five primary forms of ESCO in existence in the UK, namely **Energy Saving Performance Contracting** (also ESPC, which operates using a guaranteed savings method and focuses on demand side management)**; Build, Own and Operate** (BOO, which has traditionally designed, built, financed, and performed O&M on CHP installations); **Chauffage** (which consists of a 20-30 year contract for the provision of utility service, usually heat); **Contract Energy Management** (CEM, which focuses primarily on provision of O&M services on the back of BOO/Chauffage deals); and **Multi-Utility Outsourcing** (in which an ESCO sells all utilities including electricity, heat, water etc. under a Service Level

Agreement), all of which (with the exception of the last) have tended to focus on isolated aspects of the energy management process. For this reason, he claims, energy services companies have failed to offer holistic service provision and obtain the level of trust that is required for them to secure long term (twenty year plus) major energy management outsourcing contracts. This supports the opening statement to the literature review that a game-changing energy services business model has still not emerged with any conviction. The categorization of business models offered by Fawkes is unrivalled in any other energy services literature covered. And with the credibility of the author, being from within the industry and part of one of the pioneering utility ESCO's, his views are very informative in relation to energy service business model analysis.

As we focus in on the UK specifically, Bertoldi, Hinnels, and Rezessy, the well known authors from the European Commission, University of Oxford, and Central European University respectively, in their paper ***"Liberating the Power of Energy Services and ESCOs in a Liberalised Energy Market"***, provide the most insightful evaluation of the state of the UK energy services market and business models through the late 2000's. They claim that three distinct markets and models exist for energy services in the UK; namely one for commercial/industrial energy services known as the Facilities Management or Performance Contract model, which is served by **ESCO's, Facilities Management** (FM) firms, and large **Original Equipment Manufacturers** (OEM's); one for community heating schemes known as the Community model served mostly by **Local Authorities**; and one for domestic energy services known as the Household model, not served at all. The paper offers general support for the ESCO business model, claiming that by offering "integrated energy services" packages on a turnkey basis, traditional barriers to energy efficiency can be overcome through some "combination of design, build, finance, operation and maintenance". They qualify this perspective however by providing a set of barriers as to why ESCO's have not proven particularly successful to date. Reasons include the cost of securing and retaining household power supply licenses, exposure to the risk of wholesale energy market pricing without owning upstream assets, consumer apprehension to long term contracts with unknown service providers, insufficient consumer protection frameworks, and a regulatory environment which stifles innovation. Despite these challenges for the ESCO business model, the authors emphasise the existence of opportunities such as the possibility of "private wire" electricity sales (development of privately owned distribution networks), a microgeneration commitment

from the government, energy price escalation, and the rise of carbon markets, all of which will promote the use of the ESCO business model and related services.

Bertoldi et al conclude that most ESCO's have to date been founded by utilities, OEM's, or FM's, and as such, their objectives are not "solely on exploiting the financial opportunity of energy savings". In contrast to independent ESCO's, these companies are more interested in increasing electricity or equipment sales, and retaining customers. Instead, the paper suggests that whilst ESCO's are an appropriate model to serve all sectors from commercial/industrial to community and household projects, there are two alternative hybrid models that could be considered to meet the UK's energy efficiency targets under the Energy Services Directive (May, 2006). Firstly, the UK's Carbon Emission Reduction Target (CERT) requires electricity and gas suppliers to achieve reduced emissions in the domestic sector totalling 293 million tonnes between April, 2008 and December, 2012. This means that **energy suppliers** will need to develop energy services businesses to accompany commodity sales. Secondly, **small contractors** that have existing relationships with household consumers could become "mini-ESCO's" mitigating against consumer apprehension towards new service companies with no track record, that require strict contractual forms to operate. The article concludes with various recommendations to policy makers but without making clear commitment to the ESCO model as the solution for energy supply and service procurement, leaving the debate wide open. Bertoldi, Hinnels, and Rezessy are credible sources in relation to energy management issues and ESCO's in particular, with Paulo Bertoldi being part of the trio that published the most well known global ESCO book in 2009 entitled *"ESCOs Around the World – Lessons Learned in 49 Countries"*. Their insights into the UK although being well-framed, are relatively theoretical and lack some objectivity and specific reference to how the three models (Performance Contracting, Community, and Household) have functioned in practice. Their hybrid proposals relating to energy suppliers and small contractors becoming energy service providers are interesting prospects, yet the article fails to go into specifics about how such transitions would translate into sustainable business models for two traditional industries that are currently fulfilling completely different missions.

Building on Bertoldi et al's work which relates to retrofitting UK buildings with energy efficient measures, Saxena and Hinnels published the supporting paper in 2006, ***"Can Energy Service Companies Deliver Low Carbon New Build Homes?"*** Within the paper, which focuses solely on the new build market, they declare that the UK needs 10 million near-zero carbon homes before 2050 if it is to meet its emission reduction commitment. They then

proceed to evaluate the ESCO business model in relation to being able to deliver community housing projects. In the context of new UK building regulations that require reduced emission standards, the Code for Sustainable Homes (social housing specification requirements), Planning Policy Statement 22 (stipulating the need for local authorities to impose a 10% on-site microgeneration requirement), and the Energy Labelling scheme, the authors claim that the ESCO model is the optimal real estate development partner. Specifically they put the case forward that ESCO's could design, build, finance, own, and operate the energy infrastructure of a multi-family dwelling and obtain income through electricity and heat sales in addition to Renewable Obligation Certificates (ROC's), and monthly resident fees. The paper concludes by stating that "ESCO's can work but could expand rapidly with the right policy support...a combination of information, incentives and regulation could transform the market for ESCOs in New Build and thus pave the way for creating large numbers of Low or Zero carbon homes in the future." These authors' perspectives should be seen as vastly ambitious in the context of a traditionally immobile UK real estate industry that is unlikely to reform its practices for the sake of energy conservation. The authors are however part of a select group of researchers that are particularly close to ESCO development in Europe with Hinnels forming part of the trio that authored the previous paper with Paulo Bertoldi. The paper puts forward a very analytical case for ESCO's forming part of new build real estate development in the future, even presenting IRR sensitivity tables for a typical ESCO project. The numbers seem realistic, however with policy support still quoted as the largest barrier to such a development, the prospect is unlikely. The paper re-confirms that the ESCO business model continues to seek its optimal environment where it has something unique and compelling to offer.

While the previous two works produced by Bertoldi et al and Saxena et al have focused generally on the role of ESCO's in the UK, the Greater London Authority (GLA) is at the forefront of current ESCO activity. The GLA (on behalf of The Mayor of London, Boris Johnson) released the Climate Change Mitigation and Energy Strategy in October, 2011, entitled ***"Delivering London's Energy Future"***. This document and accompanying presentation set out a range of programmes to facilitate energy efficiency retrofits and renewable energy infrastructure in London as part of the strategy to improve air quality and reduce emissions by 20% from 1990 levels by 2015. The paper goes into detail on a number of initiatives (called RE:CONNECT, RE:NEW, RE:FIT, and the Decentralized Energy Programme) which contain plans for retrofitting 10 community areas, 1.2 million London households, public sector buildings, and installing new low carbon energy supply

infrastructure. In so doing the GLA also proposes a specific business model that will be responsible, within their "Framework Panel Approved Suppliers", for carrying out the work. This model is the Energy Performance Contracting approach that operates using a guaranteed savings method whereby 12 approved ESCO's compete within a mini-tender (OJEU compliant[3]). The GLA declare the business model to be satisfactory within the public sector although admit that it lacks impetus when interacting with private commercial enterprises.

The GLA, being the retrofit programme administrators, are a credible source for evaluating the success of the incumbent business model. They are objective in the paper quoting data for projects completed, investment undertaken, and savings achieved. The paper therefore, which serves as more of a policy primer, is very informative on the state of the UK energy services industry without strictly evaluating business model traction. Having interviewed Virginie Caujolle-Pradenc, (head of the Environment team in charge of the RE:FIT programme), and Chris Botten (leader of the Better Buildings Partnership) however, the GLA personnel are clearly some of the most advanced thinkers in terms of the status of energy services businesses in the UK, and offered their support for the ESCO model being appropriate at this point in time. It is clear however that a lack of innovation exists specifically with regard to building analytics providers that are able to take a business integration and management approach, rather than being strictly engineering and performance contract oriented.

ESCO's are not the only energy services innovation currently in play in Europe. The International Energy Agency's Demand Side Management unit (IEA-DSM) produced what was thought to be a ground-breaking discussion paper on the concept of ***"Integrated Energy Contracting"*** (IEC). The paper was based on the realisation that "one of the most urgent energy policy and energy economics challenges continues to be the search for suitable 'tools' to execute energy conservation potentials" (IEA DSM, 2009). Writing in October, 2009, and with energy services firmly on the European agenda since 2006 (2006/32/EC[4]) according to the paper, the IEA follows the development of the energy contracting industry, which can be sub-divided into **Energy Performance Contracting (EPC)** and **Energy Supply Contracting (ESC)**. It explains that while EPC is concerned with achieving demand-side **energy savings** through measures such as energy management and controls, HVAC technology, lighting upgrades, and behavioural change, amongst others, and has successfully done so in Europe

[3] Official Journal of the European Union (OJEU) - central database for European public sector tender notices.
[4] The Energy End-use Efficiency and Energy Services Directive (2006/32/EC): purpose is to encourage energy efficiency through the development of a market for energy services and the delivery of energy efficiency programmes and measures to end users.

since 1995, it has only captured 10% of the energy contracting market and primarily in the public sector. ESC on the other hand focuses on **delivering useful energy** to end users in a more efficient way, and has in the past focused primarily on boiler upgrades, capturing approximately 85% of the energy contracting market (according to the German Association of ESCO's). The paper considers the major EPC shortfall to be its tendency to rely on complex measurement and verification systems to determine baseline energy consumption (which in itself is never constant and relies on energy prices and facility usage patterns) and measure subsequent savings as the basis for remuneration, all of which increases transaction cost and raises the minimum project size to end users with at least €100,000 energy spend. The relative success of the two models, EPC and ESC, leads the authors to conclude that "marketable product innovations are easier if they are based on the ESC model". The IEA DSM therefore proceeds to propose an amalgamation of the EPC/ESC approach which they aptly name "Integrated Energy Contracting" (IEC). IEC unites "energy conservation and (renewable) energy supply into an integrated approach", and substitutes measurement and verification with quality assurance instruments throughout a project that aim to "minimize expenditure while securing functionality and performance...but not exact quantitative outcome". The paper confirms successful implementation of this business model in Austria.

The IEA is of course one of the most respected and credible sources of energy market analysis in Europe, and the paper should gain significant credit for conception of the IEC business model. Its views on EPC do reconcile with other energy services experts in that the model is not proving to be sufficiently successful outside of the public sector, and the benefits of combining demand and supply side services are well recognised. The ESC model however, as plausible as the IEA's arguments seem, does not appear to be a widely recognised concept within the energy services market. ESC, accounting for 85% of the energy contracting market in Germany, is almost certainly comprised of general boiler upgrades with cleaner but still hydro-carbon based infrastructure, rather than installation of innovative renewable energy microgeneration typically installed by ESCO's. Furthermore, ESCO's in the US have been installing both demand side management measures in conjunction with renewable energy microgeneration infrastructure for the last decade. The contractual basis for such a project has not required the IEC business model innovation, but rather maintains an EPC to manage the demand side equipment (either using guaranteed or shared savings), and where possible, secures a Power Purchase Agreement (PPA) to ensure long term electricity sales from onsite renewable generation. Both contracts involve a form of shared revenue between property

owner and ESCO. It is questionable therefore, based on the other energy services literature, whether there is any need for the IEC model, or whether it is simply a variation of an ESCO. The IEA's perspectives are however extremely valid when considering what the optimal energy services business model in Europe should be.

Moving to the example of the US, which is generally accepted to be a decade ahead in terms of energy services activity, significant ESCO activity has taken place albeit primarily government contracts. The Lawrence Berkeley National Laboratory (LBNL) tracks the ESCO industry closely, performing regular audits of approximately 30 active ESCO's usually from the National Association of Energy Service Companies (NAESCO), analyzing the size of the market, providing industry growth projections, and general market trends to allow policy makers to understand the sector. Their two most recent reports released in May, 2007 and June, 2010 estimate the size of the US ESCO market to be worth US$4.1 billion in 2008 (having experienced 7% annual growth since 2006), and US$7.1-7.3 billion in 2011 (equating to 26% annual growth from 2009). The studies claim that 84% of the ESCO market is comprised of municipality, university, school, and hospital (MUSH) customers and that 75% of projects are related to energy efficiency with only 14% being distributed generation. The reports classify ESCO's into four segments based on ownership structure, each of which has a unique business model. These four segments are **Independent ESCO's** (comprise 81% of the market in quantity, 21% of revenues), **Building Equipment Manufacturers** (13% in quantity, 59% of revenues), **Utility ESCO's** (15% in quantity, 9% of revenues), and **Other Energy/Engineering Companies** (10% in quantity, 10% of revenues). According to the report, the ownership structures have implications for business models related to product procurement techniques, motives for doing business, quality control, and financial power.

LBNL is perhaps the most credible source of ESCO commentary in the US, being the only organization to have an impartial ongoing dialogue with the majority of ESCO's in the country. Their reporting style is very quantitative and therefore policy advice is objective. Caution must however be exercised due to the non-transparent nature of the ESCO industry in general. Out of 109 ESCO's originally identified and contacted by LBNL in the US in 2008, results were only recorded from 29 companies suggesting irregularity in LBNL's monitoring techniques and a lack of responsiveness, either because firms were wrongly identified, or chose not to expose operating performance. It is questionable therefore whether LBNL's results are entirely accurate. Nevertheless, the results are the first objective evaluation of the relative success of different energy services business models in a first world energy economy.

Deutsche Bank, being one of the major financial institutions demonstrating considerable interest in the energy efficiency finance sector, have released a series of publications on energy efficiency, the latest entitled ***"United States Building Energy Efficiency Retrofits"*** (March, 2012). The report aims to quantify the size of the US energy efficiency retrofit opportunity, and present a critical analysis of the finance structures (and by implication, operational business models) that exist to address the opportunity. Deutsche Bank concludes that a US$279 billion investment opportunity exists within the commercial, residential, and institutional segments which equates to US$1 trillion in energy savings over 10 years, or 30% of US annual electricity spend. They define an energy efficiency retrofit to be comprised of four components, namely new kit, new controls, integrated design, and active energy management, and it is on this basis that Deutsche Bank quantifies the opportunity using a total addressable market of pre-1980 buildings that are capable of achieving an average efficiency improvement of 30%. The report highlights four structures for financing energy efficiency retrofits; Energy Performance Contacts (EPC) carried out by **ESCO's**; Energy Service Agreements (ESA) carried out by **Integrated Developers**; Property Assessed Clean Energy (PACE) carried out by **Integrated Developers**, and On-Bill Financing (OBF) Tariffs/Loans carried out by **utilities** and their service divisions. Having provided a detailed overview of how each financial structure works, and their strengths and weaknesses, the report shows clear preference for the ESA as the most progressive, readily available, and scalable innovation. With 15-20 Integrated Developers present in the US and approximately 100 ESA deals complete, Deutsche Bank claim that the ESA overcomes many market failures and barriers to energy efficiency deployment.

Deutsche Bank Climate Change Advisors are recognized as one of the leading commentators on clean energy with a particularly strong reputation for the high quality of their empirical data and modelling capabilities. The report provides an unrivalled quantification of a market that has never been accurately sized, and is very objective in its assertions. Although their arguments in favour of the ESA are very persuasive, in fact compelling, one must be mindful of their motives as a potential financier of such projects. Without the ESA structure, which has proven to be far more acceptable to arms length financiers such as asset managers than traditional EPC's, the opportunity for Deutsche Bank to invest millions of dollars and make strong returns would be reduced to some extent. Caution should also be exercised when relating Deutsche Bank's perspectives to the UK market, which has not had the benefit of the approximately US$7 billion ESCO industry that exists in the US and strong public sector

commitment that has stimulated energy services BMI. Nevertheless, the UK can learn plenty from the emerging business models in the US advanced by Deutsche Bank.

Brad Copithorne, a former Citi finance professional now with the California based public sector organization, Environmental Defence Fund (EDF) produced an article in March 2012 for the Energy Exchange, which builds upon Deutsche Bank's findings. In particular Copithorne reports on the latest progress of the most advanced US energy services firms that are specifically focused on implementation of the ESA, PACE and OBF. He refers to Transcend Equity, which was recently purchased by a leading energy management solutions company, creating a new Integrated Developer business model with enhanced capabilities. Also quoted in the article are diversified energy efficiency finance companies Metrus (which first pioneered the ESA), Green Campus Partners, Abundant Power, Groom Energy, and Carbon Lighthouse, all of which have successfully innovated new Integrated Developer business models. It is clear from Copithorne's views that the US energy efficiency industry is being buoyed by these companies and their business model and financing innovations. The author is a valid source for such matters and his views are therefore well regarded.

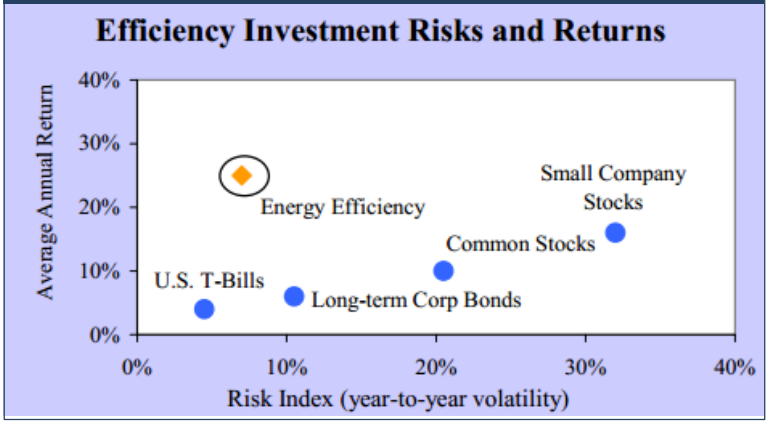
* * *

It is clear from The Brattle Group that a transition towards an energy services industry is imminent. Fawkes and Bertoldi et al provide detailed accounts of the history of energy services provision and the range of business models that have been used to date, all of which appear to be riddled with inadequacies that have so far failed to overcome the market failures and institutional barriers that are characteristic of the complex energy system. The more high profile studies presented by economists from the IEA, EUC, and US EPA suggest that integrated service provision is the most viable solution, which to some extent matches the perspective of Deutsche Bank and what is taking place in the US with the development of Integrated Developers. A key message in Johnson et al's BMI piece however is that customer value propositions should be as specific as possible, focusing on addressing **one** customer need only. Conquering one specific customer need is more likely to create game changing value than attempting to be all things to all people. What is clear from the perspectives outlined in this Literature Review, is that many variations to energy services businesses currently exist, none of them with sufficient effectiveness to distinguish themselves within a relatively immature market. ESCO's have clearly been the advancing force, but again, the range of ESCO's (whether EPC or ESC) vary to such an extent that potential definitely exists for a new, clear, business model innovation to dominate the industry.

7. Issue Identification

The economics of energy services, using energy efficiency as the proxy, are undeniable. It should be classified as a low risk, high return investment opportunity, with similar return characteristics to small companies (25-30%) and a risk profile similar to that of US Treasury Bills (5-8% on Risk Index). So why does the energy service industry continue to disappoint?

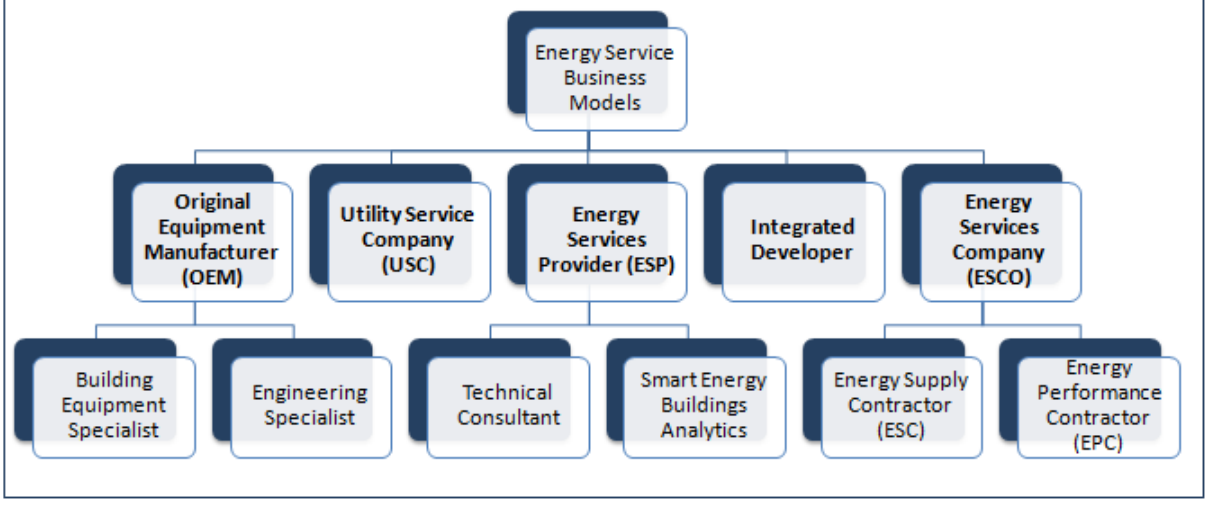
Figure 2: Benchmarking Energy Services Metrics



Source: Adapted by ACEEE from the EPA and Vanguard Group

The Energy Services industry has never been responsible for the survival of nations, nor has it been the barer of game changing consumer value in the form of leisure or livelihood improvement. It is now being asked to step up in a significant way to make the greatest short term contribution towards curbing the UK's energy consumption, reducing energy costs, improving energy supply security, and improving the country's emissions profile. Fortunately, energy services business models do exist. The literature reviewed identified five main categories business model, some of which can be further broken into sub-categories. These business models and their variations are illustrated in Figure 3 below.

Figure 3: Energy Service Business Models



Each business model offers a combination of **energy services** that span energy efficiency, microgeneration, smart energy management, and carbon management targeted at specific end-user **market segments**. In addition they operate using a variety of **operational contract forms** including Energy Performance Contracts (EPC's), Energy Supply Contracts (ESC's), Service Level Agreements (SLA's), and Power Purchase Agreements (PPA's). **Financial structuring** also ranges between guaranteed savings, shared savings, Energy Service Agreements (ESA's), On-Bill Finance (OBF), Property Assessed Clean Energy, traditional loan finance, or self finance. **Ownership structure** has implications for business motives that range from securing higher commodity sales or higher equipment sales, to achieving genuine energy and emission savings. These variables result in considerable complexity and fragmentation of the energy services supply side, as reflected in the range of different **customer value propositions** which exist. Demand side inertia also exists, partly due to energy being low priority, but also due to the complexity of contract forms. In addition to these **market barriers**, significant others continue to restrict the total addressable market:

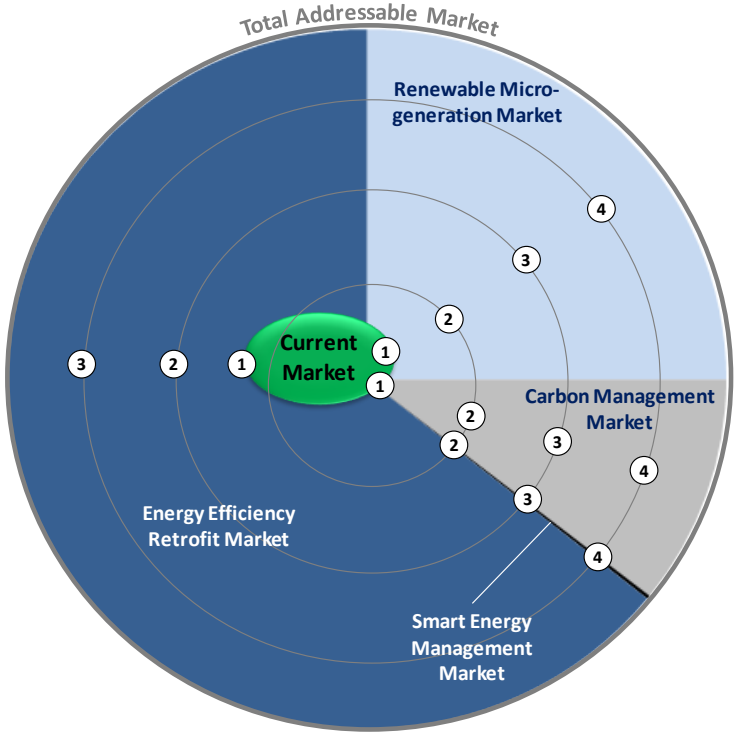
Regulatory Barriers: growth has been restricted by a regulatory focus on new build rather than existing building stock, hence the retrofit environment has not been adequately incentivised. Lack of policy visibility in relation to renewable generation support (feed in tariff continuity), has constrained investment. And lack of a market driven national carbon trade system, has resulted in an illiquid European market with a negative stigma attached to carbon monetization potential.

Technology Barriers: availability of technology is not generally seen as a constraint to energy services growth, however compatibility of certain technology across a heterogeneous building stock is a challenge, particularly for smart energy management firms attempting to deploy software services to integrate building hardware. Furthermore, installation of multiple technologies sometimes forces unacceptable disruption of business as usual.

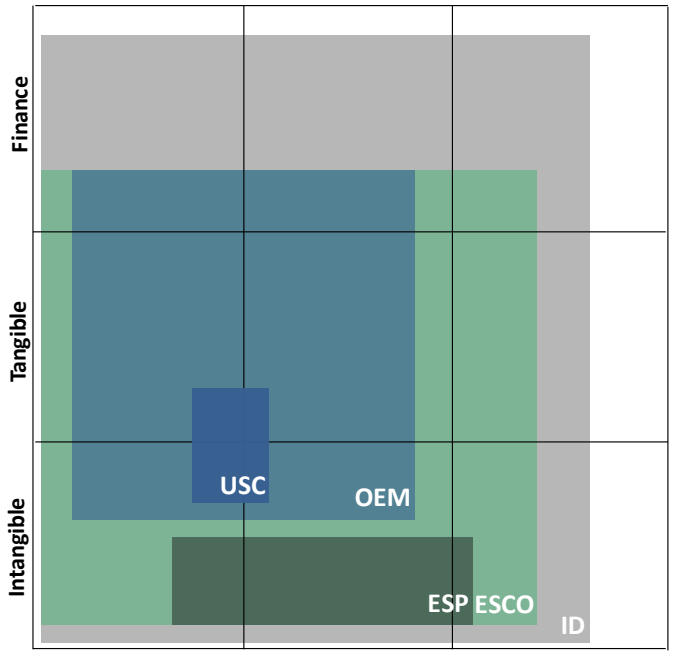
Financial Barriers: finance is usually quoted as the major constraint to energy services investment, however this has been mitigated by innovative financial structuring mechanisms. Split incentives however remain between owner and tenant, as tenants benefit from capital upgrades made by owners (who never see tangible benefit), through lower operational costs. On occasion, first cost hurdles are too excessive bearing in mind current terms of capital availability. Furthermore, some mortgage covenants prevent building owners from taking on debt against a building. Figure 4 below attempts to encapsulate this complex environment.

Figure 4: Reference Framework

(a) External Demand Constraints



(b) Internal Business Model Dynamic



DEMAND CONSTRAINTS

Energy Efficiency Retrofit
1. Appropriate Contract Form
2. Finance Mechanism
3. Split Incentive

Renewable Microgeneration
1. Regulatory Certainty (FIT)
2. Business Case
3. Technology Efficiency
4. Building Debt Restrictions

Carbon Management
1. Regulatory Certainty (CRC)
2. Pricing Mechanism
3. EU ETS Liquidity
4. Accuracy of Monitoring

Smart Energy Management
1. Technology Availability
2. Technology Compatibility
3. Regulatory Certainty
4. Business Case

VALUE DRIVERS
1. Energy Prices
2. Energy Demand
3. O&M Costs
4. Capital

PROJECT TYPE

Intangible – advisory only, no performance contract, capital upgrade, or O&M.

Tangible – proactive monitoring, analysis, hardware upgrade, or O&M under EPC/ESC.

Finance – tangible service provision accompanied by innovative off-balance sheet finance mechanism.

RANGE OF SERVICES

Energy Supply Side – focus on energy price and O&M cost value drivers.

Energy Demand Side – focus on energy price and energy demand value drivers.

System Optimization - focus on all value drivers

BUSINESS MODELS

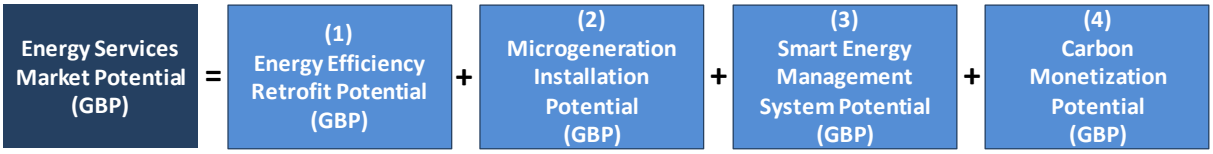
USC - Utility Service Company
OEM – Original Equipment Manufacturer
ESP – Energy Service Provider
ESCO – Energy Service Company
ID – Integrated Developer

Conclusions:

- Total Addressable Market is significantly larger than current market achieved for energy services.
- Each sub-industry faces different progressive demand constraints (market/regulatory/ technology/financial) which must be addressed through business model innovation.
- Too many conflicting business models exist on supply side.
- The ID business model is the most advanced in terms of range of services, and addressing all key value drivers – yet still room for improvement.

8. Market Analysis

This data analysis seeks to size the UK market for energy services until 2020, by modelling the demand for (1) installation of energy saving measures (energy efficiency retrofits), (2) installation of renewable microgeneration (solar PV/thermal, mini-wind, and ground source heat pumps), (3) installation of smart energy equipment and ancillary services, and (4) monetization of carbon emission reductions resulting from (1), (2) and (3).



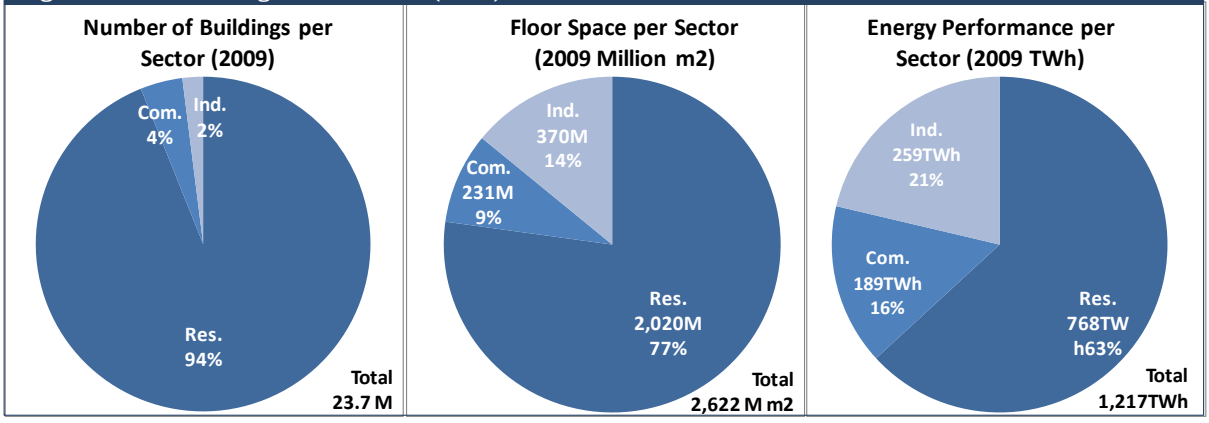
Having determined a monetary value for the investment potential of energy services in the UK, this will serve as the basis for building Energy Applications'™ growth plan.

a. UK Buildings Sector

The UK buildings sector represents the largest opportunity for the energy services industry. According to the Economic and Social Research Council (2009) buildings account for 45% of the UK's energy consumption. The addressable opportunity is largely defined by the building stock's sectoral composition, age profile, floor area, and ownership/tenure status. These factors determine energy performance and therefore saving/emission reduction potential.

The following analysis is based on three data sets:- the English Housing Survey, 2009 (which considered a sample of 16,150 buildings in England, considered to be representative of the UK), the Department of Communities and Local Government's Commercial and Industrial Statistics (2008) for England and Wales (which again is viewed as representative for the United Kingdom), and DECC's database containing energy consumption data.

Figure 5: UK Building Stock Profile (2009)

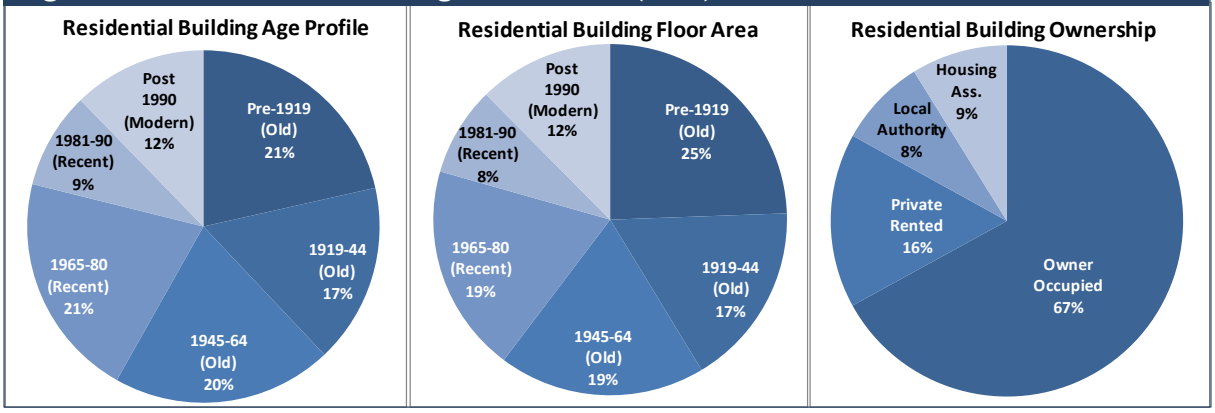


While the commercial and industrial segments only account for 4% and 2% of all UK buildings, they comprise 14% and 9% of the useful floor area, and 16% and 21% of national energy consumption respectively. These markets are more economically viable for energy service companies to address given transaction cost barriers related to the residential sector.

Residential Buildings

The largest building sector in the UK in terms of energy consumption is the residential segment which consumes approximately 52%[5] (42,526 thousand tonnes of oil equivalent (ktoe)) of the UK's energy (excluding transport). The residential building stock consists of 22.3 million dwellings and is growing at 0.55% per year according to BPIE[6]. It can be classified in terms of age profile between three main categories Old (which includes pre-1919, 1919-44, and 1945-64), Recent (1965-80 and 1981-90), and Modern (post-1990). This classification is derived from difference in construction materials and techniques, as well as implementation of building codes which have given rise to clearly different U-values[7] for the different age categories. This has significant implications for energy performance. 79% of the UK's residential buildings were built before 1980, making it one of the oldest building stocks in Europe. Pre-1980 buildings also represent 80% of UK residential buildings on a useful floor area basis. With these buildings being the most inefficient, significant potential exists for energy efficiency investment in this building stock. With the majority of buildings being owner occupied or under management of the government (76%) there are limited circumstances of split incentives where the owners are forced to invest in the energy system, whilst allowing the tenants to reap the benefits of lower bills. The residential market is therefore seen as conducive to energy services deployment, with suitable aggregation.

Figure 6: UK Residential Building Stock Profile (2009)

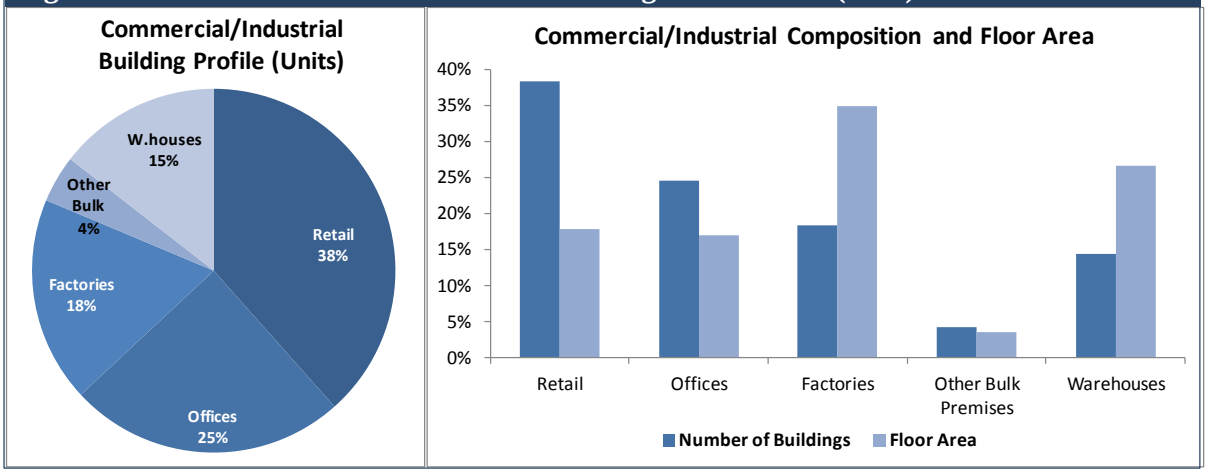


[5] DECC, "Energy Consumption in the UK – Overall Data Tables (2011)".
[6] BPIE, "Europe's Buildings Under the Microscope" (2012) – data provided by the Energy Savings Trust and BRE.
[7] U Value is a measure of how well a building conducts heat.

Commercial and Industrial Buildings

The commercial building stock consumes approximately 20% of the UK's energy supply (excluding transport) or 16,273 ktoe in total. The main commercial segments for the purposes of this analysis have been categorized as Retail, Offices, and Other Bulk (which we assume includes all government, education, and hospital buildings). The industrial building stock consumes 27% of the UK's non-transport energy supply (equating to 22,303 ktoe) and is categorized as Factories or Warehouses. Retail and Offices contain the most units (38% and 25% respectively) while Factories and Warehouses contain the greatest floor area (35% and 27% respectively), as reflected in Figure 7 below.

Figure 7: UK Commercial and Industrial Building Stock Profile (2009)



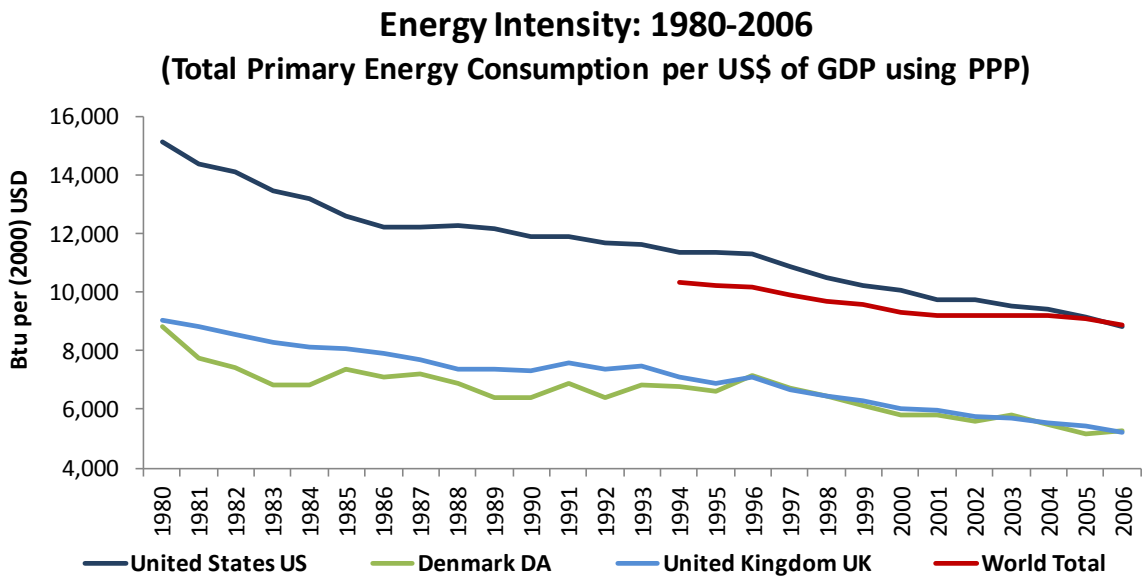
Figures 5, 6, and 7 give the first illustration of the potential scope for UK energy services deployment. It is clear that while immediate opportunities exist in the larger single tenant commercial and industrial buildings, the greatest long term potential lies in the residential sector. This market will only be addressable with suitable aggregation strategies allowing energy service providers to maximise economies of scale. Sections (b), (c), (d), and (e) will quantify the monetary potential of the four energy services sub-sectors based on this data.

b. Energy Efficiency Market Sizing

The Energy Information Administration (EIA) defines energy efficiency as when "either energy inputs are reduced for a given level of service, or there are increased or enhanced services for a given amount of energy inputs" (EIA, 2012). This can be achieved through installation of a vast range of infrastructure measures including efficient heating, ventilation, and air-conditioning (HVAC) systems, compact fluorescent lamps, A-label/Energy Star rated appliances, thermal insulation, variable flow devices, boiler conversions, LED signs, and other building retrofit equipment that saves electricity. Energy Efficiency has been referred to

as the 'plug' in the world's climate strategy by the Brattle Group, being "the one resource we can draw on at an increased pace if other key technology solutions fall short" (The Brattle Group, 2009). Energy efficiency of final consumers in the UK improved by 0.8% between 1996-2007 compared to 1.2% for the EU27 as a whole, suggesting UK progress has been slow. Figure 8 illustrates UK progress against the US, Denmark (a market leader), and world.

Figure 8: Energy Efficiency Benchmark



Source: EIA, 2007

The investment size of the market is unclear although Ernst and Young claim that with the Green Deal launch in 2012 the domestic market could be worth approximately **£800 million** by 2020 with only a 10% uptake. This is still small compared to the US, which according to Deutsche Bank has a **$279 billion** energy efficiency retrofit opportunity. Achievement of its full potential is largely reliant on the government providing a fully conducive regulatory environment. Figure 9 demonstrates the UK's regulatory readiness.

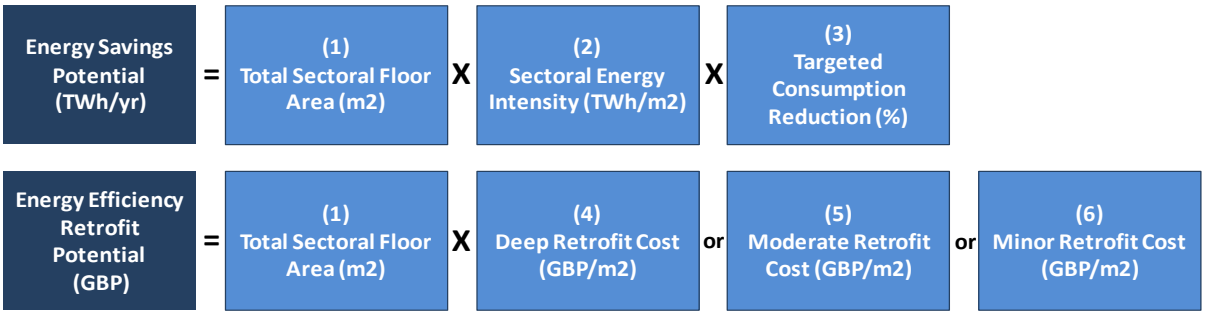
Figure 9: UK Energy Efficiency Regulatory Status

National Implementation Plan/Roadmap	Regulated Performance Standards	Binding Progress Target	Long Term Funding Program	Fiscal Enforcement Mechanism
✓	✓	✓	✓	✗

Market Sizing Model

For the purposes of this modelling exercise, we ignore the multitude of market failures and institutional barriers that are currently preventing the achievement of full energy saving potential. It is assumed that appropriate business model design and planning can overcome

these issues and widen the current total addressable market to its theoretical maximum. Quantifying energy efficiency retrofit potential requires knowledge of current energy consumption, annual energy savings achievable through retrofit, and cost of retrofit projects across a range of different building types. Energy consumption data is available within the English Housing Survey (2009) and DECC database. Residential consumption data is again broken down by age category; while for commercial and industrial buildings total consumption is only provided at a sectoral level. Energy intensity for the various sub-sectors (namely Retail, Offices, Other Bulk, Factories, and Warehouses) is then calculated using an area based weighting. So whilst some accuracy will be lost in relation to sub-sector energy consumption, overall sector potential will be consistent. Having obtained total floor area and energy intensity for all major UK buildings, energy savings and investment potential calculations could be performed as follows:



Data sets (1) and (2) are provided by the sources referenced above. Targeted consumption reduction (3) however is more difficult. It is inaccurate to assume that the same savings can be achieved consistently across a heterogeneous building stock, built over more than a century, with different materials, building standards, internal and external characteristics, and sizes. The BPIE recently performed a detailed analysis of Europe's buildings[8] in which it developed its "Renovation Model", detailing four scenarios comprised of various rates (percentage of buildings renovated each year) and depths (extent of measures applied and size of resulting energy and emissions reduction) of renovation that Europe could follow in striving for its decarbonisation targets. These four renovation scenarios are illustrated in Figure 10 below, including targeted energy savings per retrofit under each scenario and associated cost of retrofit per square metre – data sets (3), (4), (5), and (6).

[8] Building's Performance Institute Europe (BPIE), 'Europe's Buildings Under the Microscope', 2011.

Figure 10: Targeted Energy Reductions and Retrofit Cost Estimates per Retrofit Type

Description (Renovation Type)	Final Energy Saving (% Reduction)	Indicative Saving (for modelling purposes)	Average Total Project Cost (£/m2)
Minor	0-30%	15% (3)	48.44 (6)
Moderate	30-60%	45% (3)	113.04 (5)
Deep	60-90%	75% (3)	266.45 (4)
Near Zero	90%+	95%	468.30

Source: BPIE Renovation Model (2012)

Retrofit costs are determined by the scale and scope of measures required to achieve the target energy reductions. The BPIE's model classifies three forms of retrofit that we will use for this analysis – Minor, Moderate, and Deep. Each of these can be related to a specific portfolio of measures, which when combined produce a particular set of metrics based on installation cost, total savings capacity (savings-investment ratio), payback period, and impact on business as usual on the retrofit premises. Examples of minor, moderate, and deep retrofits are:

Minor	Moderate	Deep
Lighting upgrade	Interior system controls	Solid wall insulation
Cavity wall insulation	Loft insulation	HVAC replacement
Efficient appliances	Window replacement	Boiler conversion

In order to obtain the "square meter" cost per retrofit type, the BPIE consulted a range of suppliers of energy efficiency equipment, and quantified the approximate cost of each energy efficiency measure under each of their scenarios (using measures like the ones above). The savings rates and costs were judged to be achievable in the UK, and have been applied to the various residential segments according to anticipated necessity for renovating buildings of different ages. Targeted energy reduction for each residential segment was applied as follows:

- Old (Pre 1919-1964) – **75%**.
- Recent (1965-1990) – **45%**.
- Modern (Post 1990) – **15%**.

Commercial and industrial targeted energy reductions per retrofit were assumed to be 30%, in line with Deutsche Bank's recent quantification of the US energy efficiency retrofit market[9], in which it claims that "the consensus view of a wide range of authoritative sources is that 30% energy use reduction is achievable and reasonable target in the context of a program of

[9] Deutsche Bank Climate Change Advisors/Rockefeller Foundation, "United States Building Energy Efficiency Retrofits – Market Sizing and Financing Models" (March, 2012)

energy efficiency retrofits" (Deutsche Bank, 2012). This 30% view is reiterated by the BPIE which states that, "typically, energy savings of up to 30% might be expected by the application of one to three low cost/easy to implement measures" (BPIE, 2011). Applying the aforementioned retrofit rates and average costs to the UK's building stock profile, the energy saving and energy efficiency retrofit investment potential in the UK building sector has been quantified as follows:

Figure 11: Estimated Energy Savings and Energy Efficiency Retrofit Investment Required

	Residential			Commercial			Industrial		Total
Building	**Old Pre-1919-65**	**Recent 1965-90**	**Modern Post-1990**	**Retail**	**Offices**	**Other Bulk**	**Factories**	**Warehouses**	
Energy Savings (TWh/yr)	382	88	10	26	25	5	44	34	**614**
Investment Potential (£M)	327	75	12	12,136	11,583	2,361	23,766	18,146	**68,406**

Total energy savings potential is calculated to be 614TWh per annum, while the total investment required to achieve these energy efficiency retrofits is £68.4 billion. This figure can be approximately validated by Deutsche Bank's estimates that the value of the US energy efficiency retrofit market (for post 1980 buildings only) is US$279 billion.

£68.4 billion will serve as the total addressable market for energy efficiency retrofit opportunities in the UK until 2050.

c. Renewable Microgeneration Market Sizing

The UK's Department of Trade and Industry defines microgeneration as "the production of heat and/or electricity on a small-scale from a low carbon source" (UK DTI, 2012). Its scope is limited under the Green Energy Act 2009 to include electricity generating units up to 50kW and heat generating units up to 300kWth. The UK definition therefore accepts that microgeneration technologies can be installed at scale above the domestic level, namely community and small commercial sites. The UK first launched its Microgeneration Strategy in March 2006 and includes support for technologies such as solar photo-voltaic (PV) panels, solar thermal panels, ground and air source heat pumps (G/ASHP), micro-wind turbines, hydro (including water mills), combined heat and power (CHP) units, fuel cells, heat and power generation from biomass, bio-liquids, and biogas including from anaerobic digestion.

The UK has committed to generating 15% of its energy from renewable sources by 2020. This equates to approximately 20,511 ktoe (or 238TWh), some of which will be met by utility scale projects, and the balance from small distributed microgeneration. Microgeneration

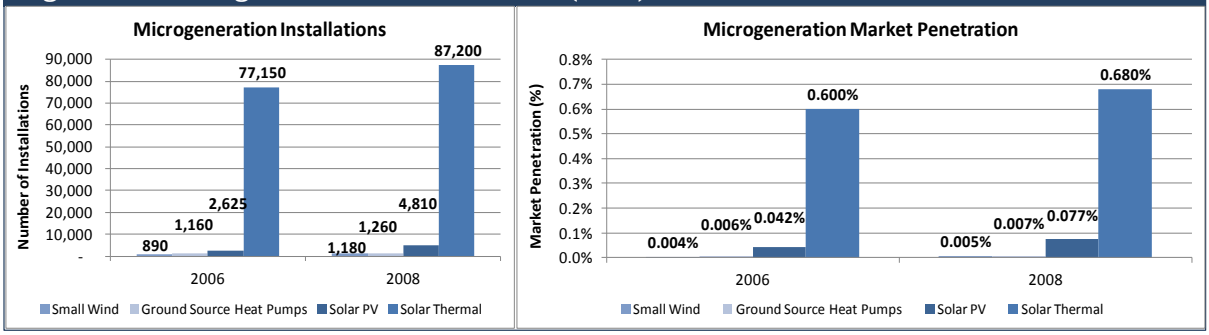
growth in the UK has been very slow to date despite the introduction of various government measures to incentivize investment in the sector, including the Feed in Tariff (1st April 2010 inception) and Renewable Heat Incentive programmes. The renewable microgeneration industry is also largely reliant on the UK's regulatory readiness, which is currently as follows:

Figure 12: UK Renewable Micro-generation Regulatory Status

National Implementation Plan/Roadmap	Regulated Performance Standards	Binding Progress Target	Long Term Funding Program	Fiscal Enforcement Mechanism
✓	✓	✗	✓	✗

The regulatory environment is not yet entirely conducive to microgeneration growth. Furthermore, most buyers are still unaware of the technology options or are pre-contemplating its installation because the business case remains commercially unviable for average UK homeowners and small businesses. Actual microgeneration investment in the UK has achieved a total of only 95,000 installations by 2008, totalling 16MW (Renewable Energy Office for Cornwall, 2008). This progress is illustrated in Figure 13 below where market penetration is below 1% for all technologies, with solar thermal being the only one to show any form of progress.

Figure 13: Microgeneration Market Status (2008)



Source: Communities and Local Government, England and Wales (2010)

Market Sizing Model

It is very difficult to forecast the likely trajectory of the microgeneration industry, particularly because it is so politically oriented. Growth however is undoubtedly expected despite the current economic recession which has introduced added financial burden to the general population as well as government budget. It is impossible to forecast the size of the microgeneration market up until 2050 with any accuracy, however using a logistic 'S' curve growth model, and some general assumptions around the availability of technology and approximate learning curves, we can get an idea of the size of investment that is required in

order to meet the UK's 2020 objective of generating 15% of its energy from renewables. Npower/RWE Group developed a model for this in which it estimated microgeneration progress (in terms of number of installations) by 2020 as represented in Figure 14 below – data set (2). When combined with C&LG data on 2008 microgeneration installations (1), the number of installations required can be calculated. Using, the Energy Saving Trust's data on average capital costs for each installation (3), total investment potential can be calculated:

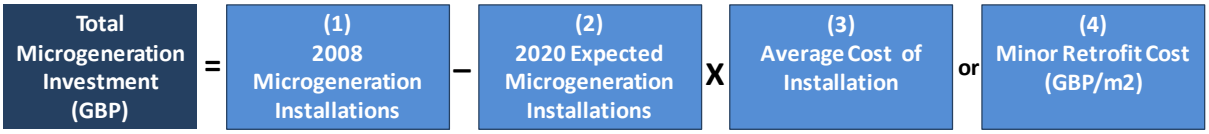


Figure 14: Microgeneration Market Size Model

Technology	(1) 2008 Installations (a)	(2) 2020 Installations (b)	Installations Required	(3) Average Installation Cost (c)	Total Investment Required (£M)
Solar Thermal	87,200	1,705,000	1,617,800	4,800	**7,765**
Solar PV	4,810	1,525,000	1,520,190	10,500	**15,962**
Small Wind	1,180	132,610	131,430	15,000	**1,971**
GSHP	1,260	60,000	58,740	17,000	**999**
Small Hydro	105	500	395	25,000	**10**
Total	**96,563**	**3,425,130**	**3,328,555**	-	**26,707**

(a) Communities and Local Government Statistics on Microgeneration Installations (2008)
(b) Npower/RWE Group estimates from Microgeneration Adoption Model (2008)
(c) Energy Savings Trust - Average Cost and Savings data for Microgeneration technology (2012)

£26.7 billion will serve as the total addressable market for microgeneration installation opportunities in the UK by 2020.

d. Carbon Management Market Sizing

Carbon (emissions) management is a theme which usually forms part of a corporate sustainability strategy. It involves analysis, reporting, planning, and process optimization in order to minimize an entity's carbon footprint. Carbon footprint is a function of electricity and heat usage within a building, as well as the fuel mix that is involved in supplying energy to site. Carbon management, like energy demand and supply management, is critical to managing a firm's costs and with carbon emissions increasingly subject to fiscal penalization, carbon trading could also become a profit centre for the best performing companies.

Globally, carbon management is gaining traction claims the IEA which states that, "CO_2 emissions per unit of GDP have declined...reflecting both reductions in final energy use per GDP and changes in the final energy mix" (IEA, 2005). Furthermore, awareness of CO_2 emissions is critical to those 6,000 UK firms that are now subject to mandatory fiscal

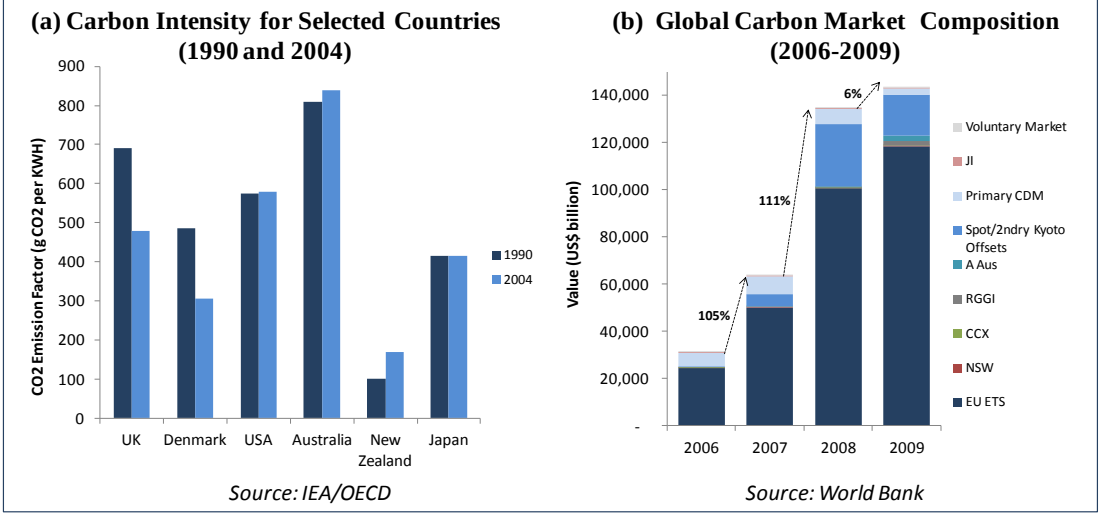
penalization under the UK's Carbon Reduction Commitment Energy Efficiency (CRC EE) Scheme, in which companies could be charged £12 per tonne of CO_2 emitted. The regulatory environment is still being prepared for a full transition to a carbon economy:

Figure 15: UK Carbon Management Regulatory Status

National Implementation Plan/Roadmap	Regulated Performance Standards	Binding Progress Target	Long Term Funding Program	Fiscal Enforcement Mechanism
✓	✗	✓	✓	✓ ✗

As part of the world's largest and most liquid emissions market, the EU Emissions Trading Scheme (which incorporates 30 countries/11,000 installations), UK businesses face growing prospects of significant carbon liabilities that must be offset using profits. The UK shows clear improvement in carbon intensity as shown in Figure 16(a), in contrast to other selected countries, some of which also had carbon cap-and-trade systems in place. Figure 16(b) depicts the growth in global carbon market value between 2006 and 2009 with the total value of trades increasing from US$31.2 billion to US$143.7 billion. Both these figures are testament to the growing role of carbon management in the UK.

Figure 16: Carbon Market Trajectory



Market Sizing Model

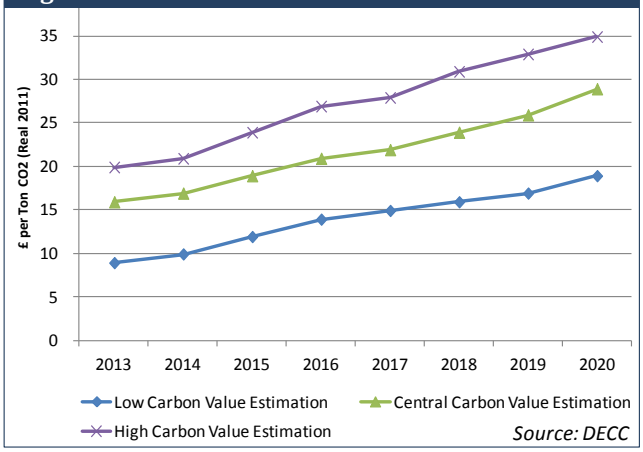
The carbon management market from an energy services company perspective can be quantified according to the commercially tradable emission reductions arising from the UK building sector. It should be restricted however to those emissions which can be monetized in UK and international carbon markets. It is only through trade brokering within these markets that UK energy services companies can make commercial gain from the monetization of

emission reductions. The methodology for arriving at a total addressable market for carbon management is as follows:

Carbon Monetization Potential (GBP)	=	(1) Energy Savings Potential (TWh/yr)	X	(2) Energy to Emissions Conversion Factor (kgCO2/kWh)	X	(3) Proportion of Emissions Eligible for Trade (%)	X	(4) Carbon Price (GBP/Ton)

Energy Savings Potential (1) was already established in section 8(b) above. Metric tons of CO_2 emissions per TWh is a measure taken from DEFRA/DECC's GHG conversion factors, as reported by the Carbon Trust (August, 2011). The conversion factor (which is based on kg CO_2 equivalent per kWh of electricity consumed) considers electricity used at the point of final consumption, and takes into account the UK energy grid's fuel mix. As the fuel mix in UK power stations changes each year however, the conversion factor used (0.5426kg CO_2e/kWh) is a five year rolling average for 2006-2010 – data set (2). As for the proportion of emissions eligible for trade (3), this encompasses buildings that participate in the CRC Energy Efficiency Scheme and EU ETS, both of which force the purchase and/or trade of carbon credits, but without overlap. The UK CRCEE Scheme incorporates the UK's largest energy consumers, specifically those which consumed more than 6,000MWh of energy in 2008, which according to DECC (the scheme's administrators) account for 12% of the UK's total emissions. When eliminating the impact of energy consumption in transportation (which is not relevant to this energy services study) these organizations (buildings) account for 16% of the UK's non-transport emissions. These companies tend to be the same ones with carbon liabilities under the EU ETS. A prudent estimate of buildings with tradable carbon emissions reductions therefore is 20%, which shall be used to represent (3) in the above formula.

Figure 17: UK Carbon Valuation Forecast



The carbon price (4) will determine the monetary value of the emission reductions following redemption in the UK CRC Energy Efficiency scheme or trade in the EU ETS. The price floor will be set at £12 per ton of CO2, which is the starting point for the UK CRC Energy Efficiency Scheme. DECC has however come up with a carbon valuation methodology for the UK (as reflected in Figure 17) which forecasts the traded carbon price up until 2100 under three different scenarios. It is on this basis that the predicted annual emission

reductions are valued. Capitalization of this market assumes that any energy service company offering carbon emission monetization acquires or at least has access to an EU ETS Primary Participant with access to the auctions. According to these assumptions, the carbon management market has been quantified as follows:

Figure 18: Carbon Monetization Potential (2013-2020)

Building Type	(1) Energy Savings Potential (TWh/yr)	(2) Energy to Emissions Conversion Factor (kgCO2/kWh)	Carbon Savings Potential (Million tCO2e)
Residential	479	0.5246	251.41
Commercial	57	0.5246	29.79
Industrial	78	0.5246	40.82
Total	**614**	-	**322.01**
(3) Tradable Emission Reductions (20% of Carbon Savings Potential):			**64.40**
(4) Carbon Price - see Annex 1.			

Carbon Monetization Potential (2013-2020)

DECC Carbon Valuation Scenario	Market Size (£ Bil)
Low (3) x Carbon Price under Low Scenario	**7.21**
Scenario	**11.21**
High (3) x Carbon Price under High Scenario	**14.10**

On review of DECC's carbon valuation sensitivity analysis, their High and even Central scenarios seem overly optimistic given the slow start experienced by carbon markets, friction to the UK CRC Energy Efficiency Scheme, and requirement for government to enforce the floor price rather than trust market forces. This study will therefore use the Low scenario as the most likely representation of carbon prices and therefore size of the carbon monetization market between 2013-2020, which is approximately £7.2 billion. The majority of this will be due to administrators of the carbon markets and issuers of carbon credits. Energy services companies will benefit by providing monitoring and trade services, and granting access to carbon markets. For this service it is estimated that a 2.5% fee can be commanded, which equates to a total market size (still using the Low scenario) of £180 million between 2013 and 2020. **£180 million will serve as the total addressable market for carbon monetization opportunities in the UK until 2020.**

e. Smart Energy Management Market Sizing

The smart energy management industry is currently in its very earliest stages in the UK. It should be seen as two pioneering markets in development; one being highly innovative, private sector driven, and aimed at the commercial and industrial markets (known as **Smart Building Energy Analytics**); and the other being a highly regulated, utility/government

driven deployment of smart meter technology for the residential sector (known as **Smart Metering**). A 'Smart Building' is defined by IDC Energy Insights (2011) as a "facility that utilizes advanced automation and integration to measure, monitor, control, and optimize building operations and maintenance". These technologies and processes therefore provide building operators with "heightened visibility into facility operations and maintenance" through gathering intelligence which then enables sophisticated management.

Smart Building Energy Analytics: this market consists of vendors of analytics solutions that assist in the optimization of the energy system of commercial and industrial buildings. The current market consists of a range of software application providers including venture-funded start-ups to large information technology and building automation and controls companies, most of which are based in the US. The UK currently has only a handful of players in this market which are still refining their value propositions and developing appropriate technology solutions. They have generated very little turnover to date.

Smart Metering: involves installation of smart meter technology on end-user premises, allowing two way communication between consumer and supplier, and therefore additional functionality including the ability to update metering software, change the read frequency, remotely control an agreed portion of a customer's consumption in order to help balance grid electrical generation and demand, update the metering tariff, and terminate energy use in the event of non-payment (Better Buildings Partnership, 2011). Smart Metering is intended to be a fully regulated market, instigated by energy utilities (both electricity and gas), under the watchful eye of the regulators, with utilities and government picking up the tab. The UK has committed to a full scale Smart Meter Implementation Programme, to be carried out by no later than 2019, commencing in 2014. It will involve the replacement of 53 million smart meters (in domestic and small non-domestic premises) at a total cost of £11.3 billion and estimated domestic/small non-domestic benefit of £18.3 billion (OFGEM/DECC, 2011). The necessary equipment includes a gas and/or electricity smart meter, In-House Display (IHD), Wide Area Network (WAN) module to connect a central communications provider which manages and stores data, and a Home Area Network (HAN) to link multiple sub-meters, the WAN, and IHD to provide an integrated service. For smart metering to become reality, a new policy framework is required which determines energy supplier obligations, technical specifications and minimum smart meter functionality standards, and data management protocol. The current state of the UK regulatory environment is as follows:

Figure 19: UK Smart Energy Management Regulatory Status

National Implementation Plan/Roadmap	Regulated Performance Standards	Binding Progress Target	Long Term Funding Program	Fiscal Enforcement Mechanism
✓	✓	✗	✓	✗

The current smart energy management industry in the UK is limited to the early innovators only with very little deployment to date, as the government deliberates over the regulatory framework. Certain European countries however, including Italy and Sweden in particular have made significant progress in rolling out smart meters, achieving 94% and 70% of advanced metering infrastructure already installed.

Market Sizing Model

A smart building energy analytics project requires the installation of certain hardware (including electricity and/or gas meters and sub-meters, and communications hardware), as well as creation of a communications network. Hardware requirements depend broadly on building size and type, hence cost is determined by number of units installed. Communications networks are installed on an area basis (i.e. £ per square meter of coverage). The calculation was performed as follows:

Smart Energy Building Analytics Potential (GBP) = **(1) Hardware Cost (£ per system)** + **(2) Cost of Communications (£ per meter)** X **(3) Average Building Area (meters)** X **(4) Number of Buildings in Sector**

Data sets (1) and (2) were obtained from the GLA's Better Building's Partnership primer on smart metering kit, as displayed in Figure 20. Data sets (3) and (4) again utilise the Communities and Local Government/DECC's Data on the UK building stock. Figure 21 illustrates the anticipated hardware requirements for different building types, as well as average areas to be covered by the communications network, and number of units per building sector. From here the last two columns of Figure 21 calculate the total installation cost per smart building energy analytics system for each different building sector in the UK, and multiply by the number of existing units to establish a total installation cost per sector.

Figure 20: Smart Energy Analytics Pricing

Hardware/Network Measure	Price (£)
Installation of electricity meter	400
Installation of gas meter	3,000
Installation of electricity sub-meter	300
Installation of gas sub-meter	1,000
Wireless transmission setup (per m)	238
Onsite data collection (per m)	40
External cellular wireless transmission (per m)	200

Figure 21: Hardware/Communications Requirements for UK Buildings								
Building Type	Electricity Meter	Gas Meter	Electricity Sub Meter	Gas Sub Meter	Average Area (m)	Number of Buildings (000)	Installation Cost per System (£)	Installation Cost per Sector (£M)
Residential Pre-1919	1	1	3	-	10	4,794	7,533	36
Residential 1919-44	1	1	3	-	10	3,689	7,364	27
Residential 1945-64	1	1	3	-	9	4,504	7,239	33
Residential 1965-80	1	1	3	-	9	4,631	7,210	33
Residential 1981-90	1	1	3	-	9	1,981	7,210	14
Residential post-1990	1	1	3	-	10	2,735	7,349	20
Commercial - Retail	1	1	10	3	14	553	13,823	8
Commercial - Offices	1	1	10	3	17	354	14,804	5
Commercial - Other Bulk	1	1	10	3	28	264	18,367	5
Industrial - Factories	1	1	20	5	9	60	17,201	1
Industrial - Warehouses	1	1	20	5	52	208	30,763	6
Total								**189**

£189 million will serve as the total addressable market for smart building energy analytics opportunities in the UK until 2020. And £11.3 billion will serve as the total addressable market for smart metering opportunities in the UK until 2020.

f. Summary

There exists an immediate opportunity for a specifically designed energy services company, with appropriate cross-sectoral knowledge and expertise, to address the challenge of enabling energy services with significant impact and scale in the short term. The total value of the market is estimated to be worth £106.8 billion as per Figure 22 below, addressable between 2013-2020 with energy efficiency retrofits addressable by 2050. Energy services companies can capitalise on this opportunity through direct revenues or intermediary based commissions.

Figure 22: Energy Services Market Size Summary	
Energy Services Sub-Industry	**Market Size (£ Bil)**
Smart Energy Management	11.5
Energy Efficiency Retrofit	68.4
Renewable Microgeneration	26.7
Carbon Management	0.2
Total	**106.8**

This opportunity has come about through many years of technological progress in the most innovative energy sectors, which are now proving commercial viability, if not individually, then as a package. A successful business model must guarantee holistic service provision by combining the economic power of energy analysis, efficiency savings, microgeneration revenues, and carbon monetization in a self-perpetuating manner to deliver energy

independence to energy users. This is the kind of game changing value referred to in the Literature Review by numerous authors, that could be established by a new hybrid business model, and which has been missing from the energy services sector to date, with providers instead focusing on isolated aspects of their clients' energy systems where the economics do not stack up.

The challenge remains integrating an appropriate range of services from these sub-sectors, in a contractually feasible and financeable fashion which can be scaled up or down for different customer segments and replicated throughout a national energy system. The question is therefore, what is the most appropriate business model to deliver this proposition? The following business plan sets out the actions and resource requirements that are required to successfully capitalize on this opportunity.

ENERGY APPLICATIONS LTD™

Enabling Energy Services

UK businesses have suffered at the hands of the energy supply industry for decades. They have been hit with some of the world's highest energy prices which continue to escalate. Extravagant national spending plans for new renewable and nuclear generation around the UK, combined with a shortage of liquidity, are only increasing the costs of capital which will no doubt be passed on to the consumer through even higher energy bills in the short and medium terms. The intersection of the UK's double dip recession with the Eurozone crisis in 2011-12 have only exacerbated the pressure on operating margins. And if that is not enough, European and UK legislation now converts carbon emissions for many UK firms into fiscal liabilities which must be met by profits.

Until now, very few solutions have existed to combat these forces, particularly those emanating from energy price hikes and new carbon liabilities. The energy services industry has not evolved to offer appropriate solutions, like the IT services industry for example has, with its outsourcing and cloud computing innovations. The technology now exists for similar energy services developments, yet business model innovation has been clumsy and stifled by mixed objectives and ambiguity in value propositions.

Energy Applications™ will seek to address this shortfall in the energy services industry, by innovatively combining a series of technologies and services, to provide tangible solutions to not only combat energy price escalation and carbon liabilities, but to introduce new profit making potential in energy cost centres where it was not previously thought possible. Its custom solutions will be offered within a newly formed virtual market place, known as SYNERGYNET™, whereby Energy Applications™ will aggregate best-of-breed product and service provision from the supply side, and offer integrated solutions supported by appropriate advisory, contract and financial mechanisms. Energy Applications™ will leverage and combine the benefits of energy efficiency, renewable microgeneration, smart energy management, and carbon trade to design appropriate energy independence strategies for its clients, offering solutions of varying complexity, duration, and return depending on a client's objectives. The following business plan sets out Energy Applications'™ intended means of fulfilling this purpose, while ensuring profitability, in a manner which is persistent and defensible.

9. Business Plan

a. Company Charters

Mission

To partner with our clients to deliver energy independence from innovative and integrated energy and carbon management solutions.

Vision

To work with best clients to identify, implement, and integrate best of breed products, services, and practices to enable migration to energy independence, through the use of proven technologies by outstanding people.

Values

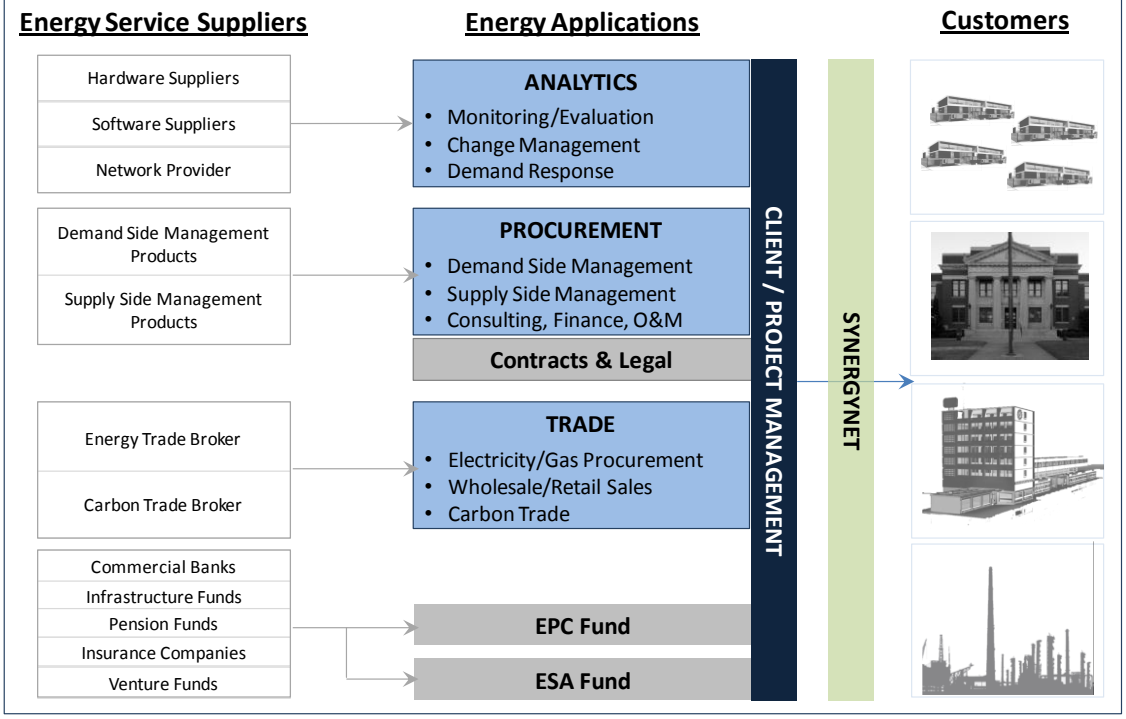
- **Professionalism** – conduct all encounters with appropriate *preparation* and *attention to detail*, delivering results that *exceed expectations*.
- **Humility** – *modest* and *unassuming* in nature, with a *willingness to openly engage* in problem solving in a complimentary manner.
- **Ownership** – *desire* to take individual *responsibility* for achieving company goals, and delivering *on time*.
- **Vision** – ability to *determine critical path*, *prioritize* complex tasks, and systematically build solutions.
- **Intensity** – *passion* to deliver the team's vision at a *consistently* high level.
- **Diligence** – *prudence* in all operations to *minimise risk* and ensure *no defects* in service provision.

b. Business Model

Five distinct business models currently exist in the UK energy services market. Utilities offering services, Energy Service Providers, ESCO's, Original Equipment Manufacturers, and more recently Integrated Developers. It is clear that business model innovation has occurred to foster these different entities, yet during this process value propositions have merely widened laterally rather than being enhanced to increase value to consumers.

Energy Applications™ is founded upon the concept of achieving energy independence for its clients, using a combination of products, services, and ancillary mechanisms that suit a particular client's objectives. It will therefore combine the most effective aspects of the aforementioned business models, deploying existing technologies, with refined contracts and financial structures, and incorporating carbon trade markets to complete the customer value proposition. In addition, it will base its offering on a unique in-house software mechanism, known as SYNERGYNET™, which will serve as an energy services market-making platform to facilitate interaction between consumers and suppliers. The high level components of Energy Applications'™ business model are as follows:

Figure 23: Energy Applications Business Model



Energy Applications™ consists of three functional business units, Analytics, Procurement, and Trade, fronted by Client/Project Management which is responsible for business development and all client interaction including project oversight and communications. The three core business units each deliver different components of the company's services offering; in chronological order:

- **Analytics** offers a range of software based (Software-as-a-Service) solutions including monitoring and evaluation, consumption and emissions profiling, and initiating change management programmes where appropriate. These Level One solutions rely on installation of two way communication meter technology onsite, which will be sourced from best-of-breed suppliers (ensuring that Energy Applications™ remains technology agnostic) and ensuring optimal integration and operability with each customer's unique infrastructure and existing control systems. In addition, clients will need to subscribe to an Energy Applications™ software package contained within SYNERGYNET™, which facilitates data collection and analysis. Following the initial assessment, ongoing access to this software will be available through an annual license. After deployment of hardware and software, retrofit opportunities will be identified by Analytics and passed to Procurement for design and tender on instructions from the building manager. Analytics does not guarantee performance or utilise performance contracts, charging minimal margins on hardware, time based fees for profiling and analytics services, and annual software license fees. This stage aims to establish short term operational credibility at minimum cost to the client.
- **Procurement (with Project Management)** utilises building data received from Analytics to identify energy independence opportunities. With instructions from the client to build the business case for such opportunities, Energy Applications™ will submit a 'Statement of Work' into SYNERGYNET'S™ project bidding system, where it becomes visible to suppliers, who in return submit sealed terms for completing the job. Scope of work could extend from any demand side management measure or supply side installation. The most competitive terms will be presented to the client with full investment analysis, including project IRR, NPV, and expected payback period. On acceptance Project Management is responsible for overseeing installation of infrastructure and ensuring integration, invoicing, and debt collection, all of which will be traceable within SYNERGYNET™. Level Two solutions will be installed under the appropriate contract, whether Design and Build, Service Level Agreement, Energy Performance Contract, Energy Service Agreement, or Power Purchase Agreement depending on the client's objectives. These services involve longer term contract duration, higher project complexity, and command margins of between 15-30%.

- **Trade** works with Analytics and Project Management to monetize excess energy supplies generated on site, and carbon emission reductions achieved. It is reliant on continuous data collected and verified from Energy Applications™ clients, which it is able to use for official reporting in the UK CRC Energy Efficiency Scheme and EU ETS on behalf of the client. Having compiled accurate data, Trade works with energy and carbon trade partners with access to liquid markets, that are appropriately regulated by the financial and energy market authorities, to deliver additional revenue streams to its clients. Fees on Level Three Solutions are commission based and contingent on trading volume and value. This stage is only relevant over the medium or long term, following commitment to Level One or Two solutions, and margins are highly dependent on circumstances.

In addition to the three revenue generating functional business units, Energy Applications™ contains an in-house **Contracts and Legal** unit to customize and oversee operational contracts with its clients. In addition, a **Financial Manager** will be responsible for fund raising and management of two funds, either in-house or using a regulated financial intermediary, called EPC Fund (for third-party project financing) and ESA Fund (for Energy Applications™ funded projects). These will be the primary sources of project finance for all Level Two solutions undertaken by Energy Applications™ and will be capitalized by a range of institutional investors including commercial banks, pension funds, venture funds, hedge funds, and insurance companies.

Energy Applications™ aims to offer a phased approach to achieving energy independence, which avoids the need for immediate, upfront, long term performance contracts, and capital commitment, until credibility is achieved through quick-win results. It allows clients to choose low capital, software based solutions, with low savings, or full scale deep retrofits incorporating multiple technologies to address both demand and supply side optimization. Energy Applications™ mitigates against contractual and financial obstacles typically faced by the other business models, through having dedicated in-house legal and financial experts administering contracts.

Energy Applications'™ **customer value proposition** is to provide end-to-end independent, but integrated energy services solutions that allow its clients to critically evaluate and optimize their energy system, through informed judgements on how best to deploy best-in-class demand and supply side management and trading applications, to achieve energy independence.

c. Company Objectives

Growth

1. **Infrastructure:** secure office space and recruit the start-up team of business unit Directors (Analytics, Procurement, Trade, and Operations) within 3 months of incorporation.

2. **SYNERGYNET™:** complete design, build, and live testing of SYNERGYNET™ within 4 months of incorporation.

3. **Contracts:** obtain and customize all operational contracts (including EPC, ESA, and PPA) to be deployed by Project Managers in future projects, within 3 months of incorporation.

4. **Funding:** secure seed capital to initiate Energy Applications™ two funds within 4 months of incorporation.

5. **Client Acquisition:** secure 5 commercial, 5 industrial, and 10 residential clients to be serviced initially by Analytics within the first 12 months of operation.

6. **Client Retention:** ensure a 90% retention rate at point of transition from Analytics to Procurement.

Profitability

1. Achieve turnover of £6,000,000 within 12 months of incorporation.

2. Achieve turnover of £13,000,000 within 36 months of incorporation, and profitability of 2% of turnover.

3. Achieve turnover of £30,000,000 within 48 months of incorporation, and profitability of 10% of turnover.

d. Implementation Strategy

Scope: Energy Applications™ will operate across the energy services industry, leveraging existing technologies and practices from energy efficiency, renewable microgeneration, smart energy management, and carbon management, as well as new technologies, practices, and sub-industries that are in development. The company will critically remain at the forefront of energy services market innovation to ensure competitiveness and incorporate the latest high impact measures of achieving energy independence for its clients.

Energy Applications™ will offer the full spectrum of services from intangible (monitoring, reporting, advisory, and mediation), to tangible (full project management), and finance/advisory. These offerings will be accompanied by an appropriate contract form including Design and Build contracts, Energy Performance Contracts, Energy Service Agreements, Service Level Agreements, O&M contracts, and Power Purchase Agreements.

Energy Applications™ will always target best customers, as defined below, and will focus initially on companies with obligations under the CRC Energy Efficiency Scheme, followed by the medium size commercial sector with large single tenant buildings, and multi-dwelling residential buildings.

Markets: The UK energy services market should be segmented according to the complexity of solutions that providers must cater for. Clearly industrial customers require a different set of products, services, and financial packages to residential or commercial customers. Market segments can be further broken down to reflect different building types according to age, size, number of tenants, and type of facility, as per below.

Figure 24: UK Energy Services Customer Market Segments

SEGMENT								
Residential			Commercial			Industrial		
Old Single Dwelling	Old 2-5 Unit	Old Multi-Dwelling	Food Retail	Food Service	Lodging	Factories	Ware-houses	Other Storage
Recent Single Dwelling	Recent 2-5 Unit	Recent Multi-Dwelling	Mercantile	Office	Public	Transport Terminals	Power Facilities	Waste and Water
Modern Single Dwelling	Modern 2-5 Unit	Modern Multi-Dwelling	Education	Worship	Health Care			

Source: Adapted from Deutsche Bank (2011)

Most tangible service providers (ESCO's) operate in the government sector, serving admin, healthcare, and education facilities under performance contract. The private commercial market has been largely untapped due to the incumbent market failures and institutional barriers. This will become the primary target segment for Energy Applications™, as well as large multi-dwelling residential buildings and smaller residential buildings where aggregation opportunities exist. Industrial segments will be addressed where operational expertise allows.

Customers: Energy Applications™ will position itself as a high quality, independent, energy services intermediary and will target high profile clients with tangible plans for optimizing their energy system, either as part of a specific demand or supply side energy management initiative, or in achieving a corporate sustainability strategy. With this positioning strategy, the company will seek to target a set of "Best Customers" which have some or all of the following characteristics:

- Subject to rising energy prices.
- Subject to a sustained or growing carbon liability.
- Participant in the UK CRC Energy Efficiency Scheme.
- Participant in the EU ETS (Phase III).
- Where a Corporate Sustainability Strategy is in practice/development.
- Where Director level interest extends to the energy system.
- Firms that are progressive and technology aware.
- UK firms with Kyoto Protocol Annex II country subsidiaries (that may benefit from Clean Development Mechanism projects).

Alignment with Best Customers will facilitate the business development process, and attempt to target like-minded clients that are likely to evolve into long term energy services outsourcing contracts.

Products/ Services: Energy Applications™ will remain product agnostic and at arm's-length from all energy services equipment providers in order to ensure impartiality and gain credibility as a gateway to all best energy services solutions on the market. It will operate three primary product categories in which specialist supplier networks will be built and maintained within SYNERGYNET'S™ procurement system. In addition, an innovation pool will be fostered to ensure new leading

edge technologies have a route to market through Energy Applications™ existing marketing and distribution channels, allowing them to migrate to one of the four primary categories once sufficiently mature and tested by Energy Applications™. These product categories will be as follows:

1. Monitoring and Evaluation Hardware.
2. Demand Side Energy Management.
3. Supply Side Energy Management.

Service provision will be retained in-house as the source of Energy Applications™ unique value proposition. Its consultants will obtain and build unique knowledge of the entire energy services market and best practice for integration, as well as structuring and deploying unique operational and financial contracts. This knowledge will be preserved at all costs. The three main service categories are in line with the three business units, namely:

1. Analytics – data mining, advisory and change management consulting.
2. Procurement – DSM and SSM design, tendering, project management.
3. Trade – monetization of excess energy and emission reductions.

Fee Basis: **Level One – Analytics**

This division uses a typical technology sourcing and installation model, whereby a sales team sources and oversees installation of a series of meters into a client premises (measures and costs as per Figure 20). These items will be sourced from industry leading suppliers, and billed at cost price plus **10% commission** in order to minimise upfront capital requirements to the client. In addition, the contract will provide for a certain number of hours monitoring, evaluation, and profiling, the output of which will be provided with change management recommendations based on an **hourly rate of £250 for commercial and industrial clients and £100 for residential**. Following installation of hardware and initial analysis and advisory, should the client decide to retain the services of Energy Applications™, an annual contract will be signed including a software license for access to SYNERGYNET™, allowing the client to record and review energy performance data, as well as obtain investment analysis for demand and supply side energy savings/generation retrofits. This license will be sold for **£1,500 for commercial and industrial clients and £500 for residential clients.**

Level Two – Procurement

Project delivery will typically take the form of an Energy Performance Contract or Energy Service Agreement depending on the structure and method of finance chosen by the client. The fee basis will differ as follows:

- **Energy Performance Contract** – Energy Applications™ would facilitate the acquisition of finance for a range of energy services solutions to be installed in a building, whilst guaranteeing a certain amount of energy savings over a fixed term. Using a 'shared savings' model, the cost savings achieved by the new capital would be shared with the client at a pre-determined percentage for a fixed number of years until Energy Applications™ makes sufficient return, before handing over all savings to the client. Margins expected for energy efficiency retrofits are **20% for commercial and industrial clients and 15% for residential clients**, while microgeneration installations are expected to be **25% across the board.**

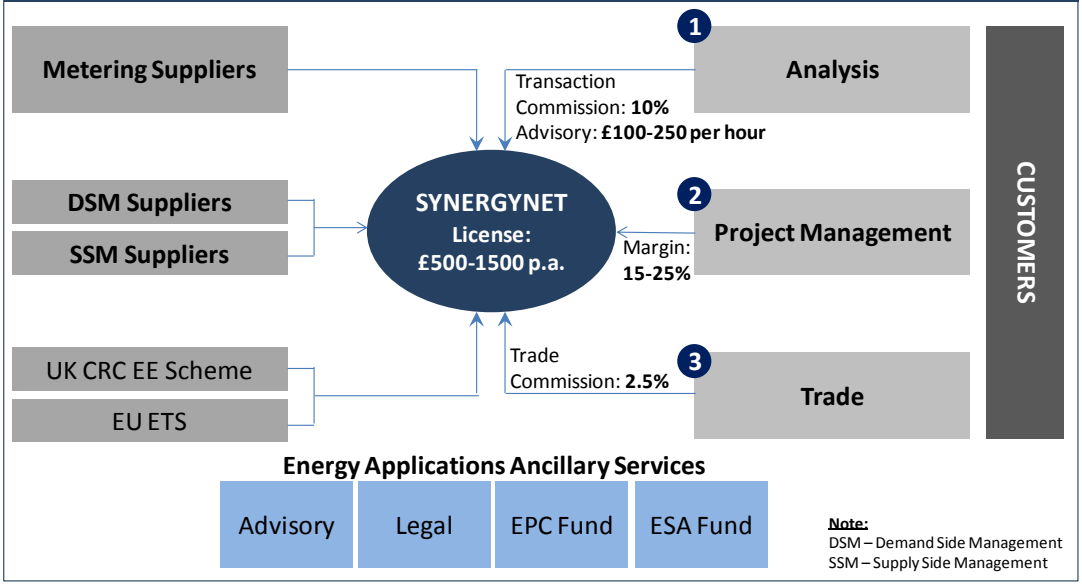
- **Energy Services Agreement** – Energy Applications™ would take over a client's operational expenditure relating to energy supply for a given period, and invest its own capital in measures to save energy or generate new energy from renewable sources. Energy Applications™ would continue to collect a fixed energy bill based on historic prices from the client, while benefiting from operational expenditure savings and new revenues generated by the facility upgrades. The investment return to Energy Applications™ from one of these contracts would depend on the capital upgrades made, ongoing energy prices, and the cost of capital, however margins are thought to be slightly higher than similar EPC projects due to the financial risk taken on as the energy services partner.

Level Three – Trade

Trade completes the service offering through its ability to utilise and achieve tangible benefit from energy savings measures and excess energy supply generated on site. So in addition to the cost benefit associated with energy savings, a client is able to benefit further through monetizing emission reductions, as well as selling surplus energy supplies back to the grid. Trade has

access to carbon trade markets, particularly the EU ETS, and UK CRC Energy Efficiency Scheme where it intends to purchase allowances on behalf of their clients, and administer submission. It also works with energy traders in spot markets to secure best prices for electricity sold to the grid. It is estimated that Energy Applications™ will charge a **2.5% volume based fee** on all trades.

Figure 25: Energy Applications Revenue Model



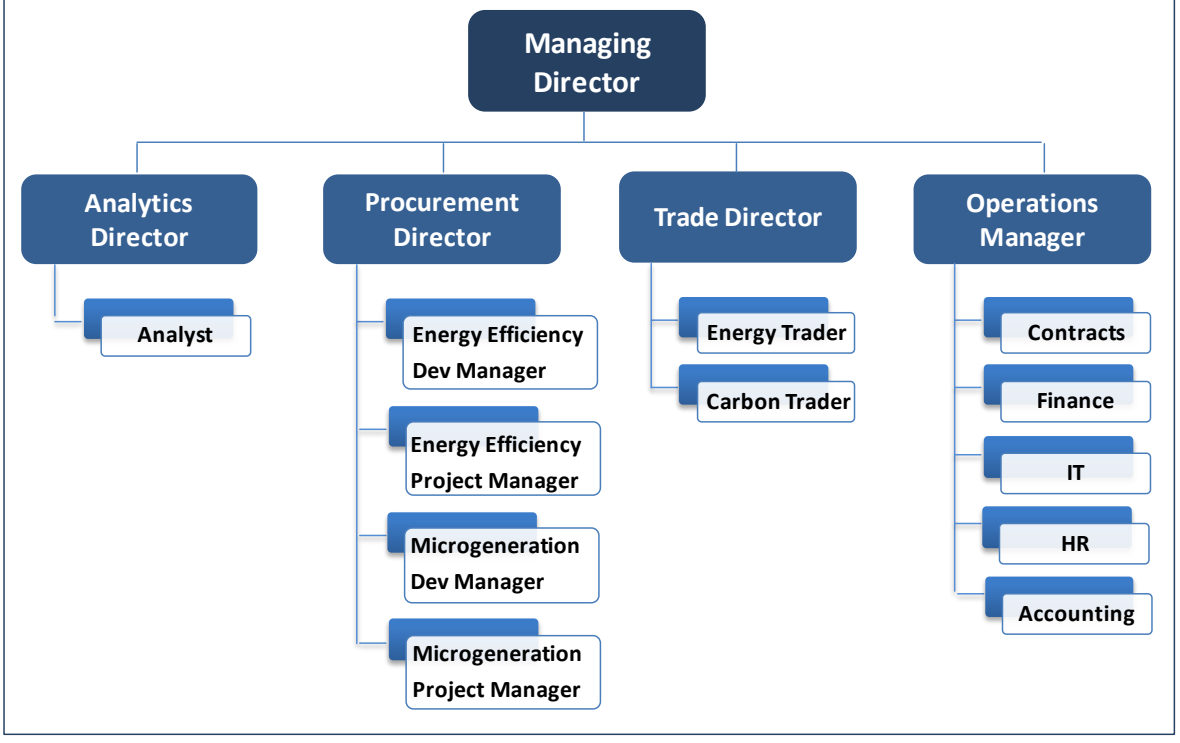
e. Key Resources and Processes

Energy Applications™ will act as an energy services intermediary, capable of delivering integrated advisory, project management, trade, and finance projects to its clients. Its resource requirement will depend primarily on the volume of projects under management at any one time, and it will rely heavily on sourcing and coordinating external resources in support of its clients' demands. This section therefore considers the minimum resource requirement to be maintained consistently within the company, with excess resources being contracted for individual monitoring, construction, installation, O&M, or legal requirements. The key resources and processes that will allow Energy Applications™ to be successful include qualified **people**, an advanced **technology** system to facilitate service delivery and supply chain management (SYNERGYNET™), key **partnerships**, and a far-reaching **marketing plan**.

People:

Energy Applications™ will have experienced department heads for the three main units being Analytics, Procurement, and Trade, underneath which a team of Consultants, Assistant Project Managers, and Traders will operate. A Client/Business Development Manager will head up a team of sales executives whose function it is to source prospective clients. These people will be supported by legal personnel to structure contracts and financial advisors to facilitate the acquisition of finance. The company will also contain senior management, as well as operations personnel including Human Resources, IT, and Accounting and Finance.

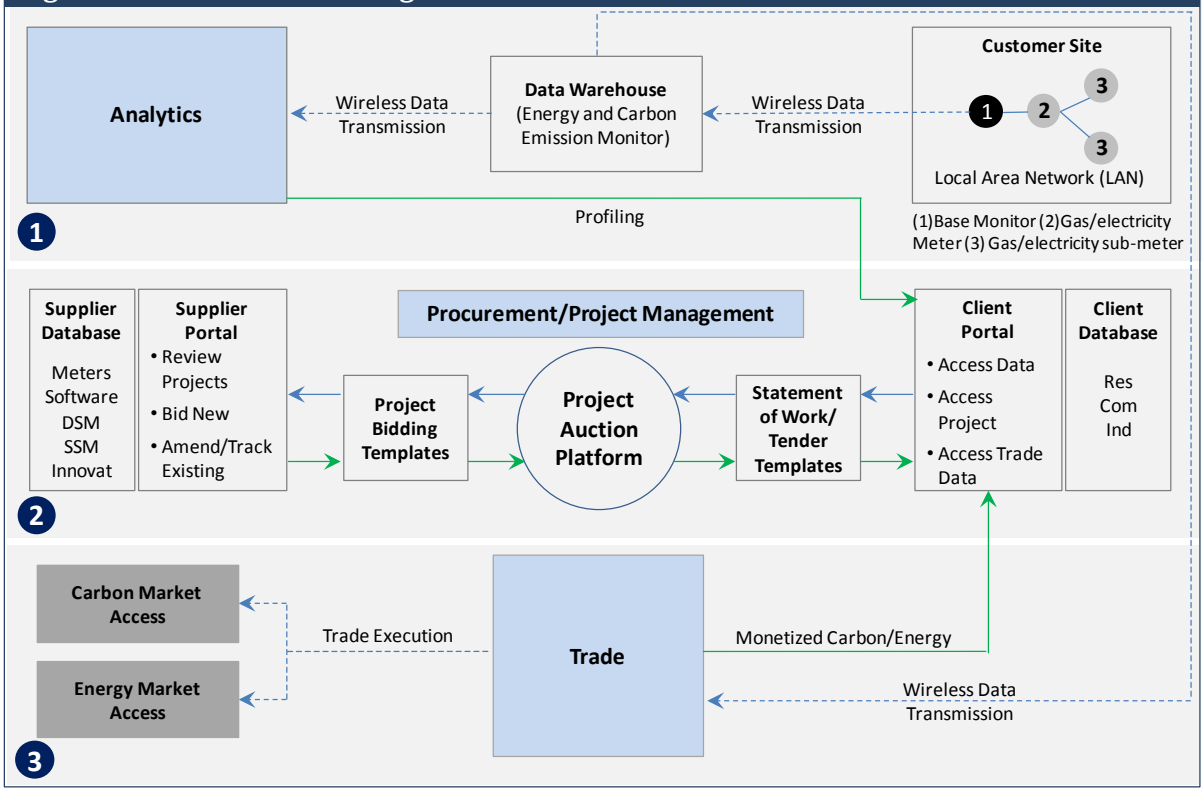
Figure 26: Organizational Chart



Technology:

SYNERGYNET™ is a virtual market place and intelligence gathering system, containing a series of data storage and analysis tools, client energy management applications, and procurement management mechanism. It serves to provide energy consumers with accurate information (accompanied by strategic consulting), working off metering hardware and wireless networking, to initiate and manage a client's energy independence strategy. It also ensures realisation of important synergies through leveraging both economies of scale and scope from its network of proven technology suppliers, whilst delivering competitively priced solutions through operation of a fully accountable sealed bid auction platform. SYNERGYNET™ offers UK consumers the ability to instantly and remotely access solutions, benchmark those solutions, and obtain transparent offers and impartial investment analysis, including contract and financial structuring options. The high level components of SYNERGYNET™ will be as follows:

Figure 27: SYNERGYNET™ High Level Schematic



SYNERGYNET™ will assist its clients in developing feasibility studies for energy services solutions, allow them to obtain and evaluate tenders from best-of-breed suppliers, negotiate contracts, integrate successful suppliers' offerings, monetize results, and monitor impact to confirm the degree to which estimated savings/revenues have been achieved. It enables this complete end-to-end process and maximum extraction of value, through seamless

interconnection of monitoring and storage services, a tangible product market, investment analysis, and trade application. SYNERGYNET™ also addresses certain key market failures and institutional barriers that have existed in the industry to date. Namely, independent oversight of project installation and integration will eliminate distorted price signals arising from arbitrary supplier margins being applied against naive customers. Restricted access to energy services solutions due to complexity of the supply chain and lack of energy savings visibility will be eliminated through process transparency, and consistent benchmarking of energy saving potential. Pre-arranged financial and contractual structures will eliminate complexity.

Partnerships:

Energy Applications™ will act as an energy services market intermediary, but within a sensitive role as a market aggregator for both supply and demand sides. It will therefore exercise caution in establishing partnerships to preserve impartiality. Initial partnerships will be formed with other market makers and facilitators like the Greater London Authority and Better Buildings Partnership, as well as Department of Energy and Climate Change, Energy Savings Trust and Carbon Trust, all of which are involved in energy services market development. Although suppliers form an important part the business model, they must remain at arm's-length and will not be commercial partners. On the other hand, entities which could facilitate Energy Applications™ operations and that of its clients, such as wireless network operators and data centres, will be considered as commercial partners.

Marketing Strategy

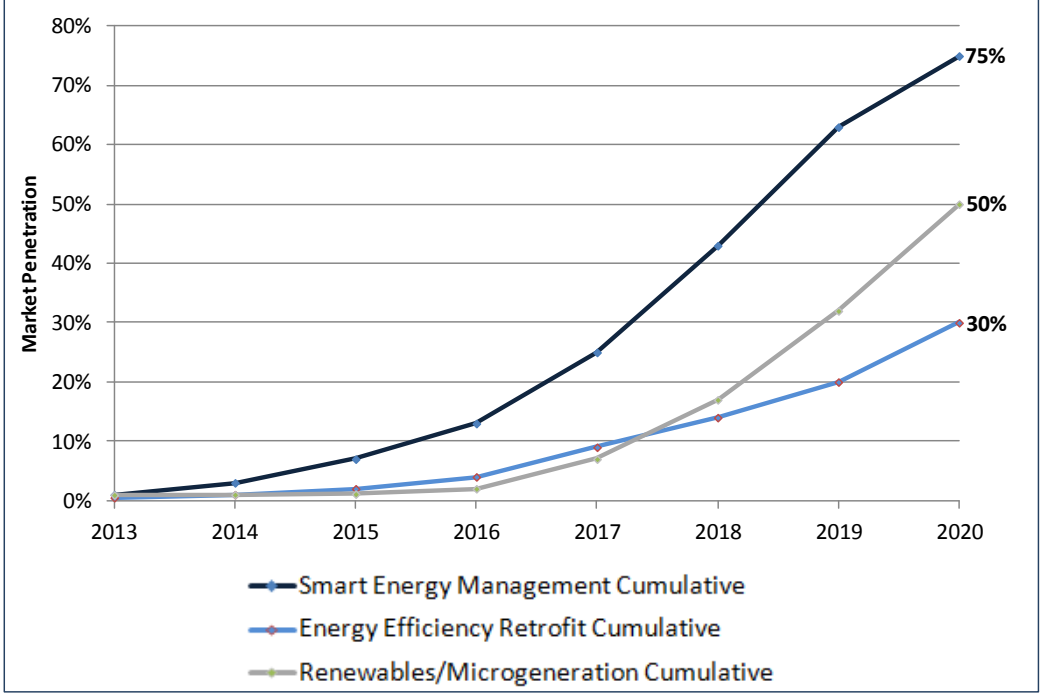
A far-reaching marketing plan is proposed in order to position Energy Applications™ as the partner of choice for energy services solutions, to communicate with target customer segments, and establish a market foothold via a small number of initial prestige projects. Specific marketing strategies are envisaged to position Energy Applications™ as the leading provider of low price, uniquely integrated solutions of products and services, capable of achieving energy independence for its clients. Substantial promotional campaigns will be engineered to ensure a presence throughout the UK in the chosen segments. The brand, Energy Applications™, will be based on credibility of upfront data monitoring and investment analysis, demonstrated achievement of timely results, best-of-breed products and the professionalism of its services. Value will be aggregated to basic product provision, by ensuring strong delivery features, and augmented service benefits.

f. Financial Evaluation (2013-20)

Market Share and Revenue

Energy Applications™ will operate within a total addressable market, already defined from the Market Analysis section of £106.8 billion. Different market penetration rates are expected to prevail across the different sub-sectors, meaning that this market is not likely to be achieved in full prior to 2020. Progress within each sub-industry is expected to take the form of a traditional S-curve, but with varying rates of evolution, reflecting different product life cycles as illustrated in Figure 27 below. On this basis, the total addressable market by 2020 can be adjusted to £42.6 billion. Cycles are determined based on a qualitative analysis of supply and demand drivers affecting each sub-industry.

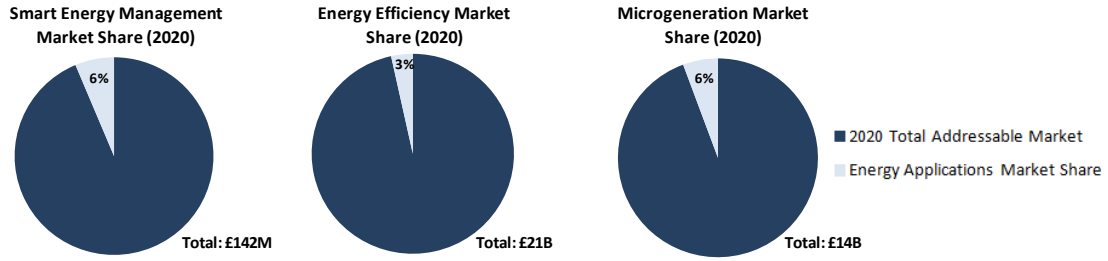
Figure 28: Energy Services Sub-industry Life Cycles (2013-20)



Energy Applications'™ revenues have been estimated using conservative market share estimates of what is believed to be achievable between 2013-2020 bearing in mind the competitive state of the energy services industry and Energy Applications'™ capabilities. Market share estimates for Smart Energy Management, Energy Efficiency, and Renewable Microgeneration are illustrated in Figure 28 below (with Carbon Management market shares being a function of the other sub-industries).

Figure 29: Energy Applications Market Share Forecasts

Year	Sub-Industry	Sector	2013	2014	2015	2016	2017	2018	2019	2020
% of Total Addressable Market Share Available (Cumulative)	Smart Energy Management	All Sectors	1%	3%	7%	13%	25%	43%	63%	**75%**
	Energy Efficiency	All Sectors	1%	1%	2%	4%	9%	14%	20%	**30%**
	Microgeneration	All Sectors	1%	1%	2%	3%	9%	19%	33%	**50%**
Energy Applications Real Market Share as % of Total Addressable Market (Cumulative)	**Smart Energy Management**	Residential	0.1%	0.3%	0.4%	0.4%	0.8%	1.7%	3.2%	**6.0%**
		Commercial	0.1%	0.5%	1.1%	2.3%	4.5%	8.6%	9.5%	**12.0%**
		Industrial	0.1%	0.3%	0.8%	1.8%	3.5%	6.5%	9.5%	**11.3%**
	Energy Efficiency	Residential	0.0%	0.1%	0.1%	0.2%	0.5%	0.6%	1.0%	**2.4%**
		Commercial	0.1%	0.2%	0.2%	0.4%	0.9%	1.7%	2.4%	**3.6%**
		Industrial	0.0%	0.1%	0.1%	0.3%	0.7%	1.4%	2.4%	**3.6%**
	Microgeneration		0.1%	0.2%	0.1%	0.3%	1.1%	2.3%	4.0%	**6.0%**



This analysis suggests that by 2020 Energy Applications™ could have 6%, 3%, and 6% respectively of the three energy services sub-sectors, and their available markets. The following Income Statement has been produced based on these conservative projections.

Cost of Revenue

Cost of revenue has been calculated using margins associated with each of the three service lines – Analytics, Procurement, and Trade. Analysis of existing margins within companies already operating in these sectors suggest that 10%, 25%, and 75% are achievable respectively. While these are likely to fluctuate between 2013-2020 as the cost of products and service charges change, these margins are the most effective way to forecast cost of revenues at this stage.

Operational Expenses

Energy Applications'™ main expenses relate to payroll, including incentives and benefits, which account for approximately 40% of total operating costs in 2013. Energy Applications™ will aim to build and retain an outstanding workforce, hence this ratio is acceptable, and typical of a services business. Full payroll and expenses breakdown is available in Annex 10.3.

Capex, Interest and Tax

It is estimated that £250,000 will be required to build and register SYNERGYNET™. This will be funded from the £2 million loan that will be secured at 8% annual interest for a term of 5 years. Corporation tax is assumed to be constant at 23% through 2020.

Figure 30: Income Projections (2013-2020)

Energy Applications - Income Projections

Year	2013	2014	2015	2016	2017	2018	2019	2020
Revenues								
Analytics	36,738	122,203	204,373	272,574	509,735	897,865	1,112,902	1,138,637
Project Management	6,309,906	9,678,942	13,269,014	31,199,699	107,833,286	153,450,052	210,259,418	299,869,877
Trade	4,359	7,400	10,362	24,314	74,466	97,033	135,323	256,967
Total Revenue	6,351,004	9,808,544	13,483,750	31,496,588	108,417,487	154,444,950	211,507,643	301,265,481
Expenses								
Cost of Analytics Revenue	33,065	109,982	183,936	245,317	458,762	808,079	1,001,612	1,024,774
Gross Margin (%)	10%	10%	10%	10%	10%	10%	10%	10%
Cost of Project Management Revenue	4,732,430	7,259,206	9,951,761	23,399,775	80,874,965	115,087,539	157,694,564	224,902,408
Gross Margin (%)	25%	25%	25%	25%	25%	25%	25%	25%
Cost of Trade Revenue	1,090	1,850	2,591	6,079	18,616	24,258	33,831	64,242
Gross Margin (%)	75%	75%	75%	75%	75%	75%	75%	75%
Total Cost of Revenue	4,766,584	7,371,039	10,138,287	23,651,170	81,352,343	115,919,876	158,730,006	225,991,423
Salaries & Benefits	336,000	636,540	636,540	878,425	1,429,287	2,691,834	3,446,107	3,446,107
Incentives & Commissions	420,000	795,675	1,098,032	1,786,609	3,266,789	3,364,793	4,182,168	4,307,633
Project Development	650,000	650,000	650,000	185,000	185,000	185,000	185,000	185,000
General & Admin	243,727	300,452	381,430	570,379	961,773	961,773	1,150,722	1,150,722
Total Operating Expenses	1,649,727	2,382,667	2,766,002	3,420,413	5,842,849	7,203,401	8,963,997	9,089,462
EBITDA	- 65,307	54,838	579,461	4,425,005	21,222,295	31,321,674	43,813,640	66,184,596
Interest/Principal	160,000	160,000	160,000	160,000	2,160,000		-	-
EBT	- 225,307	- 105,162	419,461	4,265,005	19,062,295	31,321,674	43,813,640	66,184,596
Tax Rate	23%	23%	23%	23%	23%	23%	23%	23%
Income Tax Expense	0	0	96,476	980,951	4,384,328	7,203,985	10,077,137	15,222,457
Net Profit/Loss	**- 225,307**	**- 105,162**	**322,985**	**3,284,054**	**14,677,967**	**24,117,689**	**33,736,503**	**50,962,139**
Profit (as % of Turnover)	-4%	-1%	2%	10%	14%	16%	16%	17%

g. Internal Analysis

SWOT Analysis Summary

Energy Applications'™ strengths are derived from its unique customer oriented business model, and holistic and custom service provision supported by proprietary market making software. Its reliance on third party contractors to integrate solutions represents a weakness, and usual technology and policy risks are a threat. New opportunities will emerge as the climate change agenda materializes in the UK towards 2020.

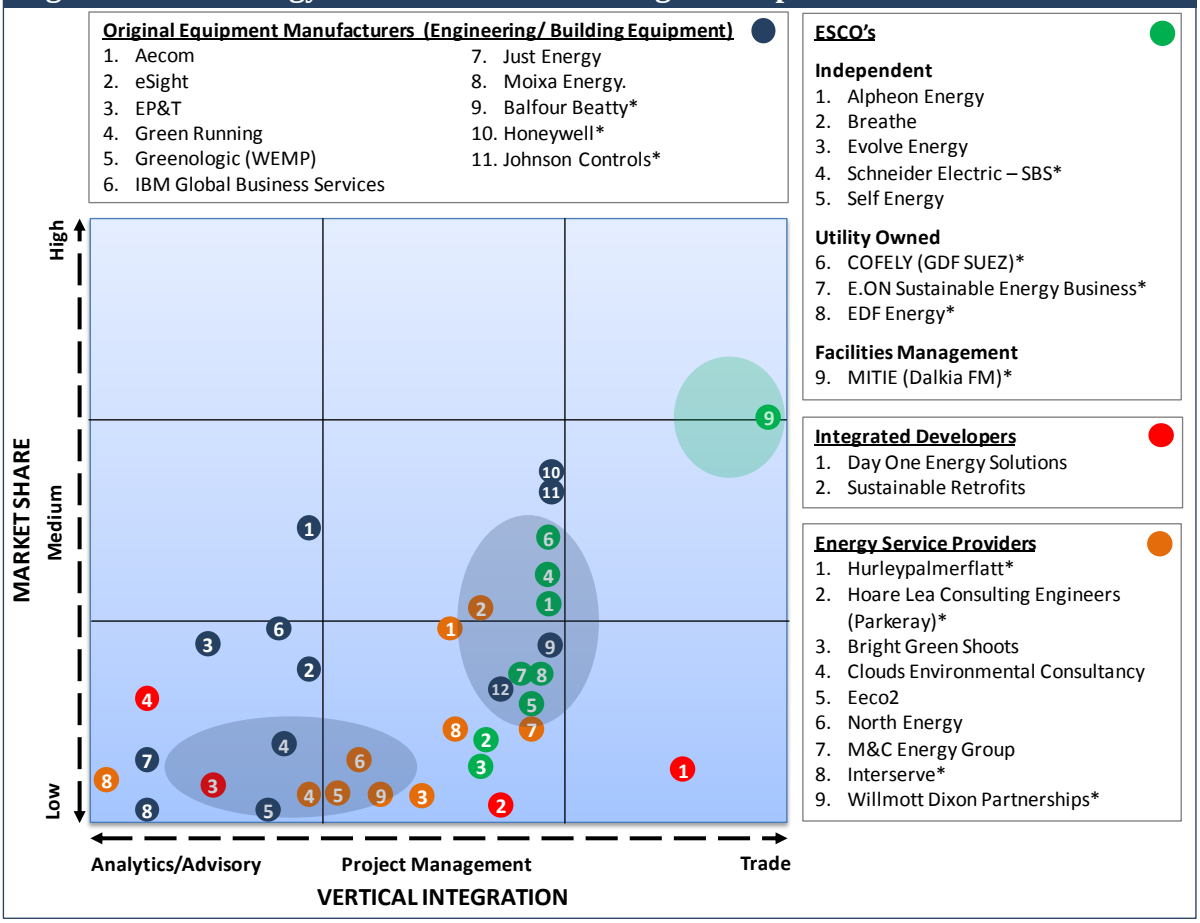
Competitive Analysis

The competitive environment in the UK energy services industry remains relatively immature, with competitor numbers in the low hundreds. Even so, clear strategic groups exist, distinguished by variables such as specialization, geographic coverage, vertical integration, and contract form deployed. The major commercial sector energy services market is currently being driven by the Greater London Authority which, in 2010, created a Framework Panel of Approved Suppliers that provide ESCO services. These companies have got the early break in the energy services industry with first access to a range of public sector projects for a period of three years (see Annex 10.4 for full competitor profiles). Even within these twelve companies, strategic groups can be identified, namely utility ESCO's, Original Equipment Manufacturers, Smart Building Energy Analytics providers, consultants, and engineering companies. The GLA is reopening the panel in 2013 for applications from new and existing companies, for which over 80 applications were received by early 2012, suggesting that the competitive landscape is vastly increasing. New companies expected to be strong energy services market competitors include a new generation of ESCO's and Integrated Developers, as well as specialist software and technology providers entering the smart building energy analytics arena. Strategic groups in the UK are illustrated in Figure 31 below.

Analysis of competitor profiles Figure 31 uncovers the existence of clear strategic groups based on vertical integration of product/service provision across advisory, project management, and trade. Two main groups are evident, (1) on the border between advisory and project management services, and (2) full project management services. Group (1) consists primarily of consultants, analytics providers, and engineering design firms providing fee based non-performance related solutions. Group (2) provides end-to-end performance related solutions across demand and supply sides. Only one or two firms are attempting to leverage the full benefit of energy services through a carbon and excess energy monetization function.

It is expected that a new strategic group will begin to form in this area. **An opportunity therefore exists for Energy Applications™ to differentiate itself by enhancing vertical integration and incorporating trade services to complete the value chain.**

Figure 31: UK Energy Services Market: Strategic Groups



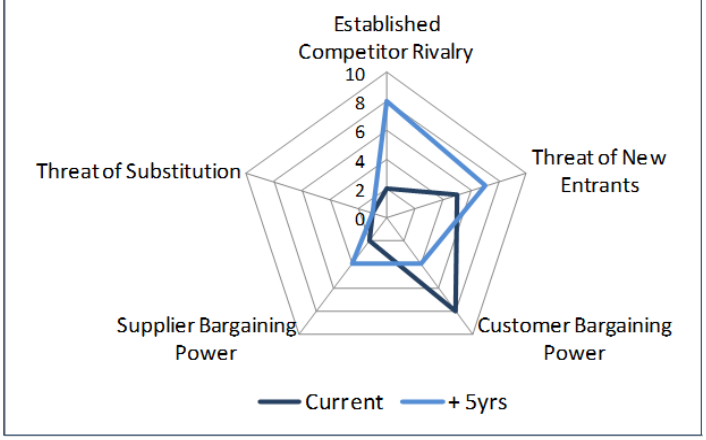
Turning to the wider competitive landscape, Energy Applications™ will be operating in an environment of moderate but increasing competitive intensity, which is still highly attractive for a new entrant. The main forces at play are illustrated below:

- **Established rival competitors** – competition amongst UK energy services providers is relatively low due to the small amount of credible operators. Within existing providers however, a small group of highly resourced companies exist with superior access to current public sector driven demand. Few competitors however, offer the range of services envisaged by Energy Applications™.
- **Threat of substitutes** – a very low threat of substitute products/services exist that cannot be incorporated into Energy Applications'™ offering, being an intermediary with access to best suppliers and products. Furthermore, the energy services industry

can only be substituted if the threat of climate change and rising energy prices disappear, neither of which are likely.

- **Threat of new entrants** – the energy services industry is currently benefiting from significant government support in the form of grants, guaranteed revenues, and tax breaks, which means that the threat of new entrants is increasing. That is somewhat mitigated by the high level of skill, and/or operating history required to be successful in the energy services sector, which will restrict a mass of new entrants.
- **Bargaining power of suppliers –** energy services suppliers are currently hindered by general consumer inertia with regard to energy services products, as well as budget constraints, and distorted market conditions preventing purchase. Supplier bargaining power is therefore at an all time low, and expected to remain so for the time being.
- **Bargaining power of customers –** legitimate buyer concentration (as opposed to government assisted) is currently very low, but roughly proportional to the firm concentration. As such, customers still have significant bargaining power being an immature industry with low initial switching costs. Lack of information availability, in particular clear price signals, does not exist however, which disempowers customers.

Figure 32: Estimated Evolution of Competitive Landscape



The current energy services market is highly attractive on the basis that low established competitive rivalry exists, supplier bargaining power is minimal, and there is almost no threat of substitution. On the other hand, consumers hold significant bargaining power, and there is a threat of multiple new entrants. Within five years, the competitive rivalry will increase dramatically as new entrants try to capitalize on a high growth industry supported by politicians. The window of opportunity is relatively small, and with the GLA launching a new approved supplier panel for energy services projects in early 2013, that window has been reduced even further, as any new entrants not on the panel will be severely disadvantaged.

Risks, Uncertainties, and Mitigation Strategies

Energy Applications™ will face substantial risks at the outset as the energy services industry continues its evolution, demand patterns become clear, and best practices emerge. The major risks, and associated mitigation strategies envisaged for Energy Applications™ are as follows:

Risk/Uncertainty	Description	Mitigation Strategy
1. **Integration Difficulties**	Ability to integrate third party products with different functions, life cycles, and maintenance requirements that were never designed to function together.	Ensure formal training provided by third party suppliers regarding product installation/operability, and use of single long term installation contractor by Energy Applications to learn technologies/improve integration skill.
2. **Contractor Performance**	Reliability of Energy Applications' chosen installation and integration contractor to complete a project on time, budget, and in accordance with the performance obligations set out in the contract.	Strictly administered Service Level Agreements with Energy Applications one installation contractor to verify performance, followed by annual tender for the installation work. Contractor to earn equity stake in Energy Applications over time.
3. **Technology Risk**	Risk associated with deployment of new technologies which are still relatively untested in a large scale commercial environment, and potentially unable to deliver required energy savings/supply.	Rigorous testing process for all technologies sold through Synergynet, including specifically designed quality assurance mechanism, and ongoing technology audits on site to monitor performance.
4. **Availability of Finance**	Credibility of Energy Applications with creditors in securing project finance to support Phase Two solutions.	Investment of own funds in EPC and ESA fund to demonstrate confidence in service delivery potential. And clear articulation of business case for financiers.
5. **Human Capital**	Ability to obtain highest quality human capital, train them in use of Synergynet, and retain their skills in a high growth market.	Must offer very competitive packages with balance between lifestyle and reward, and opportunity to earn stake in Energy applications over time.

Critical Success Factors

In addition to mitigating the above risks and uncertainties, Energy Applications™ will keep track of the following critical success factors which, in conjunction with embracing the company's values, are seen as most important for ensuring immediate profitability:

1. **Synergynet Usability** – Energy Applications'™ market making mechanism must offer the ultimate user experience for purchasing energy services solutions, transmitting professionalism, high quality, and reliability at every stage of interaction.
2. **Supplier Engagement** – Energy Applications™ must ensure availability of market leading, best-of-breed suppliers for all major consumer demands at any point in time.

3. **Superior Skills** – Energy Applications'™ people must have industry leading skills to inspire consumer confidence to go along with the impartiality and professionalism generated by the business model.
4. **Service** – Energy Applications™ must offer unrivalled service, based on clear vision, to ensure client retention beyond Phase One solutions.

h. Synopsis

- Technology advancement, policy foresight, and business model innovation have evolved to create an opportune moment for the creation of Energy Applications™, the first UK firm to enable energy services with impact in the UK.
- It will seek to deliver energy independence to its clients through the provision of tangible energy saving and generating products and services, by connecting supply with demand using an innovative market making platform, SYNERGYNET™.
- Full demand and supply side solutions will be designed and delivered by Procurement, following a period of data collection and analysis by Analytics, the additional benefits of which will be monetized by Trade through carbon and energy arbitrage.
- Ambitious objectives have been set relating to recruitment, infrastructure investment, contract planning, fund raising, client acquisition, turnover, and profitability.
- Energy Applications™ will charge minimal 10% commission for Analytics, will typically secure 10-25% margins for EPC and ESA projects, and charge 2.5% commission on all trades - Procurement will account for >90% of forecasted revenue.
- By 2020 Energy Applications™ will aim to secure a modest 6%, 3%, and 6% of existing smart energy management, energy efficiency retrofit, and renewable microgeneration markets respectively in the UK, at that time. At this level, Energy Applications™ will achieve profitability after 3 years once it surpasses £13 million in turnover. The company will need to sustain losses in years 1 and 2 of £330,000.
- Very little direct competition exists in Energy Applications'™ intended market, meaning the timing for entry therefore is ideal. Major risks facing the company include the challenge of integrating multiple suppliers' products and managing third party contractors, while critical success factors include the usability of SYNERGYNET™, high quality service, and a skilled workforce.

10. Appendices

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10.2 Business Model Categorizations

Business Model:	Utility Services Company
Definition:	Electricity/gas suppliers whose primary function is generation and supply of energy. From a services perspective offer rebates for improved energy performance, and guarantee annual tariff for renewable microgeneration.
Typical Contract Form:	None for efficiency, off-take agreement for renewable microgeneration.
Project Finance Mechanism:	None.
Markets Served:	Energy Efficiency and Renewable Microgeneration.
Typical Customers:	Primarily Residential, also Commercial.

Business Model:	Original Equipment Manufacturer (OEM)	
Business Model Variants:	**Building Equipment Specialist**	**Engineering Specialist**
Definition:	Equipment manufacturers that build, supply, or install building equipment as their main function, including small power systems, appliances, insulation etc.	Design, build, and engineering companies that undertake specific or turnkey technical solutions for building owners.
Typical Contract Form:	Design and Build. Energy Performance Contract.	Design and Build. Energy Performance Contract.
Project Finance Mechanism:	In-house Finance. Client Self Finance. Third Party Finance.	In-house Finance. Client Self Finance. Third Party Finance.
Markets Served:	Energy Efficiency. Renewable Microgeneration. Smart Energy Management.	Energy Efficiency. Renewable Microgeneration. Smart Energy Management.
Typical Customers:	Commercial and Industrial.	Commercial and Industrial.

Business Model:	Energy Services Provider (ESP)	
Business Model Variants:	**Technical Consultant**	**Smart Energy Building Analytics**
Definition:	Energy, carbon, and sustainability advisory that performs analysis, monitoring, testing, and reporting to validate or improve an energy system through change management rather than investment in capital.	Software-as-a-Service (SaaS), Building Management Systems (BMS), energy modelling, and energy/carbon performance monitoring companies that leverage networked systems to deliver insight/ expose optimization opportunities.
Typical Contract Form:	Service Level Agreement.	Service Level Agreement.
Project Finance Mechanism:	None.	None.
Markets Served:	All Energy Services markets.	Smart Energy Management.
Typical Customers:	Commercial.	Commercial and Industrial.

Business Model:	Energy Service Company (ESCO)	
Business Model Variants:	**Energy Supply Contractor (ESC)**	**Energy Performance Contractor (EPC)**
Definition:	Engineering oriented, large equipment/ power centre optimization and installation companies.	Business oriented, integrated energy contracting companies comprising demand side management and energy system optimization including decentralized supply, and third party funding programs.
Typical Contract Form:	Energy Supply Contract.	Energy Performance Contract. Power Purchase Agreement. Operations & Maintenance Contract.
Project Finance Mechanism:	Client Self Finance.	Guaranteed Savings (Client Self Finance) Shared Savings (3rd Party Finance).
Markets Served:	Renewable Microgeneration.	Energy Efficiency Renewable Microgeneration
Typical Customers:	Commercial (particularly Local Community) and Industrial.	Commercial (particularly Government) and Industrial.

Business Model:	Integrated Developer
Definition:	Integrated project developer offering full scope of analytics (software) and hardware solutions spanning demand and supply side energy management and carbon management. supported by innovative off-balance sheet finance.
Typical Contract Form:	Energy Services Agreement (ESA).
Project Finance Mechanism:	Off Balance Sheet Third Party Finance (ESA). On-Bill Finance (OBF).
Markets Served:	Energy Efficiency, Renewable Microgeneration, and Smart Energy Management.
Typical Customers:	Commercial.

10.3 Energy Applications Cost Schedule

Salaries and Benefits (Payroll) - Pretax															
		2013	2014	2015	2016	2017	2018	2019	2020		2021	2022
Role	**Monthly**	**Salary**	**Salary**	**Salary**	**Salary**	**Salary**	**Salary**	**Salary**	**Salary**	**Number**	**Salary**	**Salary**
Managing Director	£ 8,000	£ -	£ 98,880	£ 101,846	£ 104,902	£ 108,049	£ 111,290	£ 114,629	£ 118,068	1	£ 121,610	£ 125,258
Anayltics Director	£ 4,000	£ 48,000	£ 49,440	£ 50,923	£ 52,451	£ 54,024	£ 55,645	£ 57,315	£ 59,034	1	£ 60,805	£ 62,629
Data Analyst	£ 2,000	£ -	£ -	£ 25,462	£ 104,902	£ 216,098	£ 222,581	£ 286,573	£ 295,170	10	£ 304,025	£ 313,146
Project Management Director	£ 5,000	£ 60,000	£ 61,800	£ 63,654	£ 65,564	£ 67,531	£ 69,556	£ 71,643	£ 73,792	1	£ 76,006	£ 78,286
Energy Efficiency Development Manager	£ 3,000	£ -	£ 37,080	£ 38,192	£ 78,676	£ 162,073	£ 166,935	£ 214,929	£ 221,377	5	£ 228,019	£ 234,859
Energy Efficiency Project Manager	£ 3,250	£ -	£ -	£ 41,375	£ 170,465	£ 351,159	£ 361,694	£ 465,680	£ 479,651	10	£ 494,040	£ 508,862
Renewables Development Manager	£ 3,000	£ -	£ 37,080	£ 38,192	£ 78,676	£ 162,073	£ 166,935	£ 214,929	£ 221,377	5	£ 228,019	£ 234,859
Renewables Project Manager	£ 3,250	£ -	£ -	£ 41,375	£ 170,465	£ 351,159	£ 361,694	£ 465,680	£ 479,651	10	£ 494,040	£ 508,862
Trade Director (Energy and Carbon)	£ 4,000	£ 48,000	£ 49,440	£ 50,923	£ 52,451	£ 54,024	£ 55,645	£ 57,315	£ 59,034	1	£ 60,805	£ 62,629
Energy Trader	£ 2,000	£ -	£ -	£ -	£ -	£ 27,012	£ 27,823	£ 57,315	£ 59,034	2	£ 60,805	£ 62,629
Carbon Trader	£ 2,000	£ -	£ -	£ -	£ -	£ 27,012	£ 27,823	£ 57,315	£ 59,034	2	£ 60,805	£ 62,629
Business Development Manager	£ 4,500	£ 54,000	£ 55,620	£ 57,289	£ 59,007	£ 60,777	£ 62,601	£ 64,479	£ 66,413	1	£ 68,406	£ 70,458
Account Executive	£ 2,000	£ -	£ 24,720	£ 50,923	£ 104,902	£ 216,098	£ 222,581	£ 286,573	£ 295,170	10	£ 304,025	£ 313,146
Contracts Solicitor	£ 4,500	£ 54,000	£ 55,620	£ 114,577	£ 118,015	£ 243,110	£ 250,403	£ 386,873	£ 398,479	8	£ 547,245	£ 704,578
Fund Manager	£ 4,500	£ -	£ 55,620	£ 57,289	£ 118,015	£ 243,110	£ 250,403	£ 257,915	£ 265,653	4	£ 273,622	£ 281,831
IT Manager	£ 3,000	£ 36,000	£ 74,160	£ 76,385	£ 78,676	£ 121,555	£ 125,202	£ 128,958	£ 132,826	3	£ 136,811	£ 140,916
HR Manager	£ 2,500	£ -	£ -	£ 31,827	£ 32,782	£ 67,531	£ 69,556	£ 71,643	£ 73,792	2	£ 76,006	£ 78,286
Accounting Manager	£ 3,000	£ 36,000	£ 37,080	£ 38,192	£ 39,338	£ 81,037	£ 83,468	£ 85,972	£ 88,551	2	£ 91,207	£ 93,944
Total	**£ 63,500**	**£ 336,000**	**636,540**	**878,425**	**1,429,287**	**2,613,431**	**2,691,834**	**3,345,735**	**3,446,107**	**78**	**3,686,301**	**3,937,805**
Incentives/Commission (based on sales)	**25%**	**£ 84,000**	**£ 159,135**	**£ 219,606**	**£ 357,322**	**£ 653,358**	**£ 672,959**	**£ 836,434**	**£ 861,527**	**£ 20**	**£ 921,575**	**£ 984,451**
Total Salaries & Benefits		**£ 420,000**	**£ 795,675**	**£ 1,098,032**	**£ 1,786,609**	**£ 3,266,789**	**£ 3,364,793**	**£ 4,182,168**	**£ 4,307,633**		**£ 4,607,876**	**£ 4,922,257**
Annual Wage Inflation	3%											

Project Development										
	2013	2014	2015	2016	2017	2018	2019		2020	2021	2022
Advertising	300,000	300,000	300,000	150,000	150,000	150,000	150,000	150,000		150,000	150,000
Trade Shows	30,000	30,000	30,000	15,000	15,000	15,000	15,000	15,000		15,000	15,000
Exhibition Projects	300,000	300,000	300,000	-	-	-	-	-		-	-
Entertainment	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000		10,000	10,000
Travel	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000		10,000	10,000
Total	**650,000**	**650,000**	**650,000**	**185,000**	**185,000**	**185,000**	**185,000**	**185,000**		**185,000**	**185,000**

General and Admin										
	2013	2014	2015	2016	2017	2018	2019		2020	2021	2022
Rent	**100,800**	**163,800**	**239,400**	**415,800**	**781,200**	**781,200**	**957,600**	**957,600**		**982,800**	**1,008,000**
Utilities	17,927	11,652	17,030	29,579	55,573	55,573	68,122	68,122		69,915	71,707
IT and Data	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000		50,000	50,000
Maintenance and Repairs	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000		10,000	10,000
Insurance	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000		30,000	30,000
Professional and Legal	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000		20,000	20,000
Equipment	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000		5,000	5,000
Cleaning	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000		10,000	10,000
Total	**243,727**	**300,452**	**381,430**	**570,379**	**961,773**	**961,773**	**1,150,722**	**1,150,722**	**-**	**1,177,715**	**1,204,707**

10.4 Competitor Profiles

No	Company	Business Model	Profile
1	Aecom	**OEM (BEMS)**	Global provider of professional, technical and management support services to the energy management sector, including smart electricity meters and other building energy management devices.
2	Alpheon Energy	**ESCO (Ind)**	Founded in 2008 in the Netherlands and subsequently Belgium and the UK, provides end-to-end engineering and consulting, execution, delivery, and operation, and project finance services in the energy services space, particularly alternative energy generation in commercial premises.
3	Balfour Beatty PLC	**OEM/ Consultant**	Global infrastructure services business that designs, builds, and operates major infrastructure projects including implementation of energy services technologies under performance contract in the UK.
4	Breathe	**ESCO (Ind)**	Provides innovative energy and carbon efficiency solutions for businesses in the UK accompanied by external project finance, under performance contracts, and particularly focused on the retrofit sector.
5	Bright Green Shoots	**Consultant**	Specialist energy and sustainability consultancy offering advice, strategy and turnkey implementation of sustainability solutions.
6	COFELY (GDF Suez)	**ESCO**	Facilities Management specialist arm of vertically integrated French utility GDF Suez, offering design, installation and management of local and renewable energy solutions, to the operational delivery of integrated facilities. 2,200 employees in the UK with turnover of £300 million.
7	Clouds Environmental Consultancy	**Consultant**	Established in 2001, as an independent consultancy specialising in carbon, energy, and environmental management services, provides solutions in energy and carbon management, energy metering, Monitoring and Targeting, Energy Performance of Buildings Directive Compliance and CRC, operating in the public and private sectors with major clients such as the NHS, MOD, and Local Government.
8	Day One Energy Solutions	**Integrated Developer**	Independent developer and financer of non-domestic energy efficiency projects, in active competition with designers, engineers, and ESCO's. Operate primarily in the commercial sector using latest contract and financial mechanisms including the ESA.
9	EDF Energy	**ESCO**	Joint venture with the London Climate Change Agency set up in 2007 (called London ESCO) to design, finance, build, own and operate local decentralised energy systems for both new and existing developments. Rely mainly on CHP technology.
10	eeco2	**Consultant**	Energy management consultants that take a hands-on approach delivering energy monitoring and consulting services as well as Energy Performance Buildings Directive Compliance solutions.
11	E.ON Sustainable	**ESCO**	Provider of low carbon decentralised energy

	Energy Business		infrastructure and efficiency projects in partnership with Self Energy UK.
12	eSight	**OEM (BEMS)**	Energy management and metering provider, with web-enabled services based on data collection and analytics, as well as consultancy – offer three software package options.
13	EP&T	**OEM (BEMS)**	Founded in 1993, EP&T delivers cost and environmental savings to the commercial, retail, health and industrial sectors, transforming the way their clients manage their energy, water and waste using EP&T's unique EDGE technology. Provide a set of smart electricity meters and control systems.
14	Evolve Energy	**ESCO**	Provider of integrated energy solutions to private and public sectors, including energy procurement, metering and monitoring/targeting, bureaux services, energy performance contracts, integrated building management services, and carbon strategy.
15	Green Running	**OEM (BEMS)**	Founded in 2009, provide energy monitoring and management software and hardware tools to help businesses view and manage energy consumption and cost profile to instigate behavioural change.
16	Greenologic	**OEM (BEMS)**	Provide a range of domestic and commercial energy monitoring and management technology (main product: Wireless Energy Management Platform), operations commenced in 2011/12.
17	Hoare Lee Consulting Engineers	**Engineer/ Consultant**	Mechanical and electrical consulting engineers providing building information monitoring, design, project management, and operation/maintenance.
18	Honeywell	**OEM/ Consultant**	Offer integrated energy services systems and strategies to manage the interaction between supply and demand, and increase efficiency. Services include demand and supply management, energy asset management, and power generation.
19	Hurleypalmerflatt	**Engineer/ Consultant**	Monitoring and Evaluation consulting and building services engineers, specialising in mission critical design and implementation of engineering, energy, and sustainability protocols and systems.
20	IBM Global Business Services	**OEM (BEMS)**	Smart management and communications technology including hardware, software, and networking to optimize control and monitoring of energy assets.
21	Interserve	**Construction/ Consultant/FM**	Construction and support services company offering advice, design, construction, equipment and facilities management services to public and private sectors.
22	Johnson Controls	**OEM/ Consultant**	Provider of services and solutions to optimize energy and operational efficiencies of buildings, including control systems and smart management technology.
23	Just Energy	**Consultant**	Energy management consultancy serving commercial clients offering energy purchasing, energy management advice, landlord and tenant billing, energy budgets, billing validation, site surveys, advice on renewable and green energy.
24	MITIE (Dalkia FM)	**ESCO (FM)**	Provide outsourced multi-utility solutions including supply and management of water, electricity and gas, renewables, and emissions trading across commercial

			and industrial sectors. Fully integrated energy services provider with significant history in Europe.
25	Moixa Energy	**BEMS**	Design led R&D company focused on consumer energy, smart energy management, DC, and low power solutions.
26	M&C Energy Group	**Consultant**	Energy Management Consultants focused on energy procurement, compliance, and energy performance services (demand side management, investment appraisal, monitoring, targeting, and training. sustainability audit, and project implementation).
27	North Energy	**Consultant**	Midlands based renewables and sustainability consultants, formed in 1992, focused on commercial microgeneration installation services.
28	Schneider Electric – SBS	**ESCO**	End to end ESCO services including capital needs assessment, utility auditing, energy management strategy, project development, design, and construction, project finance, performance contracting, remote monitoring and control, serving primarily the public sector in the UK.
29	Self Energy	**ESCO**	Provider of decentralized energy systems as well as full range of ESCO services using performance contracts. Take a business/management oriented approach. Headquartered in Portugal with small team in London.
30	Retrostructure	**Consultant/ Integrated Developer**	Start-up provider of commercial energy efficiency retrofit projects including assessment, design, and project management services.
31	Wilmott Dixon Partnerships	**Consultant**	Capital works, regeneration and support services company with an energy services division focused on energy efficiency advisory and Green Deal support services.

10.5 SWOT Analysis

	Strengths	Weaknesses
Internal	1. Exposure to multiple growth industries with favorable political support. 2. Primarily service oriented in contrast to typical capital intensive ESCO's. 3. Contract term options from short term quick wins to full outsourcing and shared stakes contracts. 4. Multiple revenue streams spanning, services, products, trade, and finance. 5. Technology agnostic, remaining arms length from suppliers/ensuring best of breed fit-for-purpose products. 6. Transparent procurement management, tendering and tracking system ensuring utmost supply-side competitiveness.	1. Reliant on immature contract forms – both EPC and ESA requiring considerable legal expertise/cost. 2. Resource intensive business model, requiring expensive human capital to guarantee required unique expertise. 3. Reliant on immature monitoring and evaluation technology, especially emissions measurement systems. 4. Technology agnostic policy potentially reduces economies of scale. 5. Lack of consumer awareness and proficiency with technologies and support schemes. 6. Profit margins only make sense once Level Two solutions achieved.
	Opportunities	**Threats**
External	1. Development of demand response regulatory framework in Europe. 2. Significantly increasing carbon prices in Europe and UK, in accordance with DECC's forecasts. 3. Achievement of global climate change agreement and growth of international liquid carbon market. 4. Application of building retrofit regulations in the UK committing building owners to minimum energy performance standards. 5. Rising conventional energy prices spurred by fossil fuel supply shortages and geopolitical conflict. 6. Rising energy prices spurred by increasing cost of capital for power infrastructure building utilities.	1. Retraction of political incentives and finance programs, specifically Feed in Tariff regime and CRC Energy Efficiency Scheme. 2. Complexity and mismanagement of the CRC Energy Efficiency Scheme. 3. Budget constraints resulting from UK recession and further fiscal consequences of Eurozone crisis. 4. Collapse of carbon price in Europe due to over-supply of credits. 5. Breakthrough in large scale Carbon Capture and Storage (CCS) technology, reducing anti fossil fuel lobbying. 6. Breakthrough in nuclear technology, providing low cost sustainable power supplies.